

# Notes on the Origin of Language: What Evolved, and How

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- Two hubristically named ‘chapters’–
    - Now, *What evolved*.
    - Later, *How it did*.
- 

## 1 – What Evolved (in part)

# Wundt's Insight - Two Cognitive Modes

- “From a psychological point of view, the sentence is both a simultaneous and a sequential structure. It is simultaneous because at each moment it is present in consciousness as a totality even though the individual subordinate elements may occasionally disappear from it. It is sequential because the configuration changes from moment to moment in its cognitive condition as individual constituents move into the focus of attention and out again one after another.” (Blumenthal translation of Wundt 1900). Thanks to Zenzi Griffin for alerting me to this passage.

# Gestures shed light on two cognitive modes

- Among the many manifestations of the embodiment of human language and thought, gestures are outstanding - natural and universal.
- Gestures and more broadly the imagery they embody are **components of speaking, not accompaniments but actually integral parts of it.**
  - Much evidence supports this idea, but its full implications have not always been recognized.
- This realization aligns gestures with Wundt's 'simultaneous structure', and the inseparability of speech and gesture opens an empirical window into the double cognitive mode of the 'sentence' that he grasped intuitively.



# The Larger Picture - 1

- The two modes have been approached separately - each with its own traditions, methodologies, sciences, and institutional practices (& prejudices)
- Each describes something of substance:
  - ◆ **Static** = language is a thing, not a process. This is the Saussurian tradition and it bears on Wundt's segmented mode
  - ◆ **Dynamic** = language is a process, not a thing. Vygotsky tradition and it bears on Wundt's simultaneous mode.
- Gesture lets us, the observers, access the dynamic mode. This is because it plays an active part in fueling it.

# Larger picture - 2

- Dynamic side of language
  - ◆ Not meant as a replacement of the Saussurian static view or its modern descendents.
- The dynamic view is, rather, another dimension of language.
  - ◆ Ultimately, we have to consider how to combine the static and dynamic views.
- An historical figure articulating the dynamic view is Vygotsky (1987, based on texts written in the 1930s).

# Vygotsky on the two cognitive modes

- “Meaning is an act of thought in the full sense of the term. But at the same time, meaning is an inalienable part of word as such, and thus it belongs in the realm of language as much as in the realm of thought.” (T & L, p. 6)
- ◆ Vygotsky’s insight – not unlike Wundt’s - was that meaning has a dual character - holistic and analytic at the same time.
- ◆ We will develop this insight by taking into account what Vygotsky could not have considered - speech-synchronized imagery in gesture form.

# Synchrony and what it means

- Synchrony of speech and gesture make possible a mode of cognition in which the static and dynamic dimensions are both present.
- Phylogenetically, this cognitive ability arose as part of the origin of language (= the hypothesis) and is an essential part of the dynamic dimension.
- In this mode, an idea exists simultaneously in opposite semiotic formats– visuo-actional imagery and a codified linguistic form.



# The contrasting semiotic modes

- In a GP imagery and language are opposed



Imagery	Linguistic encoding
<i>Global</i> : meanings of elements depend on whole	<i>Compositional</i> : meaning of whole depends on elements
<i>Synthetic</i> : distinguishable meanings synthesized in image	<i>Analytic</i> : distinguishable meanings separated
<i>Additive</i> : no new values specific to combination	<i>Combinatoric</i> : new syntagmatic values

- In a GP, the global-synthetic ('imagery') and analytic-combinatoric ('language') semiotic modes simultaneously embody the same idea, and this is the source of instability, and dynamism.

# The cognitive mode is an imagery-language dialectic

A dialectic implies

- ◆ *A conflict or opposition of some kind*
- ◆ *Resolution of the conflict through change*

A dialectic presupposes Vygotsky's concept of a **unit = the smallest component that retains the quality of a whole**. This whole is the realm of the dialectic - it is the domain within which the cycle of conflict-resolution-development takes place

A dialectic is inherently dynamic - thus a model for the dynamic dimension.

# Vygotsky on Dialectic

- “The relationship of thought to word is **not a thing but a process, a movement from thought to word and from word to thought.** ... This flow of thought is realized as an internal movement through several planes, as a transition from thought to word and from word to thought.” (Vygotsky 1987, p. 250)


# The Growth Point Hypothesis

- The growth point is proposed as **the minimal unit of this imagery-language dialectic**.
- A growth point is a package that has both linguistic categorial and imagistic components – imagery with a foot in the door of language.
- Growth points are inferred from the totality of communicative events with special focus on speech-gesture synchrony and co-expressivity.

# The GP is so named because it is a distillation of a growth process

- An ontogenetic-like process but vastly sped up and made microgenetic in online thinking-for-speaking.
- The GP is the initial unit of thinking-for/while-speaking (from Slobin 1987, elaborated to include thinking online, during speech).
- Out of it a dynamic process of utterance-level and discourse-level organization emerges.
- Imagery and spoken form are mutually influencing in a GP. It is not that imagery is the input to spoken form or spoken form is the input to imagery. The GP is fundamentally both.

# Psychological predicates

- Another insight into what evolved is that the GP is what Vygotsky referred to as a **psychological predicate**,  and thus is intrinsically connected to the context: it does not exist separately from its immediate context of speaking.
  - In a psychological predicate, newsworthy content is differentiated from context. It cannot exist without this context.
- A robust phenomenon demonstrates the incorporation of context in the psychological predicate: gesture form and timing embody just those features that differentiated it in the context.

# Method

- We have collected much of our data in the form of narrations of an animated cartoon stimulus.
  - Two participants at a time – one, the narrator, watches the cartoon, and then tells the story from memory to the other, the listener. To encourage attention and good a good presentation, we have the listener retell the story to one of the experimenters. The resulting videos are carefully transcribed and annotated.
- While this method is quasi-dialogic (the listener is active and asks questions but the narrator does most of the talking), the advantages are:
  - a) The gesture is interpretable against a known source other than speech, enabling observation of co-expressive pairings
  - b) The known base also enables comparisons across speakers, ages, languages, neurological conditions, etc.

# A natural experiment

- In our cartoon stimulus, Sylvester tries to reach his quarry, Tweety, by means of a conveniently placed drainpipe.
- In the sequence of the cartoon, the first attempt is Outside. Then Inside.



The 2 ascents and aftermath



# Two who omitted the Outside episode

A natural experiment occurs when some subjects omit the Outside episode while retelling the Inside (no one has ever omitted Inside and remembered Outside). Sue Duncan first identified this possibility of a natural experiment.

For Inside-only narrators, interiority is non-differentiating.

We expect them then not to include interiority in gesture, even though they have perceptually registered that S. climbs the inside of the pipe. We have two such speakers ...

Both show ascent (right speaker with his thumb only). Neither includes interiority even though it was in the event.

Not that they are unaware of interiority. Both describe the bowling ball and its descent, but absent Outside, interiority is not significant.

# Outside - Inside in correct order

The remaining speakers recited Outside-Inside in the correct order and did highlight interiority - either in a rising extended index finger, which seems to convey both upward movement and Sylvester's plump body squeezed inside the pipe, or a rising upward cupped hand – the earlier 'rising hollowness' gesture.

A 4<sup>th</sup> speaker is the proverbial exception that proves the rule – as I will explain when we reach her clip.

# Also, Gesture Timing Reflects Psychological Predicates

TWO 'CLIMBS UP' EXAMPLES - S. Duncan

- Form and timing differentiated relative to context:

Climbs 1 “[he **climbs up** the...]”

Climbs 2 “climbs [up in **through** the]”



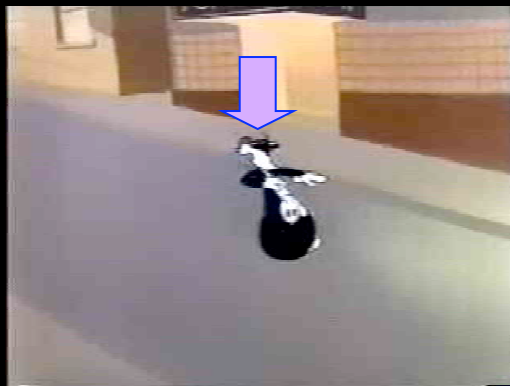
OUTSIDE : ASCENT GESTWITH 'CLIMB'



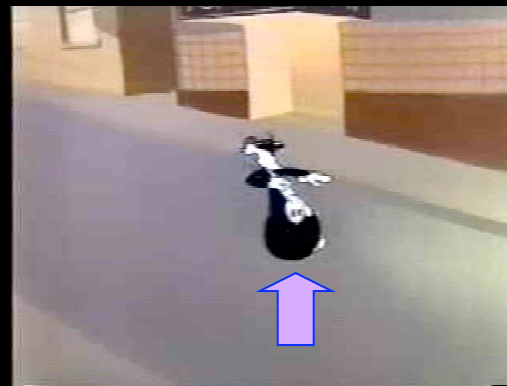
INSIDE : ASCENT GEST SHIFTS TO PATH

# A designed experiment: manipulating focus

- If we (the experimenters) can manipulate the point of significant contrast, then GPs should form where we tell them to.
- Fey Parrill's thesis: Cueing discourse focus changes speech and gesture in description of event.
- People see the part in which Sylvester swallows the bowling ball, and are prompted in one of two ways:




**Cat arrow condition**

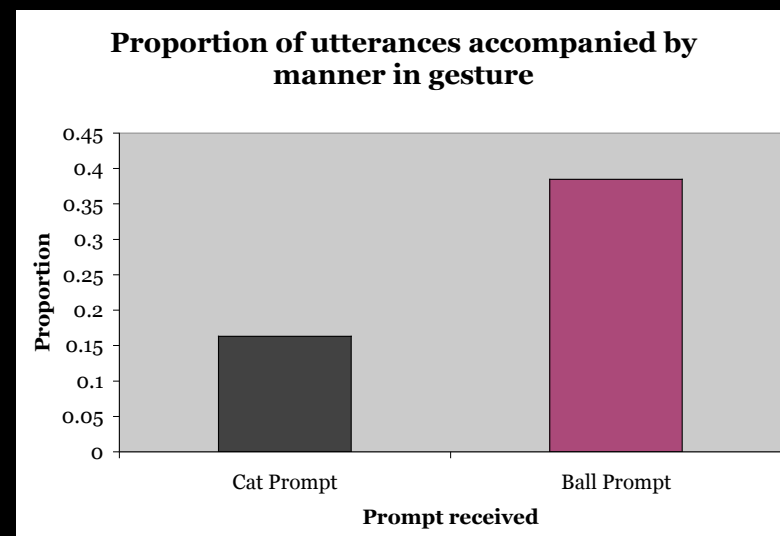
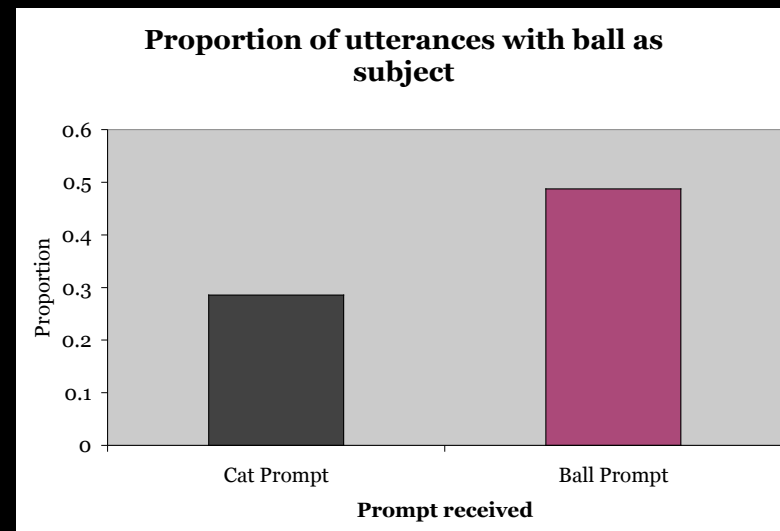


**Ball arrow condition**

# Parrill results (n=19)

- **Ball prompt** results in **more ball-subject utterances** - “the ball rolls him down the street” ( $t=1.81 > 1.66, p=.03$ ) with the gesture timed with verb
- **Ball prompt** results in **more manner in gesture**  ( $t=2.39 > 1.66, p<.01$ )

The psych predicate was what the ball did, not what S did. The gesture was formed and timed to embody this psych pred.



# To sum up

- Ample evidence that gesture and speech jointly form psychological predicates.
- The GP is a hypothesis about the psychological predicate – that it comprises a semiotic opposition and is unstable – the same idea in opposite semiotic modes , and this fuels thinking and speaking in a way that creates a dynamic dimension.
- Now, we try to see how it all evolved.

## 2 – What Evolved (in part)

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Outline of this ‘chapter’:

- Gesture-first, and the trouble with it

- Mead’s Loop and what it explains

- The Thought-Language-Hand brain link

- Selection scenarios

- Function of syntax on dynamic dimension

- Timeline

- Conclusions

# A method for testing phylogenetic theories

- Taking gesture into account, we see language as a dynamic system combining imagery and encoded categorial content during real-time utterances.
- The methodological approach this position suggests is to ask whether (and if so, how) a theory of language origin explains the dual semiotic system of imagery and conventional code.
- The ‘gesture-first’ theory fails this test—in fact, fails it twice: it predicts what did not evolve and does not predict what did.



# Gesture-first hypothesis

- The initial form of language, it says, was gestural – a sign language or other nonspoken form such as pantomime.
- Speech evolved later, scaffolded (possibly) by gesture, eventually supplanting the original gesture code.

# The problem with it

- Our basic claim is that a primitive phase in which communication was by gesture or sign alone, if it existed, could not have evolved into the kind of speech-gesture combinations that we observe in ourselves today. \*
- We don't deny that such a phase could have existed, but do claim that it could not have led to the dynamic dimension of language.
- We thus say that 'gesture-first' incorrectly predicts that speech would have supplanted gesture, and fails to predict that speech and gesture became a single system.
- **We ourselves are contradictions of gesture-first.**

\*The 'our' includes Susan Duncan, Shaun Gallagher, Jonathan Cole, and Bennett Bertenthal – my co-authors criticizing the gesture-first hypothesis.

# Why does speech have to *supplant* gesture in gesture-first?

- Arbib in several papers argues that the original gesture code ‘scaffolds’ speech and this may seem a step away, but still either gesture withers or it retreats into the background, and in either case is not part of speaking itself.
- The reason why supplantation, overt or hidden, is inescapable in gesture-first is found in the very core meaning of this theory. Gesture, according to ‘gesture-first’, is a stand-alone code. The whole logic is to picture one code coming after another, never to create speech and gesture as a single *integrated* package of semiotic opposites.

# And indeed, advocates of gesture-first invoke supplantation

Henry Sweet (and presumably Henry Higgins) believed that speech emerged when mouth parts mimicked manual gestures, which then disappeared:

“Gesture ... helped to develop the power of forming sounds while at the same time helping to lay the foundation of language proper. When men first expressed the idea of ‘teeth’, ‘eat’, ‘bite’, it was by pointing to their teeth. If the interlocutor’s back was turned, a cry for attention was necessary which would naturally assume the form of the clearest and most open vowel. A sympathetic lingual gesture would then accompany the hand gesture which later would be dropped as superfluous so that ADA or more emphatically ATA would mean ‘teeth’ or ‘tooth’ and ‘bite’ or ‘eat’, these different meanings being only gradually differentiated” (emphasis added).  
(Thanks to Bencie Woll for this quote).

Stefanini et al. (referring to Gentilucci and others):

“the primitive mechanism that might have been used to transfer a primitive arm gesture communicative system from the arm to the mouth...”

Tomasello (2008), thinking in terms of primate and very young (one-year and less) human infant gestures, likewise puts forth ‘gesture-first’ with supplantation (referring to ontogenesis, but with the suggestion that something similar took place in phylogenesis):

“Infants’ iconic gestures emerge on the heels of their first pointing ... they are quickly replaced by conventional language ... because both iconic gestures and linguistic conventions represent symbolic ways of indicating referents” (p. 323).

→ *It is not that the transitions they mention do not occur, but that they are insufficient to lead to the incorporation of gesture as we see it in current-day human speech.*

- Corballis, in an argument for speech supplanting a gesture-first language, points out the advantages of speech over gesture in a system of communication.
  - There is the ability to communicate while manipulating objects and to communicate in the dark.
  - Less obviously, speech reduces demands on attention, he argues, since interlocutors do not have to look at one another (p. 191).
- However, these qualities are irrelevant for gesture-first. This is because there are also positive reasons for gestures not being language-like even if speech and gesture co-evolved.

# Speech-gesture division of labor

- Speech is the default medium for linguistic encoding. Susan Goldin-Meadow, Jenny Singleton and I once proposed that gesture is non-linguistic because of its iconicity – it is better than speech for imagery.
- Given this asymmetry, even if speech and gesture were selected jointly, it would still work out that speech is the medium of linguistic segmentation.

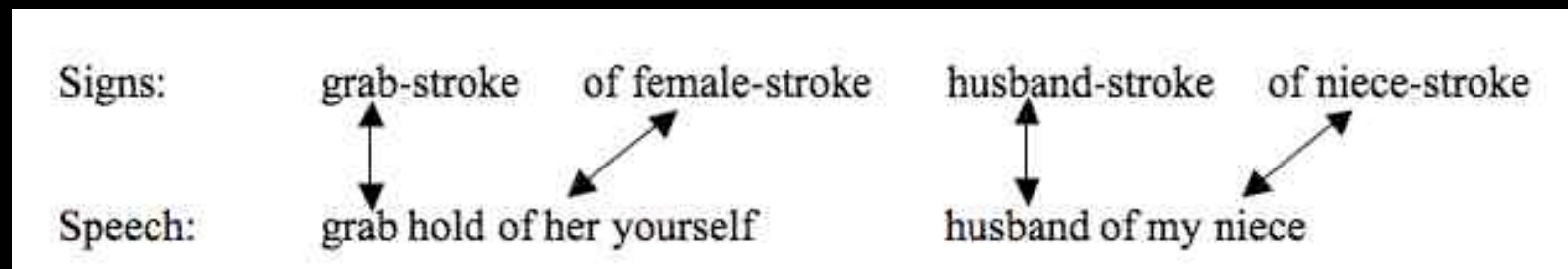
# Models of supplantation

- If gesture did come first and speech later, then, logically, a crossover would occur, a time when the old gesture code and the rising speech code coexisted.
  - It was precisely at this point, as Arbib argues, that gesture could have ‘scaffolded’ speech.
- We have contemporary models of the crossover – one shows mutual code repulsion, the other (which could be called ‘scaffolding’) doesn’t produce the GP.
- Hence, neither shows the dynamic dimension of language emerging at such a hypothetical ‘crossover’.
- In fact, we say, there was never a crossover – speech and gesture co-evolved, neither speech-first nor gesture-first.



# WARLPIRI SIGN LANGUAGE (Kendon 1988) Model of the 'crossover'

- A sign language used by women when under speech bans but also sometimes along with speech. This latter usage lets us see what may have occurred at the hypothetical gesture or sign-speech crossover.



- Speech and sign start out together at the beginning of each phrase but immediately fall out of synchrony and then reset only to become asynchronous again (there one reset in the example).
- The two codes - speech and sign - cannot lead to the dialectic opposition of imagery and linguistic code.




# ENGLISH-ASL BILINGUALS

(Emmorey et al 2005) model of the ‘crossover’

- “all of a sudden [LOOKS-AT-ME]” (from a Sylvester and Tweety cartoon narration; capitals signify signs simultaneous with speech).
  - This could be ‘scaffolding’ à la Arbib, but notice that it does not create the combination of unlike semiosis that we are looking for. Signs and words are of the same semiotic type—segmented, analytic, repeatable, listable, and so on.
- There is no global-synthetic component, no built-in merging of analytic/combinatoric forms with global synthesis. So it could not be the beginning of the GP and the dialectic of opposed semiosis.

# Pantomime

- An alternative version of gesture-first is that the initial form of language was not sign language, but a kind of pantomimic communication, much as one may resort to when you don't speak the local language.
- Could pantomime have been a precursor?
- Michael Arbib has so argued – that pantomime was the initial step and it scaffolded speech later (this at the 'crossover')

- However, pantomime is a different kind of gesture.
  - What distinguishes pantomime from ‘gesticulation’ is that gesticulation but not pantomime is integrated with speech. The gesture continuum displays the difference
  - In pantomime there is no co-construction with speech,  no co-expressiveness, timing is different (if there is speech at all), and no duality of semiotic modes.
    - Pantomime, if it relates to speaking at all, does so, as Susan Duncan points out, as a ‘gap filler’ —appearing where speech does not.
    - Movement by itself offers no clue to whether a gesture is ‘gesticulation’ or ‘pantomime’; what matters is whether or not two modes of semiosis combine to co-express one idea unit simultaneously.

# Last word on gesture-first

- Whether you are persuaded by these arguments depends, ultimately, on taking seriously the idea that gesture and speech *comprise a single multimodal system*, that gesture is not an accompaniment, ornament, ‘add-on’ or supplement to speech, but is actually part of it.
- The GP hypothesis is designed to articulate this unified speech-gesture system as a minimal unit of imagery-language dialectic.

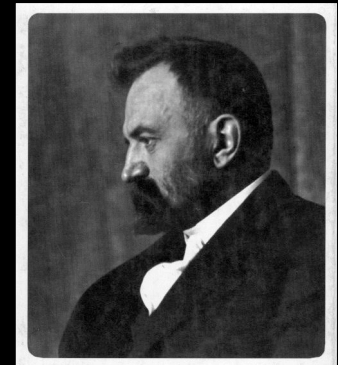
# The 'Mead's Loop' alternative

- Rizzolatti & Arbib linked mirror neurons to case grammar - a grammar of semantic connections, such as action-on-object.
  - However, this argument by-passes (many) more immediate steps.
- What would a more immediate effect have been?
  - A new way to organize sequences of movements in areas 44/45 - co-opting them by language and meaning.
  - Sequential actions that combine the manual and vocal-oral.
  - Shareable actions.

# ‘Mead’s Loop’

- Mead articulated the logic of an evolutionary step that explains how gesture and speech could co-evolve; how gesture becomes the articulatory frame of speech; and how it meshes with the social basis of human language:
  - “Gestures become significant symbols when they implicitly arouse in an individual making them the same response which they explicitly arouse in other individuals.”

G.H. Mead, *Mind, Self, & Society*, p. 47, but originally viewed at the University of Chicago Regenstein Library in a now vanished pamphlet entitled “Philosophy of the Gesture”.



# Mirror Neurons Complete Mead's Loop

- Mirror neurons could be the mechanism of this response to oneself. Not the usual primate version, but mirror neurons with a 'twist'.
- This 'twist' is what evolved - a new kind of mirror neuron response. Posit a self-response via one's own mirror neurons
- Hypothesize that part of human evolution was that mirror neurons participated in one's own gesture imagery. This hooks into Mead's loop - one's own gestures activate the part of the brain that responds to intentional actions including gestures by someone else and thus treats one's own gesture as a social stimulus.
- The evolutionary step was this self-response by mirror neurons. This brought the meanings of gestures into the 44/45 areas, where they (= meanings other than instrumental action) could orchestrate vocal and manual action sequences.

- This hypothesis is meant to explain
  - a) the synchronization of gesture with vocalization on the basis of shared meaning other than actions themselves (=the way they synch)
  - b) the co-opting of brain circuits that orchestrate sequential actions by meanings - these meaning carried by gestures.
- Mead's loop treats imagery as a social stimulus
  - Explains why gestures occur preferentially in a social context of some kind (face-to-face, the phone, but not a tape recorder).
- Mirror neurons complete Mead's loop in a part of the brain where action sequences are organized - two kinds of sequential actions, speech and gesture, converging, and with meaning as an integral component.
- Co-opting sequential actions by a socially referenced stimulus (imagery) makes a new kind of action (and cognition) possible.

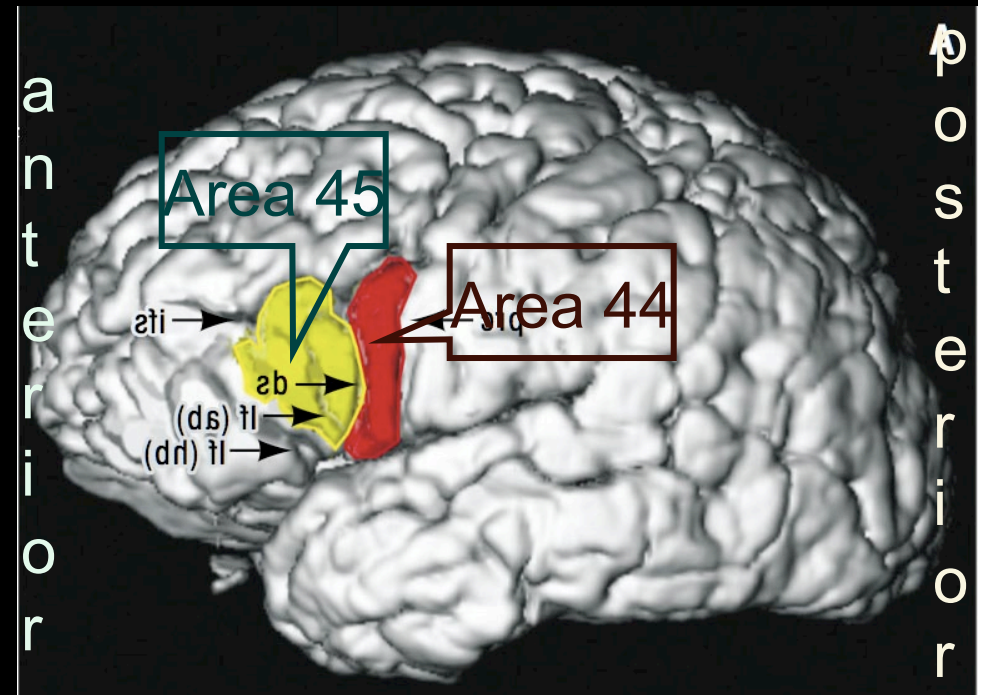


# How does the brain accomplish this?

- All action involving sequences of different movements or stages is orchestrated in 44-45.
- This would include speech movements but also manual movements with the requisite complexity (such as gestures).
- Nishitani et al (2005), based on extensive brain imaging experiments, write for example:
  - “Far beyond its classical language functions, Broca’s region contributes to action planning, action observation, action understanding, and imitation. Speech production and comprehension can be considered a highly developed form of action execution/observation matching (see also the motor theory of speech” (*Physiology* 20: 66)

# Broca's Area as an organ of action orchestration

- Areas 44/45 comprise a sequence orchestration part of the brain. This includes speech movements and also manual movements with the complexity (such as gestures).



*Image flipped to appear as left hemisphere*

# Broca's aphasia impairs both speech and gesture sequences (Pedelty thesis)

- Speech-gesture synchrony intact. Sequence orchestration interrupted.
  - Isolated speech and gesture.
  - Gesture-speech synchrony preserved
  - Implies GPs
    - Note how there is differentiation of newsworthy content with both speech and gesture
  - Unable to orchestrate action sequences of either kind



Eventually, her gesture shifts to right hand and then she says 'down' in synchrony → GP located in left hemisphere Broca's Area

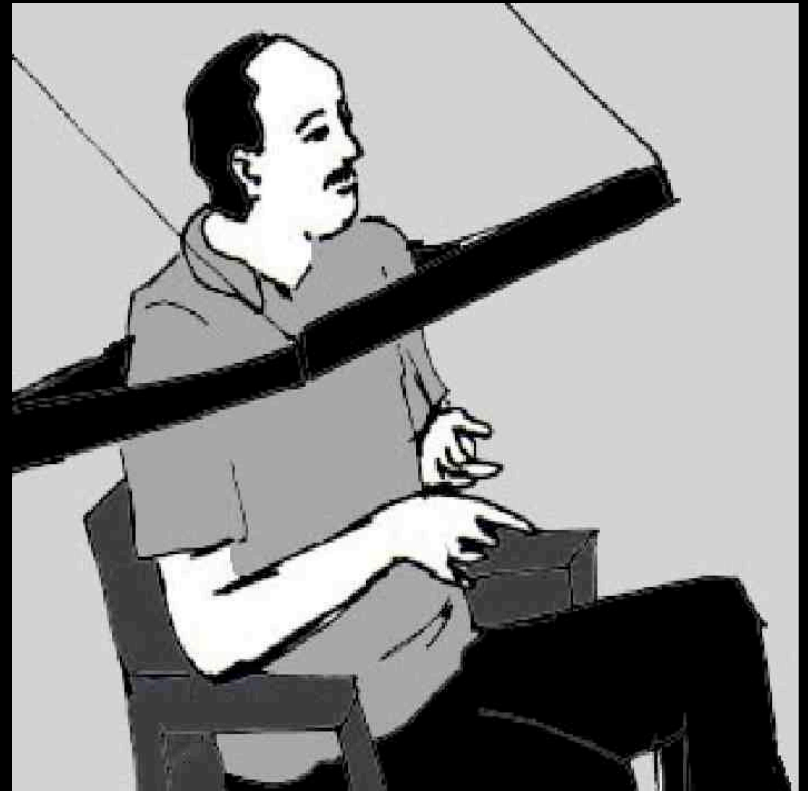
# Thought-Language-Hand Link

- An implication of the GP hypothesis is that, by speaking, gestures are generated as an integral component of the speech process. We see this in the Broca's speaker.
- In another approach, if we can examine a speaker whose physical condition would otherwise prevent organized motions from occurring, we should still see gestures with speech.
- IW is such a speaker. \*
- What the IW case demonstrates is a **Thought-Language-Hand Link (TLH link)** in the human brain.

\* The IW project is a collaboration with Jonathan Cole and Shaun Gallagher

# IW - gestures without vision

- A case that lets us disentangle gesture and instrumental action
  - IW is unable to perform goal-directed actions without vision under a blind
  - Remarkably, despite not knowing where his hands are in space without visual guidance, IW performs exact speech-synchronized gestures when vision is denied.
- The IW case
  - IW lost all motor feedback from the neck down as young man
  - Over years of effort, IW has taught himself how to move using vision and cognition.
  - However, instrumental action is possible only with vision.



# Imagine what it is like

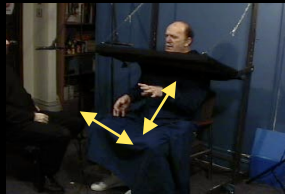
- To imagine what it might be like, try this experiment:
  - Sit at a table with your hand placed underneath it, out of view.
  - Make a fist and then extend your index finger.
  - Curl it back into the fist and then extend it again.
- The mechanisms that allow you to tell when your finger is extended or not, or even that you've made a fist, simply do not work for IW.
- IW can't perform instrumental actions without vision such as removing the screw-top of a thermos bottle, but he makes perfectly formed speech-synchronized gestures. The only abnormalities have to do with **topokinetic** accuracy – his hands do not align precisely – but gestures are formed with complete **morphokinetic** accuracy.

Things to look for:

EXACT TIMING:  
[had **chased the**  
mouse] back to  
his hole



METAPHORIC  
GEST: [**was**  
**working**]



TWO IN A ROW:  
[**gone inside** the  
hole and **up** onto  
a shelf]



# IW conversation



IW coordinates his hands around semantic values – morphokinetic shaping. *Remember:* he has no sense of where his hands are or what they are doing, apart from this semantic value.



# Significance and Implications

- The thought-language system controls the same muscles and motoneurons involved in instrumental action but can do so over a route available to IW without visual or proprioceptive feedback.
- Synchrony of hand motion with speech in absence of feedback (required for instrumental motor control) suggests a Thought-Language-Hand Link in the human brain that IW continues to exploit.
- This has created a different kind of action: expressive movements that are dependent on language. The IW case is unusual in that it exposes this link but all humans possess it – the **thought-language-hand link** is part of the origin of language.



## Possible scenario

- The origin of symbolism is linked by Wrangham to the invention of cooking and by Deacon to the formation of a gender based division of labor and 'marriage contracts' 2 MYA. Hearths date back 1 MYA.
  - Such social-cultural development was accompanied by a major expansion of the prefrontal cortex (Deacon) as well as (per current proposal) the reconfiguring of areas 44 and 45, and was completed 100,000-200,000 years ago.
  - But all too patriarchal? (A. Jolly)
- All this suggests a scenario for language origin in organized family life by bipedal creatures that was able to induce changes in brain configuration and function.

# Adult-infant interaction

- Natural selection for Mead's Loop could arise whenever sensing oneself as a social object is advantageous—as when imparting information to infants, where it gives the adult the sense of being an instructor as opposed to being just a doer with an onlooker (the chimpanzee way).
  - Entire cultural practices of childrearing depend upon this sense (Tomasello).
  - The adult is the focus of this selection pressure: children of adults who have this sense are more likely to survive, because for them culture is inculcated better; they, in turn, inherit the tendency and pass it on.
- The mother-infant scenario adds a further dimension to MacNeilage & Davis' proposal that “the first words might have been parental terms formed in the Baby Talk context of parent-infant interaction” (2005. p. 183).

# Self-aware agency

- Self-awareness as an agent is necessary for any advantage of Mead's Loop to take hold.
- A role of self-aware agency also appears ontogenetically. The emergence of the GP seems to be at age 3 or 4 years and continues for several more years – the onset for this kind self-awareness.
- A connection to self-aware agency is explained as an echo of Mead's Loop evolution. That is, Mead's Loop was first tied to it, and so now develops with it.
  - Mead's Loop should not be equated with theory of mind. Mead's Loop adaptation is toward a self-awareness of *one's own behavior as social*, not the ability to sense the cognitions and intentions of another.
  - It is likely they emerged together, but they are different functions.
  - Nor did the infant in the selection scenario require a theory of mind, only responsiveness to adult actions.

# Summary so far

- Mead's Loop was selected because of advantages deriving from seeing oneself as a social object. Interacting with children specifically. This enhanced the child's survival as a culturally-endowed creature.
- The effect was to 'twist' the primate mirror neuron system so that one's own gestures elicited a response. This brought the gesture and its significance into the part of the brain – areas 44 and 45 – where complex actions are orchestrated, including vocal-oral and manual movements.
- Thus from the very beginning, speech and gesture were linked, and the evolution of the one was inseparable from the other.

# Whence syntax?

- Not that Mead's Loop and GP explain syntactic details –
  - if anything, I am inclined to believe there evolved only broad syntactic patterns (of which a bit more later), and the details are products of other processes – cultural and historical traditions, responses to language contact situations – that have accumulated over time.
- These are static dimension properties. I will suggest that Mead's Loop and GP 'enabled' them – they have functions on the dynamic dimension.

# Syntax and action

- Mead's Loop made possible a new kind of action in Broca's Area, complex movements of the vocal and respiratory organs orchestrated by imagery. Prosody is a manifestation.
- Syntax, in this view, comprises **culturally standardized patterns of action control**.
- Evolution worked primarily on action – it was directly in the path of selection pressures arising in communal and cultural life.
- Perception could have had its own separate evolution (or was a by-product of the primary evolution of action).

# Whence syntax: shareability

- Mead's Loop, in which gesture assumes the guise of a social other, plants in the brain the seed of what Jennifer Freyd in her innovative 1983 paper called 'shareability' — constraints on information that arise because it must be shared.
- **Shareability** produces discreteness, repeatability, and portability — the linguistic semiotic opposed within GPs to the global and synthetic semiotic of imagery.
- Thus, given Mead's Loop and its reconfiguration of Broca's Area, a natural selection pressure arises to **find a companion system with the property of shareability**.
- Shareability was thus crucial to the dual semiotic of the GP.

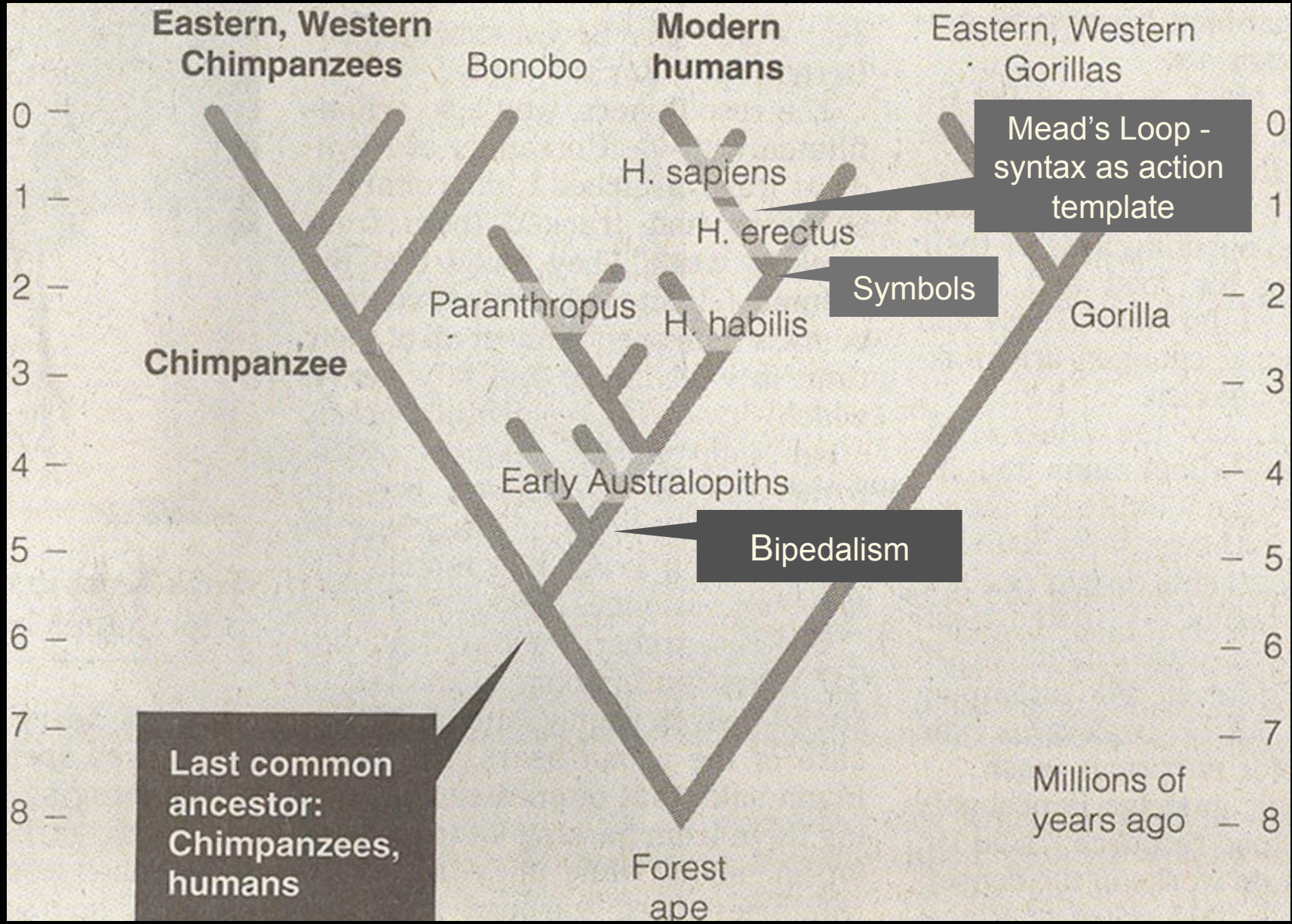
# Unpacking

- There was additionally pressure to find ways of unpacking GPs.
- The unstable meshing of unlike semiotic modes in a GP seeks stability. The static dimension provides it & defines potential ‘stop-orders’ to the dialectic in GPs – one function of unpacking.
- This creates a place for two major syntactic systems:
  - **constructions** analyze holistic meanings by adding semantic and syntactic frames (cf. Goldberg).
  - **recursive embeddings** elaborate meanings by combining constructions cf. Hauser et al).
- These systems continue the evolution that started in GPs and would have been selected at the dawn, and seem to be likely candidates for the vaunted biological capacity for language.



# Timeline

- The whole process could have started 5 MYA with habitual bipedalism
- 5 to 2 MYA - Lucy and all - the precursor to language was something an apelike brain would be capable of
  - E.g, ritualized incipient actions become signs (Kendon).
- Starting 2 MYA -self-responsive mirror neurons and reconfigured areas 44/45 bring speech and gesture together, accompanying the emergence of a humanlike family life
  - This form of living was itself the product of changes in reproduction patterns, female fertility cycles, child rearing, neotony and presumably other factors - all of which might have been emerging long before.
- Expansion of the forebrain from 2 to 1 MYA, including the mirror neurons/Mead circuit and reconfiguring 44/45 into Broca's area
  - Thus proto-language emerged over 5 million years, with the T-L-H system and meaning controlled manual and vocal gesture systems via GPs, as we currently know them, emerging over the last 1 million years.



# Conclusions - Evolution

- Not an accident that gesture and language centers are side by side. This is a point made by Rizzolatti & Arbib, and is explained by Mead's Loop. Mirror neurons in area 45 respond to imagery (probably from RH) and link it to area 44 for precise coordination.
- The result is control of action sequences in 44 by meanings other than the meaning of the action itself - the meaning of the gesture in Mead's loop.
- Such a brain system creates conditions for an imagery-language dialectic and makes GPs possible, minimal units of such dialectics.

# Conclusions - Overall

- Language is inseparable from imagery. This is because of how it evolved.
  - It has a dual reality - both instantaneous (image) and successive (linguistic and social)
  - The GP is the minimal unit of such combinations and the dialectic of semiotic opposites - a package built around a single gesture image.
- This imagery-language dialectic and the dual cognitive modes that Wundt observed is a product of Mead's Loop, how meaning in gesture came to control action orchestration in the brain.





**Mead's Loop -  
Precious**

**The End – Thank You!**

# The Psychological Predicate - Key to explaining differentiation and context

- Psychological predicate - not necessarily a grammatical predicate.
- Marks a significant departure from the immediate context.  
Vygotsky examples:
  - ◆ “What happened to the clock?” - “It fell”
  - ◆ “What fell? - “The clock”
- Implies this context as background.
- The speaker shapes the background in a certain way, in order to make possible the intended significant contrast within it.



# Vygotsky' Psychological Predicate example

The psychological predicate:

A crash in the next room – what fell? (the clock);  
what happened to the clock? (it fell). This logic  
applies to the GP.

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



In forming a GP, the speaker shapes the background  
in a certain way, in order to make possible the  
intended significant differentiation within it.



The two modes: (sequential) “he goes **up** **thróugh** it this time” plus (simultaneous) image of ‘rising hollowness’





## Forms of gesture/imagery semiosis



Illustrating the global-synthetic semiotic



Illustrating the additive semiotic



# Gesture continuum (formerly Kendon's Continuum)

Gesticulation --> Speech-Slotted --> Pantomime --> Emblems--> Signs



These differences cannot be overlooked. As one goes from gesticulation to sign language the relationship of gesture to speech changes:

- Speech presence declines.
- Language-like properties increase.
- Socially regulated signs replace spontaneously generated form-meaning pairs.
- Form standards increase.

Pantomime is toward the 'less speech', 'more language-like' end, gesticulation at the extreme opposite end.