

# Setting Language in Motion

Lecture 8

*Sherman Wilcox — Beijing, China*





“His words moved them to action.”



# Language Moves

◆ Make a sound!



# Language Moves

◆ Make a sign!



# Language Moves

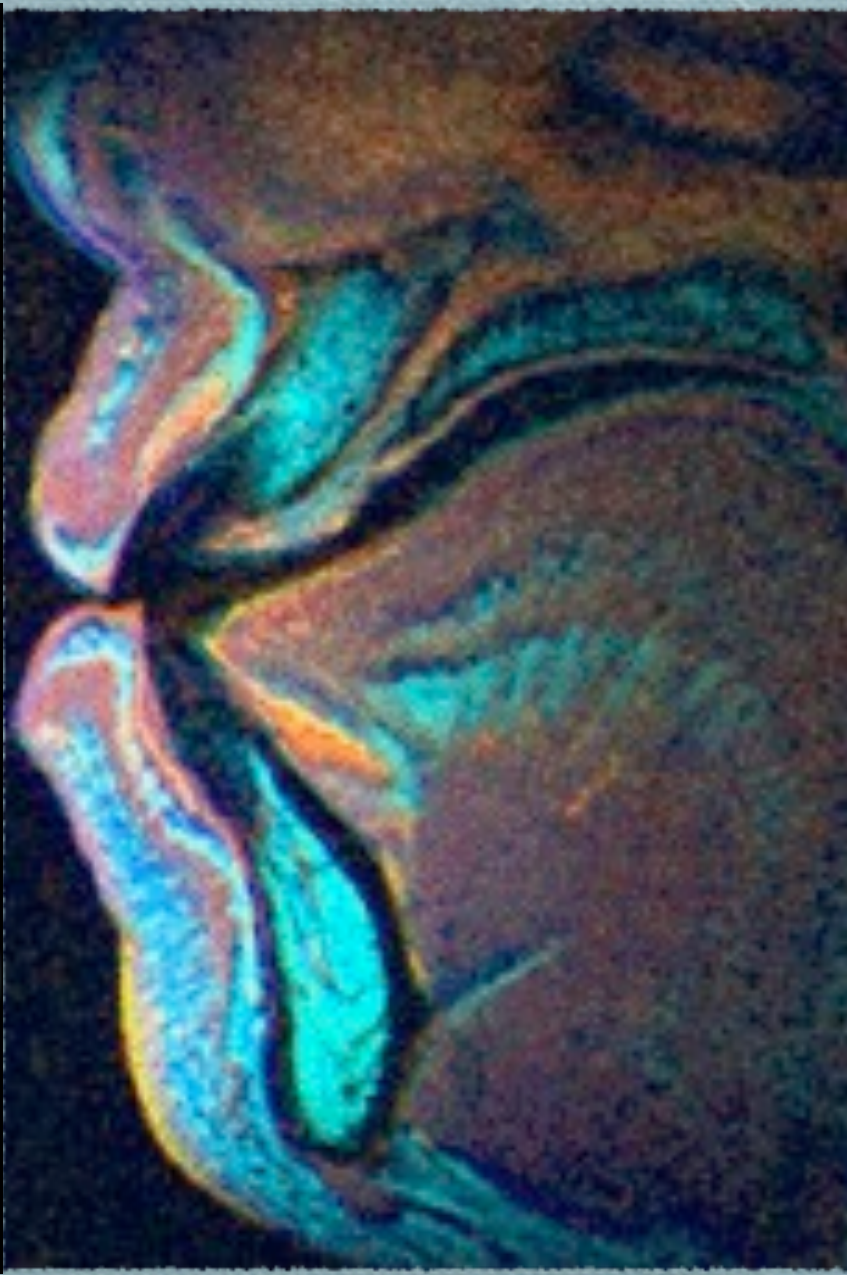
- ◆ Language is physical activity. Without bodies — without lips and tongues and hands that move, without ears sensitive to the sounds made or eyes capable of receiving the patterns of light — we could neither produce nor perceive language.





# Language Moves





# Unification



How can we unify spoken  
and signed languages?



# Two solutions

- ◆ **The Abstractionist Solution**

- ◆ **The Embodied Solution**



# Abstractionist solution

- ◆ The **abstractionist solution** removes all traces of the body from language and views language as a formal system of abstract rules devoid of physical manifestation.
- ◆ This solution strips away the performance of language by means of vocal tracts, hands, faces, and the anatomy and musculature that controls these articulators. Ultimately, the articulators have nothing to do with language under the abstractionist solution.



# Abstractionist solution

- ◆ Likewise, perceptual systems play no part in understanding language from this perspective.
- ◆ Whether perceived by ear or by eye makes no difference, because the physical manifestation of language is removed from consideration under the abstractionist solution.



# Embodied solution

- ◆ The **embodied solution** claims that language, whether spoken or signed, and indeed all communication, is made possible because we have physical bodies which we move to produce signals.
- ◆ We receive these physical signals through embodied perceptual systems, and we attribute meaning to these signals by an active process of **meaning construction** made possible by embodied brains



# Is there a problem?

- ◆ By focusing on language as a physical system, it seems that the embodied solution runs head-on into the fact that spoken and signed languages are physically quite different.
- ◆ Spoken languages are produced by moving the tongue, lips, glottis and other parts of the vocal tract. Signed languages move the arms, hands, fingers, and face. Spoken languages are perceived by ear, signed languages by eye.



# Is there a problem?

- ◆ Spoken languages are based on sound.
- ◆ Signed languages are soundless, based on — well, *what exactly are they based on?*



# *The Tree of Life*

“A language consists of a symbol set, a grammar and a medium. The medium can either be a mouthful of air or a handful of silence. In the case of American Sign Language, the medium is gesture — manual, facial, and brachial gesture. In the case of almost every other language that is native to North America, the medium is sound — oral, laryngeal, and nasal sound.”

Robert Bringhurst



# Transmission media





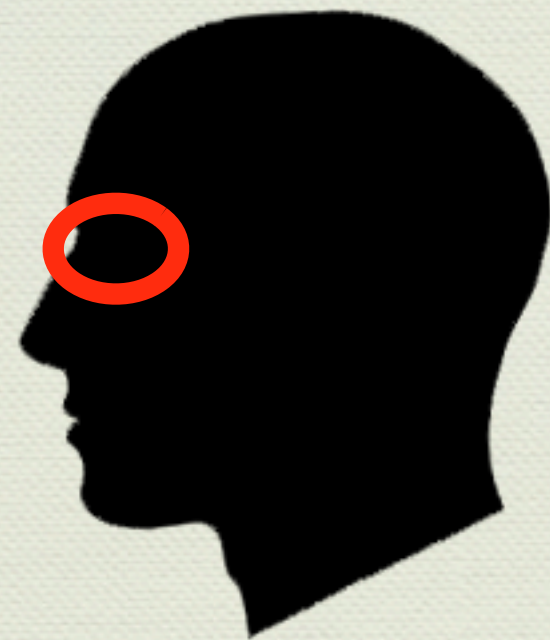
# Transmission media



?



optical



visual



Gesture is not the medium in which signed languages are transmitted. If sound is the medium of spoken language, the medium of transmission for signed language is light. Spoken languages are transmitted acoustically, signed languages are transmitted optically. Where, then, do spoken and signed languages come together as one under the embodied solution? Whether acoustic or optic, mouthfuls of air or handfuls of — not silence, but of light — **languages are systems of meaningful movement.**



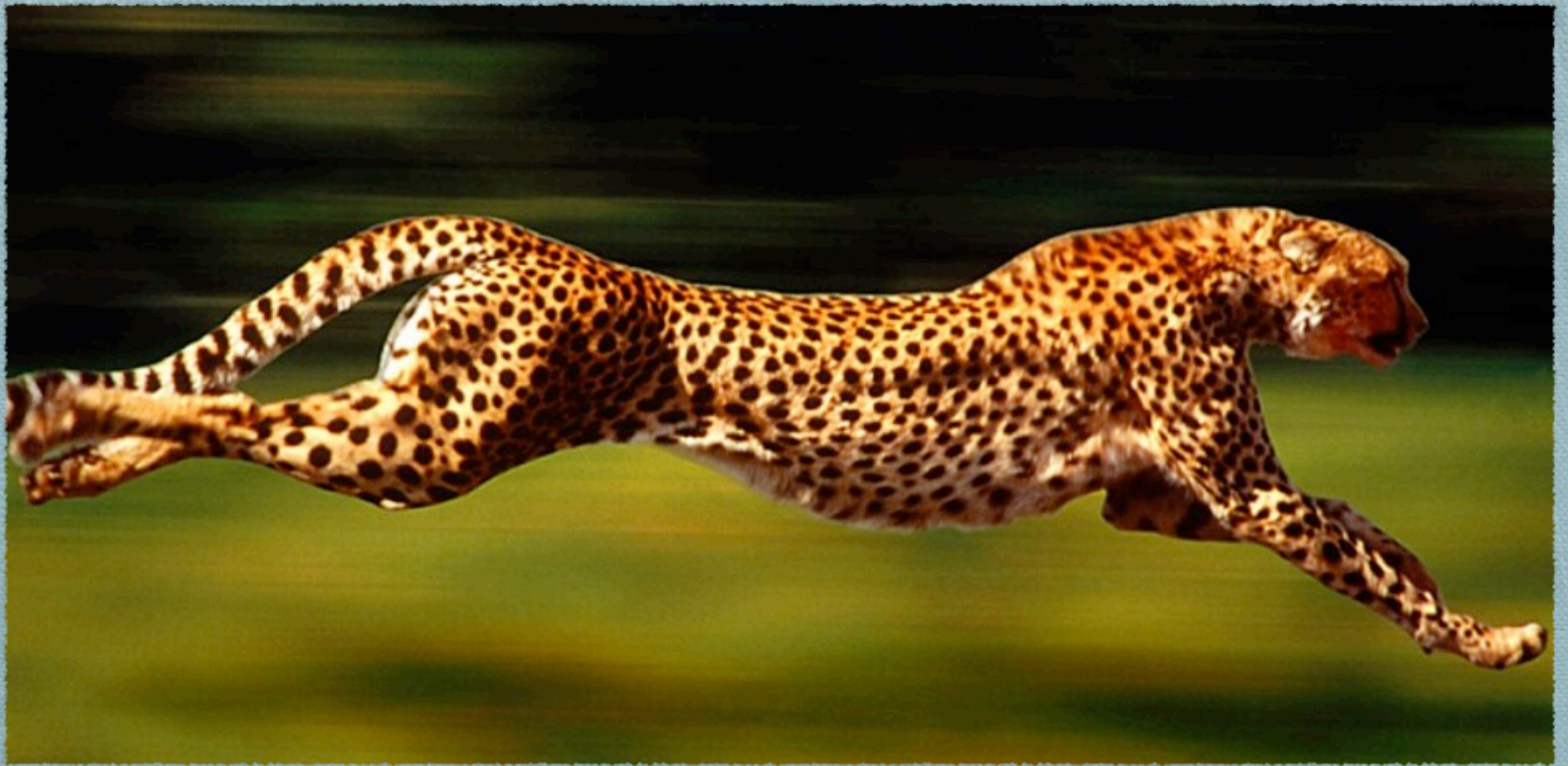
# Setting Language in Motion



# Principles & Postulates

- ◆ The evolutionary significance of movement
- ◆ The motion-perception connection
- ◆ Making sense of the world
- ◆ Language in motion
- ◆ Embodied cognition
- ◆ Language as performance
- ◆ The *what* and the *way*





# Evolutionary significance of movement



# Evolution and movement

- ◆ “The evolutionary development of a nervous system is an exclusive property of actively moving creatures”

Llinás, 2001



# Evolution and movement

- ◆ The visual perception of movement is important to virtually every living species. Even organisms without vision usually have sensors to detect movement. Obviously detection of movement plays a vital role in the survival of animals: they must be good at perceiving movement of predators and of likely prey. Inability to do this would result in disaster and it is often more important to detect immediately that something has moved rather than to know what that something is (or even in which precise direction it has moved).



# Evolution and movement

◆ Sekuler (1975) proposes that:

“During evolution, motion perception was probably shaped by selective pressures that were stronger and more direct than those shaping other aspects of vision. . . As a result of such selective pressures, our visual systems contain neural mechanisms specialised for the analysis of motion.” (p. 385)



# Evolution and movement

- ◆ “Motion specifies where objects are headed (direction) and how soon they’ll get there (speed). Motion aids in the perception of the shapes of moving objects (shape from motion) and their relative positions in 3D space (depth from motion). In fact, motion can reveal the presence of an otherwise camouflaged object when that object moves. Motion also allows mobile organisms to get about in their environments, avoiding obstacles while at the same time intercepting objects of interest (heading from optical flow). And motion portrays important information concerning other people’s body movements and facial expressions, allowing us to recognize who those people are and what their intentions might be.”

Blake & Shiffrar, 2003



# Motion-perception connection

- ◆ “The world makes itself available to the perceiver through physical movement and interaction.”

Alva Noë, 2004



# Motion-perception connection

- ◆ An embodied solution to language demands that we recognize this deep connection and seek a unified model of perception and movement, as suggested by Churchland (1986), who advises that “insofar as evolution solved the problems of sensory processing and motor control simultaneously, we may find it profitable — nay, essential — in shaping our theories, to mimic evolution and aim for simultaneous solutions as well.”



# Motion-perception connection

- ◆ If asked what aspect of vision means the most to them, a watchmaker may answer 'acuity', a night flier, 'sensitivity', and an artist, 'color'. But to the animals which invented the vertebrate eye, and hold the patents on most of the features of the human model, the visual registration of movement was of the greatest importance.

Gordon Walls



# Motion-perception connection

- ◆ “Visual systems first evolved not to enable animals to see, but to provide distal sensory control of their movements. Vision as ‘sight’ is a relative newcomer to the evolutionary landscape.”

Goodale, 1998



# Making sense of the world

- ◆ “As animate creatures, we are born moving. It is originally through movement that we come to inhabit a world that makes sense to us — that is, a world that has meaning for us.”

Mark Johnson, 2008



# Making sense of the world

- ◆ The role of prediction in making sense of the world:
  - ◆ “At the behavioral level any actively moving creature must have predictive abilities in order to interact with the external world in a meaningful way.”
  - ◆ “the capacity to predict the outcome of future events — critical to successful movement — is, most likely, the ultimate and most common of all global brain functions.”

Llinás, 2001



# Making sense of the world

Making sense, comprehending the world, is not accomplished by reading off information in the world. The world does not “inform” a creature what is happening, how to act, what to do next, or how to survive. Making sense of the world is not an **instructionist** process. The environment — including the natural environment and also other living creatures with which the moving animal will interact — does not ‘instruct’ the animal about the reality it must comprehend, get along in, or adapt to.



# Making sense of the world

- ◆ Making sense is constructionist or **selectionist** in nature:  
brains generate ongoing, dynamically changing emulations of the environment. Successful emulations are those that enable the animal to act and react appropriately.



# Making sense of the world

- ❖ “I can easily show that throughout the whole extent of these mental departments which are highest, which are most characteristically human ... the new conceptions, emotions, and active tendencies which evolve are originally produced in the shape of random images, fancies, accidental outbursts of spontaneous variation in the functional activity of the excessively unstable human brain, which the outer environment simply confirms or refutes, adopts or rejects, preserves or destroys — *selects*, in short, just as it selects morphological and social variations due to molecular accidents of an analogous sort.”

William James



# Making sense of the world

- ◆ In this view, language is an evolutionary specialization of communication and, by extension, of the ability to make sense of our world.

making sense of the environment > comprehension >

communication (comprehension + expression) > language

- ◆ Movement lies at the heart of this progression. Movement is the distal source of the perceptions which the organism must make sense of.



# Language in motion

- ◆ The language as motion framework insists that all language, whether spoken or signed, is physical behavior. Language is possible because we have bodies that we move to produce perceptible signals. What unites languages transmitted acoustically and those transmitted optically is that they are **articulatory performances of the body.**



# Language in motion

- ◆ The embodied solution relies solely on a **general purpose cognitive system** and **articulatory performances of the body**.
- ◆ The model that is adopted for describing these physical performances is dynamic systems theory (DST). In the case of language, this means using dynamic systems theory to model the real-time process of moving articulators, whether they are the components that make up the speech vocal tract, or the articulators involved in fluent signing



# Embodied cognition

- ◆ Dynamic systems theory also can account for embodied cognition. From the dynamic systems perspective, “cognition — mental life — and action — the life of the limbs — are like the emergent structure of other natural phenomena.”

Thelen & Smith



# Embodied cognition

- ◆ The language as motion framework also suggests that vision is more deeply embedded within our cognitive abilities, including the human language ability, than we have previously realized. Movement, vision, cognition, and language go hand in hand.



# Embodied cognition

- ◆ “Meaning is shaped by the nature of our bodies, especially our sensorimotor capacities and our ability to experience feelings and emotion.”
- ◆ The embodied theory of meaning “sees meaning and all our higher functioning as growing out of and shaped by our abilities to perceive things, manipulate objects, move our bodies in space, and evaluate our situation”

Mark Johnson, 2008



# Language as performance

- ◆ Because language is conceived here as the production and perception of movement, language is intimately tied to the physical reality of our bodies and our perceptual systems. Our body and its movements are not just the means by which language is performed, they are also the evolutionary precursors of cognition and language.



# Language as performance

- ❖ **Cognitive grammar (CG)** adopts a number of fundamental claims about language that are compatible with the language as motion framework.
- ❖ CG presents an explicitly non-abstractionist view of grammar: “The picture that emerges belies the prevailing view of grammar as an autonomous formal system. Not only is [grammar] meaningful, it also reflects our basic experience as moving, perceiving, and acting on the world”

Ron Langacker, 2008



# The *what* and the *way*

- ◆ “I don’t mind what she said, but I don’t like the way she said it.” (Bolinger, 1986)



# The *what* and the *way*

- ◆ “It was an important step to probe below concepts, propositions, and sentences into the sensorimotor processes by which we understand our world, but what is now needed is a far deeper exploration into the qualities, feelings, emotions, and bodily processes that make meaning possible.”

Mark Johnson, 2008



# The *what* and the *way*

- ◆ The qualities, feelings, emotions, and bodily processes that make meaning possible.



# The *what* and the *way*

- ◆ In order to see these two aspects of movement we must follow Stokoe's lead and look at movement in different ways if different aspects of movement's structure is to be seen.



# The *what* and the *way*

- ◆ On one view, we see **what** movement is being performed — walking in a *straight line* or walking in a *circle*.
- ◆ On the other, we see the **way** in which that movement is performed, its quality or manner — walking with *fatigue*, or with a *lilt in our step*, or while *carrying a heavy weight* in our arms.



# The *what* and the *way*

- ◆ I use the word *perform* here intentionally.
- ◆ If we abstract away from the actual physical performance of movement, we lose the ability to see its qualities. Only by adopting the embodied solution can we retain the felt, the visible, and the performed qualities of bodily movement.



# Setting language in motion

- ◆ **Language is performance:** if we lose sight of the physical *performance* of language, we will never understand what language is or how it came into being. Language is **not** an abstraction. Language is embodied in the most literal sense of that word.



# Setting language in motion

- ◆ **Grammar is skill:** Grammar is the set of abilities — cognitive, social-interactive, articulatory, and perceptual — that permit us to perform language.



# Setting language in motion

- ◆ How do we go about understanding **skilled performances** — of physical activities such as riding a bicycle or hitting a soccer ball with your head, of playing the violin or the oboe, of dancing, or even of performing a slight-of-hand magic trick?



# Setting language in motion

- ◆ The way we understand how we acquire and perform these skilled actions — these coordinated movements of parts of our body — is *precisely* how we should go about understanding language as performance and grammar as skill.



# Undoing the Reification



# Language is Activity

- ◆ “Language itself is a way of acting. Our habit of viewing it as a thing is probably unavoidable, even for the linguist, but in a sense it is false. Language is *skilled* behavior ...”

(Dwight Bolinger, *Aspects of Language*, 1968)



# Cognitive Grammar

- ◆ “Talking is a complex activity, so ultimately a language must be viewed dynamically, as something people do rather than something they have.”

(R. Langacker, *Cognitive Grammar: A Basic Introduction*, 2008)



# Language is skilled

- ◆ “A linguistic system comprises a vast array of skills employed in talking. Ultimately, those skills reside in recurrent patterns of neural and neurally guided processing activity.”

(R. Langacker, *Cognitive Grammar: A Basic Introduction*, 2008)

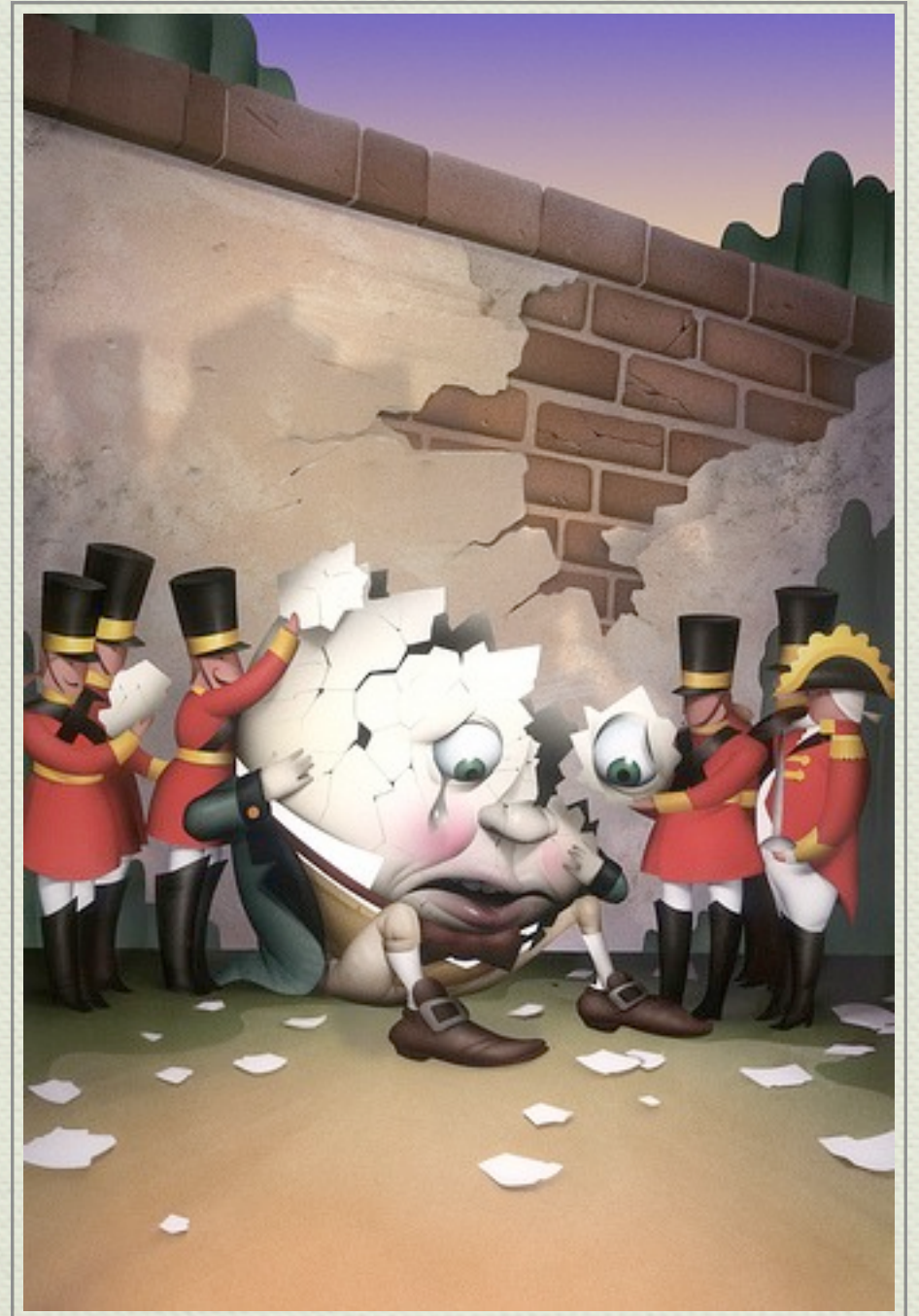


Where do we begin?



# Humpty Dumpty Science

Humpty Dumpty sat on a wall,  
Humpty Dumpty had a great fall.  
All the king's horses  
and all the king's men  
Couldn't put Humpty together again.





What are the pieces?



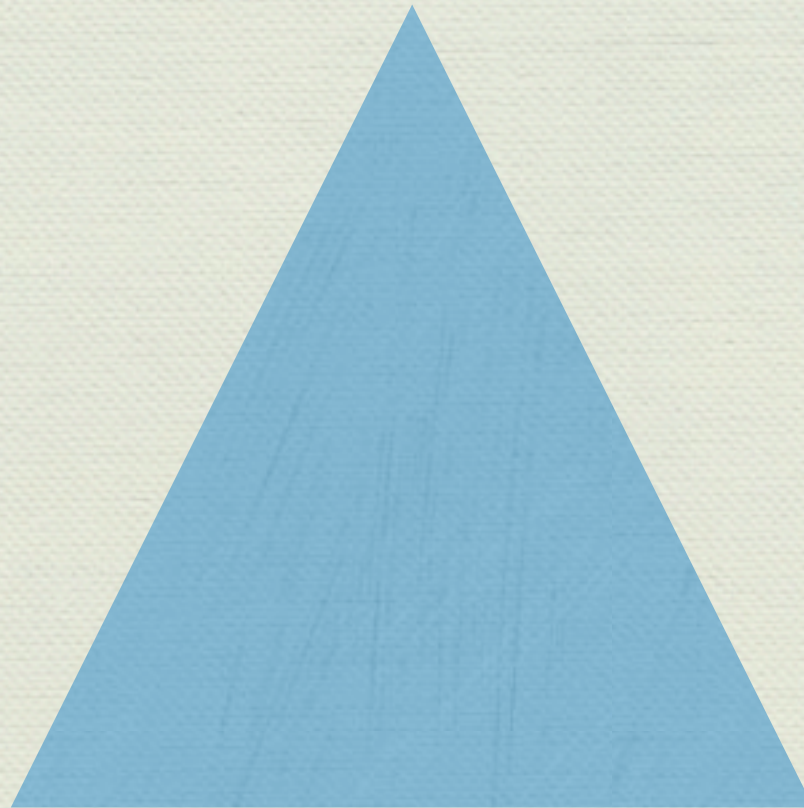
❖ The task is much more complex when it comes to developing a unified theory of language. This task depends not just on putting the pieces back together — we don't even know what the pieces are.



- ◆ Which theory of language should we choose?
- ◆ What is the relation between cognition and language?
- ◆ Which theory of cognition do we adopt?
- ◆ Which theory of brain structure and function?
- ◆ What is the relation between signed and spoken languages?
- ◆ What is the relation between language and gesture?



Cognitive Grammar



Cognitive  
Neuroscience

Dynamic Systems  
Theory



# The Next Steps ...

- ◆ Dynamic Systems Theory (Lecture 9):
- ◆ Dynamic systems theory is “ ... the natural language needed to describe the ‘integrated behavior’ of systems coordinating the actions of many elements.”
- ◆ The study of complex systems and how they produce patterns that evolve over time.



# The Next Steps ...

- ◆ Neuroscience (Lecture 10):
- ◆ Gerald Edelman and the Theory of Neuronal Group Selection, or “Neural Darwinism”



