

## Communication Systems and Human Language

Communication is the intentional transmission of information.

Etymology of **communication**:

- From Latin:
  - *communicare* 'to share'
  - *communis* 'shared by all'
  - *com* 'together' + *munia* 'public duties'
- Related words in English: *common, community, communism, communion*

Human language is a communication system; not all communication systems are languages.

What characterizes a communication system?

## Properties of more sophisticated communication systems

- **Interchangeability** – The ability of a single individual to both send and receive messages, for example: the female silkworm moth can only send messages, and the males can only receive messages.
- **Arbitrariness** – No direct or motivated link between the form of the symbols used and the meanings of those symbols.
- **Cultural Transmission** – The communication system can and needs to be learned, it is not completely innate. Example: Children learn the language of their environment. The communication systems of most animals (e.g., insects) are completely innate, but chimps and some birds learn a portion of their signals from their surroundings.
- **Discreteness** – The existence of messages composed of smaller, distinct parts. No animal communication systems is known to have this property, but human language does.

## Properties of all communication systems

- A **medium** – The mechanism by which messages are sent. Some examples are:
  - **Visual**: gestures, signs, writing
  - **Auditory**: speech, warning cries
  - **Tactile**: braille
- **Semanticity** – Signals must have meaning; if the signals are simply random, then no communication is taking place.
- **Pragmatic Function** – Messages serve some purpose (e.g., survival, transmission of culture, influencing others' behavior)

## Properties of one communication system: Human language

- **Displacement** – Ability to communicate about things or situations not present in space or time. Animals do not appear to have the ability to talk about the past or speculate about the future. They similarly do not communicate about hypothetical situations or events. Displacement allows much more abstract communication to take place.
- **Productivity** – The system has the capacity to expand when needed, i.e., the number of possible distinct messages is not limited. This is a result of *discreteness*, which lets us make messages out of smaller parts. Every day there are millions of never-before-uttered sentences produced, and yet they are understood.  
Since languages are not limited to a certain fixed set of messages, they are called **open communication systems**. Animal communication systems, on the other hand, are referred to as **closed communication systems**.

## An Example for an Animal Communication System: Bees

- Honeybees have an intricate system of communication used to indicate the location of food sources to other bees.
  - There are not one, but three distinct methods used by bees to communicate (not all of these are found in every species of bee). All are based on "dances" performed by scouts returning to the hive after having located food sources.
- A. **Round dance** – This dance is used when food is less than 20 ft. away from the hive. It communicates three things:
- the **existence** of food (by the very performance of the dance);
  - the **quality** of food (by the excitement level of the bee);
  - the **type** of food (by the dust on the bee).

5

## Which Properties Does The Bee Communication System Have?

1. Basic
  - (a) Semanticity
  - (b) Pragmatic Function
2. Possible
  - (a) Interchangeability
  - (b) Arbitrariness
  - (c) Cultural Transmission
  - (d) Discreteness
3. Human
  - (a) Displacement
  - (b) Productivity

7

- B. **Sickle dance** – This dance is used when food is between 20 and 60 ft. from the hive. It communicates five things:
- the **existence, quality, type** of food (as with round dance)
  - the **direction** of the food with respect to the hive and the sun (by angle of "perpendicular" wrt vertical);
  - the **distance** of the food (farther distances are indicated by faster repetitions of dance).
- C. **Tail-wagging dance** – This dance is used when food is more than 60 ft. from the hive. It also communicates five things:
- the **existence, quality, type** of food (as with round dance)
  - the **direction** of the food (by the angle of the "straight" part of the dance wrt vertical);
  - the **distance** of the food (longer time to get there – i.e. longer distance = slower dancing). This is the opposite of the strategy used in the sickle dance. And with good reason – the bees can only dance so fast, so they need a sort of limit on how fast they must dance to communicate any piece of information.

6

## Properties of the Bee Communication System

1. Basic
  - (a) Medium: visual
  - (b) Semanticity: dances mean that food exists at a particular place
  - (c) Pragmatic Function: prevents hive from starving
2. Possible
  - (a) Interchangeability: limited (only scouts can send messages, a bee can possibly be a scout once and a "listener" at another time)
  - (b) Arbitrariness: limited (there are distinct dances which are used to differentiate distances without any real link, but two of the dances use solar angles, which are definitely non-arbitrary.)
  - (c) Cultural Transmission: no, innate.
  - (d) Discreteness: no, holistic message.
3. Human
  - (a) Displacement: a little (subject of communication always displaced, max. 1hr/10km)
  - (b) Productivity: no, a closed system.

8

## Primate Studies

- The great apes (gorillas, chimpanzees, and orangutans) have very complex communication systems. They communicate with facial expressions, gestures, and calls to express anger, dominance, fear, danger, and the like.
- These communication systems nevertheless lack properties as *displacement* and *productivity*.
- The great apes are, however, very intelligent creatures and the nearest relative of homo sapiens.

Can language be taught to apes, even though it does not occur naturally?

9

## Teaching ASL to Chimpanzees

### Washoe

- A chimp named Washoe was taught American Sign Language (ASL).
- By the time Washoe was five years old, she had acquired 132 signs.
- She supposedly had also invented her own novel combinations.

### Nim Chimsky

- Nim was also taught ASL.
- When Nim was four years old, he had acquired 125 signs.

### Criticism

- The apes' uses of signs are very different from human language.
- 40% of the signs were mere repetitions of what the trainer had just signed.
- The signing of the chimps was always a request for food or social reward.
- There was no evidence that Nim knew any grammar.
- The training procedures taught problem solving and not language.

11

## First Experiments

### Gua

- A baby chimpanzee was raised in a human environment to determine if the chimp would acquire human language on its own.
- Gua's development was compared with that of a child of the same age.
- The experiment was stopped after nine months without any success.

### Viki

- The female Chimp Viki was also raised as much like a human child as possible. It was believed that the vocal tract of the chimp was similar enough to a human's for it to be able to articulate human sounds.
- After three years, Viki could speak three words: *cup*, *mama*, and *papa*. It sounded as if Viki were only whispering.

### Problems

- Chimps are not capable of producing human speech sounds. Trying to teach a chimp to speak will therefore always be fruitless.

10

## Koko the Gorilla

- In 1972, the one year old gorilla Koko started learning ASL.
- Koko is now 30 years old and apparently uses around 1000 signs and can understand around 2000 signs.
- She also invents her own combination of signs.
- In addition, she supposedly understands spoken English.

### Questions

- Has Koko acquired human language?
- How long are her signed utterances?
- What are the main topics of her signing?
- Is there any evidence that she really knows the meaning of the signs she uses?
- Is she probably also only repeating and imitating her trainer's signs?

12