Interest in Animal Communication

- Assume human language evolved
  - Identify properties in common with other communication systems
- Need communication model that captures the salient features of human communication
  - Structural, biological, pragmatic (Demers, 1985)

Structural properties

- Nonhuman systems
  - Vertebrates possess a set of discrete sounds employed under specific eliciting systems
  - Discrete
    - Certain set of sounds/symbols
  - Bounded
    - Constrained by situation

Birds

- Calls
  - Short & discrete
- Songs
  - Complex
  - Typically given only by the male
  - Linear ordering
    - Ordered subparts
      - Individual notes

Cetaceans (Dolphins & Whales)

- Dolphins
  - Pure tones
  - Pulsed sounds
    - clicks, barks, moans, yelps
    - Clicks for echolocation, communication (?)
    - Pulsed sounds for emotional states, signature whistles
  - No linear order proven
- Whales
  - Whale songs consist of subparts
  - Linear order

Monkeys

- Vervet
  - Alarm calls
    - snake chutter
    - terrestrial predators
    - avian predators
- Cotton-topped tamarin
  - Vocalizations
    - Systematic discreteness
    - primitive rules of combination

Biological Properties

- Developmental sequence
  - Vervets
- Critical period
  - Chaffinch
- Innate ability
  - Chinchilla monkeys
- Cerebral dominance
  - Birds

Pragmatics in animal communication systems

- Use of context to determine meaning of communication is a pervasive feature of animal communication
- Dogs
- Birdsongs
- Primate vocalizations

Animal Communication Systems

- Present a few examples and available data
  – You decide
- Whale communication
- Dolphin communication
- Chimpanzee communication

Humpback Whale Songs

- Highly organized
- Labile
  – Constantly changing
  – Major changes adopted by all singing whales
  – Song evolution
- Dance
- Regional differences
- Similarities within a region

- Songs last from 5-30 minutes
  - Repeated for extended lengths of time
  - Low and slow (subsonic)
- Songs do not seem to be externally driven
  - Seasonal, food supply, etc.
- Internally driven displays
- May be linked to sexual behavior
  - Occurs most frequently in calving and breeding grounds
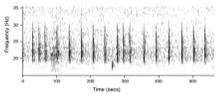
Playback Experiments

- Singing whales are alone
  - Move towards other whales
  - Avoid other singing whales
- Playback experiments
  - Social calls
    - Sought out underwater speaker
  - Whale song
    - Left the area

Dolphin Communication

- Skilled at quick mimicry of sounds
  - Presented with verbal stimuli Repeated with 70% accuracy
- John Lilly & JANUS
  - Uses computer to send and receive dolphin sounds
  - Computer generated sounds, visual letters and symbols displayed on an underwater screen
  - Trying to create a new language accessible to both dolphin and man

- Louis Herman
  - Traditional training
    - Shaping & Reinforcement
  - Language training
    - Taught words
    - Taught actions
    - Taught syntax
  - New tricks without explicit training
- Jarvis Bastian (1965)
  - Dolphins in adjacent tanks
  - Taught problem solving task to one
  - Other was also able to perform task without training

Teaching Language to Apes

Vicki signs "cup"

- Vicki (Myers)
  - First attempt at cross fostering
  - Pan troglodyte chimpanzee
- Attempted to teach Vicki speech
  - Cup mouth into correct shape
- Poor success
  - Chimps do not have same vocal apparatus as humans (duh!)

Project Washoe

- 1971-1978
- Used ASL (American Sign Language)
- Started training Washoe at 10 months
- 51 months later
  - Acquired 132 signs
    - Used them for classes of referents
  - Asked questions
  - Produced novel combinations
  - Displacement

Criticisms of Ape Studies

- Herbert S. Terrace
  - skeptical of ape language studies
- Said apes signed only to receive rewards from trainers
  - words most used are almost all related to food, drink and other desirable activities like tickling and chasing

Nim Chimpsky

- Training method same as Washoe
- Learned about 125 signs
- Syntax demonstrated
  - Using the verb more frequently before the object than vice versa
    - (e.g. "hug Nim" instead of "Nim hug")
- Words used in novel contexts
  - DIRTY when he had to go to the toilet
  - Warned people by using the signs for ANGRY and BITE
    - tended not to attack if this warning was heeded.

Criticism

- Close analysis of training tapes
  - Nim simply repeated signs trainer used first
  - Repeated same signs over and over
- Prompting by researchers
- Found same problems on Washoe tapes
- Terrance concluded real language use was not being demonstrated

Second Generation

- Research had more controls
  - Double blind technique
  - Recording and testing was meticulous and precisely defined
- Used newborn apes
- Signers fluent in ASL
- Chimps had signing companions
- Lab well-stocked with stimulating objects and materials
- Teaching was spontaneous and informal

Symbol Acquisition and Use

- Graphic communication system
  - Set of abstract symbols
  - Used to represent concepts, actions, other linguistic entities ("Larger than")
  - Terms arranged according to simple grammar

Symbol system

- Used because it does not require fluency of ASL
- Acquired more readily
- Produced more clearly and unambiguously
- Keyboards are easily transported
  - Some have synthesizers

Pan Troglodyte

- Originally trained with reinforcement paradigm
- Chimps born in wild
  - Trained while still young
    - 1-2 years old
- Success
  - Symbolic language enabled more complex thought
- Problems
  - Didn't comprehend lexical system prior to intensive training
  - Receptive skills minimal
  - Little accordance between symbol use and behavior

Pan Paniscus (bonobo)

- More similar to humans
  - Stance more upright
  - More gentle
- Mulika
  - Born in wild training begun at 3 years
  - Relatively unsuccessful training program
  - Useful in breeding program
    - Kanzi

Kanzi

- Spontaneous language acquisition
  - No training necessary
  - Receptive language acquisition
- Behavioral concordance with language use
- Language used for more than requests
  - Comment on the environment
  - Occurred in absence of referent
- Good speech comprehension

Learning Context: Behaviorist

- Training
  - Present object
  - Ape produces symbol
    - Reward appropriate behavior
    - Extinguish inappropriate behavior
- Results
  - Ape acquired rudiments
  - Production context bound
  - Use mainly for requests
    - Not clear they understand symbol is abstract representation of a concept

Learning Context: Schema Driven

- Communication encouraged, not required
- Communication occurs in the context of day-to-day activities
  - Play time
  - "Foraging" for food
- Establish a common ground between communicators

Kanzi: Language Performance

- Uses language at the level of a 2.5 year old child
- Production is not context bound
- Production is not limited to requests
- Able to understand and carry out novel (unusual) requests