### Agenda: 1/12/06

- Survey/Attendance
- Syllabus
- Introduction:
  - What is language?
  - How is it learned (or not)?
  - What course does it take?
  - How do we study it?
  - How can we account for it?

### What Is Language?

**Definition**

**Language versus communication**
- What can natural (animal) communication systems tell us?
- What can we learn from attempts to teach language to non-humans?

**Components of Language**

**Human Language is...**

A translation system in which a person can:
1) convey the content of his/her thoughts
2) by converting that content into linguistic form that other members of the language community can interpret.

In addition, a speaker must know how to use linguistic form in such a way that other members of the language community can recover the intended message.
Forager bees “dance” movements (one of three patterns) reveal location, quality, and quantity of food.

- **Round**: food within 20 feet; dances a circle shape.
- **Sickle**: food within 20-60 feet; dances a sickle-shaped figure eight. The angle of the dance equals angle that the food source is from the sun.
- **Tail-wagging**: bee wags its tail as it dances; same as sickle dance but number of repetitions per minute indicates precise distance; the slower the repetition rate, the longer the distance.

Which dance is used depends on the distance the food is from the hive. [Link](http://www.cals.ncsu.edu/entomology/apiculture/Dance_language.html)

Number of repetitions used and the vivacity of the dance indicate how good the food source is. [Link](http://www.pbs.org/wgbh/nova/bees/danceslang.html)

Mating songs produced by males differ among species and geographic region.

- **Size of vocabulary**: 5-15 different categories of sound.
- **Any variation of song is in intensity; no change in pattern.**
- **Song must be learned**: different species have different songs.
- **Song learning needs an adult model for accuracy**: exposure too late prevents learning.

Different calls for different predators (snakes, eagles, leopards). Other vervets respond context appropriately (look up for eagle, down for snake or leopard).

Infant monkeys can make these calls but initially use them for a broader range of stimuli, then learn to narrow their use. [Link](http://www.wjh.harvard.edu/~mnkylab/media/vervetcalls.html)
Chirp to indicate alarm, squeak to indicate alertness. Calls are sometimes combined always with chirp first to indicate vigilance in the presence of danger.

All calls are referential only; refer to internal alertness state of the calling monkey. [link](http://www.wjh.harvard.edu/~mnkylab/media/tamarincalls.html)

**Human language:** in conversation, a human can express a potentially infinite number of meanings. In fact, we can even talk about language itself.

**Animal communication:** animal “signals” have meaning but fixed and finite topics (food, danger, courtship).

*During language development, children must first learn how to find words in the continuous speech stream and only then can they begin to assign meaning to these words.*

**Human language:** human language has a duality of patterning whereby a finite number of sounds (phonetics) can be combined into an infinite number of meaningful elements. These sound patterns are then encoded into a mental representation (phonology).

**Animal Communication:** no animal system has the variety of sounds that human languages do nor a system of representing those sounds in the mind.

*During language development, children must learn 1) the sounds of their language and/or dialect, 2) which of those sounds are distinct from each other, and 3) the sound patterns and intonation associated with pronouncing words.*
**How Is Human Language Different?**

### Form (morphology)

**Human language:** in human language, words are made up of smaller units of meaning (called morphemes); some morphemes are meaningful on their own (like “dog”) but others must combined with another morpheme to have meaning (the “s” in “dogs” indicates more than one dog).

**Animal Communication:** calls or songs in animal systems cannot be decomposed into smaller meaningful parts.

During language development, children must learn the morphemes of their language, the phonological and combinatorial properties associated with those morphemes, and the exceptions (kick~kicked but not go~*goed). No animal communication system has morphology.

### Form (syntax)

**Human language:** words in human language can be combined by a system of rules into larger units (phrases, clauses, sentences). The relation among the words affects how we interpret them (venetian blind vs. blind venetian).

**Animal Communication:** in some systems, calls can be combined in a fixed order (tamarins) but these combinations never mirror the variety of arrangements allowed in human language.

During language development, children must learn the legal arrangement of words and phrases when forming sentences in their language. They must also learn the syntactic constraints involved with meaning assignment.

### Form and Content

**Human language:** in human language, the relationship between form and meaning is arbitrary; i.e., nothing intrinsic to the sounds in “penguin” that means flightless black and white bird, swims well, toboggans, smells like fish, really cute.

**Animal communication:** most animals use iconic signals that directly represent their meaning (bared teeth on a dog means “I don’t like you”) or use signals that are purely referential in nature (“Uh! I heard an eagle”).
**How is Human Language Different? Use (pragmatics)**

Human language: human language is used for a wide variety of purposes and varies with context (who you are talking to, what they know makes a difference in what you say). E.g., “It’s hot in here” could mean “open the door” in the right context.

Animal communication: most animal systems are used for limited purposes and do not vary with context. E.g., we might argue that vervet monkeys respond to context, but the “snake” call doesn’t change depending on type of snake or who is being warned (an older monkey, a male monkey, etc.)

During language development, children must learn how to convey complex meanings (like indirect commands) and the right social tone based on cultural norms (turn-taking, sensitivity to one’s audience, etc.)

**Teaching Language to Non-humans**

Primates considered the best candidates for teaching language to another species because they are extremely intelligent and much like humans in other respects as well.

Attempts to teach primates spoken English have had little success because the vocal tracts of apes are completely unsuited to speech.

As a result of these failed attempts, researchers searched for other modalities. One such alternative is sign language, which has been used with some success.

**Teaching Language to Non-humans: Classic Cases**

Washoe: chimpanzee raised by a family. Learned to produce 132 signs after 4 years of training; could also produce signs in combination. [Washoe](http://www.u.arizona.edu/~ohalad/washoe.mpeg)
Teaching Language to Non-humans: Classic Cases

Koko: lowland gorilla taught sign when a year old. Has a vocabulary of over 1000 signs; can use them in complex statements and questions.

[Link](http://www.u.arizona.edu/~ohalad/koko.mpeg)

Nim Chimpsky: like Washoe, learned to produce over 100 signs and could produce many sign combinations.

[Link](http://www.u.arizona.edu/~ohalad/nim1.mpeg)

Don’t forget Hoover!

Teaching Language to Non-humans

Some criticisms:

- Many utterances not spontaneously produced but imitated after caregiver.

- Acquisition of signs reaches ceiling, beyond which no advances are made.

- Content of utterances involves much repetition.
Language form, content, and use compose the fundamentals of any language. These subcomponents of language are collectively referred to as the grammar of a language - or the knowledge a speaker has of the language they speak.

- phonetics
- phonology
- morphology
- syntax
- semantics
- pragmatics
- sounds
- words
- sentences
- meaning

Common misconceptions about language learning

Possible language learning mechanisms

Misconception 1: Children learn language by imitating their parents or caregivers.

Taken to the extreme, this would mean that children could only say things that they had heard before. This is clearly not the case.

Many of children’s productions are original, creative and can in no way be said to arise from direct imitation of adult speech (e.g., “firetruck man” for fireman; “he giggled me” for he made me laugh).
How Children DO NOT Learn Language

Misconception 2: children need to hear exaggerated speech to learn language. Exaggerated speech directed to young children is called motherese or caregiver speech.

Although potentially helpful to the child, motherese is not necessary for language acquisition. Some cultures do not talk to their children any differently than they would to an adult and some don’t even talk to their children at all.

Some characteristics of motherese:
- Slow, carefully articulated speech, higher pitch, exaggerated intonation and stress, longer pauses.
- Fewer vocabulary, concrete reference to here and now.
- Few incomplete sentences, short sentences, more imperatives and questions.
- More repetitions, fewer utterances per conversational turn.

How Children DO NOT Learn Language

Misconception 3: children learn language by attending to overt corrections of ill-formed utterances given by parents or caregivers.

Child: Want other one spoon, Daddy.
Father: You mean you want the other spoon.
Child: Yes, I want other one spoon, please Daddy.
Father: Can you say “the other spoon”?
Child: Other... one... spoon.
Father: Say “Other”.
Child: Other.
Father: Say “Spoon”.
Child: Other... spoon. Now give me other one spoon?

Do children learn from recasts, though?

Adult responses to children’s utterances that contain non-overt adjustments to the form and/or content of the child’s are referred to as recasts.

Child: Daddy here.
Mother: Yes, Daddy is here.
Child: Him go.
Mother: Yes, he is going.

There is conflicting evidence as to the role of recasts in language learning.
Misconception 4: language and cognitive development are dependent on each other. Children can’t learn language without certain cognitive skills and vice versa.

Although there are connections between language acquisition and cognitive development, the two are not dependent on each other and/or do not necessarily develop in tandem.

There are many cases where an individual’s cognitive development is severely deficient but not so their linguistic development and vice versa.

- Type 1: linguistic savants, severely retarded children with sophisticated language skills.
- Type 2: individuals with highly developed cognitive skills but impaired language (e.g., children with SLI).

The development of object permanence may facilitate vocabulary growth.

- Children’s understanding of object permanence may lead to an increased ability to learn the names of objects.

The development of seriation may facilitate a child’s use and understanding of the comparative.

- Children’s ability to arrange elements in order of increasing or decreasing size may lead to an understanding and use of terms such as longer and shorter.

Some studies show that children can learn to recognize words by calculating the statistical probabilities with which certain syllables follow others. For example, in one study (Saffran et al, 1996):

Babies heard four different “words” (e.g., tupiro, golabu, bidaku, padoti) presented in random order in a stream of speech for 2 minutes.

Babies then heard the same string of words or a different string of words made up of the same syllables.

RESULT: Babies show a listening preference for the new words. This means they can distinguish the old words from the new ones!
By counting the frequency with which one syllable followed another in the training exercise, babies learned that:

• "tu" was always followed by "pi",
• which was always followed by "ro",
• but "ro" was followed by three different syllables.

Hence, they learned the word "tupiro".

Even though the new words they heard at test used the same syllables, the transitional probabilities of the syllables in sequence were different (e.g., "tu" was followed by "la" was followed by "go", but "go" was followed by three different syllables).

This is called **statistical learning**.

Some studies show that children can abstract from the words themselves and learn the pattern or rule that underlies the syllable sequences. For example, in one study (Marcus et al, 1999):

Babies heard sequences of syllables for 2 minutes that were presented either in an ABA pattern (ga ti ga, li na li) or in an ABB pattern (ga ti ti, li na na).

Babies then heard sequences of different syllables that either had the same pattern they heard in training or a different pattern (e.g., wo fe wo vs. wo fe fe).

http://www.u.arizona.edu/~ohalad/marcus stimuli.aiff

RESULT: Babies can distinguish these types of sequences, too - even though the syllables the babies heard were completely different! This means that babies can learn a pattern that must be described in terms of variables.

This is called **rule learning**.

• A quick overview
To study language acquisition, some researchers merely observe and record children’s language use in a natural setting.

This method is often referred to as a *diary study* or *baby biographies*, where a child’s linguistic progress is recorded on a regular schedule (e.g. daily, weekly, twice-weekly).

These studies are typically *longitudinal*, meaning the child’s progress is followed for an extended period of time.
To study language acquisition, some researchers make use of specially designed tasks to investigate a particular phenomenon.

These studies are typically *across subjects*, meaning a particular linguistic activity of a number of children is studied at the same time.

Additionally, some experimental studies are *cross-sectional*, meaning that the linguistic activity of groups of children are compared (e.g., different age groups, different language or cultural groups).

**Foundational theories**

**Current theoretical camps**

**Foundational Theories:**

*Behaviorism (~1930s-50s):* a stimulus/response theory of language development; children learn language by imitation and reward. The extremist position of this view is that the mind plays no role in language at all.

*Cognitivism (~1950s-today):* an understanding of the human mind is central to explaining human behavior, including language and its development.

*How can we account for language development?*

- Foundational theories
- Current theoretical camps
Chomsky’s contribution to cognitivist theories of behavior was pivotal both in the field of linguistics and in language development.

He noted that there is also mental system (grammar) behind what we say because from this point, researchers began to think of language as a system in the mind rather than a product of it. And insofar as adult and child utterances differ, so too must adult and child grammar’s differ.

Language development is the result of human nature, just like walking: language is innate.

Two nativist positions: either the knowledge itself is innate (referred to as Universal Grammar) or the mechanisms for learning language are innate.

Reasons: language is acquired rapidly, effortlessly, and without direct instruction, much like maturation.

Language is learned from experience, like manners; social interaction is critical and can affect the course and pace of language development.

Language is constructed by the child using innate mechanisms that act upon information in the environment (also called constructivism).

Reasons: language learning is actually quite slow, and requires a lot of work and a relationship with others.
The human ability to develop language is a self-contained module in the mind.

The mind has many modules - one for perception, one for understanding spatial location, one for learning language.

The mechanisms used in language development are specific to language and are not used for any other activity.

The mind contains a set of general-purpose reasoning abilities that are also used for language, such as pattern analysis, symbolic representation, and memory skills.

In recent years, the domain-general theory of connectionism has been used to model language.

*Under this view, language learning is achieved through activation of nodes that collect input from the world or other nodes in the same way that all other learning takes place.*
Language is an autonomous, arbitrary system whose form is independent of its function. The nature of language and its development are distinct from its use as a communicative tool. The use to which the tool is put provides no clues to the system’s structure.

Current Theoretical Camps: Formalism

Language is shaped by the communicative function it serves. Children discover the form of language in using it to communicate. An extreme view on this position is that language is a social skill uninvolved with abstract linguistic rules.