

LECTURE GOALS:

- Go beyond classifying different categories of communication and begin to understand how evolutionarily stable communication systems can “evolve”.
- Know what is meant (and what is not meant) by “honest signaling”.
- Consider how the environment shapes the evolution of communication.
- Consider how the receiver shapes the evolution of communication.
- Consider the complexity of multimodal signals.

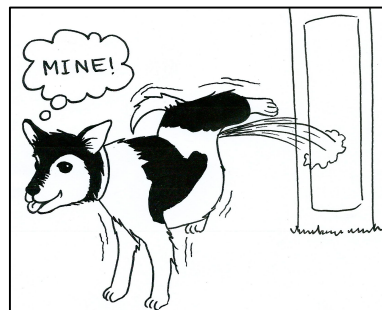
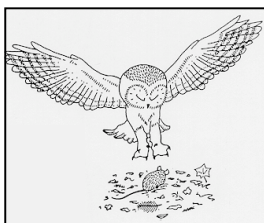
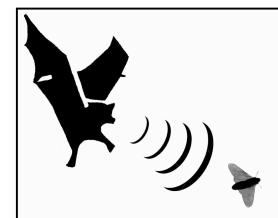
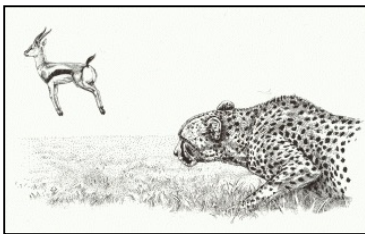
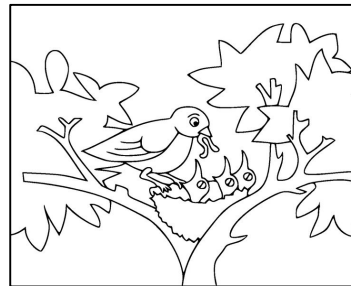
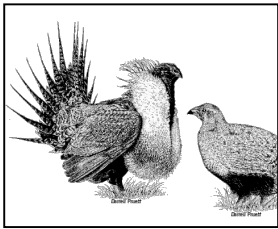
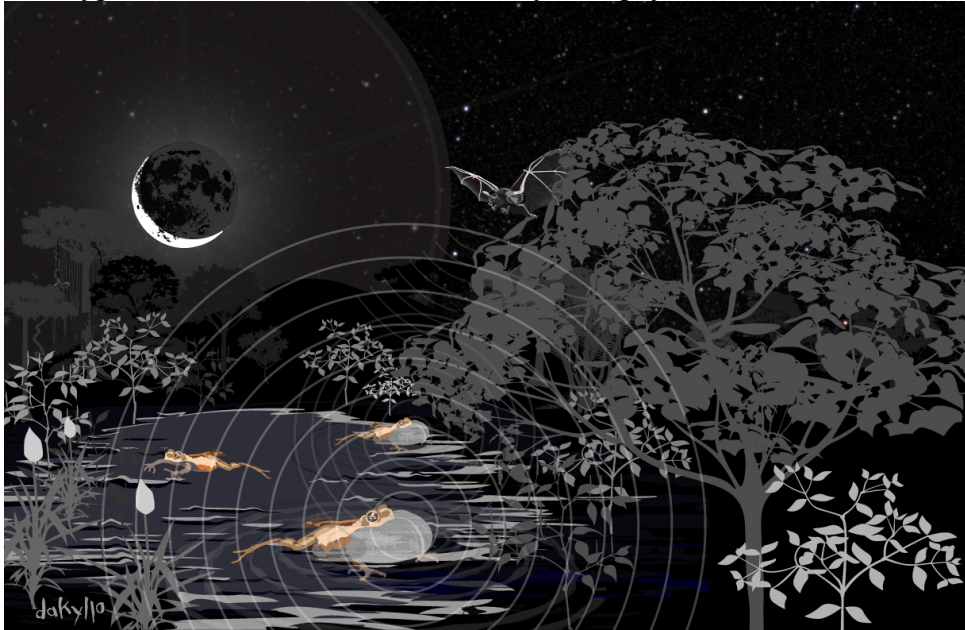
LECTURE OUTLINE:

1. "Communication" requires a sender, a receiver and the transfer of information through the environment by means of an evolved mechanism.
2. While classical ethologist categorized communication systems, more modern approaches can consider communication in terms of a gene-centric view and game theory models.
3. Game theory provides a lens with which to understand “flamboyant displays”.
4. When animals have different “incentive”, even true communication can evolve as an “arms race”.
5. Distinct classes of signals have been theorized to produce evolutionary stability.
 - A. Indices: some signals are under physical constraint.
 - B. Handicaps: the cost to produce a signal prevents those of poor condition from producing the signal such that signals are honest.
 - C. Signals of Convention.
6. Regardless of the model, “honest” signals are at best “honest on average”.
7. Because communication “signals” are physical stimuli produced by behavior that must travel through the environment, the environment can shape the form of a signal on different timescales.
 - A. Proximate, Rapid time scales (e.g. frog calls, whale song)
 - B. Ultimate, Evolutionary timescales (e.g. frog calls)
8. Because communication signals must be perceived and reacted to by a receiver, the receiver can “bias” the evolution of signals, a theory known as “sensory drive”, “sensory bias”, or “sensory exploitation”.
 - A. Example: Cichlids, cuttlefish, guppies, swordtails, birds.
9. There are multiple hypotheses to explain the use of multimodal signaling
 - A. They may reduce ambiguity of the signal
 - B. They may compensate for environmental variation that compromises a signal
 - C. The different components carry different information that may vary in importance with the context but the sender needs only 1 display
 - D. Different receivers may attend to different components.
 - E. By exploiting multiple sensory modalities the signal may be stronger or less easy to cheat.
10. There are costs associated with multi-modal signaling
 - A. Energetically more expensive
 - B. There is more “public information” cost of potential eavesdropping.
 - C. Increased predation/parasitism.

HELPFUL FIGURES & NOTES:

(All PowerPoint files will be available on the Moodle after lecture. The subset of incomplete figures and notes here are meant to assist your note taking.)

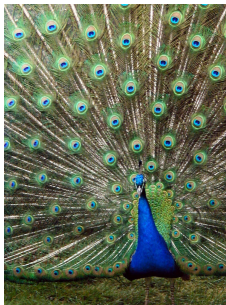
The Type of Communication is defined by who pays the cost and who receives benefit



		Receiver value in information	
		Positive	Negative
Sender value in information	Positive		
	Negative		



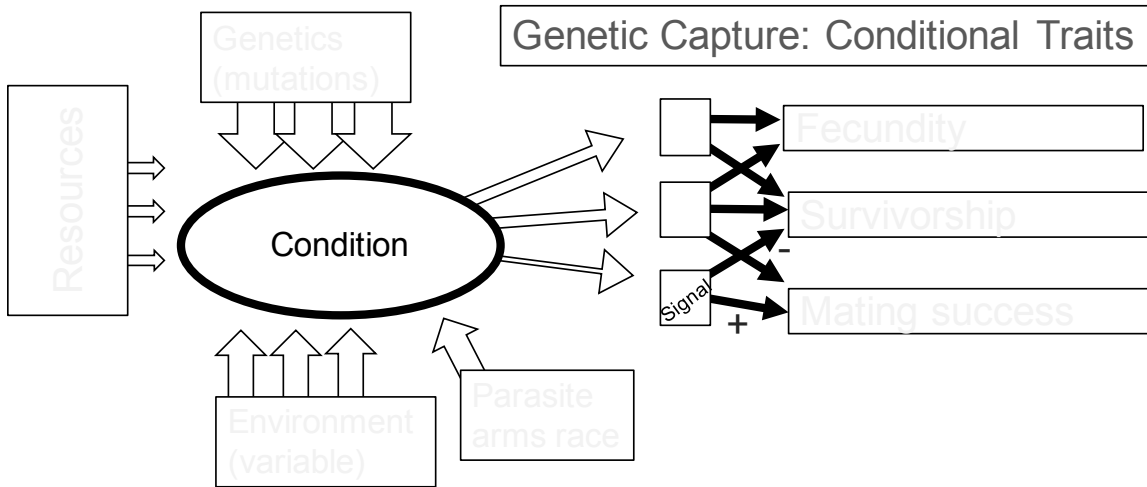
Indices



Handicaps (Conditional)

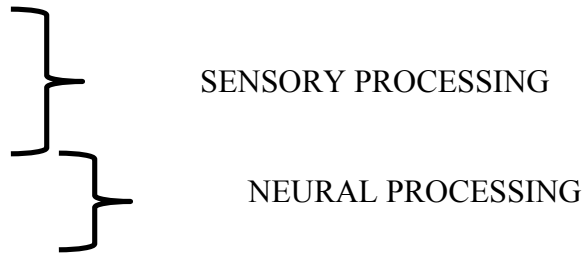


Live long and prosper Conventions

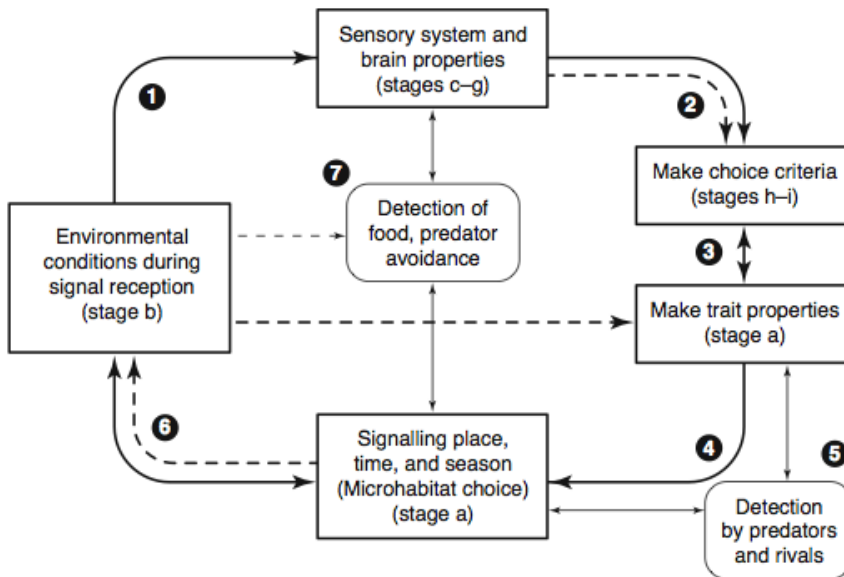


Stages in communication:

- A) Generation --
- B) Transmission
- C) Reception
- D) Transduction
- E) Coding
- F) Perception
- G) Classification
- H) Assessment
- I) Decision



Sensory Drive explains the evolution of some communication signals.



VOCABULARY:

(Practice writing interesting, informative sentences that include, and capture the meaning of, 4-5 words from this list. To simply memorize a definition is not sufficient.)

Communication	Conspiratorial whispers	Signal of Convention
Sender	Conspicuous displays	Honest Signal
Receiver	Arms Race	Umwelt
Signal	Handicap	Sensory Drive
Cue	Indices	Multimodal signals
Channel	Genetic Capture	
Modality	Conditional Signal	

PRACTICE EXAM QUESTIONS:

1. Define "Communication" and explain your terms.
2. Describe 2 types of communication other than "True Communication".
3. Squirrels, which are resistant to snake venom, wave their tail when confronted with a rattlesnake. The data below records the behavior of a live snake in response to a squirrel mode. Is this True Communication? Can you explain the evolution of this system in terms of Sensory Drive?
4. Propose 3 hypotheses to explain the adaptive value of a multi-modal signal over a unimodal signal.
5. Why might a species use a unimodal signal (given all the possible adaptive reasons to use a multimodal signal)?
6. Discuss similarities and differences between the theory of "deep homology" and the concept of "phylogenetic constraint". Use an example of animal communication.
7. What are some potential costs of multi-modal signaling?

READING FOR TODAY:

Read the relevant chapter on Byer's chapter on communication.

Hurd (2010) Honest Signaling

Extra:

Endler and Basalo (1998) Sensory ecology, receiver biases and sexual selection TREE 13:415-420. (this is way more detail than you need to know but it is where the figure comes from that I used)

