

LING 001
Introduction to Linguistics

Lecture #5

Animal Communication

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Announcements

- **Exam 1 is next Monday!**
- What will be on the exam?
 - The **content from the study guide**; deeper understanding of content from class material
 - Questions will be **just like practice problems**
- Come to office hours if you'd like to meet; email ASAP to meet outside of office hours.

Recap last time

- Languages are more similar deep down than is widely believed
 - All languages acquired in basically the same way
 - All languages exhibit complex structure
 - All languages are basically capable of expressing the same thoughts
 - No strong evidence for profound variation in how languages influence thought
- This doesn't mean that languages don't vary in many exciting ways!
 - In fact, apart from very fundamental features, it's hard to find hard and fast features that are truly, uncontroversially universal.

Animal Communication - Questions

- **Question 1:** What sorts of **communicative capacities** do animals display in nature?
- **Question 2:** How do these capacities **compare to the linguistic capacities** of humans?
- **Question 3:** Do any animals exhibit **abilities to learn a human language** (or anything close to it)?

Case Studies

- **Complex communication** systems in relatively **simple organisms**:

Honey bees, birds

- **Natural communication** of **primates**

Vervet Monkeys

- Attempts to **teach them language**

Chimpanzees, Gorillas, Orangutans, Bonobos

All communication systems have

- **Mode** - a way in which a message is transmitted
 - Sound, visual cues, touch, smell, etc.
- **Meaning** - always serve some useful purpose
 - usually related to survival (eat, mate, fight, flee)

Some communications systems have

- **Arbitrariness:** the form of the symbol is not directly related to its meaning.
- **Discreteness:** able to construct complex messages built up out of smaller discrete parts
- **Interchangeability:** both send and receive messages
- **Cultural transmission:** at least some part learned through interaction with others.

Key Property of Human Language

- **Grammatical Systems** are **unbounded discrete combinatorial systems**
 - **Discrete parts** (e.g., morphemes) - categorical perception!
 - Rules for **combining** parts
 - **Unbounded (productive)**: No limits on application of rules (always more new / longer words, sentences, etc.)
- This provides humans with a communicative tool of essentially **unlimited expressive power**
- We can communicate about thing not present in space or time (**displacement**)
- How does this compare to animal communication?

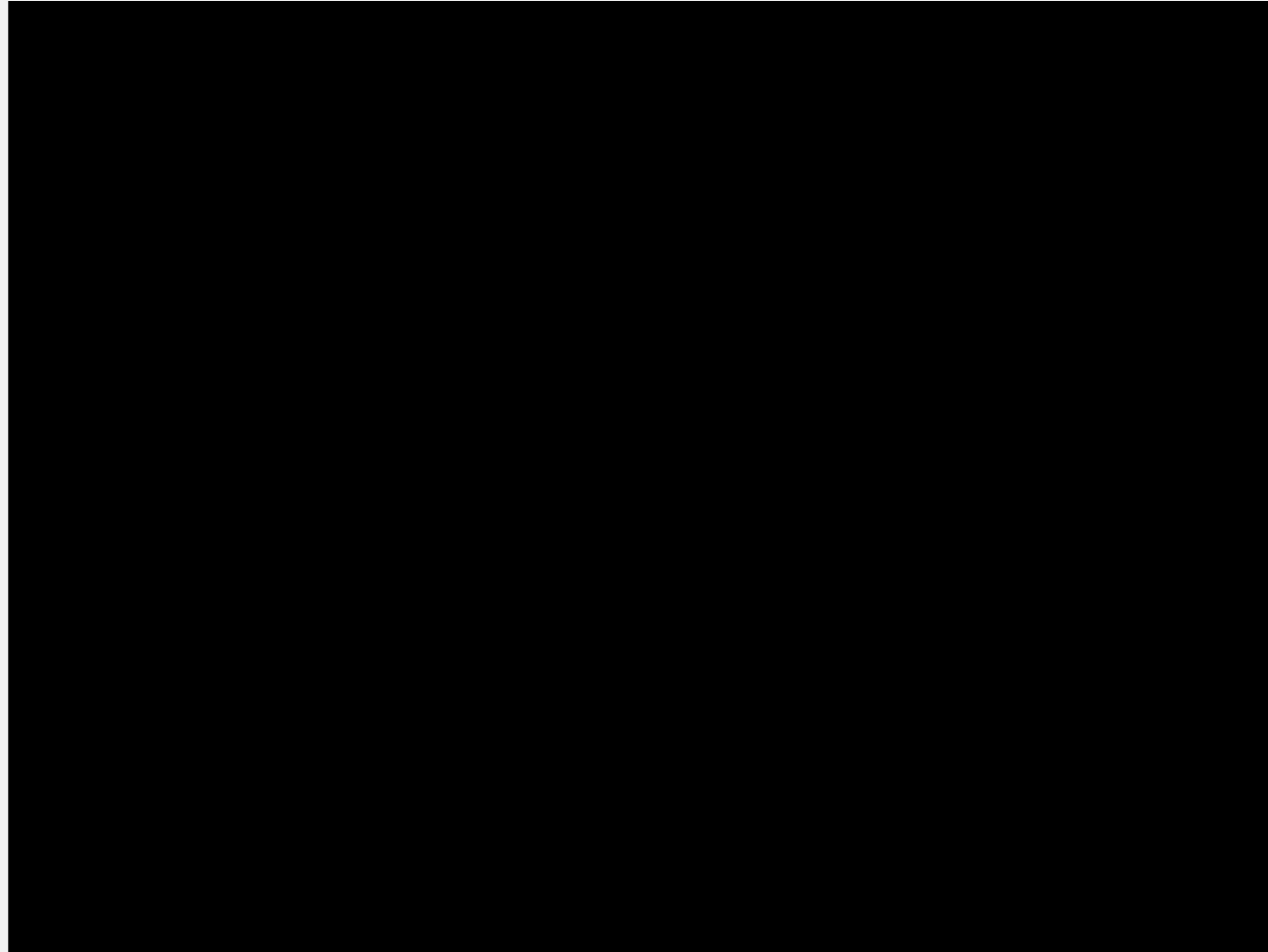
Case Study #1: Honey bees

Honeybees

- **Messages** you can **send**:
 - I've found some food!
 - There's X much of it.
 - It's Y distance away.
 - Fly in Z direction to get to it.



Honeybee video



The Round Dance

- **Simplest dance.** Only **two messages**:
 - I've found some food!
 - There's X much of it. (Vigor of dance.)
- **Other bees** are **alerted**,
go outside to find food source by smell.
- For distances < 50 meters.
(Longer distances require waggle (or sickle) dance.)

The Waggle Dance

- Announces **distant** food sources (> 50 m.)
- Communicates **quantity, distance, and direction.**
- **Quantity:**
greater => more vigorous dance
- **Distance:**
fast dance => fast flight to food.
- **Direction:**
angle of food from sun = angle of dance from vertical.

Turn-speed - Distance Correlation

Frequency of turns
is **inversely correlated**
with the
distance to the food
source

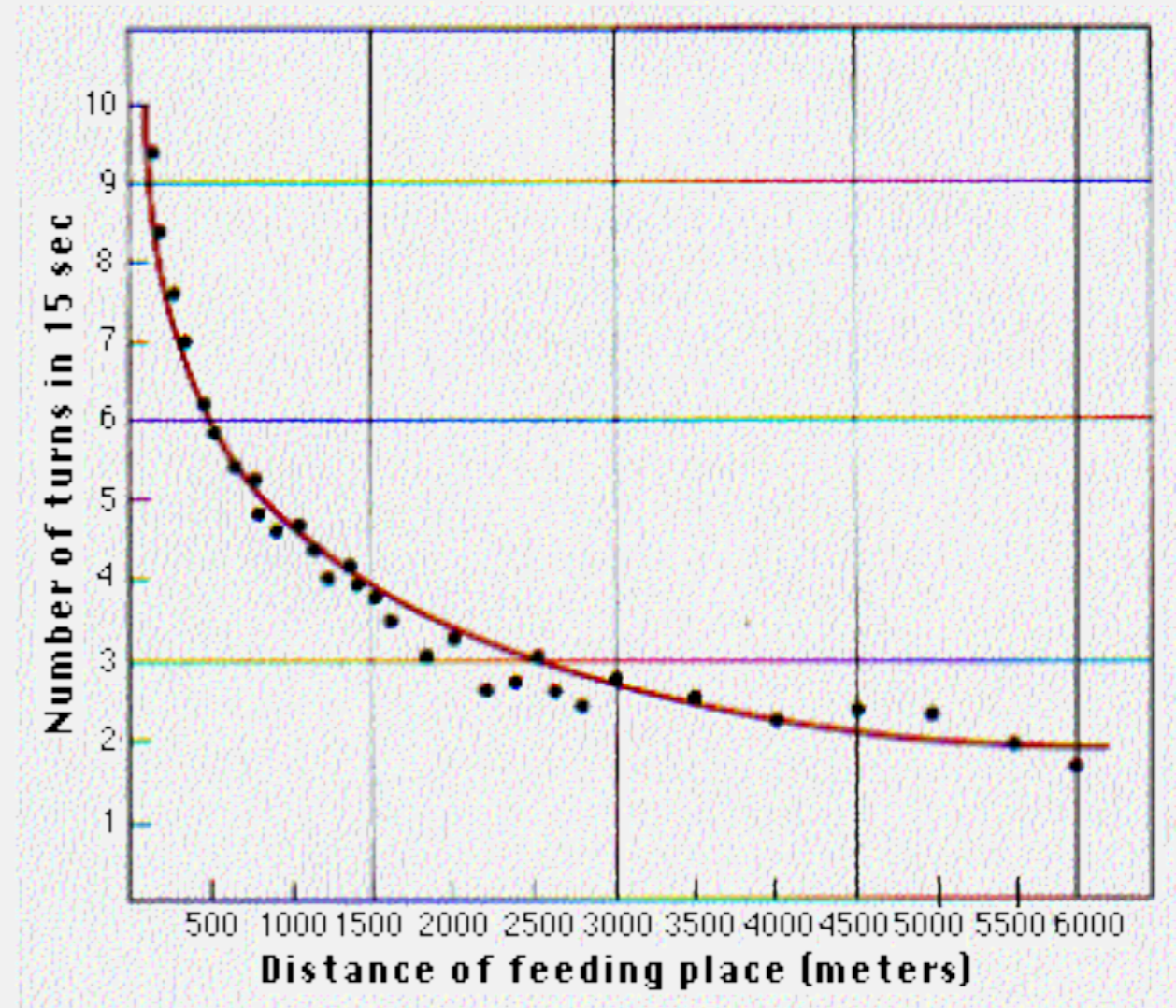
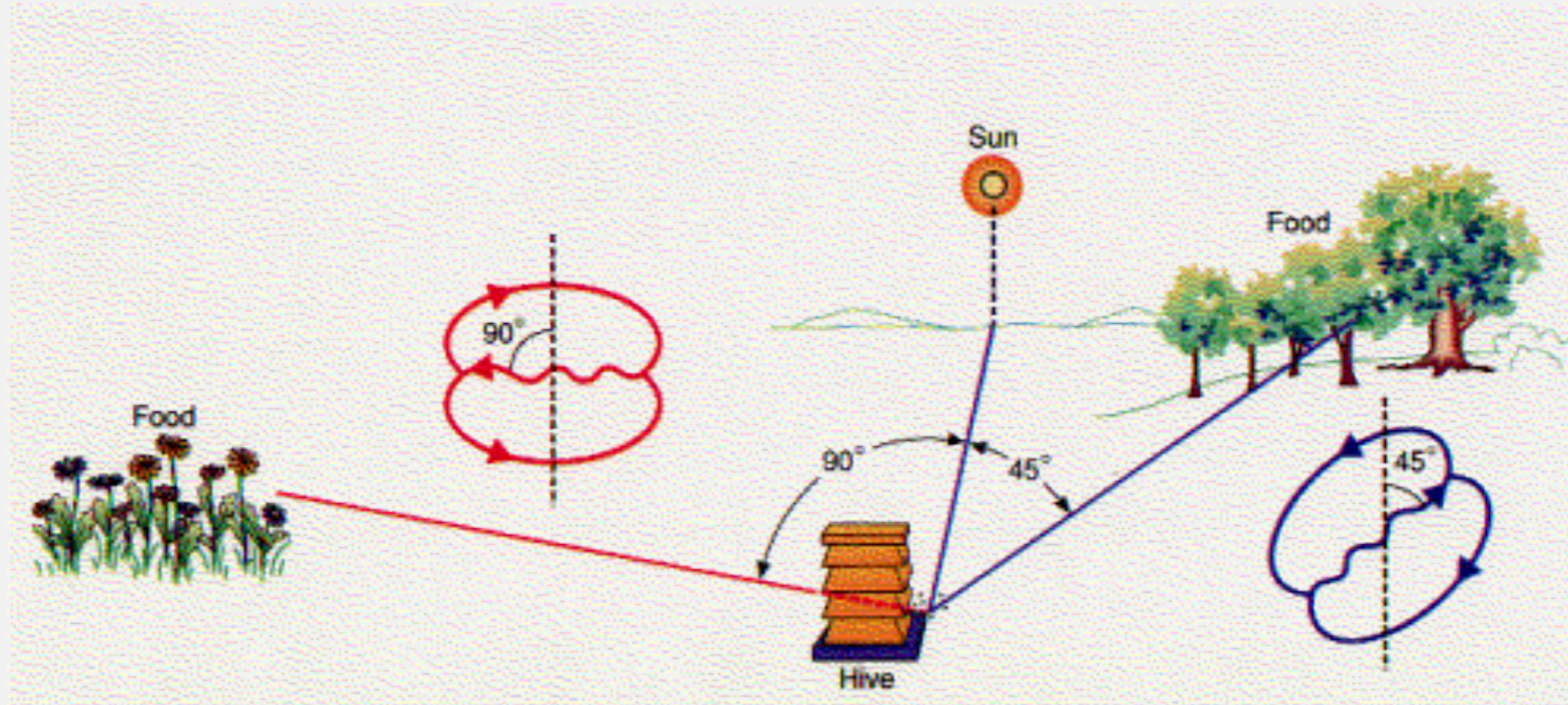


Illustration of Waggle Dance



Bee Language is Instinctual

- Much more instinctual than human language
- Bees **haven't got the brains** to think this up and transmit it culturally.
- "Orphan" bees are immediately understood – **no learning.**
- Bees **can't learn other bee dialects:**
Italian bees introduced to **Austrian** hives **aren't understood.**

How sophisticated is `Bee language`?

- **Impressive:**

- (potentially) **infinite** number of messages
- Discrete combinatorial system

- **But:**

- Very **limited expressiveness**
- Largely **iconic** (cf. arbitrariness of language)
- Entirely **dependent on internal experience** of bee:
 - Distance = perceived time
 - Crosswinds lead to wrong dancing direction

Case Study #2: Song birds

Songbirds

Two types of productions:

- **calls** (innate)
 - set of **short, simple sounds** associated with **particular events and activities**, (e.g. alarm calls , flight calls when flying in a group)
 - limited, **closed inventory** of **discrete messages**
 - **no creativity**, no combinatorial system
- **songs** (often partially learned)
 - range from a simple series of a few notes through long arias that may last 10 seconds or more;
 - serve as an expression of territoriality, and to attract a mate

Acquiring Meaning of Calls

- Birds **have calls instinctually**, but they don't know their meaning.

Instinct helps them acquire it:

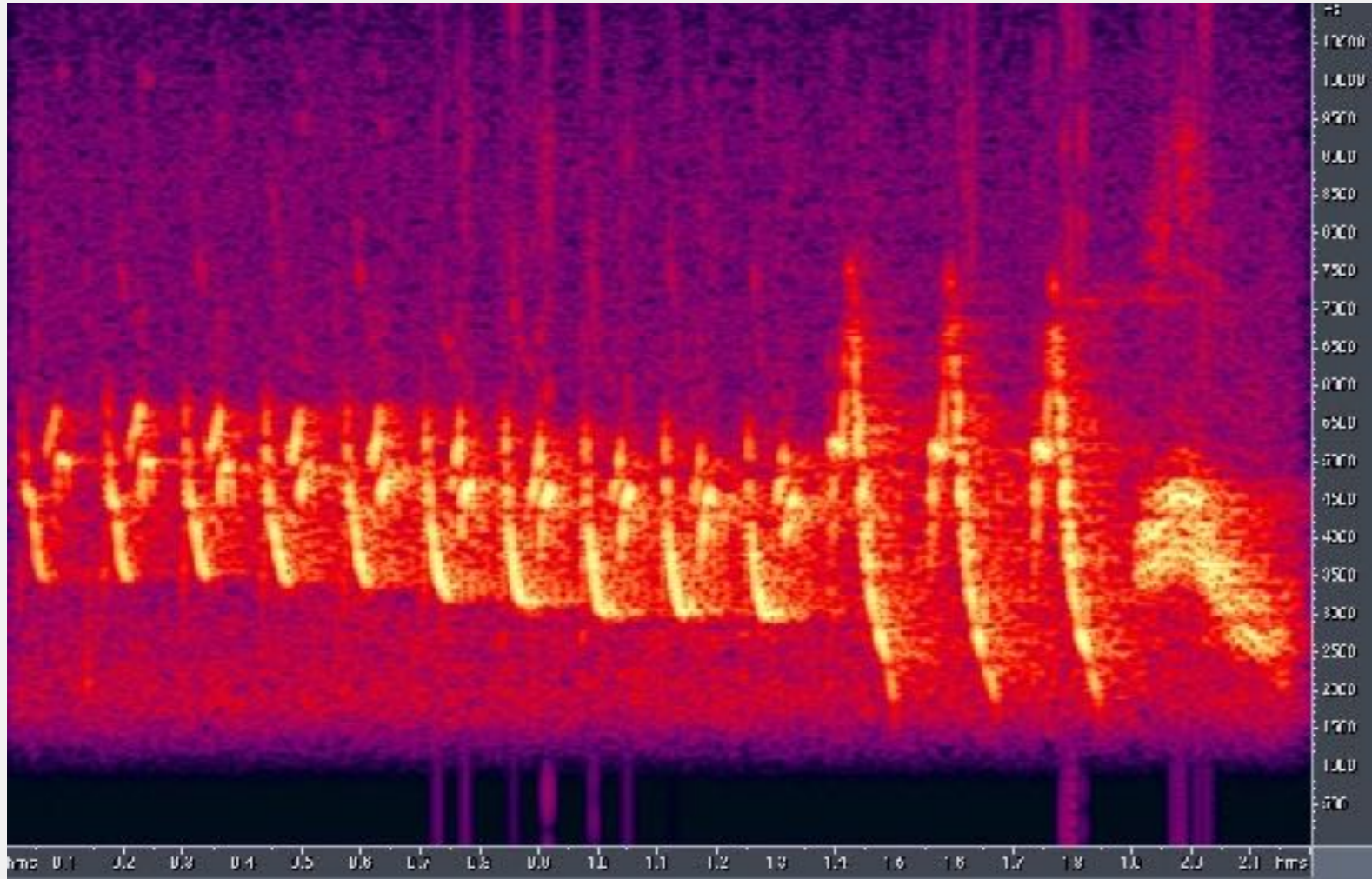
- Whistle alarm for hawks. (Hide!)
 - Mobbing alarm for nest predators. (Defend!)
- Baby birds **don't know which species are dangerous**; they **learn by observation** when they hear calls.

(Can be **tricked** into mobbing milk bottles and will pass it along to offspring.)

Song Dialects

- Songs are especially **loud**, longer than calls, highly patterned
- Differences of “**dialect**” within a single species; fall within broad **range of possibilities** available to the species
- These differences are **learned** - if you move a baby bird to a different area, it will **learn the new dialect**
- **Partially innate:**
 - at 2wks will react to a few notes of their species’ song
 - raised in isolation will produce a song similar to their species’ song
(but not good enough to win them a mate!)

Combinatorially

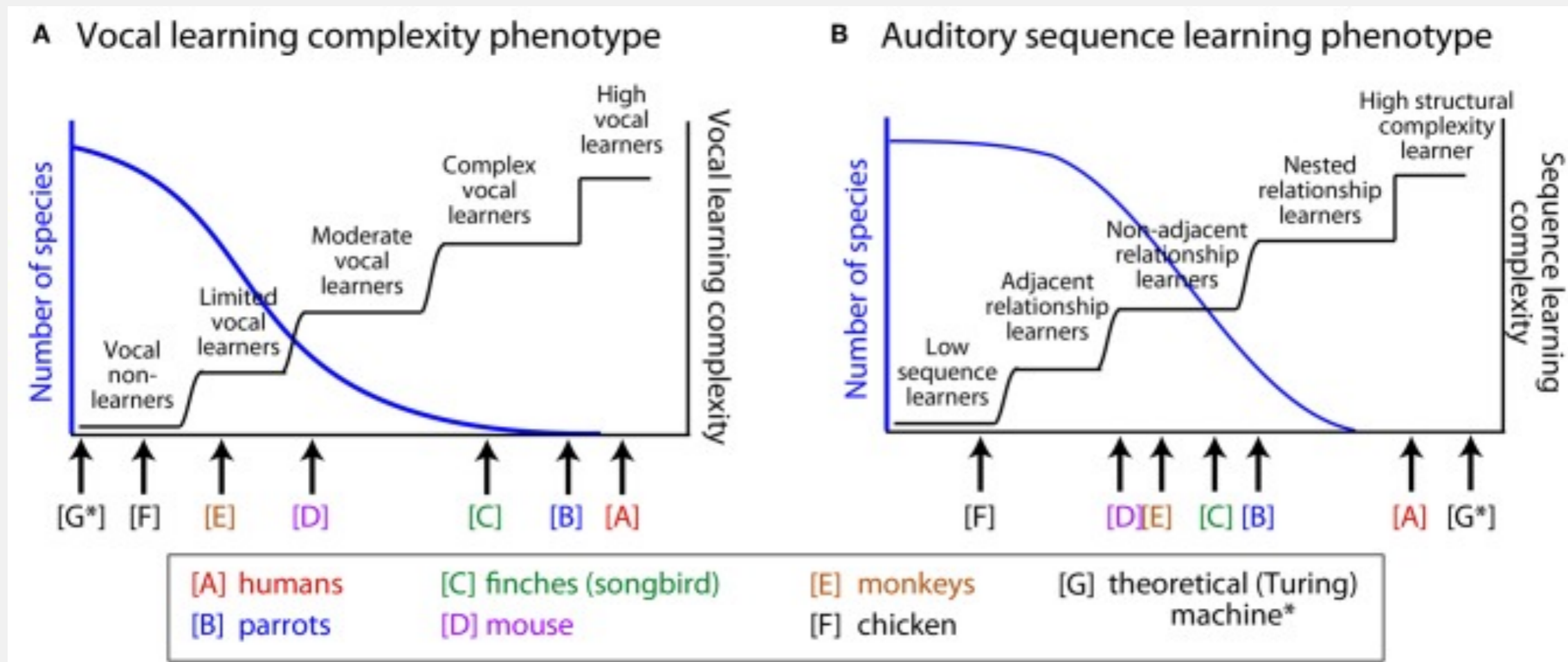


Similarities with Language

- **Critical period** during which input must be available, or else song will not develop
- **Specific range of systems** it is capable of learning
- During plastic song stage, **produce songs that are not the same as any they have heard**, but fall within range of possible song elements for their species

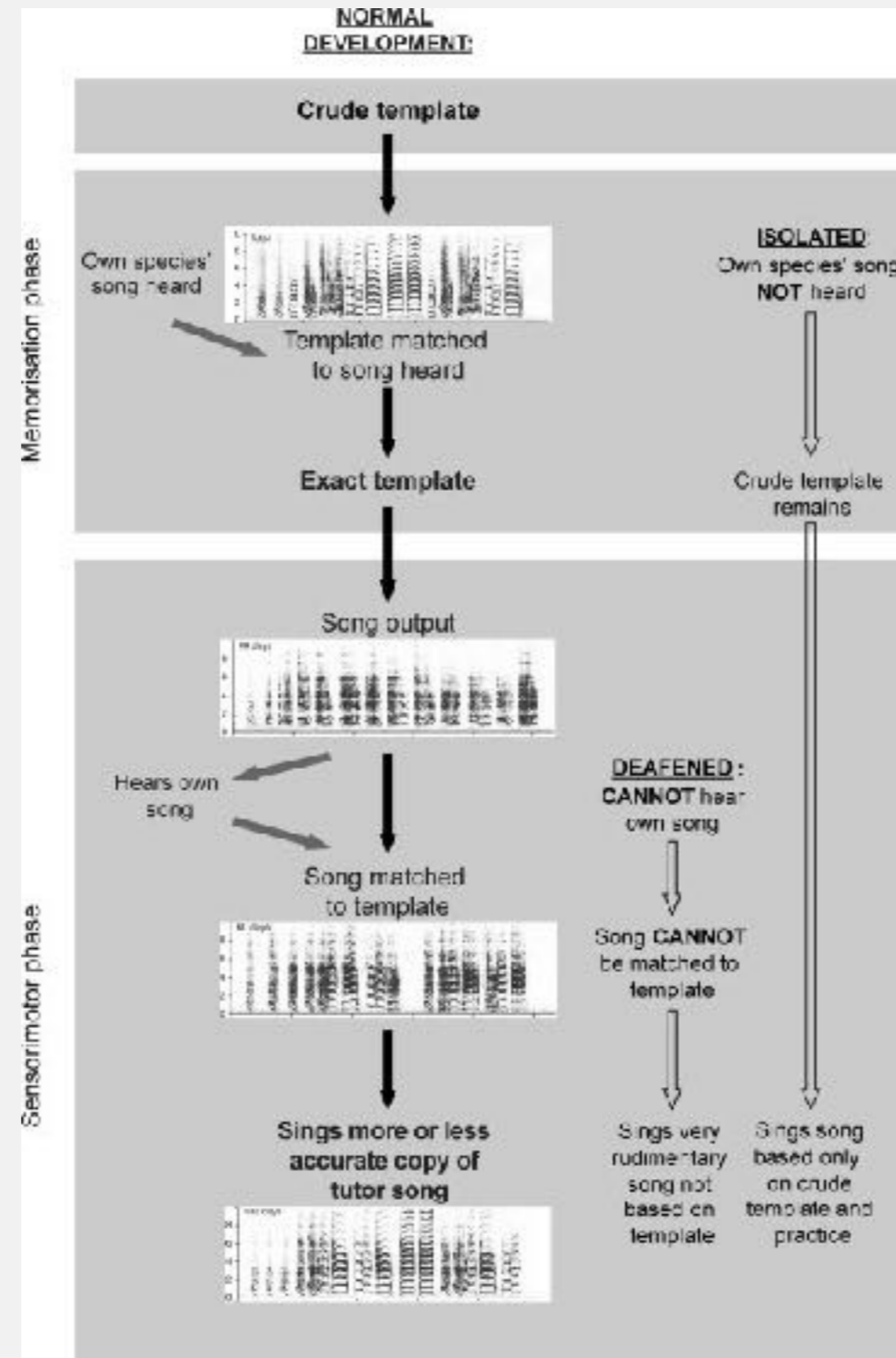
Similarities with Language

Petkov and Jarvis 2012



Similarities with Language

Bolhuis & Moorman 2015



Different from Language

- **BUT:**
 - no discrete combinatorial structure: whole calls have meanings, but discrete units essentially meaningless
 - limited communicative role (territory & mating)
 - no expressiveness - can't express new meanings

Case Study #3:
Primate Communication
in the Wild

Vervet Monkeys

- Vervet monkeys of Eastern Africa (old world monkeys)

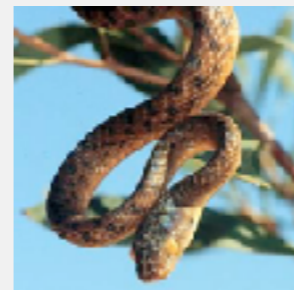


- Three **alarm calls**:

leopard



snake



eagle



Calls are Innate

- Vervet monkey **calls** and the general categories they represent are **innate**, but:
 - young vervets **learn by observation** which species of each predator class is dangerous.
 - infant might deliver an **aerial alarm** because of a **vulture**, a **stork**, or even a **falling leaf**.
- Note similarity to learning of bird calls.

Vervet Communication?

- Are they **trying to communicate**?
- Tentative evidence:
vervet call system used to **affect behavior of others**
 - Vervets **do not call when alone**
 - call more in presence of **kin or offspring**
- **No evidence** that the call system is used to **affect the knowledge state** of other vervets
 - Call just as much even though **everyone else has already seen** the leopard

Nonhuman communication systems

- So far, nonhuman communication systems seem to be based on one of three designs (Pinker):
 - a continuous signal that registers the magnitude of some state
 - or a series of random variations on a theme
 - a finite repertoire of calls

- Next time...

Case Study #4:
Can Apes learn Language?

Ape Projects

- Viki (oral production)
- **Sign Language:**
 - Washoe (Gardiner) (chimp)
 - Nim Chimpsky (Terrace) (chimp)
 - Chantek (orangutan)
 - Koko (Patterson) (gorilla)
 - Kanzi (Savage-Rumbaugh) (bonobo)

How to do well this week

- Make sure you understand the material on the study guide.
- Make sure you can do the practice problems and read the tips for solving on the solutions sheets.
- Exam questions will be **a lot** like practice