

***Hand To Mouth:
Linking Spontaneous Gesture and Aspect***

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Contents

1. Overview	1
2. Motor Programs and Aspect	1
3. Gesture	3
4. Mappings Between Physical and Conceptual	4
4.1 <i>Thinking-for-Speaking</i>	6
4.2 <i>Motion Events</i>	7
4.3 <i>Iconicity</i>	8
4.4 <i>Metaphor</i>	10
4.5 <i>Growth Points</i>	11
4.6 <i>Force Dynamics</i>	13
4.7 <i>Conceptual Integration</i>	15
5. Aspectual Classes	19
5.1 <i>Perfective</i>	19
5.2 <i>Imperfective</i>	20
5.3 <i>Habitual</i>	20
5.4 <i>Continuous</i>	21
5.5 <i>Progressive</i>	22
5.6 <i>Stative</i>	23
6. Mirror Neurons	26
7. Evolution of Syntax	28
8. Data	29
8.1 <i>Perfective</i>	29
8.2 <i>Imperfective</i>	39
8.3 <i>Habitual</i>	39
8.4 <i>Continuous</i>	45
8.5 <i>Progressive</i>	57
8.6 <i>Stative</i>	60
9. Conclusion	66
10. References	76
(Appendices omitted)	

1. Overview

Spontaneous gestures sometimes bear an iconic relationship to the aspectual class of the linguistic expressions with which they occur. For example, long smooth gestures may accompany duratives (activities extending through time) while repeated beats may occur with iterated actions (activities having internal complexity). Because it has been proposed that aspect is related to motor programs for bodily movement in general, and brachio-manual movement specifically, this correlation becomes particularly interesting; one of the many functions of gesture may be a physical manifestation of the information which structures linguistic expressions. A connection between gesture and aspect would support the theory that conceptual systems can be grounded in motor schemas, and additionally, would provide further evidence for the embodiment of the mind and the cognitive unconscious, thus challenging traditional theories of language. Also relevant is the research of Rizzolatti and Arbib, who propose that the neural structures responsible for the production of action are also responsible for the recognition of action. They suggest an origin for interpersonal communication in a system which developed first manually, then came to include vocalization (1998). The notion that gesture was crucial to the development of speech has been postulated independently of the Rizzolatti/ Arbib work, perhaps most convincingly by Armstrong, Stokoe, and Wilcox (1995). This paper attempts to discuss the implications of these issues in conjunction with a detailed analysis of the connection between linguistic aspect and spontaneous gesture.

2. Motor Programs and Aspect

The claim that aspect is grounded in the motor programs responsible for bodily movement is based on the assumption that when two systems have identical organizational structure, principles of parsimoniousness dictate that they are likely to share much of their physical (neural) structure. The data which support this claim are largely a consequence of the work of Bailey (1997) and Narayanan (1997a).¹ Bailey set out to construct a model of a

¹ For a more detailed summary see Lakoff and Johnson 1999: 576-583.

neural network that would be capable of recognizing and executing verbs of hand motion (*squeeze, pull, etc.*). With Narayanan, Bailey succeeded in creating a model which, given an action, can name the corresponding verb, and given a verb, can perform the action. The development of a computational model which is consistent with human neural structure lends credence to the claim that there is significant overlap between conceptual neural structures and those which carry out actions. In other words, the semantics of the verb *push* may contain the same information (in terms of motor synergies) required for the action of pushing. This does not entail that the meaning and the action are the same: one can recognize (or understand) as well as produce the verb without the action.²

Narayanan then observed that all high-level motor schemas have one basic control system. This system reflects what we think of as event structure; when speaking of language event structure is known as aspect. Pursuing this line of inquiry, he constructed a computational model of verbal aspect which takes into account both the inherent semantics of the verb and the grammatical markers which modify that meaning, calling this an Aspect Processing Net (APN).

The core of Narayanan's model is the *controller schema*, which captures some of the properties of actions (or process primitives): *prepare, start, iterate, suspend, etc.* (1997b). These parameters provide for generalization over verb classes, and also make it possible to model the logic of aspect, including inferences about event structure. That is, if an action is ongoing it has not ended, if a goal has not been reached where a goal exists the action is ongoing or suspended. The controller features, or the parameters to which a given verb is set, do not themselves determine meaning: "As evidenced by the complications that arise even for simple states, aspectual composition is highly sensitive to constraints imposed by context and clausal elements" (Chang et al. 1998, 3). The controller, in combination with a particular verb's parameters, determines which possibilities are available. The model also

² Lakoff and Johnson draw a parallel between the operation of motor synergies during speech and during dreams (1999). Mental imagery, or motor synergies without accompanying actions, may also function in our ability to recognize the actions of others.

incorporates information about the consumption of resources during ongoing activities, which provides a treatment of telicity, as will be discussed below.

3. Gesture

In order to discuss gesture, it is necessary to introduce some conventions about classification and transcription. The examples which will be presented are from a series of video recordings made by Andrea diSessa of the Graduate Department of Education at U.C. Berkeley, as part of a study on naive understandings of physics (1996). My transcription and classification system is largely based on that of David McNeill (1992). McNeill describes four types of gesture: *beat*, *metaphoric*, *iconic*, and *deictic*. Beats accompany speech and are synchronized with it (although not necessarily perfectly). The form of the beat is generally the same regardless of the speech: one hand flicks up and down or back and forth, generally with a short, quick movement taking place wherever the hand happens to be. Beats are often used to mark rhythm. Iconics are representations of events or objects which are referred to in the corresponding speech. Their meaning is relatively transparent, as when a gesture of a fist moving in a circle at shoulder level accompanies a phrase about the motion of the Earth around the Sun. Metaphorics are gestures which depict concrete representations of abstract discourse topics. For example, a gesture in which the hands are configured as though holding an object and offering it to an interlocutor may occur when a new topic is introduced. Metaphorics are similar to iconics in that they represent a “picture”, but when an iconic occurs, the picture illustrates something concrete, whereas a metaphoric accompanies speech referring to something abstract. Deictic gestures are referential gestures, although they may refer to some metaphorical concept or entity not physically present. It should be apparent that this classification system is not intended to be exclusive; an iconic hand shape, for example, may be used to depict a metaphoric scene. The issue of the convergence between metaphoric and non-metaphoric gestures, however, is rather complex and will be discussed in greater detail below.

Transcriptions will have the following form: the utterance is broken into intonation units with the primary accent marked (^). Traditional transcription convention for pauses and unintelligible speech are followed.³ The portion of the utterance over which the gesture occurs is enclosed in brackets, with a post stroke hold being enclosed in curly brackets. The gesture is glossed beneath. In cases where more than two or three gestures occur within a single segment the gestures are numbered. LH refers to the left hand, and RH to the right hand, while BH refers to both hands. The hand shape descriptions come from ASL: a list can be found in appendix II. A diagram of McNeill's division of the gesture space can be found in appendix appendix I. The gesture space is described by a series of concentric squares the most central of which is the center center space (CC). The configuration of the hands is described by the orientation of the palms and fingers (P, F) where T is towards, A is away, and C, B,U, and D are center, body, up and down, respectively. For example:

there's air pressure at every ^point
 there's air pressure going the exact opposite way at every point ^too
 [so it all completely counteracts {and it doesn't..play}] a part.

BH CC LPTB/FTC, RPTU/FAB make three motions towards body and back out in 5 hands, not in synchrony, hold.

This would then translate to something like the following. Both hands are in the center center region of the gesture space, with the right palm facing the body and fingers pointing towards the center line, and the left palm upward with fingers pointed away from the body. The motion occurs over *so it all completely counteracts* while the hands are held over *and it doesn't..play*, then come down before the speaker says *a part*. These transcriptions are brief in the interests of economical presentation, but I have also included the detailed transcriptions for each example: these appear in appendix III.

4. Mappings Between the Physical and the Conceptual.

³ Cf. Edwards and Lampert 1993. (..) for a short pause, (...) for a long pause. <X X> for uncertain hearing, <X XXXX X> for unintelligible speech, where each X is a syllable. (()) for non-speech information, as in ((LAUGHS)).

Gesture provides a visual representation of mappings between schematic concepts and their linguistic referents. It is quite easy to take for granted the immense amount of conceptual work which goes into this process, but the insights into the mechanisms at work which can be gained are largely what makes the topic worth investigating! The following section attempts to describe some of the frameworks which make it possible to describe this process and to represent mappings between the form and motion of a gesture and the conceptual structure which underlies it.

4.1 Thinking-for-speaking:

Recent research on the relevance of gesture to the study of language and cognition has focused on the importance of gesture for understanding a speaker's strategies for encoding conceptual information in his or her particular language, or *thinking-for-speaking* (Slobin 1985, 1987). Thinking-for-speaking is an ongoing process whereby the speaker's conceptualization of an event or scene⁴ is expressed according to the parameters established by the speaker's language. As Slobin puts it, "Any utterance is multiply determined by what I have seen and experienced, my communicative purposes in telling you about it, and the distinctions that are embodied in my grammar" (1985, 73). Slobin raises the question of whether or not aspects of the conceptualized scene which are not expressed linguistically are nevertheless part of the mental image. He presents the following case: a scene from a picture book (Mayer 1969) is shown to speakers of English and Spanish. In this scene a boy falls out of a tree while a dog runs past (being chased by bees or wasps). An owl observes these two events. In Spanish the activity of the owl's seeing was described both as perfective and as imperfective, depending on the activity in the dependent clause:

<i>El buho vio</i>	<i>que el niño se cayó.</i>
The owl saw-PFV	that the boy fell-PFV.
<i>El buho veía</i>	<i>que el perro corría.</i>
The owl saw -IPFV	that the dog ran-IPFV.

⁴ I will use terms like *scene* or *image* to refer to conceptual information throughout this paper. I do not mean to imply that thought is necessarily imagistic.

In English we would use *saw* for both cases. If the subject's language offers the option for seeing to be durative one assumes that an ongoing activity of seeing is part of the mental representation of that subject. If *see* can only describe a perfective event, as in English, is the notion of an ongoing activity still part of that subject's representation or mental image?

I would argue that gesture can permit us to make judgements about which non-linguistic elements are part of the mental scene. For example, if we were to observe an iterative gesture with the perfective verb form *see* we might be justified in claiming that the subject construes the event not as a punctual *see* but as a durative *watch*. My intention in writing this paper is to argue that a holistic approach to the analysis of aspect, one which includes gesture as a source of information, can deepen our linguistic analyses by adding insight into construal of the contents expressed.

4.2 Motion Events:

Thinking-for-speaking is often discussed within the context of Talmy's *satellite-framed* and *verb-framed language* distinction (1985a). These terms refer to two ways languages differ with respect to the encoding of motion events. Within this framework, the conceptualization of motion events consists most simplistically of the following elements:

1. The *Figure*, or the moving object,
2. *Motion*,
3. The *Path* along which motion proceeds,
4. The *Ground* serving as a backdrop for the motion, and
5. The *Manner* in which motion proceeds.

In a verb-framed language, such as Spanish, the verb encodes Path information, while Manner information must be specified with an adjunct. In a satellite-framed language (e.g. English) verbs encode Motion and frequently Manner, but Path is specified by an argument of some sort. An example of the former would be Spanish *sale volando* - "exit flying" (Path + Manner) and of the latter, *rolls down the pipe* (Manner + Path) (McNeill and Duncan 2000).

This picture of conceptualization can be elaborated by considering gestural information. The gestural representation of motion events differs from the linguistic

representation: unlike language, gesture is not required to be linear (one word at a time), but may present a holistic (or global) conceptualization of an event or scene. This seems a simple enough claim, but how is it that we can interpret such scenes? What exactly is the nature of the information conveyed in gesture?

4.3 Iconicity:

One of the mechanisms through which gestures are interpretable is *iconic mapping*. An *icon* (in the sense of Peirce's⁵ classification of *sign-referent relations*) is a sign which is related to its real-world referent through physical resemblance, thus *degree of iconicity* (Bates et al, 1979) may be used to describe the variation in the number of attributes shared (or the degree to which a particular attribute is shared) by a vehicle and referent. Gestures are typically recognizable as iconic only if one has knowledge of the topic of conversation. That is, because the same hand shape or trajectory of motion may be mapped onto a number of very different schematic scenes contextual information is required in order to understand exactly what is being mapped onto the hands. Sarah Taub provides a detailed treatment of the issue of iconicity and metaphor in American Sign Language and in gesture, a small portion of which will be repeated here (1997, 2001).

A *mapping* refers to a perceived resemblance between aspects of the hands and some referent. This resemblance is based on the preservation of shared features, with the degree of iconicity being progressively higher the more shared features are preserved. The recognition and extraction of features is, of course, determined by the way we categorize and conceptualize objects and events. One of the postulated cognitive mechanisms which governs these processes is the *image schema* (cf. Brugman 1981, Talmy 1983, Lakoff 1987). Image schemata are abstract representations of generalizations over our experiences. For example, a *container schema* characterizes our knowledge about containment (including

⁵ As discussed in Bates et al.1979. The three categories are *icon*, *index* and *symbol*. An *index* is a class of sign related to its referent through some physical "participation in the referent object-event," the example given being smoke as an index for fire (1979, 47). A symbol, however, is related to its referent through convention alone. Some gestures are conventional in this sense; Kendon (1988) refers to these as *emblems*.

notions of boundeness, enclosure, etc.). Other examples are the *part-whole schema* and *source-path-goal schema*.

Another cognitive mechanism believed to be at work is the *frame* (Fillmore 1982). Frames are abstract representation of events which have slots for the various participants: a *ball tossing frame* would minimally have a slot for the person tossing, the ball itself, and the act of tossing. Frames and image schemata can be said to characterize our expectations about the world, and thereby enable us to extract features such as containment, agency, or directed motion, and generalize across domains. In other words, the correspondences we perceive between the gesture and its referent enable us to fill out our schematic mental model of the event.

In the case of a fist which represents a ball, the shape of the hand maps onto the shape of the ball. The correspondences being preserved are the spherical outer curve and the inner solidity (a *shape for shape* mapping). The arm extending from the hand is not part of the mapping because, in comparing the shape to our mental model of the scene, we know there is no arm growing out of a ball (thus there is no correspondence to be mapped). Shape can also be depicted by using the hands to trace the outline of an object: a hand moving in a circle can represent a circular object, in which case the motion of the hand maps onto the shape of the object (*path for shape*). Motion can also represent motion, as when an object's physical trajectory through space is partly depicted by the movement of the hand (the hand shape is often part of such mappings, combining motion for motion and shape for shape).

The space between the hands can also represent an object, requiring the observer to complete the schematic mapping (the space maps onto a physical object in the schematic scene). The motion of the hands in combination with their shapes can map onto a scene in which the hands are interacting with an object, where the object is present only in the mental model of the scene. The space between the hands may also represent a physical area of space, but perhaps more often the use of space is metaphorical.

4.4 Metaphor:

Conceptual metaphor of the sort which motivates the mappings described here can be defined as the regular use of a concrete domain to describe abstract concepts. For example, the domain of vision is systematically used to describe the domain of knowledge, as in *it's clear to me now, I see your point*, etc. This metaphor is known as Knowing is Seeing (Lakoff and Johnson 1981, 1999). In the example of a metaphoric gesture mentioned on page three, a new topic of conversation was presented as an object. The metaphor involved in this example is Ideas are Objects, one of the entailments of which is that communication is transferring an object from one person to another (Lakoff and Johnson 1981, 1999). This is regularly depicted by gesturing in the space in front of the body with both hands palm-up. This gesture requires a mapping from the space between the hands to a frame in which an object is offered to someone. Following Taub's double mapping convention (1997, 2001), some of the correspondences are represented below:

Iconic		Metaphoric
Articulators	Source	Target
Space between hands	Object	Idea
Motion	Presentation	Communication

Here the iconic aspects of the gesture are described by the mappings from the articulators to the source domain of the metaphor (a concrete domain). The metaphorical aspects of the gesture are described when the target domain mappings are added; in this fashion a full description of the relationship between the hands and an abstract domain such as discourse can be characterized. Lakoff and Johnson (1981, 1998) provide a detailed discussion of the topic of conceptual metaphor but I will briefly describe some of the more common metaphors which will arise in the analysis of the gestures below. Sweetser (1987, 1992, 1998) points out that both mental states and thought are often conceptualized in terms of metaphors for ideas as objects (Ideas are Objects), and both domains share the metaphor for mental activity or thought as travel (metaphorical motion through space: Thought is Motion

on a Path). Thus gestures about thinking or understanding may involve motion as well as treating ideas as objects.

The space between the hands can also be used to represent time: time is regularly metaphorically construed as space (Lakoff and Johnson 1987, 1999). In the metaphor Time is a Landscape the observer moves through or over time (*we're coming up on Christmas*), but time can also be conceptualized as moving itself (the Moving Time metaphor: *Christmas is coming up soon*). As well as being an area of space, the landscape may be represented as a smooth line extending through space, or as points on a line, where each point is a moment.

Just as motion can be used to represent change in physical location, so it can be used to represent change in state by means of a metaphorical mapping. Through what Lakoff and Johnson (1998) call the Locative Event Structure Metaphor, a state is seen as a bounded region in space. Change in state is seen as movement into or out of this region (change in state is change in location). Causation is forced movement into or out of the region, and purposes are destinations. While the mappings of this metaphor are quite detailed, these few should suffice to suggest the ways in which the metaphor permits emotional or mental events to be conceptualized in terms of motion through space. This conceptualization manifests in gesture when we map the space between the hands onto a bounded region, or the motion of the hands onto a change of state, or the force dynamic interactions of the hands onto this schematic representation of causation.

One final metaphor which manifests in gesture in several different ways is an extension of the metaphor described by Grady (1997) as Abstract Structure is Physical Structure. This metaphor is evident in, for example, a gesture where the speaker tilts her hand back and forth to indicate uncertainty. Here the lack of stability of the hand's motion is mapping onto the "shakiness" of the argument she is proposing. Abstract structure treated as physical structure can also be seen in the use of spatial axes to represent conceptual scales (understanding, resource usage, etc.)

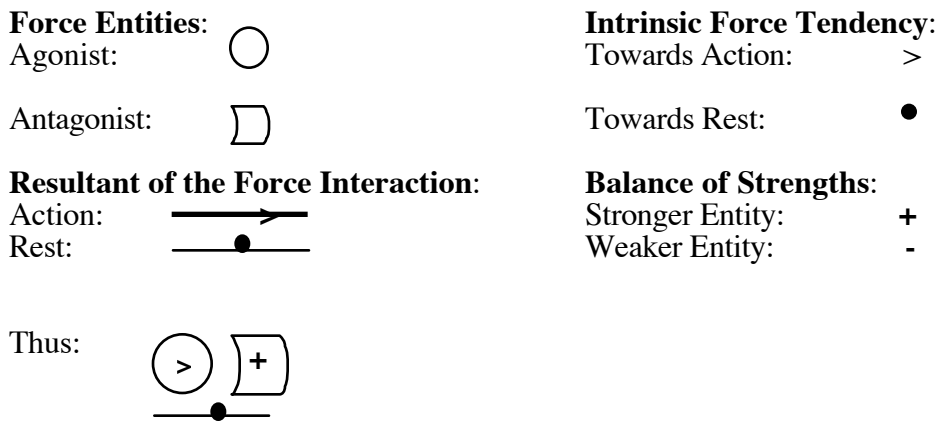
4.5 Growth Points:

Much current work on gesture has focused on the analysis of both modalities (spoken and gestural) as a method of exposing both cross-linguistic differences and commonalities in thinking-for-speaking (*cf.* McNeill and Duncan, 2000). The substantial variance in the information encoded in speech suggests that languages do indeed differ with respect to the parameters within which conceptual information can be expressed. It is likely, however, that both gesture and speech need to be considered in tandem in order to fully understand how much information is being conveyed. The issue of whether or not gesture is communicative is a source of considerable disagreement among researchers. For this particular question such a debate is irrelevant. Regardless of whether or not a gesture is "intended" to communicate and regardless of whether or not it conveys information in a normal discourse situation, gesture can unquestionably be used by an analyst as a source of information, information which is often complimentary to that conveyed in speech. Furthermore, the fact that gesture-to-speech mappings vary may be evidence that gesture and speech are separate, but simultaneously extant, representations of conceptual information. They are fused in what McNeill (1992) calls the *growth point*, a unit which is neither linguistic nor imagistic, but common to both. Growth points can be determined by looking at gesture-speech synchrony. The stroke (or primary motion) of a gesture generally occurs with the prosodic peak of the speech, and usually provides information about which aspects of the scene are incorporated into the growth point. For example, in one segment speech about the interviewer's meaning is accompanied by a gesture which depicts an ice skater's motion (discussed in example 8.3.12). The claim would be that both the interviewer's meaning and the ice skater's motion are part of the growth point of this expression.

4.6 Force Dynamics:

Another highly relevant framework is Talmy's semantic category of *force dynamics*, or "how entities interact with respect to force" (1985b). Talmy sets out a basic matrix

wherein the interaction between the *Agonist* (focal force entity) and the *Antagonist* (element opposing it) is summed. The Agonist has a basic tendency either towards rest or towards motion, and it may be weaker or stronger than the Antagonist. If the Agonist has a tendency towards rest and a stronger Antagonist overcomes this tendency, a causative results (*The wind blew the wombat off the wall*). If the Agonist is stronger, we get something of the *despite* category: the Agonist remains still despite the force acting against it, as in *man remained upright despite the wombat's charge*. The despite category also covers cases in which the Agonist's tendency is towards motion and it is stronger than the Antagonist (Agonist moves despite Antagonist's attempt to prevent it: here the Antagonist is a hindrance), as in *The ball kept rolling despite the stiff grass* (1985b). If the Agonist has a basic tendency towards motion but the Antagonist is stronger, we get a causative type again, what Talmy calls the "extended causative of rest" (1985b). In this case the Antagonist blocks the Agonist as with *the log kept lying on the incline because of the ridge there* (1985b). These concepts are graphically represented as follows (after Talmy1985b).



Here the Agonist's force relative to the Antagonist's is less, as in the above sentence *the log kept lying on the incline because of the ridge there*, where the log is the weaker Agonist with a tendency towards action, the ridge is the stronger Antagonist with a tendency towards rest therefore the result is rest.

Talmy points out that force-dynamic scenes represent one of the most fundamental ways that humans organize information, and, unlike other semantic categories, are related to

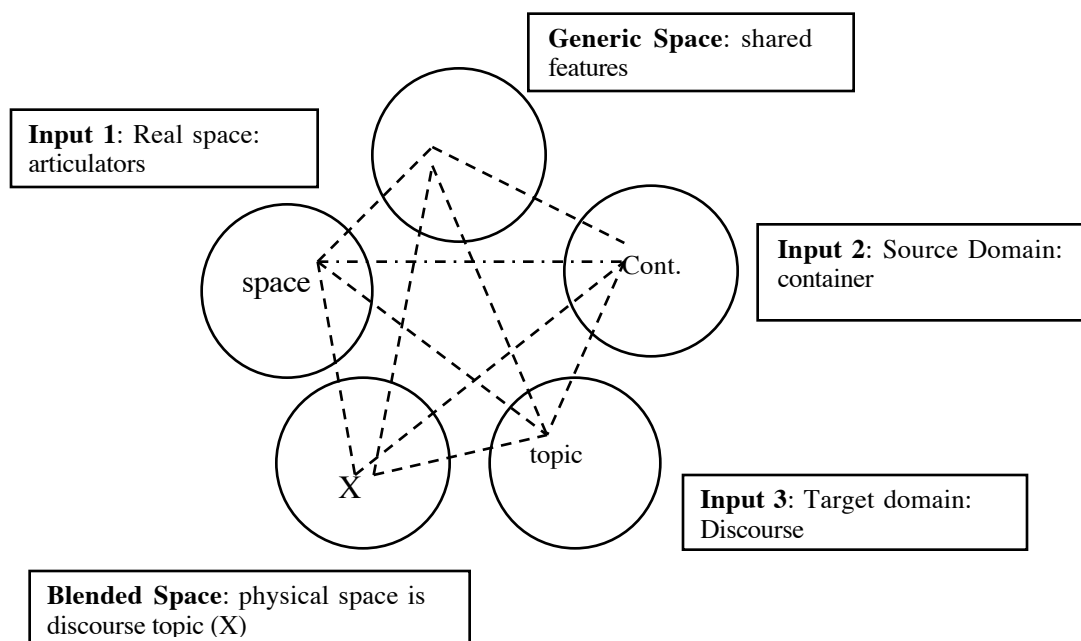
our kinesthetic system. The force dynamics framework is clearly critical to the analysis of gesture: the hands may not always be in opposition (although this frequently occurs), but one hand is often acting as an Agonist or an Antagonist. Furthermore, because force dynamics underlie our basic understanding of physics (Which is particularly relevant to the data used in this paper!) they also, through metaphorical extension, underlie our understanding of psychological and social dynamics. Thus force dynamic scenes occur not only in the depiction of objects and their actions, but also on the level of the speech interaction.

4.7 Conceptual Integration:

Mappings between physical forms and their referents can be represented in a number of ways, but one of the more efficacious means is the *mental spaces* framework (Fauconnier 1994, 1997). This framework was originally constructed in order to account for ambiguity in reference in cases such as, for example, *Shakespeare is bound in leather*, where the referent of *Shakespeare* is a volume of the works of that person and not the man himself. A mental space is, most simplistically, a partially structured mental model. Connections between multiple spaces permit various types of mapping between roles and values in those spaces, thus in the case above there is a mapping between the writing (the *trigger*) and the author of the writing (the *target*). In gesture the use of physical space complicates the picture. The hands may be used to create areas in space which are simply physical, as when a gesture where both hands come down with the palms facing each other occurs with an expression like *this part right here*. More common is the situation in which the referent of the space created by the hands is an abstract one, as with the treatment of a new topic as an object. In fact, different discourse topics are often represented as different areas of space in front of the speaker's body. To illustrate, in one example the expression *I'm used to doing well* is accompanied by a gesture where both hands with the palms down define a physical space to the right of the speaker's body. This physical space maps onto a metaphorical space made up of a number of instances of good performance (discussed

further below: see example 8.2.1). Scott Liddell (1998) has developed an insightful analysis of the relationship between Real Space (the mental representation of the physical elements of one's immediate physical environment) and referents in the speech interaction. Liddell points out that a speaker's use of his or her physical space or surroundings to represent some entity in the discourse creates a *blend* of different mental spaces, in the sense of Fauconnier and Turner's (in press for 2002) *blending* or *conceptual integration* model. An important element of the blend is the *generic space*, which is the locus of shared features (perceived similarities) that permit cross-space mappings. The example above can be depicted as follows, using the conventions of the blending model in conjunction with Taub's double mappings.

Iconic	Metaphoric	
articulators	Source	Target
Space between hands	Container/region	Repeated instances of an event as conceived of as a unit
Motion	Placement of container	Introduction of topic
Location with respect to speaker's body	Location of container with respect to other containers	Relationship of topic to other topics



Here Real Space (which corresponds to the articulator mappings) and the source and target domains of the metaphor all serve as inputs to the blend. While this example is vastly simplified, it should make clear that this framework has obvious benefits in terms of being explicit about the relationships between the various sources of conceptual information.

5. Aspectual Classes

The category of verbal aspect has inspired an alarming amount of scholarly research and an equally alarming wealth of debate, thus care must be taken to establish distinctions among aspectual categories as they will be used here (with no general claims being made about the reality of this particular set of categories). Before attempting to describe these categories, it must be pointed out that aspect is a product of a combination of elements including (at least) the lexicalized meaning of the verb, and its arguments. The lexicalized meaning of the verb is generally referred to as *aktionsart*. Comrie describes aspect as a grammaticization of the semantic distinctions among verbs, and *aktionsart* as a lexicalization of these distinctions (1976). For example, in English we have different lexical items to express the aspectual difference between *hear* and *listen*, while in another language this may be expressed with grammatical marking. Or, as a somewhat more complex example, Russian has the imperfective⁶ form *slushat*, meaning *to listen* and the perfective form *poslushat*, meaning *to obey*. In addition, there is also the imperfective *slishat*, *to hear*, and the perfective *uslishat*, *to notice*. In this case, the difference between *hear* and *listen* is one of *aktionsart* as well as aspect, while the difference between *listen* and *obey*, or *hear* and *notice*, is one of aspect.

⁶ The categories of imperfective and perfective are used here in a language-specific sense as Russian has a somewhat more specialized system of perfectives and imperfectives.

The verb's arguments have a great deal of influence in determining the aspectual value of the predicate; for example, the difference between the acceptability of the following pairs is due to the construal imposed by the subject:⁷

The wombat runs from here to there.
The wombat is running from here to there
The river runs from here to there.
**The river is running from here to there*

Similarly, the object or adverbial modifier which occurs with a verb will constrain the interpretation, as in:

The wombat ate for an hour.
**The wombat ate in an hour.*
The wombat ate the cake in an hour.

The entailments of these propositions are quite different as a result of the type of action described and the object of that action. Clearly aspect requires an understanding of some of these distinctions.

The model offered by Vendler establishes four categories of predication (1967). Vendler first divides predicates into those which have a "continuous sense" and those which do not. Those which do are *activities* and *accomplishments*. These differ according to whether or not there is a natural boundary to the process, or whether it may terminate at any time without any effect on the truth conditions of the predication. For example, an activity like *drawing* may go on and on: if at any point one were to stop it could still be said that one had drawn. *Drawing a wombat*, however, is an accomplishment. It cannot reasonably go on forever and if one were to be stopped at some early point in the process one could not be said to have drawn a wombat.⁸ This distinction corresponds to the classic differentiation between atelic (having no notion of closure) and telic (having natural boundaries) predicates. Those predicates which do not have a continuous sense are *states* and *achievements*. Achievements occur at a particular instant within an interval and include predicates like *reach the top* and *win the race*. States, such as *know*, *love*, *understand*, and so on, do occur

⁷ Langacker (1991) insightfully analyzes this phenomenon as *subjective motion*, cf. also Chang 1997.

⁸ The specific point in the process at which one would have to be interrupted, and the question of what the thing one has drawn can be said to be, are the subject of interesting discussion, e.g. Parsons 1989.

over a period of time, but are predicated of any instant in an interval, not of an interval. States and activities are alike in that they share the notion of internal homogeneity (thus any instant of knowing or walking will be like the previous one).

These distinctions among predications are often spoken of in terms of *event* (telic, bounded in time, thus achievement or accomplishment), *process* (ongoing activity) and *state*. Such divisions are not absolute, as any situation is subject to a number of different construals. That is, a process can be converted into a state by removing the element of change over time, as in *I open the door* versus *the key opens the door* (Chung and Timberlake 1985). Similarly, a state can become a process if there is some notion of change over time, as with *I understand*, but *I am understanding better all the time*. Chung and Timberlake (1985) cite several features of predicates which determine their interpretation, namely dynamicity (change over time), closure (boundedness in time, or telicity), iterativity (repetition), and durativity (extension through time).

Features like these map nicely onto actual observable features of physical motion: gestures can define bounded areas of space, display iterative motion, and so on. This raises two questions. The first involves the distinction between grammatical aspect and the aspectual structure inherent to gesture, which is independent of any utterance. That is, if aspect is “the pattern of distribution of action throughout time” (Talmy 1985a), it is possible for an expression to be classified quite differently according to its gestural aspect and its grammatical aspect. My approach, however, has *not* been to analyze the two as distinct phenomena. What is relevant for the consideration of aspectual class here is not so much grammatical aspect, but the ways in which the inherent lexical meaning of a verb or predicate (aktionsart) are incorporated into a particular construal of a scene. This should be reflected both in the grammatical aspect of an expression, and in any event-related gesture which accompanies it. Thus, my claim is that gesture and aspect are two instantiations of a particular construal of a conceptual scene: instantiations which will be related only inasmuch as both have a single source, the growth point.

The second question raised by the correspondence between features which are visible in gesture and which are also used in the classification of grammatical forms is the sort of framework which can best capture such similarities. Nancy Chang (1997) argues convincingly for the necessity of using frameworks from within the cognitive linguistics tradition: for aspect, she points out, the Cognitive Grammar framework (Langacker 1991) is particularly apt. Chang uses Cognitive Grammar to extend the computational model of aspect described earlier (Narayanan 1997b and Chang, Gildea, and Narayanan 1998) to the sentence level. Some of the key ideas from Cognitive Grammar, and their incorporation into Narayanan's APN (Aspect Processing Net) model, are as follows.

Within this framework a verb is considered a *process*. Processes may be *internally homogeneous*, meaning that the component phases of the process are essentially interchangeable, or they may be *internally heterogeneous*, meaning that there is some difference between each component phase. In the APN, component states correspond to different *markings*. In the network a current state has information about (or is a product of) the previous states: this permits inferences over the event as a whole. Take, for example, the predicate *wash the wombat clean*. The wombat must be in a state of cleanliness in order for the process to end, thus each state must have information about the current level of cleanliness.

A process may be *temporally bounded* or *unbounded*. Within the network, boundedness is equivalent to the presence of a *done* transition node, thus making it possible to distinguish between *wash the wombat*, an activity, and *wash the wombat clean*, an accomplishment. The *done* transition specifies that the result obtains only if the goal has been reached, permitting inferences about the telicity of an event. Not all telic processes are perfective, however. It is possible for the internal complexity of the process to be profiled, in which case it is not construed as a unit, and therefore not perfective. A key element of such processes in the APN model is *energy consumption*. The depletion of resources can also force a telic construal, as with *walk to the park*. Carol Tenny (1995) offers an insightful

analysis of predications (classed generally as *measuring-out* verbs) like *wash the wombat clean, eat the cake up, walk to the bridge*, etc. In the interest of brevity I will merely say that such modifiers (a state such as *clean*, an object like *cake*, or a path such as *to the bridge*) can be treated as resources, which are consumed in some sense.

Using the criteria discussed above to evaluate the forms under discussion, we can now turn to a description of the aspectual classes which will be used in this paper.

5.1 Perfective:

Perfective events are those which describe completed actions. Such events are typically accomplishments and achievements. Perfectives describe situations changing through time (heterogeneous) which are temporally bounded, but they are construed as units rather than as internally complex (Langacker1991).⁹ The following is a gestural example of perfectivity.

(J2.b:18)

going [I ^learned] something
you know
I didn't ^know that before

BH come up PTU/FTU CC in relaxed claws, and down emphatically in front of body.
Presenting motion.

The presenting gesture is often perfective. Conceptualizing an event as an object which can be set up in the space in front of the speaker entails that the event is construed as a bounded unit. In this case the fact that the speaker learned something, an event, is conceived of as an object.

5.2 Imperfective:

Imperfectives are temporally unbounded and viewed as internally complex. That is, perfectives profile the completed process (by including the endpoints within the scope of predication) whereas imperfectives profile the component phases of the process (Langacker

⁹ Langacker cites the classic criterion for distinguishing perfective from imperfective in English sentences describing present actual actions or situations: perfectives occur in the progressive and imperfectives in the simple present. He also points out that some verbs and verb forms can be used perfectly or imperfectly: *Roger likes his new teacher / Roger likes his new teacher more and more every day* (1991), although *Roger is liking his new teacher more and more* is also possible here.

1991). The exact construal of the internal structure of the process permits a further subdivision into habitual, continuous, progressive, and stative.

5.2.1 Habitual:

Habitual makes reference to the distribution of a particular sort of event. The event usually involves several instances of the same situation, as in *I wash my wombat on Sundays*. Because multiple instances of the same event can be construed as a unit, a habitual can also be a situation characteristic of an extended period of time. Because habitual events can be both punctual (*drop my knitting every time I see that wombat*) and durative (*sleep all day once a month*), habituality must be distinguished from iterativity, which refers to repeated instances of an event, as in *coughed five times* (Comrie 1976). The event described by *cough* is not only bounded, but also punctual, what Talmy refers to as a “full-cycle” verb, akin to *hit* or *flash* (1985a). When a series of episodes or iterations of *cough* takes place, the event may be construed as a unit. This does not make it habitual despite the fact that it is the repetition of an event. In general, habitual processes are either states or activities.

(J4.a:04)

because it's [easy {when you're talking about a ^ball-
If you're ^running}] with a ball

L comes up, moves from CC to LC PTU/FAB, holds.

The speaker is talking about a general situation when a ball is the object of analysis. This general situation is depicted by the hand's sweep to the left. The hand's motion through space maps on to an extension through time. In this case the multiple instances of the same event are mapping on temporal continuity: any point in time on the line corresponds to a talking-about-a-ball event.

5.2.2 Continuous:

Continuous events are construed as homogeneous but dynamic. In such situations the phases of the state are construed as uniform, but internally structured (Comrie 1976). Continuous events are typically activities. Continuous verbs may be either multiplex, as with

breathe or *beat*, or steady state, as with *sleep* or *carry* (Talmy 1985a). As Chang et al. point out, continuous processes usually involve resource consumption (1998). This entails that most continuous events will have a natural end, but these ends differ from the goals of telic processes, which establish prespecified ends.

(J4.a:27)

and [^]so
the whole [[^]time
the water's [^]pushing] back the same-
with the same [^]force
or the same-
it has the same momentum counteracting

L in L-like hand, PTB/FTC, CC, makes two motions to the right.

This expression is classed as continuous because the water's action against the object is an ongoing dynamic situation, but not a telic one. The left hand maps onto the force of the water, and its repetitive motion maps onto continuity through time (repeated instances of the same event are seen as durativity).

5.2.3 Progressive:

Progressive situations are ongoing or continuing processes in which the individual components (sub-events or situations) are essentially different from one another; progressives are characterized by change over time towards some goal. Progressives are usually telic, that is, the activity is understood to end when the goal is reached. According to the APN model, progressive reflects an ongoing process in which resources are being depleted. Clearly the category of progressives here does not include many English forms which are grammatically progressive: by progressive I mean only those ongoing processes which involve progress towards a goal and suggest change over time: this may be movement towards a physical goal or change eventually resulting in an end-state which is different from earlier states. Progressives may be either activities or accomplishments, but critically not states.

(J1.b:6)

Think through things and I [^]bounce things off each other
[^]Instead [of like thinking through the whole thing in my head] 2

And saying
^okay here's the answer

R comes up to near shoulder level (RC) PTB/FTC, makes two circular motions towards head, comes down.

This expression is classed as progressive because the situation described is ongoing and internally complex, as well as having a natural end. The telicity of the event is a product of the thinker's ability to arrive at a solution. While *thinking* is not telic nor even necessarily progressive, the *through* of *thinking through* suggests that the thinking process is construed here as a metaphorical path which has an endpoint (Sweetser 1992). Arriving at this endpoint is of course also metaphorical. The argument *the whole thing* contributes to this construal, as it makes explicit the fact that the thought process, although ongoing, is metaphorically conceptualized as a bounded unit (an object). The corresponding gesture is iterative, referring to the iterated stages involved in thinking through something. These stages are construed as similar, while the end state or the conclusion reached by thinking is distinct. There is also some iconicity involved in the location where the gesture occurs, in that the head is viewed as the place where this process is carried out.

5.2.4 Stative:

A stative is construed as having no energy input: the state will continue unless something happens to alter it. In general, statives have no agent. In force dynamic terms a stative situation might involve an Agonist with a basic tendency towards rest. Some of the classic stative verbs are *know*, *love*, *have*, and *believe*. As discussed above, statives cannot appear in the progressive but processes can be construed as states if the sense of change over time is not profiled (Chung and Timberlake 1985). Similarly, states can be construed as processes if the construal invokes change over time. In addition, some states which describe locations may appear in the progressive if they are assumed to be temporary, as with *the wombat is lying on the sofa* versus *New Orleans lies on the Mississippi* (Chung and Timberlake 1985). Below is a gestural example involving a stative process.

(J1.a:10)

^No
^yeah.
^That's just general knowledge, [I know that's right
and] the twenty-four ^hours thing...

L moving from L hand into G hand PTB/FTU makes two circles LUC with index pointing up, moving away from body to left, then towards body to right. After second circle index goes to mouth (*and*).

This utterance is classed as stative because the speaker is referring to a static source of background knowledge upon which she is basing her argument. *No, yeah* suggests a certain degree of uncertainty. The cyclic gesture refers to the metaphorical notion of this thought process being a journey which ends in the same location as the one in where it began. This construal makes use of a metaphor for causality in which a change in state corresponds to a change in location (the Locative Event Structure Metaphor described earlier). In other words, the speaker is uncertain, hence the *No, yeah*. She thinks about the situation again and decides she is correct, thus she returns to the original state. The location in which the gesture is performed may be an artifact of the local resting point established near the speaker's face, or it may have to do with a metaphorical understanding of knowledge as being contained in the head, as above.

6. Mirror Neurons:

One basis for a correspondence between manual and linguistic expression is suggested by the research of Rizzolatti and Arbib on *mirror neurons* (1998). Mirror neurons are a set of neurons, located in the rostral part of the monkey premotor cortex (area F5), which discharge both when the monkey performs an action and when it observes an experimenter performing what the researchers term "a similar gesture".¹⁰ Rizzolatti and Arbib propose that mirror neurons are responsible for the mental representations of actions relevant both for imitation and understanding. "Understanding" here refers to "the capacity that individuals have to recognize that another individual is performing an action, to

¹⁰ Since the neurons demonstrate differing degrees of specificity a similar gesture appears to be intended as a maximally general term covering a variety of cases.

differentiate the observed action from other actions, and to use this information to act appropriately” (1998, 189).

There is limited evidence indicating that humans also have a mirror system linking action performance and action recognition. The human homologue to the monkey area F5 is generally agreed to be Broca’s area: F5 is thought to be responsible for hand movements and Broca’s area responsible for speech. In fact, the motor functions of Broca’s area extend beyond the movements of the mouth and larynx: Broca’s area also becomes active during mental imagery tasks involving hand grasping movements, as well as during mental hand rotation tasks. According to Arbib and Rizzolatti, the parallels between these two areas suggest that their respective functions are different aspects of the same phenomenon: communication. When we are about to execute an action, or when we observe the execution of an action, premotor areas are activated. While we are normally prevented from carrying out the action through inhibition, there are situations in which our attention is concentrated on the action we are observing to such a high degree that we do exhibit part of the motion.¹¹ Arbib and Rizzolatti term this reflexive movement a *prefix* (1998). They propose that intentional communication developed out of the exhibition of prefixes, which represent a direct link indicating a psychological state shared by two individuals: “The actor will recognize an intention in the observer, and the observer will notice that its involuntary response affects the behavior of the actor” (1998, 191).

In order to account for a transition from the prefix stage to language, Arbib and Rizzolatti describe a “prelinguistic grammar” consisting of action frames with slots (*case* or *thematic roles*, based on Fillmore 1968). The two frames discussed are the imperative and the declaratives frames (these terms do *not* refer to the linguistic representation but rather refer to the action involved). The imperative frame consists in a specific type of action and the object on which the action is performed (e.g. *pick up, ball*). A generalization is made over a particular type of action and the set of noun phrases which can be the object of that

¹¹ A few contexts in which this occurs are in sleep, when watching television and playing video-games, or viewing sporting events.

action. That is, a class of items can be grasped with a particular type of grasp (*grasp, raisin*, but not **grasp, wombat*). “As actions become more refined and as the transition to language occurs, the constraints on slot fillers might become more rigorous. From this it follows that if the same principle holds for linguistic commands as for motor commands, Broca’s area would code for ‘verb phrases’ and constraints on the nouns that can fill the slots” (1998, 192).

According to Rizzolatti and Arbib, imperatives are handled by non-mirror F5 neurons because imperative structure has to do with the performance of an action rather than the observation of an action. Strangely, this approach does not seem to take into account the role of the agent in the performance of the action - even if one considers the action as something abstracted away from any linguistic utterance. When one is ordering someone else to perform an action the agency of that person is fairly salient. Presumably the authors mean that it generally not necessary to specify whom the agent should be, the very reason why the subject is implied rather than overt in so many instances of the imperative. In this model declaratives do focus attention on the actor, thus there is a slot in the frame for the agent as well as for the action and object acted upon. Declaratives are therefore handled by the F5 mirror neurons.

The key idea is that our ability to recognize the actions of others (through the mirror system) and link these actions to our perceptions by way of imitation, developed into a manual communication system which only later became vocal. Interestingly Elizabeth Bates notes that children by around the age of nine months seem to have developed similar mechanisms for social interaction, which she refers to as *protoimperatives* and *protodeclaratives* (1979). The protoimperative is exemplified by a child directing an action at an object, or the *person-to-object sequence*. In her example a child requests her father to open a purse by placing the purse in his hand, pointing and making small noises. This behavior, however, is aimed at the adult rather than object itself. That is, while the child is not pointing at the father, than at the purse, she is certainly interacting with him, and not with the

purpose. This again suggests that agency is relevant to any sort of imperative structure, however divorced from language. Of more importance than the exact form of this purely hypothetical pre-linguistic grammar is the potential for the hands to image-schematically depict primitive scenes which can be generalized over. This notion remains intriguing, as does Rizzolatti and Arbib's account of the interpersonal emotional connection which provides for a bridging of the gap between individuals.

7. Evolution of Syntax:

The proposal that a gestural communication system preceded or was contemporaneous with vocal communication is laid out in great detail by Armstrong, Stokoe, and Wilcox (1995). The crucial feature of gestural communication which makes it an ideal transitional system is its ability to be iconic. Iconicity, they argue, does not indicate that a system of communication is not sufficiently abstract to be considered language. Instead it is a critical factor in concept formation. "Not only do visible gestures, whether of sign languages or not, often resemble what they signify, they are also likely to have originated because a two-legged primate with hand-eye coordination ...suddenly or gradually discovered that certain actions observed were, and others could be, mimicked with manual-brachial actions" (1995, 22). This account provides a method whereby syntax could have evolved incrementally. Because of the salience of the hands as active, manipulatable physical entities, the actions of the hands can be characterized as prototypical "things"¹² and their movements as actions in the world. That is, one hand gripping a finger of the other hand can come to represent a number of schemata, all of which share the element of grasping.

Armstrong et al. cite two kinesthetic models developed by Langacker to characterize basic conceptualizations of events, the first of which is the *billiard ball model*. This model is ultimately force dynamic, having to do with the locations and movements of physical objects, and the consequences of their interactions. The decomposition of events into

¹²A physical object. Langacker (1991) makes an important distinction between a prototype and an abstract schema. His technical use of the term *thing* (a region in some domain, bounded in the case of count nouns) includes prototypical things but is abstract enough to include other entities as well.

entities, the roles and frames which those entities fill, and their interactions, provides motivation for a rudimentary sort of valence. This valence structure could give rise to syntax by motivating relations between the forms which express the semantic roles such as agent, patient, etc. Langacker refers to these as *role archetypes*, on the grounds that they are cognitive primitives which are nonlinguistic in origin. Langacker's second model ties in nicely with Rizzolatti and Arbib's claims about the role of the observer in the development of language. This is the "stage model" (Langacker 1991), wherein an external viewer observes the action of objects (presumably the observer is also present in the billiard ball model, but this is made explicit here). These two models provide two construals of a scene, one of which is akin to the imperative situation described above, in which actions are performed, and the other of which is analogous to the declarative situation, in which action is observed.

The proposal that language had a manual expression before it could have had a vocal expression has some anatomical basis as well. Broca's region, and the large brain in general, are believed to have been present in *Homo Habilis* (two million years ago) while the vocal tract of the anatomically modern human is supposed to have developed gradually between *Homo Erectus* (one million years ago), and *Homo Sapiens* (present-day human) (1995). As they put it, "Explaining the large size of the brain and its staged increase prior to the appearance of anatomically modern *Homo Sapiens* before the upper Paleolithic is a major problem for those who believe that syntax arrived by mass mutation at that time" (1995, 24). If language began with a primarily manual form it is not difficult to see how it might have come to be accompanied by vocalization, nor is it impossible to believe that the manual modality might never be entirely abandoned. While speech is more efficient for communication with an interlocutor who is not visible (one who is at a distance, obscured, etc.), and for communication in situations where the hands or the attentional capacity must be directed elsewhere, manual communication may be more conceptually efficient. Not only does it permit us to represent events image-schematically, but it also permits non-linear representations which are more akin to our perceptions of events. As Sarah Taub points out,

there are options for preservation of structure in iconic mappings which exceed the possibilities available in spoken language (1997, 2001). That is, the hands and forearms may represent features of the referent which cannot be represented in spoken language, because of the higher degree of arbitrariness of the phonological sign. Furthermore, the sign articulators can represent motion as well as using motion to represent form (the “path-for-shape iconicity” discussed earlier) (1997, 2001).

In summary, there seem to be neurological reasons to believe that our understanding of events (which surfaces linguistically in aspectual classes) is based on motor programs. These motor programs can be linked to hand and arm movements: if the origins of interpersonal communication are in an action-recognition system which is also tightly linked to hand and arm movement, a theory of language must involve gesture as well. This paper is intended as a beginning to the process of incorporating gesture into the analysis of language.

8. Data

The objective of looking for a correspondence between gesture and speech is to use conceptual mappings to gain insight into the structure underlying both language and gesture. Therefore, to reiterate, when a long sweeping gesture occurs with a durative verb (for example, a continuous situation such as *sleep*) the point is not that the gesture is a reflection of the verb’s grammatical aspect. Instead, the sweeping motion is a representation of a feature of an image-schematic scene, in which the action seen as extending over time is metaphorically represented as extending over space.

One final caveat involves the problematic distinction between production and processing. This paper focuses on meaning construction, not on the cognitive mechanisms at work during production. The process of interpretation has been touched upon (section 4) but I will nevertheless explicitly point out that determining the nature of iconic mappings is a product of the analyst’s conceptualization of the situation. It should be borne in mind that when reference is made to the speaker’s construal or understanding, what is actually

intended is *my construal of her construal!* But this analysis is by no means arbitrary nor subjective, as the relatively detailed description of mappings given for each example should make clear.

8.1 Perfective:

The majority of the examples discussed below have been extracted from complex segments involving numerous gestures. As much context as seems reasonable has been provided, but these data should be considered to have been simplified. The following sequences have been classed as perfective.

8.1.1 (J1.a:8)

He gives us all this extra information and what do I do with it
whereas he takes the [most ^basic {formula..}] **1** [and just...]**2**
you know it's- it's really not that ^hard <Xto see where the answers areX>.

1. Legs are crossed with left ankle on right knee, R is at rest on left shin. At *most* R begins to move up, left center, in bent 5 hand with PAB. Stops after *basic*, holds for *formula*.
2. L has been at rest on left knee. During pause between *formula* and *and*, R goes back down (although remains tense and not actually resting on anything) and L comes up in 5 hand with palm down. Moves from left periphery to left center then sweeps to left (back into periphery) in 5 hand, holds over knee.

The speaker is talking about her instructor's habit of giving problems on exams and homework assignments which contain much more information (and are therefore more difficult) than those he solves in lecture. This is described as using an object (prototypically an instrument) to accomplish a task: the formula is metaphorically seen as the instrument (which can be *taken*) with which the problem is solved. This linguistic metaphor is also evident in the gestures. In the first gesture, the right hand maps onto the formula: the shape maps onto a hand holding an object and the motion of the hand (up from rest) maps onto the act of picking the object up for use in some activity. In the second gesture, the left hand uses motion through space to depict the change over time. This motion is abrupt: the space defined has distinct boundaries. This space represents a process. That is, solving the problem is an event which is construed as involving change over time, and this is metaphorically seen as a path from a formula to a solution. This path is represented with extension in space.

One of the more interesting aspects of this example is the fact that the verb is elided: we have only gestural and contextual information about the event which is accomplished with the formula (possibly something like *solves the problem, applies it*, etc.). Despite the absence of the verb, I would still argue that the gestural representation of this event suggests that it is viewed as a whole. Although the event extends through time (space, in non-metaphorical terms), it is bounded and displays no internal complexity. This would entail that the event is perfective. A second noteworthy feature is the fact the speaker switches hands between gestures. This has the effect of contrasting the two events, or the entity serving as the instrument, and the process.

8.1.2. (J1.a:13)

[if {it spins...<Xif-X>}] **1**
 [^If it spins{...}] **2**
 [<Xw-X> makes s-] **3**
 [goes around one ^time {..in}..364] days.. **4**
 then you can-..
 I don't ^know how fast it goes around.

1. L comes up to LP in bent 3 (up by *spins*), PAB/FTU.
2. L wrist makes slight turn at second *if it spins*, then pulls back towards body, holds.
3. R turns at wrist so that hand rotates. During this time speaker's mouth is moving as though she is searching for the right word. L then goes to rest as R comes up.
4. R comes up RC in G hand, makes one circle (RC to CC), holds, then comes in to chest still in G hand, relaxes into closed fist by *days*.

A good portion of one interview involves confusion about how fast the Earth revolves around the sun and how fast it rotates on its axis. The segment above occurs during this portion of the interview and again illustrates a tendency towards switching hands when two scenes or roles are being contrasted. The preparatory gesture (1) introduces the Earth by depicting its outline. The use of the bent 3 hand -rather than something like a fist, which would more completely depict the shape of the Earth- may indicate that the speaker is imagining the action of spinning a small sphere; the choice of hand shape suggests that the motion being conceptualized is rotation rather than revolution. During the pause between 1 and 2, the subject's mouth is moving while she searches for the next word. She makes another attempt to begin describing how fast the Earth spins on its axis, this time representing the motion of the Earth on its axis with the twisting motion of her wrist.

During the second pause (while her hand continues to turn), her mouth is moving again. She may be having difficulty with word retrieval but she may also be having difficulty deciding which concept she actually wants to describe; she is clearly visualizing a scene in which the Earth rotates and is unsatisfied with it. I would claim that *makes* signals that she has determined that she is trying to talk about revolution rather than rotation (where *makes* occurs as part of some expression like *makes a complete orbit* or *makes a circle around*). She then arrives at *goes around one time* and is able to complete the expression. The gesture with the right hand, which iconically represents revolution, begins before she has completely planned *goes around one time*, suggesting that the image is in place as soon as she says *makes*: she is now attempting to match the image to the linguistic form. The shape of the left hand allows the extended index finger to map onto the Earth's axis; the remaining curled fingers may map onto the shape of the Earth.

The entity which the left hand has been representing is not the Earth, per se, but rather the Earth's rotation, and therefore the left hand is abandoned when she decides she actually wants to talk about the Earth revolving about the sun. The right is used for this role. In this case two concepts (Earth rotating and Earth revolving) are being contrasted. Both gestures are iconic: in mapping the shape and motion of the hands onto the schematic scene of the Earth's motion the gestures reflect the scene's construed aspectual structure. These two motion events share many features, but are essentially different. Spinning is an activity: one may say *how long did it spin*, but not **how long did it take to spin*. In addition, *spins for five minutes* is acceptable, but not **spins in five minutes*, since spinning has no natural notion of telicity. The gesture represents spinning as far as possible, given the fact that the wrist is not infinitely flexible. *Going around one time* is an accomplishment, as the same tests can demonstrate.¹³ Making a complete revolution, or *going around one time*, is construed as a perfective event.

¹³ Without the bounding of *one time*, *going around* is not constrained in the same way: *how long did it go around/how long did it take to go around* are both acceptable. *Go around in/for five minutes* are also both acceptable, but in both cases the telic versions have once, or one time, as a default.

8.1.3. (J1.b:2)

That's what I don't ^like is that

[sometimes when someone points something out to ^me{..}] 1

[it makes ^complete sense] 2

but why I can't think it out ^myself..

I- I don't know ^why

1. L comes down from face in palm up H-like hand, holds.
2. From hold of gesture above L moves up and then comes rapidly down to R on lap while turning palm down. Contact between hands is audible.

The first gesture is a presenting gesture: a topic is being conceptualized as an object. The second gesture is perfective. The speaker is commenting on the fact that she is quite capable of comprehending an explanation that she can't necessarily produce herself. In the absence of any modifier, *make sense* is subject to a number of different construals; because it is a phrase which occurs often in these data I will attempt to give a sketch of some of the different senses.

Mental state verbs like *know* or *understand* can have what's usually called an "insight sense", where a stative verb is made perfective by profiling the inception of the state, as with *suddenly I understand, now I know it*, and so. The example above involves an insight sense, thus we can submit it to a test for an achievement (e.g. *At what time did it make sense-At 2:08 am*). In such a situation the event takes place at a single instant within an interval.

On the other hand, *make sense* can also be viewed as an ongoing process (rather than as a completed unit). Just as it's possible to make some states into achievements by profiling the element of inception, so it's also possible to construe some states as processes by adding dynamicity, or some notion of change over time, as with *I am understanding better all the time*. So this verb phrase can appear in the progressive (which a perfective never could), as in *So far this paper is making sense*. *Make sense* is grammatically stative; it's an event with no real agent and no energy input. Because of the way in which we conceptualize mental processes, it can be construed as a telic event or as an atelic process. We can say both *How long did it take (for it) to make sense? Until I read the last chapter*

as well as *How long did it make sense? Until I tried to do the homework*. In the first case making sense occurs after obtaining some crucial piece of information; this is the telic version in which make sense is an achievement. In the second case making sense is ongoing until some conflict of ideas causes the speaker to become confused: this is the process sense. In this example the telicity of the event is represented with a ballistic gesture which indicates the clear endpoint of the event.

8.1.3. (J3.a:23)

is where you take a specific ^instant where it says like something's going [this fast at this point] **1** [^this fast{at this point}] **2** [this fast] **3** plot [distance {versus time}] **4** [velocity {versus time}] **5** [acceleration {versus time}] **6** In that case it's always been linear

1. BH in 5 hands turn palm down CC, PTD/FAB.
2. BH in 5 hands move up, then down and further to left. PTD/FAB, LCC, RRC
3. L holds while R in 5 hand, PTD/FAB, moves into RP
4. L in 5 hand comes palm up LC (PTU/FAB) and holds
5. L moves back towards body then out again to LC, PTU/FAB in 5 hand
6. L moves back towards body then out again to LC in 5 hand, PTB/FAB

This segment describes the manner in which the speaker is accustomed to conceptualizing events for the purpose of graphing them. An object has a certain velocity at a certain location and at a certain time, then the same object has a different velocity in a different location at a different time. This conceptualization is discrete, the function of the graph being to use the data given to extrapolate information about the object's progress in the intervening periods. These events are arranged temporally with respect to one another, as shown by the fact that the gestures move from left to right. The movement to the right is mapping onto the movement of the object in space, as well as in time. The discontinuous motion maps onto the discrete intervals (*this point*) which make up the metaphorical time line, but also onto the specific points that the person doing the graphing has information about. Both hands may be involved initially because there are multiple entities involved in the construal of the process (the left hand leaves the picture as the hands move to the right). These gestures, however, should probably be considered progressive rather than perfective

because of the relevance of their being a sequence of events. The last three gestures are perfective. They describe the complete process of making a graph: each graph represents different types of information and each event is construed as independent of the others. Each event is depicted with a simple beat, all of which are made in the same location as they are not temporally sequenced. The ballistic motion of the left hand, with its sharp beginning and end, maps onto the well-defined boundaries of the events. It is interesting to note that the actual physical path connecting these gestures is not intended to be part of the mapping: abrupt motion here is used to indicate discrete intervals. It is also interesting that the left hand is used alone for the graphing events, unlike the previous gestures. This suggests that some notion of contrast is part of the construal.

8.1.4. (J4.a:12)

[you ^give something a force]
 and then [it ^has momentum{..}]
 it doesn't ^have {force the whole time}]

R in bent 5 PAB/FAB pushes forward on table RC (with heel of hand touching table)
 L holding pen, PTD/FTP, moves in smooth sweep from CC to LC, holds, does same thing, holds.

This segment consists of three distinct events, of which the first is perfective. The first is a force-dynamic transfer of energy from an agent (*you*) to a patient (the hockey puck): this is a perfective event. The sliding gesture is representing this schema. The motion has distinct boundaries which map onto the boundaries of the real event. This is an iconic depiction of pushing an object forcefully. The speaker switches hands between the first and second gestures. This makes clear the fact that they are conceptually separate (as expressed in the language). This shift also involves a change in viewpoint: the speaker is initially representing the agent and then represents the patient.

The phrase *it has its own momentum* describes independent motion which is the result of the transfer of energy. This is an interesting case of mismatch between language and gesture. The process described in the speech is stative: *having* something is a static situation. The gesture, however, describes the continuous motion of the puck, thus profiling

not the possession of the attribute of momentum, but the consequences of that attribute (motion). That both aspects of the scene should be expressed suggests that the growth point involves both.

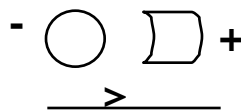
The two right-handed gestures (*have momentum, not have force*) are physically the same. As described above, these gestures depict the consequences of properties of the puck (has momentum, lacks force) with gestures which represent the object's motion through space. The hand shape which is common to both gives few clues about the conceptualization of the event because the speaker is holding a pen, although both the pen and fingers provide directionality (they are pointed in the direction of motion).

8.1.5. (J1.b:7)

Yea cause it [makes me ^think]
and I ^know that..
here I am ^trying to figure something out

L comes up then down again forcefully. BH move slightly towards body

This segment describes the event of being compelled to think as a result of being asked questions, a construal which draws on the Locative Event Structure Metaphor, where causation is forced motion. Forced motion involves a force-dynamic situation in which two entities (which we can call *speaker's mental state* and *interviewer's questions*) are seen as Agonist and Antagonist. The Antagonist (*interviewer's questions*) is more powerful than the Agonist (*speaker's mental state*) and can therefore force the Agonist into action (cause a change in mental state). In the force-dynamic diagram below the circle represents the weaker Agonist which is being compelled to move.



Both the action of the Antagonist against the Agonist and the resultant fact of motion are represented in the gesture. The left hand maps onto the Antagonist (questions) while the right hand depicts the Agonist (mental state). The impact involved in the contact between the two hands maps onto a similar impact in the force-dynamic schema. This

impact actually results in motion: after the contact the hands both pull back towards the body. This represents the change in location which maps onto a change in state.

8.1.6. (J1.a:4)

And..it like [^skips **six** steps]
and they go you know
how did you ^get there.

BH are at rest in lap with fingers intertwined. BH come up from lap. R in loose 5 hand moves into center right, then comes down to rest on leg. L comes up higher than R. Simultaneous with motion of R, L in 5 hand turns palm down with quick bend of wrist, then moves from left center to center center, goes to rest on lap. Both hands move down at the same time, are at rest by *steps*.

The event described in this segment is the act of departure from an expected orderly progression in the explanation of a problem. Explanation is being conceptualized as a series of steps, a conceptualization which is based on a metaphor in which logical thought is movement on a path. This metaphor is quite pervasive in discussions of reasoning (Sweetser 1987, 1992).¹⁴ The process is progressive in nature, but a sudden discontinuous movement from one location to another is construed as perfective (several steps are viewed as a unit). The gesture reflects these elements: the span of space covered by the hand maps onto the metaphorical path, and the ballistic motion maps onto the boundaries of the event. As with the previous example, the speed of the hand's motion is part of the mapping; in this case it is iconic for the notion of abruptness.

8.1.7. (J1.a:17)

<XI tell X> you that [we're ^here{..}]**1** and then
[tomorrow] **2** at this ^time [we're going to be here ^again] **3**
[and we've gone all the way ^around?] **4**

1. BH come up emphatically, hands a few inches apart, palms up, hold.
2. From hold of previous gesture BH make upward beat, hold.
3. From hold of previous gesture BH move left and up in circle, ending C
4. From hold of previous gesture BH move left, then L holds while R in C-like hand makes circle.

The speaker is discussing the strangeness of the fact that it only takes the Earth, an enormous body, a single day to rotate on its axis. Both the first and second gestures map a particular physical space (the space between the hands) onto a particular piece of the Earth's

¹⁴ The linear nature of writing may contribute to the appropriateness of the metaphor in this context.

surface (*here*). The first gesture is also a presenting gesture. The palm-up position suggests surprise: the concept which is then elaborated is being presented as an object of wonderment. The two functions of the initial gesture are not incommensurable. The space between the hands maps onto the idea being presented as an object: this idea is *we're here*. *Here* is a physical space which maps onto an area of the surface of the Earth.

The third gesture depicts a perfective event: one complete rotation. The circular gesture iconically represents the Earth's motion, but as conceptualized from a viewpoint in which the observer is focused on a particular spot on the surface. That is, the hands are mapping onto an area of the surface and the larger Earth is backgrounded but part of the conceptual scene. The motion of the hands maps onto the motion of that area, but that area's motion is the result of the larger planet's motion.

8.1.8. (J3.a:04)

slowly gets slower and ^slower because [gravity's pulling on it pulling on it
um
then it gets to the ^point-
to the ^top
and..then um..]
it's not getting any more energy to go ^up
you're not giving it any more ^forces
so the only force that it has on it is ^gravity and it comes right back down.

R moves up in thumbs up PTC/FTP, L in 5 hand comes up a little and makes four downward motions towards table while R holds. R then pulls back towards head changing to A/S (for *the point*), comes out and holds again, moves down so that elbow rests on table.

This segment describes the behavior of a ball thrown into the air. The process of getting to *the top* (the apex of a trajectory) is perfective: it is an accomplishment. The ball is conceptualized as an Agonist with an inherent tendency towards rest: it is propelled upwards by a more powerful Antagonist. This propulsion is the result of a transfer of energy from a tossing agent to the ball itself. The ball ceases to move upward when it has used the energy given to it by the agent, and will then return to its initial state of rest (although the return journey is not profiled here). The trajectory traced by the ball gives the event well-defined boundaries, and the apex is the *done* node which provides the event with intrinsic telicity.

The profiled portion of the trajectory is depicted in the gesture, which maps the motion of the hand onto the motion of the ball. The end-point is also represented. The shape of the hand initially seems to be representing the direction of motion rather than the shape of the ball. This suggests that the trajectory is more relevant to the speaker's construal of the scene than the object which is in motion. With the second gesture (moving towards the head), however, the hand shape changes to depict the ball. The upward motion is repeated because the speaker is searching for the appropriate linguistic expression to match the conceptual scene: quite possibly she wishes to avoid having to be specific about *the point*.

8.1.9. (J2.a:6)

okay I have to [adjust that{..what I thought}]

BH make about 2 up and down motions each, not in synchrony.

The activity of *adjusting* one's thinking about a problem is metaphorically construed: the ideas are treated as physical objects which can be used more effectively if properly adjusted, as with machinery (where the internal structure is tinkered with) or clothing (where the fit on the body is adjusted). In this context the process is construed as a perfective event. The interviewer leads the speaker towards a more accurate conclusion without explicitly telling her she is wrong, and her reevaluation of her own understanding (adjustment) is viewed as a completed action. The gesture reflects the internal complexity of this event. Possibly her hands map onto the individual entities involved and their metaphorical motion. The lack of synchrony between the hands possibly depicts an attempt to bring two elements into harmony.

8.1.10. (J3.a:27)

^think about things and go
[that ^makes{sense}]
that's-..
you know that seems ^logical

BH come up from rest on table, make two emphatic palm up beats.

The notion of making sense is here being conceptualized as an object which is being presented to the interviewer. The hands are mapping onto hands in a mental model of giving,

the motion onto the motion, and the space between the hands onto an object. This entails a perfective construal as the event is being treated as a unit.

8.2 Imperfective, Habitual:

Recall that, according to the distinctions established for use here, imperfective processes are those which are construed as unbounded (the endpoints are not within the scope of predication) and internally homogenous. Habitual processes often involve several instances of the same situation, viewed as a unit. The following are examples of habitual processes.

8.2.1. (J1.a:2)

And when I say ^bomb [I don't mean like D or F] **1**
[it's just I'm used to doing ^well] **2**
so when I ^bomb it and I studied hard it's-
you know even a B- or ^C is still bombing if you-
if you've studied that hard.

1. BH come up from rest in palm up 5 hands with fingers a little bent, center center. R holds: L turns palm down (5 hand) and moves left to right twice (in left center, for *F*). With side-to-side swipes R begins turning palm down in loosely closed fist. L wrist bends so that palm is facing body, comes down a little.
2. From position of previous gesture, BH in palm down 5 hands move from center center to center right. L goes down to rest on top of right thigh (in Y hand, palm down), R goes down to rest on side of thigh/ on chair.

The second gesture describes the speaker's expectations based on her past performance. Performance on exams is a generalization over a number of separate events: this is a case in which several instances of the same event are viewed as a unit. This is made possible by the cognitive ability to conceive of multiple instances of the same thing as a unit. Just as many instances of *mouse* are *mice*, or more aptly, many *grains of rice* are *rice*, so many instances of *good performance* are *doing well*.¹⁵ The gesture is establishing a space which metaphorically represents the space in which the speaker performs well. That is, a schema involving a bounded area is employed to represent the unit consisting of many instances of good performance, and this container is represented as a space to the right of the speaker's body. The physical space between her hands is mapping onto this

¹⁵ A full discussion of this topic, both in terms of events and in terms of count and mass nouns can be found in Langacker 1991.

metaphorical space. This contrasts with the space originally established by *and when I say bomb*. The first part of the first gesture is a presenting gesture, in which “this thing I just said” is offered as an object. Both the form and the location in which this first gesture are made contrast with the form and location of the third gesture. 3 is made with the palms down and with a significant degree of body torque in order to emphasize the compartmentalization of the space in which the speaker is accustomed to doing well.

The second gesture is a fairly emblematic gesture of waving away which is used to indicate that something should be disregarded. This gesture, then, moves all Ds and Fs out of the topic space. The space over which the hand moves maps onto a physical space and the hand's motion maps onto the same motion in a schema where the action is performed in a physical space.

8.2.2. (J2.a:04)

the study's ^basically-
they want to ^figure out...
how people [^think
you know like..]

BH come up but L stops moving. L makes four beats towards body and out again.

The speaker is telling the interviewer about a conversation with her mother in which the interview was discussed. The situation of *people in general thinking* is habitual, involving common themes or approaches which emerge from many instances of separate individuals engaging in the thought process. These common elements are characterized as *how people think*, and viewed as a unit. The activity of thinking continues over an extended period of time, so it is reasonable that the similarity between one person thinking and another person thinking would be extracted and the agentive role would be replaced by *people in general*. The iterative gesture depicts multiple aspects of the internal structure of this unit. The repeated motion of the hands may map onto a number of occasions in time, or it may map onto the many individuals involved, or both. The palm-up motion, (at least in the case of the second gesture which occurs with *you know*) may also be representing the topic of the conversation, as the form is something like a presenting gesture.

8.2.3. (J2.b:06)

When I-I- I can think of [things on both ^sides]
that-
it's that kind of thing

BH move right more or less in synchrony, then L moves left and R moves left a few frames later. BH close into A-like hands and R move right a little.

The process of *thinking of things on both sides* consists of distinct episodes, but the speaker's ability to do this regularly suggests a habitual construal. In other words, this is a general process of being able to reason equally well about two opposing theories based on the same basic ideas. This is an ability which the speaker can make use of during any reasoning situation, therefore it can be seen as a unit made up of many such instances. The gesture reflects the metaphorical spatial arrangement of ideas into two separate areas (again invoking a container schema). *Both sides* refers to this organization, and the gesture's movement from side to side reflects this. The two hands are synchronized, thereby emphasizing the conceptual scene in which competing theories occupy separate spaces, and reasoning about each is moving from one space to another. That is, each hand maps onto the physical concept of a side, and the motion of the hands maps onto the activity of thinking in each of these physical regions.

8.2.4. (J2.b:15)

but it's easy to ^see that because..
the [balloon's ^plastic] and [it ^moves]
^this it's hard to see it
balloon is depicted

1. R points to left, PTB/FTC, CC
2. BH in 5 hands, CC, make two motions towards each other with PTB/FTC.

In this segment the speaker has introduced an example of air pressure which she feels is intuitively clear: when a balloon is poked in it pushes back out. The movement of the balloon is not a one-time event but is a property of the balloon: one can repeat the experiment with the same result. This gives the scene a habitual construal (*every time I push into it it pushes back out*). The gesture which accompanies *it moves* is iterative, making reference to the implicit repetition of the process which establishes the property, or to the

many occasions on which this relationship will obtain. That is, the multiple motions of the hands map onto multiple temporal intervals (metaphorically understood as physical points) on which this activity can be performed. The lack of synchrony may represent the multiple instances involved. The gesture which occurs with *the balloon's plastic* iconically depicts the act of poking the balloon: the hand is in the appropriate shape for carrying out the action on a real balloon and the action itself is equally appropriate for interaction with a physical object. Poking is not mentioned in the speech with which this gesture occurs, but clearly the growth point of the gesture does involve such an action.

8.2.5. (J1.a:15)

[like at first I thought okay it spins in 364 ^days {then I started thinking...}]1

[or 24 ^hours..] 2

[then I started thinking that's too ^fast{..}] 3

but I mean..I guess I don't really [have a- a ^concept {of how fast that is because I mean the {earth is a huge ^thing} and it's easy to start going] 4

^oh it spins like too fast

1. R turns slowly at wrist PAB/FTU, holds.
2. R wrist turns again quickly.
3. From position of previous gesture R comes palm up in 5 hand, holds.
4. L comes up from rest, makes beat for *concept*, holds, makes second beat for *earth*, goes to rest.

The Earth rotating continually on its axis is a process which extends over time and is unbounded. This construal can be contrasted with the perfective example 2, in which the focus is on one complete rotation or revolution. In this example reference is made to the internal structure of the process, in that each spin occurs in an interval of twenty-four hours, but the speaker is focused on the conflict between the facts as she understands them and the apparent strangeness of the situation. The concept of the Earth spinning *too fast* describes a habitual situation: it is a regularly iterated event of which certain properties hold, and over which certain generalizations can be made. Initially the speaker's right hand represents the Earth spinning in a certain amount of time. The fist-like hand shape maps onto the shape of the Earth. This hand, therefore, is not active while she is reflecting on the difficulty of reasoning about the motion of celestial bodies. It comes back into play when she returns to the topic of the Earth spinning. The fact that she does not use her right hand again when she

talks about the size of the Earth suggests that the Earth spinning is the most salient part of the scene and has the status of a conceptual unit. The gesture with the left hand is a rather abbreviated presenting gesture: the lack of a concept is presented to the interviewer as an object.

8.2.6. (J1.a:18)

^Said to me

[it m- it spins-] **1**

[I mean I'm not saying you have to] **2**[but ^someone said] **3**

[..it spins{..} this many times in an ^hour...

I mean in a ^day] **4**

and it goes around

1. L comes up from rest on leg in G hand and comes back down pointing downward.
2. R comes palm up and sweeps to right of body.
3. R comes palm down and moves back towards center-center.
4. R in G-hand points down.

This segment is quite similar to the previous example, although in this case the speaker's hands do not alternate when she inserts meta-commentary (she does, however, change direction and hand shape). The activity of the Earth spinning is again habitual; it is a general event occurring repeatedly. There is some continuity between gestures 1 and 4, both of which occur with utterances about the Earth spinning, in that they are made in the same hand shape. This shape (as in example 8.1.2) allows the index finger to map onto a conceptualization of the Earth's axis as being a line which extends from the pole, while the curled fingers map onto the shape of the Earth. Interestingly, in example 8.1.2 the index finger points up, and here it points down. This is not an entirely arbitrary choice. The line which represents the axis can be depicted as extending out in either direction, but if the speaker wished to show spinning motion it is more natural (the movement is freer) to use an upward-pointing G-hand. Here she does not show the spinning motion, but only refers to it. This lack of motion allows the shape to make reference to the stability of the situation over time, rather than to internal complexity (spinning).

8.2.7. (J1.a:03)

Whenever [I'm stu-

I'm studying a ^concept] **1**

[the first thing that comes into ^mind] **2**

[is if he gave us something] **3** [that-] **4**

[that you can ^totally relate to] 5

1. BH are at rest in lap together. L comes up in palm down 5 hand and goes back down to stomach (for *I'm stu-*). Almost at the same time R in palm up 5 hand moves to right center, then comes back to lap palm down. BH are back in lap by end of *concept*.
2. L comes up from rest on stomach, fingers prepared to snap (the first thing), then returns to stomach, then immediately comes out again (*mind*) and moves a little left still poised to snap.
3. After *mind*, speech speeds up. It looks like L snaps at *is if*, then changes into something more like L hand (palm up with index pointing to speaker's left) while moving to center left, holds center left.
4. From position of previous gesture, L in L hand moves up and turns so that palm faces away from body and index is pointed upward, makes a leftward and downward beat while fingers open out into 5 hand.
5. From position of previous gesture, L makes a beat pulling towards body and moving slightly up (*that*), then returns to original position. At *you*, L pulls back towards body (shoulder) and up again, then quickly pushes forward (*totally*) and down until heel of hand comes to rest on pull-out shelf of desk. When hand pushed out trunk and head pull back a little.

Studying a concept is an activity which extends over a period of time. It is internally structured, but the phases of the state are construed as uniform. The situation evoked by *whenever I'm studying a concept*, however, is one which involves repeated instances of this activity, and is therefore habitual. That is, it is more or less equivalent to the expression *every time I study a concept*, which makes explicit reference to repetition of the activity. The gesture which accompanies the utterance is a presenting gesture, one of the functions of which is to establish a metaphorical bounded region in which concept-studying occurs. This gesture also presents concept-studying as the topic of the discussion. The rest of the scene makes use of the opposite hand:¹⁶ the right hand represents an ongoing situation which remains constant during the events which the left hand depicts. The gesture maps the hand's stability onto the profiled element of the scene: the event's extension over time.

The first thing that comes to mind is represented with a snap to indicate rapidity: things come to mind in an instantaneous fashion. The concept of a thing *coming to mind* is metaphorical (Sweetser 1987, 1992). The thing is conceptualized as an object moving from one location to another (entering the mind). The aspect of this process which is being

¹⁶ Sweetser (1998) notes a tendency for right-hand dominant speakers to use the right hand to establish topic with a presenting gesture. Contrast can then be effected by changing hands.

profiled is the speed with which this occurs: snapping for things which happen instantly is a fairly conventionalized gesture. This event is perfective.

8.3 Continuous:

Continuous processes are construed as homogeneous but dynamic.

8.3.1. (J1.b:04)

I went- she went in the ^summer
[and ^skied]

R comes up from rest on knee and moves out to ERP, returns.

This segment describes the continuous activity of skiing, conceived of as extending over time. Since the event frame of skiing is nested within an event frame of going which occurred in the past (*went*), we can infer that the skiing has also ended. The profiled element of the scene, however, is the activity's extension through time, thus the boundaries of the process are backgrounded. This process involves uniform components. The gesture combines an iconic depiction of skiing (i.e. the physical trajectory of the skier maps onto smooth motion) and a metaphorical representation of the temporal interval over which the relatively homogeneous activity proceeds. The extension through time is shown as extension through space.

8.3.2. (J1.b:06)

[Think through things and I ^bounce things off each other]
^Instead [of like thinking through the whole thing in my head]
And saying
[^okay here's the answer]

1. R turns palm sideways and moves towards and away from body twice, returns to rest.
2. R comes up to near shoulder level, makes two circular motions towards head, comes down.
3. BH come up in 5 hands, then down to lap

Bouncing things off each other is a metaphorical conceptualization of information exchange. It is presumably based on a metaphor for cooperation derived from games played by bouncing a ball off some barrier: in such games hitting a ball against a wall or hitting it with a racquet is an essential part of continuing the play. Through metonymy, players bouncing a ball off some independent object becomes bouncing a ball off each other, and things (ideas) can be metaphorically substituted for the ball. This process is continuous. It

extends over a period of time and is unbounded, but has the internal complexity of a multiplex activity. The gesture reflects the motion involved in the metaphorical conceptualization, thus reflecting the internal structure of the process. Both the motion and the hand shape suggest the physical activity of hitting a ball against something.

The result of this process is then represented with the presenting gesture which occurs with *here's the answer*. This is an example of explicit reference to the idea which is being presented as an object.

8.3.3. (J2.a:01)

You know
even though I ^knew that some things I was [saying was ^wrong]
I was like..
[I ^thought about things..like..the ^whole time]
I just..
I mean-
I don't know

1. L comes up in relaxed claw ,then down
2. L comes up from lap slightly, makes beat for *thought*, two more during *whole time*, returns to rest.

This is a fairly simple example of an activity (*thinking*) which continues over a period of time. The construal can be continuous despite the fact that the temporal interval is bounded because the profiled element in the construal of the scene is the internal complexity of the interval. That is, during the temporal interval in question (the first interview), thinking went on continuously. The gesture reflects the internal complexity of the activity by using uniform motion to represent the uniform phases of an activity. The fact that one beat occurs with *thought about things* suggests a perfective construal for that event. The multiple beats occurring with *the whole time*, however, support an analysis in which the temporal interval is the more salient aspect of the scene. Clearly the interval over which the event of thinking occurred is construed as having dynamicity.

8.3.4. (J2.a:07)

I [mean like..th- the rays are glancing ^over] so that in Australia it's a brighter day

R comes up from rest in 5 hand, holds in RC, then moves down to globe on desk and makes circular sweep over and around it. PTD/FTD

The conceptual scene in which rays of sunlight pass over the Earth represents a continuous process. This activity may well have natural boundaries in the real world, but in this context they are backgrounded. The glancing of the rays extends over a period of time and consists of internally structured phases which are construed as uniform. The gesture illustrates the conceptualization of the sun emitting individual rays which strike the Earth, in this case tangentially rather than straight on, giving rise to the image of rays *glancing over*. The motion of the hand maps onto the motion of the rays, and the uniformity of the motion onto the construed uniformity of the process.

8.3.5. (J2.a:06)

It's hard to take something as small as this [and..{put it into}] a huge scale because I mean I don't really know

From hold, R moves to RP and turns palm up, L comes up from rest and moves to LP, turns palm up. Both PTU/FAC 5 hands.

Because the speaker has been reasoning based on a frame in which a small globe (which the interviewer provided as a visual aid) has been representing the Earth, the scale of her conceptual scene is accordingly adjusted to the scale of the globe. It becomes apparent to her, however, that she will need a more accurate mental model in order to make judgments about the time periods involved in the movements of the Earth. She must invoke a different value for the role of Earth: one in which the Earth is massive. She conceptualizes this adaptation as taking one set of values for the roles involved and transposing it onto another set, metaphorically seen as taking an object and putting it *into* another bounded region.

While the transposition might be viewed as a perfective event, the activity is characterized as being a difficult process, which is continuous. The process seems to be one she is currently struggling with, rather than one which is generally difficult, which would suggest a habitual interpretation. In other words, the profiled process is the ongoing difficulty she is experiencing as she attempts to reason while using these two models. The gestures reflect the object and container metaphor: the right hand seems to behave as the Earth for the first gesture although the shape of the hand is determined by the pen being held. The repeated motion of this gesture maps onto the conceptualization of the property of *smallness* holding

over time: uniformity of motion represents a uniform situation. The second gesture, using both hands, serves multiple functions. The space created depicts the bounded region or mental space in which the value for the Earth has the property of being realistically large. The hands are also representing the hugeness of this space, but the fact that they are quite close together suggest that *hugeness* is not the only element of the scene being represented. The two handed gesture is probably also serving as a presenting gesture, the speaker's astonishment at the true size of the Earth being the metaphorical object presented.

8.3.6. (J2.b:03)

You know just like ^last week
 I can-
 if something ^makes sense I can rationalize it
 [..^find things that make-]
 [..back it ^up]
 just like how when I have a false ^theory

1. L comes up from rest CC, PTB/FTC in 5 hand, makes about 3 motions towards body then out again.
2. L comes further forward in LC, palm up, FAB in 5 hand

The activity of finding things that make sense (*sense* being the inferred completion of the phrase) is continuous. *Making sense*, as previously discussed, may involve either ongoing judgments or a complete event viewed as a unit. Finding things that make sense, however, strongly suggests the interpretation in which the process is continuous: each thing that makes sense is found in response to a series of ideas which are dynamically unfolding. The first gesture reflects this internal complexity. The regular motion of the beats maps onto the uniform phases of the finding process. *Back it up*, on the other hand, may be construed as a stative event: it is unclear whether the speaker intended *find things that back it up*, or simply *back it up*. The repair probably occurs because to repeat *make sense* would be rather redundant. Not only has she just used the collocation and it is also one which she uses quite frequently.

8.3.7. (J2.b:04)

...doesn't work with it I can say
 oh ^that works [and this works and that works] so when you say that to me

R makes two motions towards body then out again while L moves up and down, both CC. LPTU/FAB, RPTB/FTC, both in 5 hands.

While the individual judgments represented by *that works* could be interpreted as perfective events, I would argue for a continuous interpretation for the scene as a whole. The speaker is describing an ongoing process of monitoring the accuracy of her interpretation (as reflected by *until*). That is, she operates under the assumption that she is correct until confronted with conflicting data, a process which can continue until something doesn't work: to say that something works in this case refers to the fact that it does not conflict with the speaker's current understanding. Thus *that works* means the newest piece of information does not prevent the speaker from continuing the monitoring process, a process which is continuous and made up of uniform but structured phases. The gesture represents the internal complexity of the process. Both hands create a space which maps onto the ongoing activity. The beats also depict the three *things that work*, each beat being mapped onto a different thing, or idea metaphorically seen as an object. The synchronized motion seems to map onto the concept of successful operation being motion in unison or coordination.

8.3.8. (J2.b:08)

there's air pressure at every ^point
there's air pressure going the exact opposite way at every point ^too
[so it all completely counteracts {and it doesn't..play}] a part.

BH make three motions towards body and back out, not in synchrony, hold. LPTB/FTC, RPTU/FAB, both in 5 hands, CC.

In this example *counteracting* is being construed as continuous. The conceptual scene involves forces which are balanced against one another (Agonist and Antagonist are equally matched), and as long as this relation holds there will be no motion. The gesture depicts opposing forces acting in conjunction to produce this situation, thus reflecting the internal complexity of the situation. The motion of the hands maps onto the activity of counteracting: different entities interact without any one overcoming any other. The lack of synchrony between the two hands emphasizes the element of opposition. The motion of the

hands in different directions maps onto the different directions in which the forces are acting which enables them to cancel (counteract).

8.3.9. (J2.b:09)

but..[on everything..right now {..there's- there's the} same..pressure {from air}]
but the force isn't strong enough to move anything because the same pressure from air is going the exact opposite way

R moves up from knee and out to right, comes in again and out further to right, holds, comes a little left for *same*, back to right for *pressure*, holds. PTU/FAB, 5 hand, CC.

In this example the same space is being used in several different ways. The situation described is continuous, involving a stable relationship between space and the entities in that space. The gesture which describes *everything* creates an area of space in which all entities present are considered to be included: the side-to-side motion denotes inclusion. The second gesture is also an inclusive gesture: one moment in time is being depicted metaphorically as a space to the right of the speaker's body. The metaphorical space contains all the different things that air pressure is acting on at that moment. The smooth motion maps onto a construal of uniformity over the many entities. The motion to the left, then back to the right, of gestures 3 and 4 is also reflecting a conceptual equivalence, but these gestures are more emphatically marking the boundaries of the space. The first gesture serves to establish an *everything* space, and the second to establish a *right now* space. The same relationship between the same basic entities can be said to hold for both spaces because the *right now* space includes the *everything* space.

8.3.10. (J3.a:21)

Force versus time ^graphs
because the [^force at every single {point}]
[is ^changing]

BH come up CC in relaxed claws, PTB/FTC, make beat to left, beat to right, holds. From hold, R moves up, then down, while L moves down also.

This example describes the difficulty of conceptualizing (and therefore formalizing) a dynamic situation. This is a continuous situation with significant but uniform internal complexity. The elements involved are viewed force-dynamically, with a central Agonist which has a number of forces (Antagonists) acting against it. The Antagonists are seen as

being in flux. The gestures reflect this conceptual scene. The Agonist is depicted as an object which exists within the space created by the hands. The hands both describe the shape of the Agonist and represent the Antagonists which are acting against it. That is, the hands map onto particular Antagonists, but the space created between them maps onto the Agonist. The hands move to the right in order to locate the object at a new point. This motion may be using a change in location to depict a change in state, but the new point is probably a new point in time as well: space is being used to metaphorically represent time. The hands simultaneously shift their positions in order to indicate the forces changing (a different interaction between Agonist and Antagonist at a different time), thus motion maps onto change.

8.3.11. (J4.a:02)

[there's nothing acting ^against{it..
but}][..in real ^life
there's ^both]

L comes up from rest PTU/FAB in 5 hand and makes two motions to left, moving up then down further to left, holds. CC to LC.
L in relaxed claw LC PTU/FAB makes circular motions moving towards body then out, another small motion which is slightly circular.

This sequence describes the force dynamics of the previous example. The puck is an Agonist with an inherent tendency towards motion: in an idealized situation where there are no Antagonistic counter-forces it will continue to move indefinitely. *Real life*, however, involves Antagonists such as friction and air resistance which operate to slow the object by small degrees. Either situation (the unhindered puck moving or the puck being slowed by opposition) is continuous. The motion of the beats to the left maps onto various points along the puck's trajectory at which there is a consistent lack of opposition (or various times). *Real life* represents a new mental space which contrasts with the previous idealized situation: the circular gesture may reflect the conceptualization of this space as a bounded region (or may signal change or contrast, depicted as revolution). The gesture which follows elaborates the relationships which hold in this space. The motion of the fingers maps onto

the interaction between the puck, and air resistance and friction, by suggesting internal complexity: multiple movements map onto multiple entities interacting.

8.3.12. (J4.a:03)

[{I'm not sure exactly what} you're ^asking {but I-}] 1

[I ^guess you just mean that] 2

[the ^ice skater {is..} moving {at the same..}] 3

[force or ^speed
as the ^puck] 4

1. L comes up from rest in 5 hand PTU/FAB LC and holds, moves towards body PTB/FTC at *you're*, comes back out, holds.

2. L turns PTD/FTD in Y hand CC, moves backwards towards body, holds.

3. L comes down CC in Y hand PTD/FTD to contact table, makes motion forward for *ice skater*, pulls back and off table, holds during pause, comes down and pushes forward for *moving*, holds.

4. R comes up off table PTC/FTP, holding pen, makes two upward then downward motions for *force* and *speed*, then moves RC to CC emphatically for *puck*.

This segment contains a number of interesting elements. The first few gestures are commenting on the speaker's internal state: the first is a presenting gesture in which the speaker offers as an object some concept which we can call her understanding of the interviewer's meaning. Interestingly, the second gesture depicts the skater (the inverted Y-hand, where the fingers map onto the skater's legs). This occurs before the speaker begins to talk about the skater. This entails that the growth point of this gesture includes the skater, despite the fact that the speech has nothing to do with the skater. The skater's trajectory is then depicted with forward motion. The process is continuous because it is homogeneous and unbounded.

The right hand then is used to represent the puck. The gesture is undefined until the speaker decides on a term to characterize the motion of the puck, which is depicted with the push forward. This forward motion of the hand maps onto the forward motion of the puck, and the abrupt onset of this motion maps onto the sudden beginning of motion which results from a transfer of energy.

8.3.13. (J4.a:06)

I think it's a [^better argument] 1

[the ^skater's {skating by}] 2

[because that's {^easy to say-}] 3

^oh

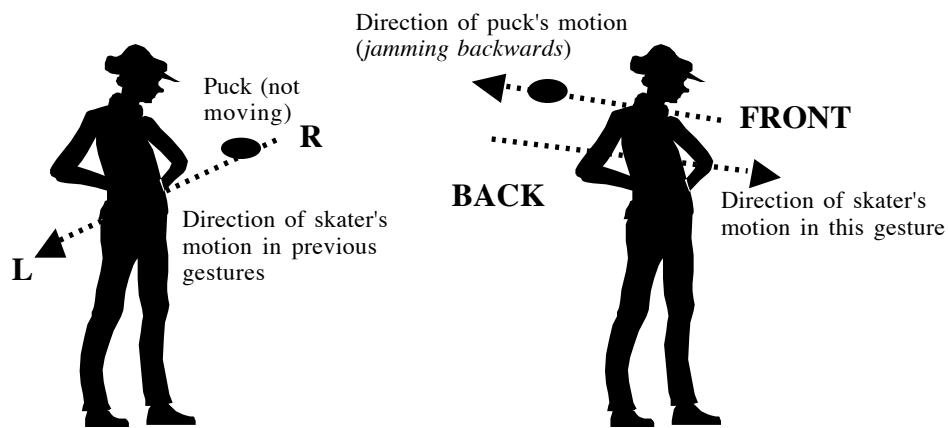
[it's just ^jammin backwards] 4

1. L comes up from table to LC in D hand PTC/FAB, moves towards speaker, points at region of table.
2. L comes up to CC in D/L hand, moves towards body in circle (PTB/FTC to PTD/FTD), comes back out and down to table.
3. L comes palm up LC in 5 hand PTU/FAB, holds.
4. R holding pen comes up from table to RC, PAB/FTP, moves back towards body, then moves emphatically back at *jammin* so that hand is near shoulder (URC), comes back out.

The first gesture is both metaphoric and deictic. In pointing to the interviewer the speaker is referring to the argument he has proposed, which he, as the source of the argument, can represent metonymically. But an argument is not an object, thus the gesture is metaphoric. The second gesture may simply represent the trajectory of the skater, or it may enclose the argument within a space by defining its boundaries. The third gesture (another presentation) refers to the idea which is about to be described and offers it to the interviewer as an object. The fourth gesture depicts the puck's motion. This is a continuous situation: the puck's motion is construed as having no definite boundaries.

A particularly interesting aspect of this gesture is the fact that with 4, the speaker adopts a new viewpoint. Previously she has represented the skater and puck as moving along a left-to-right axis, horizontal with respect to her body. The salience of movement *backwards* causes her to shift to what McNeill (1992) calls *character viewpoint* (as distinct from *observer viewpoint*). With this change to character viewpoint the speaker's orientation is the same as that of the skater, thus the motion of the puck must be directed behind her, as depicted by the motion of the right hand. Presumably this change is necessitated by the fact that *backwards* is deictically grounded at the speaker's position. That is, the speaker's current physical location usually exerts a strong influence on the positioning of the figure (in the *figure* vs. *ground* sense of the term), particularly in an image schema involving a person. The growth point of a gesture involving such a schema may well require character viewpoint. The body often acts as some kind of reference point in structuring space (*up* and *down*, for example are dependent on the body's position), but terms like *backwards* (or *behind*, *in front of*) are defined with respect to some object, in this case the "skater's" body. On a left-to-right axis, conversely, depicting *backwards* as motion to the left instead of the

right is dependent on a previously established direction of motion.¹⁷ The diagrams below illustrate this distinction.



8.3.14. (J1.a:07)

So when you..are seeing him [go ^off..] on this-...
 on some ^tangent you know
 deriving some ^formula
 when you've never seen the formula and you don't know what it means

L is resting on shelf in palm up 5 hand with fingers tense, rolls on back of hand on surface of shelf to left a little, then fingers begin to curl in towards palm (seeing him). At *go off*, fingers uncurl as L moves off shelf in arc moving towards body and up to LP, PAB/FAB. During pause after *off*, L comes straight down with palm sideways, little finger touches shelf. At *on* L returns to rest on shelf with palm up.

Going off on a tangent makes use of a metaphor in which rational thought is mapped onto movement on a path (Sweetser 1987, 1992). This process is continuous. Although it does have an implicit endpoint that endpoint is not profiled: *going off on a tangent*, in this context, connotes that the digression will be quite protracted. The gesture makes reference to the instructor's trajectory on the path. That is, the physical motion of the hand is mapping onto metaphorical motion on a conceptual path.

8.3.15. (J3.a:12)

because you haven't been

¹⁷ An interesting interaction between spatial axes and deictic centers has been observed in ASL representations of time. Consecutive temporal intervals (say, days of the week) are depicted as points on a line which is horizontal with respect to the signer's body. When the signer needs to refer to the past, however, he or she often reverts to a front-to-back axis (cf. Engberg-Pedersen 1993). This is because of the common metaphorical conceptualization of the past as behind the speaker and the future in front of the speaker. The present, obviously, is the speaker's current location. While I have not seen this in gesture (because I have not looked for it yet) I would be astonished if it did not occur.

you haven't like [reinforced the force]
like you just gave it to it once
and you didn't give it any ^more

R moves down from neck while L makes about four motions towards and away from body
CC. RPTD/FAB, LPTB/FTC, 5 hands.

This example discusses the behavior of a ball thrown into the air. The speaker is commenting on the fact that the ball eventually stops moving upward because it uses up energy: unless the agent gives it more energy it will return to rest. *Reinforcing the force*, or giving the ball more energy, is a punctual or bounded event. The act of not giving the ball force however, is continuous, and it is this ongoing situation that the gesture represents (negative and positive versions of the same situation may have different aspectual construals). The motion of the hands in opposition to one another suggests the opposing forces acting on the ball. That is, the motion of each hand maps onto the conceived force of gravity and the ball's energy (the force of gravity is pulling the ball down, while the energy given to the ball by the agent propels it upward). In this case the act of *reinforcing the force* may have to do with overriding this balance of opposing forces (i.e. *you haven't reinforced the force = you haven't given it enough energy to overcome gravity*), and thus the gesture depicts the state of continued opposition.

8.3.16. (J2.b:10)

I don't know if you can say..that..
it [has to be an up down ^thing
you know]
because ^you could say
some of the air pressure's going ^this diagonal and ^this diagonal
kind of from every which ^way and..and

BH make three motions towards each other and away, both in L-like hands, CC.
RPTD/FTD, LPTU/FTU

The speaker is referring to the force of air pressure on an object (a book), and is wondering if she needs to consider the infinite number of angles involved. An *up down thing*, therefore, refers to a situation characteristic of an extended period of time, in which two forces (air pressure *up* and air pressure *down*) are acting on an object. Although this situation has a great deal of internal complexity involving energy and dynamic interaction, it

can be construed as a stable relationship, and may therefore be continuous. The gesture makes reference both to the stability of the situation and to the dynamic interaction: the area between the two hands maps onto the stable physical object (the book) on which air pressure is acting. The hands represent the forces which are seen as most relevant, depicted as movement up and down. The motion of the hands maps onto the conceived motion of the force of air pressure and the direction in which the hands are moving is part of the mapping. The shape of the hands emphasizes motion in a direction: possibly the fingers are pointed to suggest a more precise location at which the force acts on (or makes contact with) the book.

8.3.17. (J2.a:02)

and you asked me things that you knew I would think about and go
okay so I was a little ^wrong
[so let's think about this ^more{..}]
And so that was neat

L comes up from rest on left knee, PTD/FAB in 5 hand, to CC, holds, moves in smooth sweep left to LC, holds, returns to rest.

In this example the speaker is talking a reasoning process. The gesture occurring with the utterance represents the process as occupying a certain temporal interval (metaphorically represented as space), and possibly also depicts the metaphorical conceptualization of sweeping aside an inaccurate characterization of a phenomenon. The smooth motion suggests that the activity of thinking is not construed as having definite boundaries, thus it is continuous.

8.3.18 (J1.b:6)

In ^some classes when they're very straightforward you know..
^this is what happens, here's a formula, here's an example.
^then you can understand it
and then when you read it in the ^book it's like
^oh
[that makes ^sense because of the lecture]

BH make pawing motion with L still center right and R in right periphery, PRB/FTC. These motions consist in L moving in towards body (stomach level), and out again about three times in L hand while R does pretty much the same thing. The two hands are not synchronized, thus when one is going in the other is coming out. Trunk leans to right during this segment, then straightens out as it ends.

Here the speaker is saying that when she reads something after it has been discussed in lecture she finds it sensible. This involves comparing two sets of information, say lecture ideas and book ideas, and finding that in combination they are sensible. The internal structure of this process permits it to be construed as an ongoing activity extending through time, therefore it can be continuous. The iterative gesture represents the dynamicity of the process.

8.4 Progressive:

The essential property of progressives as defined here is change over time.

Progressives are often telic. Activities may be progressive while states will not be.

8.4.1. (J1.b:05)

In a way it's weird
because I feel like I have to give an answer right away
so I'm saying some things that [later I'm realizing really{..}] didn't make that much sense
you know?

R comes up PTU/FAB in 5 hand, moves R with a circular motion for *later* and another for *realizing*, holds, makes small beat-like motion for *didn't*, returns to original position.

Realizing involves a change in mental state based on a reassessment of a situation.

The process of change is in this case progressive, being made up of a number of different phases. A change in mental state also provides the process with an implicit goal. *Realizing* is often discussed using metaphors for movement on a path (Sweetser 1987, 1992), as expressions like *coming to a realization* demonstrate. The gesture reflects this metaphorical construal: the separate beats are used to depict the different phases of the process. The motion to the right maps onto the metaphorical reasoning path which extends in space.

8.4.2. (J3.a:18)

I'm trying to figure out if [it gets like]
slower at the exact same rate] as you're throwing it up or if it

L comes away from mouth in 5 hand, PTC/FAB, makes four motions forward CL.

The exact same rate is depicted in this gesture as regularity of motion. That is, the regular motion of the hand maps onto a similar but more complicated scene in which the object (a ball) is moving slower in equal intervals. Each motion of the hand represents one

of these intervals, which are construed as being identical despite the fact that the object itself is actually moving more slowly (each phase of the process is actually different). While getting slower is progressive, the sameness of the intervals suggests that the similarity of the phases is being profiled.

8.4.3. (J3.a:22)

Or what you do
when you want to like [figure out in your ^mind {what's going on}]
you can ^draw it and say
okay
^right here
^what's acting on this ball.

R 5 hand (holding pen) comes up to RC from rest on table with PTB, then turns PTD/FAB in smooth motion, moves forward a bit.

In this example the mind is conceived of metaphorically as a container in which an action can be carried out. The activity of *figuring out* is conceptualized metaphorically, through a metaphor in which thinking is seen as mathematical calculation. The situation is being construed as progressive: it is a process with an end-point, and can thus have a metaphorical path in space. The motion of the gesture maps onto the metaphorically construed space in which the activity occurs (where the mind is a container), but also maps onto the path which the activity follows.

8.4.4. (J3.a:24)

In ^that case
it's always been ^linear
Because you know that ^one-
[you know you can ^figure out if it's] speeding up at this point, slowing down at this point, speeding up at this point, you can figure out exactly what it's ^acceleration is

L in B hand PTC/FAB makes 4 left and right motions CC with fingers just above table, then come down to contact with the table.

In this case, far more of the internal structure of the activity of *figuring out* is part of the conceptual scene. The first two gestures describe a general state of affairs wherein such a process is possible. The space over which the left hand moves is representing the space in which this occurs. While this suggests generic habituality, the event is about averaging over discrete values and thus the emphasis is on the component states rather than on multiple episodes. The third and fourth gestures suggest internal complexity to the activity by

depicting its individual phases. The contact with the table and the hand shape are probably anticipating the gesture in which the hand sides over the table, but it is possible that contact with the table depicts focus (the contact with a particular physical point being a metaphorical representation of mental precision). The movement to the right maps onto the motion of the object, and this is depicted in spurts in order to match the changes in velocity described in the speech. The direction in which the fingers are pointed emphasizes the feature of directionality.

8.4.5. (J4.a:05)

[^you're bringing the-]
 [^your {force}] [upon the {stationary ^object
 it's like-
 it's like a}] collision
 but that ^object doesn't have any force

While L holds, R comes up to chest, holds. RPTD/FTB, LPTU/FAB 5 hands RCC, LLC
 L comes up in 5 hand, holds LC PAB/FTU
 R comes CC and closes into A hand, L comes CC and closes over R. Hold. R A, L5.
 RPTC/FTP, LPTD/FTC

Because the focus in this example is on the internal structure of the event rather than on the end result, the situation is interpreted as progressive. The speaker is describing a scene wherein an Antagonist serves as the source of energy which is being transferred to an Agonist. The speaker initially seems to take the viewpoint of the Agonist, using her right hand to indicate herself as the object upon which the force is being directed. The motion towards her chest, however, may simply be in reference to a generic *you*, with whom the speaker identifies, acting as the agentive entity.¹⁸ The second gesture, which locates the source of energy at her position, is made with the left hand. This suggests that a distinction is being made between the roles of agent (the person *bringing*) and force. With the third and fourth gestures the Agonist is distinct from the speaker: in the fourth gesture the right hand maps onto the stationary object while the left maps onto the Antagonistic roles of agent and force in combination. These gestures, by depicting the interaction of these entities, serve to represent the internal complexity of the various phases of the situation.

¹⁸ Jo Rubba (1996) offers an interesting treatment of the deictic uses of the generic *you*.

8.4.6. (J2.a:03)

like oh, if you have something coming on an incline plane
at this ^angle..
you know
[what ^happens
It's not like ^that] type physics
even though ^knowing me I'd probably know that..better
but that's more like ^book physics

BH come CC palm up, R in C hand, L in bent 5, hold. During the gesture they turn and end PTC. BH move towards body then away about three times, not in synchrony.

The speaker is referring to the typical sorts of physics problems one encounters. This example involves an implicit mental continuation of the scene. *What happens* is not referring to the behavior of a stationary object on an inclined plane, but to the result of allowing the object to roll or slide down the plane. This motivates a progressive interpretation for the conceptual scene. The speaker is talking about the different physical components of the situation (friction, gravity, etc.), and the ways in which they change as the object moves. The result may be construed as perfective, but the focus here is not on the fact that the object is going to come to the end of the inclination, but rather on a dynamic and mutiplex conceptualization of the scene. The first gesture creates an area of space in which this takes place, but also probably presents this problem as the topic. The area between her hands maps onto a construal of the problem or event as an object. The second gesture depicts the complexity of the individual phases of the process as well as its ongoing nature. The lack of synchronization maps onto the multiple entities involved and the continuation over time (multiple movements map onto multiple phases).

8.5 Stative:

A stative process is one which is construed as having no energy input: this generally entails that the state will continue unless something happens to alter it.

8.5.1. (J1.a:01)

When you ^walk around,
you're in a [physics mind ^set],
you ca- see--
everything you s- you ^see,
you can ^relate to physics.

BH are at rest: legs are slightly apart and hands are hanging loosely clasped, palms down, L a little over R. R forms fist (or A hand) with wrist bent and comes up from lap, elbow pulls back (*physics mind-*) so hand is CC. At the same time L opens into shape like H hand but with thumb out as in B spread. R then moves back out while L is turning palm up. R comes into L (*set*) and both return to rest still touching. This is done with a loose, smooth motion.

This example involves a both a conceptualization of the mind as an object (a mindset being a situation in which the mind is somehow configured in a certain way, and a schema which allows one to be *in* a mindset (through the Locative Event Structure Metaphor states can be locations). The activity described in this segment is partly continuous; walking around certainly uses energy. But being in a mindset is a state, akin to being in a state of mind, therefore this situation is stative. No change is occurring, no energy is required. The gesture seems to be making reference to the things one can accomplish in this mindset rather than to the state itself, however. It is similar to (and evokes) the gesture of punching the fist into the palm. Another interpretation, given the fact that there is no contact between the two hands, is that the gesture may be representing the construal of an unchanging situation with smooth, continuous motion.

8.5.2. (J1.a:11)

I'm not sure ^exactly
..like

[..when it comes to an ^ellipse] I don't think that-

Speaker is leaning to left writing on pull out shelf of desk. Trunk straightens, R comes up still holding pen but forming bent five hand PTU/FAB, before she has begun speaking, holds. As she says *comes* R moves up and in towards body, then back out and returns to writing position.

The speaker is talking about the orbit of the Earth. *It comes to an ellipse* reflects a metaphor for reasoning: if reasoning is movement on a path, an ellipse can be a point at which the mover (or the process, perhaps, as *it* is used rather than *I*) arrives. The reasoning scene as a whole is probably progressive, but the individual segment described is stative. The speaker is wondering about the radius of an ellipse, a relationship which is an unchanging situation requiring no energy. The gesture is a presenting gesture, in which an idea is being offered to the interviewer.

8.5.3. (J1.a:16)

[^Obviously..we don't feel it moving and we know that it's..^so ^huge..]
that you could look at it either ^way

BH are holding LP and RP in palm up 5 hands PTU/FAB. Make upward beat for *so* but move down only a few inches before making another upward beat for *huge*, return to original position

In this example the speaker is explaining her confusion about the Earth's rotation by discussing the fact that it is not possible to use common-sense judgements about entities on such a macroscopic scale. The Earth having a given property, hugeness, is a stative situation. The relationship has no energy input and is unchanging. The gesture largely reflects the size of the Earth, but the beats depict the lack of change over time (as above, the uniform motion maps onto stability over time). This gesture also has the features of a presenting space - one which offers wonderment to the interlocutor.

8.5.4. (J2.a:03)

It's not like ^that type physics
even though ^knowing me I'd probably know that..better
[but that's more like ^book physics]

L in 5 hand PTD/FAB CC turns palm down, moves in circle.

Book physics represents a certain type of problem, and is a stative relation between physics as a whole and this subcategory. The gesture is again an erasing or disregarding gesture which asserts that book physics is not to be considered here. *Here* is a physical space, which maps onto a discourse space, namely the current. The motion over the physical space maps onto a schematic scene in which something can be wiped off a physical surface.

8.5.5. (J2.b:16)

sit on something [that's{..}
that's ^soft]
it's going to smoosh ^down but it's going to be
you know when you ^get up
I guess maybe you could say

R comes up and moves to right, holds, makes two up/down motions, PTD/FAB, 5 hand, RP.

This example has to do with the property of an object, in this case softness. Such a property is a stative relation between two things. The motion of the hand reflects this by creating an area in space over which this property holds. That is, softness is claimed to be

present in all the locations which the space includes. The iterative motion of the hand represents uniformity over space: the gesture depicts the homogeneity of the object.

8.5.6. (J2.b:19)

but I ^mean if you totally [are still the same street {person that} doesn't ^understand..]

it's also ^hard to picture

R comes up from rest in lap, PTU/FAB, moves down R for same, moves up again and further right, comes down REP for street.

The interviewer has asked the speaker to imagine explaining the problem under consideration to the average person on the street who has no knowledge of the concepts. The example above is the speaker's response to a later comment made by the interviewer. The situation described (being the same person) is one which does not change over time and is internally homogeneous. That is, our conceptualization of identity may be represented by a constant mapping between an entity and a point in time. The fact that the hand comes up with the palm up suggest a presenting gesture: the speaker is offering her comment without entirely rejecting the interviewer's suggestion. The movement to the right uses space to represent extension through time (the metaphorical time line over which the state continues), and the hopping motion depicts the discrete intervals at which the identity of the individual can be ascertained to still be the same.

8.5.7. (J3.a:03)

when it stops..

the gravity pulling ^down and the force pulling ^up are equal

so it's in like [equilibrium for a second]

R closes into A hand, moves back towards body, L then does same while R moves out again. Each hand moves in and out 3 times, not in synchrony. PAB/FTD, CC.

This example comes from a portion of an interview in which the interviewer asks the speaker about the behavior of a ball thrown into the air. Being *in equilibrium* is a classic state. The gesture may be representing the intervals over which the relationship holds (by mapping motion onto phases of the state), or it may be representing the opposing forces operating on the object (air resistance and gravity acting in opposition). Because of the force

dynamics of the situation (the equal strength of two Antagonists keeps the Agonist from moving) energy input seems to be an important part of the scene. That, is dynamicity is certainly a feature of the growth point of this gesture despite the fact that there is no grammatical or semantic cue expressing this.

8.5.8. (J3.a:06)

so that [neither ^one's larger than the other for it to go anywhere]
but ^that's ^only for like a second

BH move up and down twice CC, PTU/FAB in 5 hands, not in synchrony. Change to A hands, move up and down three more times, open back out into 5 with palms now TC, continue moving up and down while change to Y-like hands

In this example, the speaker is again conceptualizing air resistance and gravity as two Antagonists acting against an Agonist, the ball. The relative strength of these Antagonists is being compared. The comparison of one object's size to that of another is based on static properties, and is therefore a stative relationship. The gesture, as in the example above, could be reflecting an iterative construal of the scene, or could be depicting opposing forces. That is, the motion of the hands may be mapping onto either the phases of the state or the entities involved (or both). The fact that the gesture occurs with a clause which discusses size rather than opposition does not necessarily argue against an interpretation in which the gesture reflects the action of the forces against the ball as the actions of the forces are going to be part of the growth point of the gesture. If both the opposing forces and the multiple phases of the state are construed as image-schematically similar they might even be conflated imagistically, although not necessarily conceptually.

8.5.9 (J1.a:12)

[In far ^places]
[it's not ^hot everywhere]
but I don't know if they call it ^summer or not.

R is crossed over chest and resting on left shoulder. Comes out at *far* in 5 hand with PTD/FAB, sweeps from LC to RC, basically arm fully extends at elbow. R returns almost to shoulder during *it's not*, then moves out and to right again (*hot everywhere*). 5 hand with PTD/FAB. Goes to rest on left shin (legs are crossed with left ankle on right knee).

This gesture depicts both *far places* and *hot everywhere* with the same sweeping motion over space. *Far places* are simply far away, at a location far from the speaker's deictic center. *Hot everywhere*, however, is a state in which each location making up *everywhere* shares the property *hot*. This is depicted with continuous motion which maps onto a region of space (*everywhere*) and also onto the continuity of this property (shared features allow us to group entities together). One reason for arguing that the growth point of this gesture involves *hot* and not just *everywhere* is that not only does the gesture begin before *everywhere*, but the prosodic peak is actually on *hot*. This suggests that there is a more complex mapping for the second gesture.

8.5.10. (J1.b:14)

^find something that makes sense..
[cause ^that's the way it is]
and..if you know that that' s the way it ^is then..
and you know what ^happens
then you figure out why.

L turns PTU/FAB and R makes two in-out swipes (*that's, the way it is*)

This gesture refers to a classic stative process, namely a state of affairs. The gesture is dynamic, however, because a state of affairs can be construed as internally complex if the properties which define it are profiled, rather than its homogeneity. The iterated motion maps onto continuity through time by establishing the boundaries of a space. Thus, any time in the interval over which this state holds is included within the space defined by the hand's motion. The iterative motion may also map onto multiple properties making up this state.

8.5.11 (J4.a:02)

there's nothing acting ^against it..
but[..in real ^life
there's ^both]

L in relaxed claw PTU/FAB makes circular motion LC moving towards body then out, another small motion which is slightly circular.

The existence of entities (in this case, friction and air resistance) is a stative situation. As with the examples we have seen above, continuity over time is represented with continuous motion, in this case circular motion. The first circular motion defines a space which can represent *real life*. This gesture is then repeated in a looser form to add information about the contents of this space.

10. Conclusions:

The purpose of this paper has been to investigate the relationship between two sources of information about the conceptualization of a scene: gesture and speech. If these two modalities are in fact manifestations of the same conceptual content, then gesture can be used to gain insight into the structure underlying the linguistic expression of that information. In gesture we have access to additional data about which features of an event are actually part of a speaker's conceptualization of a scene and these data should certainly be exploited.

Given the fact that I did not set out to compare gestural aspect with grammatical aspect, I will not attempt to give a catalogue of which gestures occur with which aspectual classes. In considering the data as a whole, however, some generalizations do emerge about the sorts of gestures which occur with certain types of conceptual scenes. As expected, with perfectives single emphatic chops and ballistic slaps are fairly frequent. These gestures usually refer to events which do not involve any such physical actions or events (they are metaphorical). If a crucial characteristic of perfectivity is a construal of the event as a completed action, this is a natural correlation : clear physical boundaries map onto the metaphorically construed temporal boundaries of an event.

In addition, we do not find gestures making reference to the internal structure of the event occurring with perfective scenes, as we would expect. The gestures which occur with the examples I have classed as perfective seem to evoke a construal of the process as a unit or as the result of some event, by either presenting these processes as objects occupying mental spaces (presenting gestures), by marking their completed status with a sharp motion,

or by iconically depicting the perfective event itself. The only example of dynamic motion with a perfective is 8.1.10, in which the phrase *adjust that* is accompanied by a complex two-handed gesture. This may be a case of the aktionsart of the verb being profiled. That is, the lexical meaning of *adjust* involves internal complexity, but the event can certainly be perfective (treated as a bounded unit).

Imperfectives seem to coöcur most often with presenting gestures, with dynamic motion, or with sweeping gestures. Among habituals, the presenting gesture is quite prevalent. An event which occurs repeatedly over time can be construed as a unit, which is, of course, one of the basic meanings of habitual aspect. Such a unit can easily be treated as a metaphorical object. It is also the case that making a statement about the habituality of some event is frequently a space-builder¹⁹ for what is to follow (as when, for example, a presenting gesture coöccurs with *when I say bomb* [8.2.1]). Since discourse topics are often represented with presenting gestures this is a natural correlation.

With continuous and progressive activities, sweeping and iterative gestures are more frequent than presenting gestures. This is unsurprising given the fact that focus on internal structure is a necessary component of such processes. Internal focus can be depicted in a number of different ways, however. To begin with, a sweeping gesture may be metaphorical or it may represent some actual trajectory. That is, motion may map onto either metaphorical or literal motion. And because any continuous process can be represented as extending through time, the choice between a sweeping gesture and a dynamic gesture is likely to provide important information about the construal of the event. Actions like *thinking*, *counteracting*, or *finding things that make sense*, which do not involve any physical trajectory, seem to evoke a multiplex construal and are thus represented with multiple beats. But there seems to be no direct link between the lexical meaning of the verb or predicate and the gestural representation. Compare the following examples, all of which are continuous activities depicted with sweeping gestures.

¹⁹ An utterance which sets up a new mental space (Fauconnier 1994, 1997).

- 8.3.1. *went in the summer and skied*
- 8.3.14 *go off on some tangent*
- 8.3.17 *think about this more*

In the first case, physical motion is represented as motion.²⁰ In the second case, the trajectory is metaphorical: reasoning maps onto motion on a path and this motion creates a trajectory. In the third case the motion is again metaphorical, but the metaphor is temporal: the motion maps onto the interval over which the process of *thinking more* will occur. These examples might be the basis for positing a continuum of likelihood for a dynamic activity to be represented with a sweeping gesture. That is, actual motion through space is certainly likely to be represented as motion through space. Metaphorical expressions which invoke a trajectory moving through space might be next on a such a continuum, while time as space might be less likely to occur when the activity described has internal complexity. In principle we can preserve multiple features of continuous unidirectional motion in the manual modality. That is, motion over time can be represented either in terms of a physical trajectory, or by using an iterative gesture occurring in only one location to depict the continuation through time of a stable situation. While the hands can depict the object's trajectory as well as individual components of the process or event (a dynamic gesture moving through space), this seems uncommon. Trajectory + internal structure gestures do occur, however. One case is 8.4.2. where the phrase *it gets like slower at the ^exact same rate* is accompanied by iterative motion forward. Another example is 8.5.6 where *still the same street person that doesn't understand* is accompanied by a series of hopping beats to the right. In both cases the mapping between an entity and a point in time seems quite important to the construal, but this in no way explains why this representation is not more common. Galvan and Taub have suggested that there are cognitive restraints²¹ which

²⁰ This motion may also be metaphorical: the space covered by the hand may also represent the temporal interval (*summer*) over which this activity occurred. These two interpretations are not mutually exclusive: the growth point of such a gesture may involve both.

²¹ Galvan and Taub suggest such restraints for the encoding of motion events in ASL (Galvan and Taub 1999), but also posit that these are general cognitive principles. They use McNeill's evidence from young children, but adults clearly operate under some kind of restrictions as well.

determine how much information can be easily represented with a single gesture.

Determining which feature in the construal of the situation takes precedence might be an interesting topic for further investigation, and this might in fact vary greatly across speakers.

Different means are exploited to depict the internal structure of states as well. We might expect some statives to pattern with those perfectives which are also achievements, as both are predicated of instant within an interval. This does seem to occur, as with 8.5.2, where *when it comes to an ellipse* is presented as an object, or 8.5.1, where *physics mindset* is accompanied by a ballistic gesture. In general, however, statives are represented with dynamic gestures which profile the construal of a state as a constant relationship between entities. That is, often the gesture represents the intervals over which this constant relationship holds, as with 8.5.10, where *that's the way it is* occurs with a two-handed asynchronous iterative gesture, or 8.5.7, where *it's in like equilibrium for a second* occurs with a similar gesture. The notion that statives might be dynamic is an interesting one. They are generally characterized as having no energy input, but the notion of something remaining the same over time can clearly be represented as having internal complexity. This suggests that there may be reason to separate the notions of dynamicity and change over time.

Let me briefly remark on two issues of interest. First, the difference between two-handed gestures in which the hands are synchronized and those in which the hands are not seems quite critical to the representation of the event. Compare the following examples.

a. 8.2.3: When I-I- I can think of [things on both ^sides]

BH move right in synchrony, then L moves left and R moves left a few frames later. BH close into A-like hands and R moves right a little.

b. 8.3.7: [and this works and that works] so when you say that to me

R makes two motions towards body then out again while L moves up and down, both CC. LPTU/FAB, RPTB/FTC, both in 5 hands.

In the first case the hands are mapping onto different locations and motion between those locations, while in the second the hands are mapping onto different entities which work. In

principle these seem like similar activities, the first being taking alternate perspectives on a situation and the second being taking alternate approaches to a question, so to speak. In the first case, however, the motion of the hands is synchronized while in the second it is not: one hand moves back and forth while the other moves up and down. There are certainly cases where asynchronous motion seems more motivated, as with the following.

c. 8.3.8: [so it all completely counteracts {and it doesn't..play}] a part.
BH make three motions towards body and back out, not in synchrony, hold. LPTB/FTC, RPTU/FAB, both in 5 hands, CC.

Here the motion maps onto entities which are metaphorically acting in opposition. There are not enough data to make any real claim about this feature but it may be the case that multiple entities tend to be represented with asynchronous motion while the motion of one entity from one state to another tends to be represented with synchronous motion.

Second, it is interesting to note that some motions, generally those without obvious boundaries, are assumed to continue on indefinitely. For example, when the expression *the rays are glancing over* (8.3.4) is accompanied by a gesture sweeping smoothly over space, this gesture is representing many rays of light passing over the planet continuously. Our understanding of this fact is based on the same sort of general image-schematic knowledge that allows us to view a situation at different levels of granularity. That is, a gesture can depict a view of a scene and then use the gestures which follow to give detail about that scene. We understand that this is the same scene just as we understand that a series of photographs zooming in on a view show the same scene. In the case of motion which is assumed to continue, a phase of a process which is thought to be representative of the activity as a whole is being depicted. The entailments of this representation require that such gestures will only occur with events which are construed as have internal homogeneity: stative and activities both fall into this category.

It is also noteworthy that very similar linguistic forms can occur with quite different gestures. This generally happens only when the construal of the scene is also quite different. If we set up a binary opposition between dynamic or iterative gestures cooccurring

with imperfective processes, and non-dynamic gestures cooccurring with perfective events, we can use pairs of examples to demonstrate gesture's capacity for disambiguation. The following example suggests that gesture, while not our *only* clue for understanding the differences in the speaker's construals of the events discussed, is certainly a source of valuable insight.

a. 8.1.11: ^think about things and go [that ^makes {sense}] that's...you know, that seems ^logical
BH come up from rest on table, make two emphatic palm up beats.

b. 8.3.18: In ^some classes where they're really straightforward you know...^this is what happens here's a formula here's an example ^then you can understand it then you read it in the ^book it's like ^oh [that makes ^sense] because of the lecture.

BH move with L center right and R right periphery: L moves in towards body then out again about three times in L hand. R does same thing, not in synchrony (when one is going in the other is coming out). Trunk leans to right, then straightens.

In the first case, *that makes sense* is viewed as bounded unit which can be presented to the interviewer as an object: this entails a perfective construal. In the second case *that makes sense* is viewed as an internally complex activity: this entails an imperfective construal which is represented in the gesture with repetitive motion. *Makes sense* is subject to a number of different construals, as discussed on page 32. These examples suggest that the variation in the construal is actually part of the speaker's mental representation of the scenes. Gesture is only one source of evidence that the situation in *that makes sense because of the lecture* has greater internal complexity: clearly the additional argument tells us that as well. But without gesture we do not have the cue that the additional complexity is part of the speaker's conceptualization of the event of making sense. That is, *that makes sense* and *that makes sense because of the lecture* are different propositions with or without the gestural track, but with the gestural track we can make the claim that the difference in the construal of the event is actually part of the speaker's mental content.

This claim is not likely to create any agitation within the cognitive linguistics community but is assuredly quite bizarre outside of it. After all, the fact that gesture has relevance to the topic of aspect at all entails that aspect must be characterized according to how we believe language users process information and conceptualize events, not according

to the truth value of some predication. This is rather an important point for those seeking evidence for the cognitive reality (or, indeed, the *usefulness*) of the frameworks used by cognitive linguists. Despite the many well-warranted criticisms to which the tradition is vulnerable, cognitive linguistics is still a remarkably advantageous approach to the study of language simply because of the framework's commitment to the idea that meaning construction is a process involving high-level mental operations. In gesture we see evidence for the claim that conceptual metaphor, image-schematic and force-dynamic reasoning and conceptualization, and so on, really are useful ways of thinking about cognitive processing. We can see (In a literal sense!) that some features of an event seem to have cognitive reality, dynamicity and boundedness clearly do.

Given the fact that there appears to be a correspondence between event structure and bodily motion, we can propose gesture as a means of grounding the linguistic category of aspect. But if aspect is a theoretical category which attempts to explain the distribution of forms occurring in the world's languages, and gesture is physical motion, what can be gained by looking at the two in conjunction? Simply this: if features which we believe to be crucial to our understanding of events (and have therefore incorporated into our analyses of aspect) seem to have analogues in physical motion, this suggests that aspect is bodily based. The suggestion that the connection is direct (based on shared neural structure, as Narayanan and others propose) is pure conjecture, but it is not too fantastic to suppose that we will someday know whether or not this is the case. Certainly we can say this: much of the information about our conceptualization of events appears to be available in the visible gestural form.

Gesture occupies a rather interesting position: gestures function as communicative devices, but also have non-communicative capacities. They reflect the cognitive structures which underlie our conceptualizations of events, but conceptual structure in turn relies both on perception and on social interaction. While the critical aspect of the evolution of language is its dependence on interpersonal interaction (there is no necessity for language

without social relationships), once it has evolved, the manual modality is at liberty to serve other purposes. It is quite possible that those purposes have everything to do with facilitating the speaker's thinking-for-speaking, and nothing to do with conveying information for the benefit of the listener.

I hope to have the opportunity to take a more methodical approach in attempting to address some of the questions raised in this paper. In particular, I hope to use cross-linguistic variation in aspectual encoding to tease out any systematicity in the information about events conveyed in gesture.

References:

- Armstrong, David F.; W.C. Stokoe and S.E. Wilcox. 1995. *Gesture and the Nature of Language*. Cambridge: Cambridge University Press.
- Bailey, D. 1997. *A Computational Model of Embodiment in the Acquisition of Action Verbs*. Ph.D. dissertation, Computer Sciences Division, EECS Department, University of California, Berkeley.
- Bates, Elizabeth; Laura Benigni; Inge Bretherton; Luigia Camaionia and Virginia Volterra. 1979. *The Emergence of Symbols: Cognition and Communication in Infancy*. New York: Academic Press.
- Brugman, Claudia. 1981. *The Story of Over: Polysemy, Semantics, and the Structure of the Lexicon*. New York: Garland Publishing.
- Comrie, Bernard. 1976. *Aspect*. Cambridge: Cambridge University Press.
- Chang, Nancy. 1997. *A Cognitive Approach to Aspectual Composition*. Available at <http://www.icsi.berkeley.edu/~nchang/research/>
- Chang, Nancy; Daniel Gildea and Srini Narayanan. 1998. *A Dynamic Model of Aspectual Composition*. Available at <http://www.icsi.berkeley.edu/~snarayan/>
- Chung, Sandra and Alan Timberlake. 1985. Tense, Aspect and Mood. In Timothy Shopen, ed. *Language Typology and Syntactic Description. Vol. III: Grammatical Categories and the Lexicon*. Cambridge, Cambridge University Press. 202-258.
- diSessa, Andrea. 1996. What Do “Just Plain People” Know About Physics. *The Handbook of Education and Human Development: New Models of Learning, Teaching, and Schooling*. David R. Olson, ed. Cambridge: Blackwell Publishing. 709-730.
- Edwards, Jane A. and Martin D. Lampert, eds. 1993. *Talking Data: Transcription and Coding in Discourse Research*. New Jersey, Lawrence Erlbaum.
- Engberg-Pedersen, Elizabeth. 1993. *Space in Danish Sign Language: The Semantics and Morphosyntax of the Use of Space in a Visual Language*. Hamburg: SIGNUM-Verlag.
- Fauconnier, Gilles. 1994. *Mental Spaces*. Cambridge: Cambridge University Press.
- Fauconnier, Gilles, and Eve Sweetser, eds. 1996. *Spaces, Worlds, and Grammar*. Chicago: University of Chicago Press.
- Fauconnier, Gilles. 1997. *Mappings in Thought and Language*. Cambridge: Cambridge University Press.
- Fauconnier, Gilles and Mark Turner. In press for 2002. *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities*. New York, Basic Books.
- Fillmore, Charles J. 1982 Frame semantics. In *Linguistics in the Morning Calm*. Seoul, South Korea; Hanshin Publishing Co. 111-137.
- Fillmore, Charles J. 1986. The case for case. In Bach and Harms, eds. *Universals in Linguistic Theory*. New York: Holt, Rinehart, and Winston. 1-88.
- Galvan, Dennis and Sarah Taub. 1999 Draft. *The Encoding of Motion Information in American Sign Language*.
- Grady, J. 1997. *Foundations of Meaning: Primary Metaphors and Primary Scenes*. Ph.D. dissertation. Department of Linguistics, University of California, Berkeley.

- Johnson, Mark. 1987. *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. Chicago: University of Chicago Press.
- Kendon, Adam, ed. 1981. *Nonverbal Communication, Interaction, and Gesture*. The Hague, Paris, & New York: Mouton. 1-57.
- Lakoff, George and Mark Johnson. 1981. *Metaphors We Live By*. Chicago: University of Chicago Press.
- Lakoff, George. 1987. *Women, Fire and Dangerous Things: What Categories Reveal About the Mind*. Chicago: University of Chicago Press.
- Lakoff, George and Mark Johnson. 1999. *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*. New York: Basic Books.
- Langacker, Ronald. 1991. *Concept, Image, and Symbol: The Cognitive Basis of Grammar*. Berlin: Mouton De Gruyter.
- Liddell, Scott K. 1998. Grounded blends, gestures and conceptual shifts. *Cognitive Linguistics* 9-3: 283-314.
- Mayer, Mercer. 1969. *Frog, where are you?* New York: Dial.
- McNeill, D. 1992. *Hand and Mind*. Chicago: Chicago University Press.
- McNeill, D. ed. 2000. *Language and Gesture: Window into Thought and Action*. Cambridge: Cambridge University Press.
- McNeill, D. and Susan D. Duncan. 2000. Growth Points in Thinking-for-Speaking. In David McNeill, ed. *Language and Gesture: Window into Thought and Action*: Cambridge: Cambridge University Press. 141-161.
- Narayanan, S. 1997a. *Embodiment in Language Understanding: Sensory-Motor Representations for Metaphorical Reasoning about Event Descriptions*. Ph.D. dissertation, Department of Computer Science, University of California, Berkeley
- Narayanan, S. 1997b. Talking the Talk is Like Walking the Walk: a Computational Model of Verbal Aspect. In M.G. Shafto and P. Langley, eds. *Proceedings of the Nineteenth Annual Conference of the Cognitive Science Society*. Mahwah, NJ: Erlbaum. Available <http://www.icsi.berkeley.edu/~snarayan/>
- Parsons, Terrence. 1989. The Progressive in English: Events, States and Processes. *Linguistics and Philosophy* 12: 213-41.
- Reddy, Michael. 1979. The Conduit Metaphor. In A. Ortony, ed., *Metaphor and Thought*. Cambridge, Eng., At The University Press.
- Rizolatti, G. and M. A. Arbib. 1998. Language within our Grasp. *Trends in Neuroscience* 21:5, 188-194.
- Rubba, Jo. 1996. Alternate Grounds in the Interpretation of Deictic Expressions. In Fauconnier and Sweetser, eds, *Spaces, Worlds and Grammar*. Chicago: University of Chicago Press. 227-261.
- Sasse, Hans-Jürgen. 1991. Aspect and Aktionsart: A reconciliation. *Belgian Journal of Linguistics* 6. Amsterdam, John Benjamins Publishing Company. 31-45.
- Slobin, Dan I. 1985. From 'thought and language' to 'thinking for speaking'. In J.J. Gumperz and S.C. Levinson, eds. *Rethinking Linguistic Relativity*. Cambridge: Cambridge University Press. 70-96.

- Slobin, Dan I. 1987. Thinking for Speaking. In Jon Aske, Naatasha Beery, Laura Michaelis, and Hana Filip, eds, *Proceedings of the Thirteenth Annual Meeting of the Berkeley Linguistic Society*. 435-445.
- Sweetser, Eve. 1998. Regular metaphoricity in gesture: bodily-based models of speech interaction. Actes du 16^e Congrès International des Linguistes (CD ROM). Elsevier.
- Sweetser, Eve. 1992. English Metaphors for Language – Motivations, Conventions, and Creativity. *Poetics Today*, Winter 13:4. 705-724.
- Sweetser, Eve. 1987. Mental Models of Thought and Speech: a comparison of historical directions and metaphorical mappings in the two domains. In Jon Aske, Naatasha Beery, Laura Michaelis, and Hana Filip, eds, *Proceedings of the Thirteenth Annual Meeting of the Berkeley Linguistic Society*. 446-459.
- Talmy, Leonard. 1983. How Language Structures Space. In H. Pick and L. Acredolo, eds., *Spatial Orientation: Theory, Research, and Application*. New York: Plenum Press. 225-82.
- Talmy, Leonard. 1985a. Lexicalization patterns: semantic structure in lexical forms. In T. Shopen, ed., *Language Typology and Syntactic Description, vol. 3: Grammatical Categories and the Lexicon*. Cambridge: Cambridge University Press. 57-149.
- Talmy, Leonard. 1985b. Force dynamics in language and thought. In *Parasession on Causatives and Agentivity*. Chicago Linguistic Society, 21st Regional Meeting. 221-65.
- Taub, Sarah F. 1997. *Language in the Body: Iconicity and Metaphor in American Sign Language*. Ph.D. Dissertation, Department of Linguistics, University of California, Berkeley.
- Taub, Sarah F. 2001. *Language from the Body: Iconicity and Metaphor in American Sign Language*. Cambridge: Cambridge University Press.
- Tenny, Carol. 1995. How motion verbs are special: the interaction of semantic and pragmatic information in aspectual verb meanings. *Pragmatics and Cognition* 3:1. Amsterdam: John Benjamins Publishing Co. 31-73
- Vendler, Zeno. 1967. Verbs and Times. *Linguistics in Philosophy*. New York, Cornell University Press. 97-121.