GESTURE: A PSYCHOLINGUISTIC APPROACH[1]

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As a field of study, gesture has become energized in recent years. There is now an organization (International Society for Gesture Studies) and a journal (*GESTURE*, Adam Kendon and Cornelia Müller, founding editors).[2] In preparing this article, I have aimed to balance the empirical basics of gestures with a theoretical perspective from which to regard gestures and see what insights they bring to an understanding of the nature of language.

The word 'gesture' covers a multiplicity of communicative movements, primarily but not always of the hands and arms. Often, gestures are assumed to comprise a channel distinct from speech, but careful investigation challenges this traditional view. Gestures and language are best thought of as a single system, larger than either language or gesture as traditionally assumed. It will be useful to begin our survey by drawing distinctions among different actions, all of which might be termed 'gesture'.

KENDON'S CONTINUUM

Adam Kendon once distinguished gestures of different kinds along a continuum that I named "Kendon's Continuum", in his honor (McNeill 1992). The gestures we are mostly concerned with are the 'gesticulations'. See the 1992 reference for details.

'Gesticulation' is motion that embodies a meaning relatable to the accompanying speech. Gesticulation is by far the most frequent type of gesture in daily use and it covers many variants and usages. It is made chiefly with the arms and hands but is not restricted to these body parts – the head can take over as a kind of third hand if the anatomical hands are immobilized or otherwise engaged, and the legs and feet too can move in a gesture mode. In a large sample of gestures, Shuichi Nobe found the stroke phase of the gesticulation is synchronous with the co-expressive speech about 90% of the time (gesture phases are defined below). When strokes are asynchronous, they slightly precede the speech to which they link semantically, usually because of brief hesitations, and the time-gap is small. Gesticulations rarely if ever follow their co-expressive speech (Kendon 1972). There is no basis for the assertion that strokes occur during hesitations. Such view has attainted urban legend status, but it is based on a misrepresentation of the original study by Butterworth & Beattie (1978). They reported that the rate of gesture occurrence was higher during speech pauses than phonations. However, far more gestures

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[1] I am grateful to Fey Parrill for help with preparation of this article. I also wish to acknowledge financial support by grants from the National Science Foundation and the VACE program under the Advanced Research and Development Activity in Information Technology (ARDA).

[2] A web page describing the Society and *GESTURE* is at http://www.utexas.edu/coc/cms/International_House_of_Gestures/

occur during phonation than pauses, so the 90% figure is the result (Nobe also did not replicate their higher gesture rate during pauses, possibly because of different communicative situations: Nobe was looking at narrations, while Butterworth & Beattie had analyzed college tutorials, where gestures during pauses are likely to have had 'turn-suppression' functions not prominent in narrations). The expression 'co-expressive speech and gesture' is explained below. Other controversies have revolved around the issue of whether gesticulations are communicative – 'made for the listener' – or beneficial primarily for speech production – 'made for the speaker' (cf. Krauss et al. 2000, Alibali, Kita, & Young 2000). Gesticulations combine both 'universal' and language-specific features. Speakers of every language studied thus far (and this is a sizable list: in our lab alone, besides English, Japanese, Mandarin, Korean, Spanish, French, German, Italian, Turkish, Georgian, Russian, ASL, Taiwanese Sign Language, and a few African languages) produce them, and the gesticulations for the same events in a cartoon stimulus show clear similarities across these languages. Yet, there are also striking differences which are traceable to characteristics of the languages the gestures are co-occurring with, in particular whether the language is, in Leonard Talmy's typology (Talmy 2000), S-type or V-type (see McNeill & Duncan 2000). Gesture space is oriented in terms of absolute compass direction by speakers of Guugu Yimithirr (an Aboriginal language with obligatory absolute orientation in its verb morphology) and also speakers of Tzotzil (a Mayan language that lacks the lexical precision of directional reference as seen in Guugu Yimithirr, but whose mode of living promotes exact spatial orientation, which is then embodied in gestures; see John Haviland 2000).

'Speech-framed gestures' are part of the sentence itself. The term is from Karl-Erik McCullough. Such gestures occupy a slot in a sentence, e.g., "Sylvester went [gesture of an object flying out laterally]", where the gesture completes the sentence structure. These gestures time differently from gesticulations – they occupy a gap that fills a grammatical slot, rather than synchronizing with speech that is co-expressive.

'Emblems' are conventionalized signs, such as thumbs-up or the ring (first finger and thumb tips touching, other fingers extended) for "OK", and others less polite. Kendon prefers the term 'quotable gesture', referring to a potential for a more or less complete verbal translation – "OK" translating into terms of approbation for example. Emblems or quotable gestures are culturally specific, have standard forms and significances, and vary from place to place. Kendon (1995) has for some years studied the gesture culture of Naples, a locale with an exceptionally rich repertoire of quotable gestures (cf. de Jorio, an early 19th C. figure, in Kendon 2000). These gestures are meaningful without speech, although they also occur with speech. They function like illocutionary force markers, rather than propositions, the mode of gesticulation, and when they occur they time with speech quite differently. A single Neapolitan emblem for 'insistent query' (the 'purse' or *mano a borsa*: prototypically, the hand palm up, the fingers and thumb loosely bunched together at the top, and rocking up and down) was observed in one case stretching over several utterances and then continuing into the next speaker's turn, still demanding clarification. This gesture is not employed in North America (a similar looking gesture is used to mean that something is "precisely so"), which illustrates the cross-cultural variation of the emblem. Emblems can blend both sequentially and simultaneously with gestures of other kinds. Many emblems have deep historical roots, far outlasting the spoken languages with which they occur. Some go back

to Roman times (Morris et al. 1979), including the infamous 'finger', beloved of the American road – it would have been understood by Julius Caesar. Most emblems have iconic or metaphoric components. The contact of the thumb and forefinger in the "OK" sign captures the idea of precision. But the emblem is also specified by a convention pairing the form of the gesture to the approbation meaning. The fixity of the emblem is the evidence of this. Putting the *second* finger in contact with the thumb is still precision but no longer is the "OK" sign of approbation.

'**Pantomime'** is dumb-show, a gesture or sequence of gestures conveying a narrative line, with a story to tell, produced without speech.

And at the other extreme of the Continuum,

'Signs' are lexical words in a sign language such as ASL. Sign languages have their own linguistic structures, including grammatical patterns, stores of words, morphological patterns, etc. The linguistic code of ASL is quite unlike that of English. Sign languages have evolved without the requirement of being coordinated with speech. In fact, hearing signers find producing speech and signs simultaneously to be disruptive to both. For an authoritative description, see Liddell (2003).

As one moves along Kendon's Continuum, two kinds of reciprocal changes occur. First, the degree to which speech is an obligatory accompaniment of gesture *decreases* from gesticulation to signs. Second, the degree to which a gesture shows the properties of a language *increases*. Gesticulations are obligatorily accompanied by speech but have properties unlike language. Speech-framed gestures are also obligatorily performed with speech, but relate to speech in a different manner – sequentially rather than concurrently, and in a specific linguistic role. Signs are obligatorily *not* accompanied by speech and have the essential properties of a language. Clearly, therefore, gesticulations (but not the other points along Kendon's Continuum) combine properties – gesture with language – that are unalike, and this combination occupies the same communicative instant. A combination of unalikes, at the same time, is a key psycholinguistic fact and a framework for an imagery-language dialectic. The remainder of this article focuses on gesticulations. If no ambiguity results, from here on I shall use the simpler term 'gesture'.

Traditions of gesture study not summarized in this article because of length are gestures of the theater (Fischer-Lichte 1992), histories of gesture studies (Bremmer & Rooddenburg 1991), 'neurogestures' (McNeill 2005), gestures in human-computer interface design (Wachsmuth & Fröhlich 1998), methods of gesture transcription and measurement (Quek et al. 1999), and the gestures of children (Bates & Frederic 2002), including homesigns (Goldin-Meadow 2003).

THE ICONIC, METAPHORIC, DEICTIC, BEAT QUARTET

These categories, or as I will later say, dimensions are inspired by the semiotic categories of C.S. Peirce. Elena Levy and I proposed a classification scheme with four categories: *iconic*, *metaphoric*, *deictic*, and *beat*. All are gesticulations or speech-framed gestures on Kendon's Continuum.

Iconic: Such gestures present images of concrete entities and/or actions. For example, appearing to grasp and bend back something while saying "and he bends it way back." The gesture, as a referential symbol, functions via its formal and structural resemblance to event or objects.

Metaphoric: Gestures are not limited to depictions of concrete events. They can also picture abstract content, in effect, imagining the unimageable. In a metaphoric gesture, an abstract meaning is presented as if it had form and/or occupied space. For example, a speaker appears to be holding an object, as if presenting it, yet the meaning is not presenting an object but an 'idea' or 'memory' or some other abstract 'object' (for examples, see McNeill 1992, Cienki 1998). This is a gestural version of the 'conduit' metaphor that appears in expressions like "he packed a lot into that lecture", where the lecture is presented as a container and the message as its contents (Lakoff & Johnson 1980). Recent work on metaphoric gestures has greatly expanded the subject. Cornelia Müller (2004) has developed a new theory of metaphor as a dynamic process (whereby 'sleeping' metaphors are 'awakened' in context) in which metaphoric gestures play an essential part. Parrill & Sweetser (in press) have developed a new theoretical account based on 'mental spaces blending theory'. Metaphoric gestures often indicate that the accompanying speech is meta- rather than object-level – for example, saying "the next scene of the cartoon" and making a conduit cup of meaning gesture (iconic gestures, in contrast, favor the object level).

Deictic: The prototypical deictic gesture is an extended 'index' finger, but almost any extensible body part or held object can be used. Indeed, some cultures prescribe deixis with the lips (Enfield 2001). Deixis entails locating entities and actions in space vis-à-vis a reference point, which Bühler called the origo (Bühler 1982, Haviland 2000). Much of the pointing we see in adult conversation and storytelling is not pointing at physically present objects or locations but is abstract pointing, which Bühler referred to as *deixis at phantasma*. The emergence of abstract pointing is a milestone in children's development. In striking contrast to concrete pointing, which appears before the first birthday and is one of the initiating events of language acquisition, abstract pointing is not much in evidence before the age of 12 and is one of the concluding events (McNeill 1992).

Beats: so called because the hand appears to beating time. Other allusions to the musical analogy use the term 'baton' (Efron 1941). As forms, beats are mere flicks of the hand(s) up and down or back and forth, zeroing in rhythmically on the prosodic peaks of speech. This rhythmicity has made beats seem purely speech-related. However, they also have discourse functionality, signaling the temporal locus of something the speaker feels to be important with respect to the larger context. One can think of a beat as gestural yellow highlighter.

With these four categories, Levy and I were able to classify nearly all gestures in the narrative materials we collected . Other researchers have proposed more finely subdivided categories.

Dimensions rather than kinds. I wish to claim, however, that none of these 'categories' is truly categorical. We should speak instead of *dimensions* and say:

iconicity, *metaphoricity*, *deixis*, '*temporal highlighting'* (for beats), *social interactivity*, or some other equally unmellifluous (but accurate) terms conveying dimensionality.

The essential clue that these are dimensions and not categories is that we often find iconicity, metaphoricity, deixis and other features mixing in the same gesture. Beats often combine with pointing, and many iconic gestures are also deictic. We cannot put them into a hierarchy without saying which categories are dominant, and in general this is impossible. A practical result of dimensionalizing is improvement in gesture coding, because it is no longer necessary to make forced decisions to fit each gesture occurrence into a single box.

TIGHT BINDING

The temporal binding of speech and gesture is almost impervious to forces trying to interrupt it. The very heterogeneity of the following observations shows the inviolability of the speech-gesture unit (see McNeill 2005 for details).

Gesture synchrony and DAF. Delayed auditory feedback or DAF has a dramatic effect on the flow of speech, which slows down, becomes hesitant and is subject to drawling and metatheses (Spoonerisms). Nonetheless, despite the interruptions, speech and gesture remain in synchrony.

Gesture inoculates against stuttering. Mayberry & Jaques (2000) made two noteworthy observations. First, the onset of a gesture stroke inoculates against the onset of stuttering. Second, if stuttering begins *during* a stroke, the speaker's hand freezes in midair and may fall to rest. In both observations, we see an incompatibility between the interruption of speech in stuttering and the occurrence of the meaningful gestures.

Gestures of the blind. Congenitally blind speakers, who have never observed gestures, nonetheless do gesture and do so as frequently as sighted subjects, and gesture even when they know are talking to another blind person (Iverson & Goldin-Meadow 1998). This is dramatic evidence of a speech-gesture bond.

Information exchange. Information received in a gesture may be recalled later as speech (not gesture) (Cassell et al. 1999). Symmetrically, Kelly, et al. (1999) observed subjects recalling information presented in speech as having been gestural.

Gestures and fluency. Speech and gesture become complex or simple in tandem, even to the point of jointly disappearing (the gesture disappears along with speech, rather than replacing it).

To sum up binding. Speech and synchronous co-expressive gestures form a tightly bound unit, capable of resisting outside forces attempting to separate them, such as DAF, stuttering, lack of visual experience of gesture, and loss of fluency. Speech and gesture also spontaneously exchange information in memory, so that when something is recalled the speaker cannot tell the original format. Tight binding clearly fosters an imagery-language dialectic by creating unbreakable psycholinguistic units within which it can take place.

GESTURE ANATOMY

The anatomy in question is temporal, an anatomy of 'phases'. The gesture illustrated in Fig. 1 includes all phases except a final, retraction phase, which did not occur in this case because a new gesture followed immediately. The speaker had been given a comic book to read and was retelling the story to a listener from memory. The transcription is as follows:[3]

so he gets a / hold of a big [oak tree / and <u>he</u> **bends it way ba**<u>ck]</u>

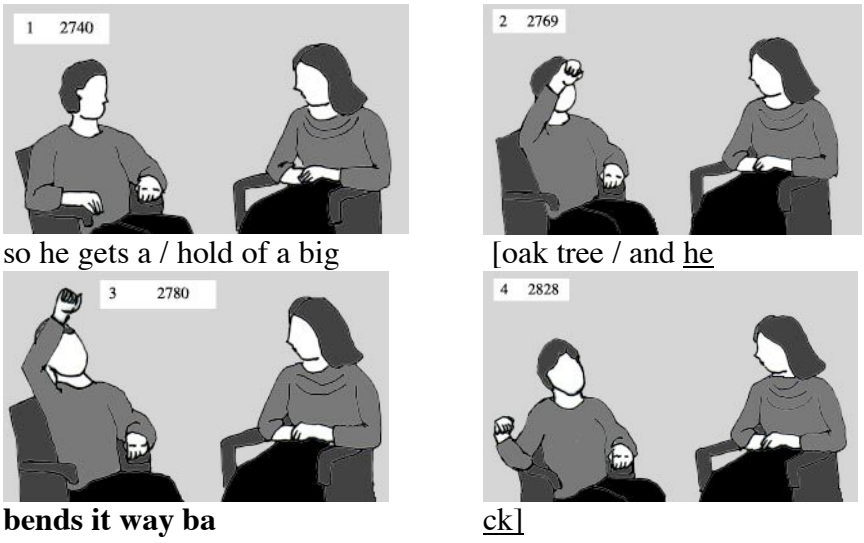

Figure 1. Gesture phases in the "and he bends it way back" gesture. The insert is a frame counter (1 frame = 1/30th sec.). The total elapsed time is about 1.5 secs.

Panel 1. **Pre-preparation position**. Hand is shown just prior to lifting off from the armrest.

Panel 2. A **Prestroke hold** occurs while saying "he" – the hand waiting for "bends." This figure decpicts the hand at the start position of the stroke (ready to pull down and to the rear). The preparation interval was slightly less than 1 second.

Panel 3. Middle of **stroke** – "way" The hand has closed around the 'oak tree' and is moving downward and to the rear. Note how the speaker's own position in space defines the location of the oak tree and the direction of the bending back movement – the gesture framed according to a 'first-person' or 'character' viewpoint.

Panel 4. End of stroke and beginning of the **poststroke hold** in the middle of "back." Hand is at its farthest point to the rear. After the poststroke hold, the hand immediately launched into a new gesture.

Unfolding in time and its meaning

As this example illustrates, gestures pass through a series of phases, each with its own position and function in the gesture. The phases enable us to peer into performance dynamics. Kendon (1980) differentiated among what he termed gesture units, gesture phrases, and gesture phases.

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[3] Transcription by S. Duncan. <u>Notation</u>: / a silent pause; [the onset of motion; underlining a hold; boldface the stroke;] the end of motion. Computer drawings from McNeill Lab video by Fey Parrill.

A gesture unit is the interval between successive rests of the limbs. In the example, the gesture unit included not only the interval from “oak” to “ back,” but also further speech and later gestures not shown.

A gesture phrase is what we intuitively call a ‘gesture’ and it in turn consists of up to five gesture (without an “r”) phases, in sequence:

> *Preparation* (optional): The limb moves away from a rest position into the gesture space where it can begin the stroke. The onset of preparation shows the moment at which the visuospatial content of the gesture starts to take form in the cognitive experience of the speaker. “Oak tree and” coincided with the preparation phase in the illustration, and it is noteworthy that the preparation commenced with the first mention of the object in the preceding clause – as the idea was introduced, so the next image flicked on to become a gesture.
>
> *Stroke* (obligatory in the sense that, absent a stroke, a gesture is not said to occur): The stroke is the gesture phase with meaning; it is also the phase with effort, in the dance notation sense of focused energy. In the example above, the stroke was the bending back, the hand in a grip around something thick, timed with the co-expressive “bends it way back”.
>
> *Retraction* (optional): the hands return to rest (not always the same position as at the start). There may not be a retraction phase if the speaker immediately moves into a new stroke, as was the case in the illustration.
>
> In addition, Sotaro Kita identified:
>
> *Pre- and post-stroke hold phases* (optional): temporary cessations of motion either before or after the stroke motion; in the example a prestroke hold occurred during “he” and a poststroke hold during the second half of “back”; holds ensure that the meaningful part of the gesture – the stroke – remains semantically active during the co-expressive speech. Holds suggest that the stroke and the co-expressive speech comprise an idea unit created in advance, from the start of the preparation phase.

The gesture phases are organized around the stroke. This is the ‘object’ being presented. It is prepared for, withheld if need be until the co-expressive speech is ready, and held again until all linked speech is over. The full span of phases, from the beginning of preparation to the end of retraction, describes the lifetime of a particular gesture and its linked idea unit.

CO-EXPRESSIVENESS AND SYNCHRONY

Gesticulations (but not other points along Kendon’s Continuum) have the property that strokes synchronize with co-expressive speech. This section explains this concept. An example is illustrated in Fig. 2. The speaker was describing a cartoon episode in which one character tries to reach another character by climbing up a drainpipe on the inside. The speaker is saying, “and he tries going **up thróugh** it this time”, with the gesture occurring during the boldfaced portion (the illustration captures the moment at which the speaker is saying the vowel of “through”). Co-expressively with “up” her hand

rose upward, and co-expressively with "through" her fingers spread outward to create an interior space. The upward movement and opening of the hand took place simultaneously, and both were synchronized with "up through", the linguistic package that carries the same meanings.

Fig. 2. Synchronous, co-expressive gesture with "up thróugh"

The effect is a uniquely gestural way of packaging meaning – something like 'rising hollowness', which does not exist as a semantic package of English at all. The gesture and the linguistic construction synchronize as a whole, not component by component. Thus, speech and gesture synchronize at the point where they are co-expressive and this, not the components, is the unit that aligns them.

Growth points and context

Synchronous combinations of such unlike modes of cognition – visuospatial-actional gesture synchronized with analytic-combinatoric speech – may be operative psycholinguistic units, termed 'growth points', or GPs (McNeill & Duncan 2000). One way to think of a GP is as imagery that is categorized linguistically; an image with a foot in the door of language. A GP is inferred from the totality of communicative events, with special focus on speech-gesture synchrony and co-expressivity. It is called a growth point because it is meant to be the initial form of a thinking-for-speaking unit out of which a dynamic process of utterance and thought organization emerges.

THE PSYCHOLOGICAL PREDICATE

Regarding the GP as a psychological predicate (a term from Vygotsky 1986 – not always a grammatical predicate) suggests a mechanism of GP formation in which *differentiation of a focus from a background* plays an essential part.

The concept of a psychological predicate illuminates the theoretical link between the GP and the context of speaking. Defining a psychological predicate requires reference to the context; this is because the psychological predicate and its context are mutually defining. The psychological predicate:

1. marks a significant departure in the immediate context; and
2. implies this context as a background.

We have in this relationship the seeds for a model of realtime utterance generation and coherent text formation.

First, when gestures and speech synchronize they jointly form the contrast underlying a psychological predicate. Second, the form of the gesture embodies the content that makes this differentiation meaningful. These correspondences can be demonstrated by exploiting a quirk in the cartoon stimulus that we have employed, in which Sylvester attempts to reach Tweety by climbing a drainpipe conveniently running up the side of the building from street level to the floor where Tweety is perched; he does this twice – first on the outside of the pipe, then on the inside. If a speaker recalls both attempts and in the correct outside-inside order, the gesture-speech combination relating to the second attempt includes a focus on interiority; this is the differentiating element. If a speaker misses the outside attempt but does recall the inside attempt, or recalls them in reverse order, interiority does not now contrast with exteriority, and the gestures with such recall do not include it as a particular feature. These results have been reported by Susan Duncan at workshops; I summarize them, with illustrations, in McNeill 2005.

Contexts and catchments

The context of differentiation is an empirically approachable concept via gestures that organize themselves into 'catchments'. A catchment is recognized when one or more gesture features recur in at least two (not necessarily consecutive) gestures. The logic is that a discourse theme will produce gestures with recurring features. These gesture features can be detected. Then, working backwards, the recurring features offer clues to the cohesive linkages in the text with which they co-occur. A catchment is a kind of thread of visuospatial imagery that runs through a discourse to reveal the larger discourse units that emerge out of otherwise separate parts. The recurring features can include hand use (right hand, left hand, two hands similarly deployed, two hands differently deployed), space, orientation, trajectory, hand shape and position, and others, although these are the most common.

By discovering the catchments created by a given speaker, we can see what this speaker is combining into larger discourse units – what meanings are being regarded as similar or related and grouped together, and what meanings are being put into different catchments or are being isolated, and thus are seen by the speaker as having distinct or less related meanings. The multimedia Annex to this article is a suite of files with material derived a living space description – because of informed consent considerations, material different from the examples described in the body of this article. The Annex illustrates: a) naturally occurring spontaneous and apparently unwitting gestures during a speaker's description of her house; b) how the gestures have been transcribed and analyzed; and c) how they form themselves into catchments, or cohesive discourse segments. In addition, d) the catchments are correlated with discourse purposes and prosody. At least for the first run-through, I recommend that the Annex material be viewed in this sequence: first, Video 1; next PDF 1 Transcript; third, PDF 2 Gesture Coding (see Video 1, PDF 1 Transcript, and PDF 2 Gesture Coding).

Viv's catchments. I shall use one speaker's recounting of an episode from the cartoon stimulus to demonstrate catchments and how they can be used to infer something of the dynamic process of utterance formation.

The episode involves a bowling ball, and follows directly the ascent inside the drainpipe described earlier. Tweety, seeing Sylvester, fetches a bowling ball and drops it into the top of the pipe; the ball and Sylvester meet in the middle; Sylvester shoots out the bottom of the pipe, the bowling ball now inside him; he rolls, bowling-ball style, down an inclined street and into a bowling alley; after a significant pause, there is the sound of pins being knocked over.

Viv's gesture performance reveals 3 catchments, recognizable from hand use and hand shape/position:

C1. The first catchment involves one-handed gestures, and accompany descriptions of Sylvester's solo motion, first up the pipe, then out of it with the bowling ball inside him. Thus, **C1** ties together references to Sylvester as a solo force.

C2. The second catchment involves two-handed symmetrical gestures that group descriptions where the bowling ball is the antagonist, the dominant force. Sylvester becomes what he eats, a kind living bowling ball, and the symmetric gestures accompany the descriptions where the bowling ball asserts this power.

C3. The third catchment involves two-handed asymmetrical gestures and groups items in which the bowling ball and Sylvester mutually approach each other in the pipe. Here, in contrast to the symmetric set, Sylvester and the bowling ball are equals differing only in their direction of motion.

With these catchments, we can analyze the realtime origins of the utterance and gesture in the accompanying example, in a way that incorporates context as a fundamental component. The illustrated example is in the symmetrical **C2**, which shows that one of the factors comprising its field of oppositions was the various guises in which the bowling ball appeared in its role of an antagonist. That is, the idea unit was not only dropping the bowling ball but the bowling ball as a force in its own right. We can write the meaning of the psychological predicate as:

Antagonistic Force: Bowling Ball Downward.

This was the context and contrast. Thus, "it down", unlikely though it may seem as a unit from a grammatical point of view, was the cognitive core of the utterance – the "it" indexing the bowling ball, and the "down" indexing the significant contrast itself in the field of oppositions. And the verb "drops", therefore, was *excluded* from this GP; it referred to something Tweety did, not what the bowling ball, as a force, did.

Fig. 3. Downward stroke with "**it do**wn".

Viv.'s gesture in Fig. 3 was made with two symmetrical hands — the palms loosely cupped and facing downward as if placed on top of a large spherical object, and the hands moved down during the linguistic segments "it down". The inferred GP is this image of downward movement *plus* the linguistic content of the "it" (i.e., the bowling ball) and the path particle "down". The stroke *excluded* the verb, "drops". The full utterance was "Tweety runs and gets a big bowling ba[ll and drops **it do**wn the drainpipe #]".

The exclusion of "drops" was not an accident. First, the preparation phase of the "it down" gesture had two features that skip the verb. Preparation began at the first mention of the bowling ball in the preceding clause (again, preparation for the next gesture began with the object was first mentioned). This shows that the bowling ball was part of the discourse focus at that moment. And, second, preparation continued right *through* the verb, suggesting that the verb was irrelevant to this focus. Further, a brief prestroke hold seems to have preceded "it down" (although coding varies), which, if present, targeted the stroke to "it down". Finally, a poststroke hold lasted exactly as long as it took to complete the spoken articulation of "down", which preserved the synchrony of the gesture and the word. So the stroke fully and exactly timed with just two words, "it down", and excluded a third, "drops". The rest of the utterance can be explained by 'unpacking' this GP via a construction (in this case, the caused-motion construction, which provided the verb "drops" as well as the ground element, "the drainpipe"; cf. McNeill & Duncan 2000).

Social context

Vygotsky (1986), in his argument against Piaget, famously asserted that everything appears in a child's development twice, first on the social plane, later on the psychological. The concept of a social-to-psychological transition can be applied to gestures as well. Gestures imply a social other. If one denies access to a listener, the frequency of gesture declines (Alibali et al 2000). Increasing the number of listeners changes the shape of the gesture space and this in turn changes the direction of gestures depicting movements of characters in the story (Özyürek 2000).

I shall conclude with examples of the social sharing of gestures. The research from which they are drawn is not yet published, but the phenomenon of social sharing or

resonance through gesture is significant and I believe should be noted in this Encyclopedia.

MIMICRY AND TWO-BODIED GESTURES

Gestural mimicry occurs when one conversational partner, within a short time, reproduces the gesture of the other partner; the effect is often to cement a kind of social solidarity and is accordingly seen commonly between close friends. The example in Fig. 4 from research by Irene Kimbara shows the woman on the left reproducing the gesture just performed by her friend on the right.

Fig. 4. Gestural mimicry. First panel is a gesture by the speaker to the right; second panel is mimicry by the speaker to the left.

A different kind of shared gesture is also possible between strangers. The following illustrations are from Nobuhiro Furuyama who studied the gestures of learners as they were instructed in a new motor task (*origami* paper folding). In each illustration, the learner is seated at the left (two different training sessions).

Fig. 5. Gesture mimicry that synchronized with the other's speech.

Fig. 6. Gesture appropriation synchronized with the person's own speech.

In the Fig. 5 example, the learner mimics the gesture of her tutor. The mimicry occurred without speech by the learner, but her *gesture* synchronized with the *tutor's*

speech. As the tutor said, "[pull down] the corner", the learner performed the gesture during the bracketed portion.

The Fig. 6 example, in contrast, shows the learner appropriating the tutor's *gesture* by combining it with her *speech*. The learner is saying "[you bend this down?]", and during the bracketed speech moved her hand to the tutor's hand, and then moved her hand downward and away (the illustration shows the start of the gesture). As Furuyama observes, the tutor had turned in his chair so that the same left-right gesture space was before him and the learner, a maneuver that might have invited her to enter his gesture space. It is striking that any taboo against strangers coming into physical contact was overridden while the hands were in a symbolic mode.

Examples of these kinds address what can be called collectively the 'social resonance' of gesture. Janet Bavelas has long been interested in this phenomenon. Bavelas, et al.(2000) have demonstrated resonance not from the viewpoint of shared feelings, the more traditional approach, but as joint cognition and storytelling; gestural repetition seems to act as grounding and in general conveys mutual understanding.

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NOTES

1. I am grateful to Fey Parrill for help with preparation of this article. I also wish to acknowledge financial support by grants from the National Science Foundation and the VACE program under the Advanced Research and Development Activity in Information Technology (ARDA).

2. A web page describing the Society and *GESTURE* is at http://www.utexas.edu/coc/cms/International_House_of_Gestures/

3. Transcription by S. Duncan. Notation: / a silent pause; [the onset of motion; underlining a hold; boldface the stroke;] the end of motion. Computer drawings from McNeill Lab video by Fey Parrill.