

PRIMATE VOCAL COMMUNICATION



Primate Social Behavior
20 October 2020

WIKIPEDIA DUE DATES

- Sandbox (first draft) edits due this Friday (10/23)
- Final edits due next Thursday (10/29)

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PRIMATE COMMUNICATION: THE OLD DAYS

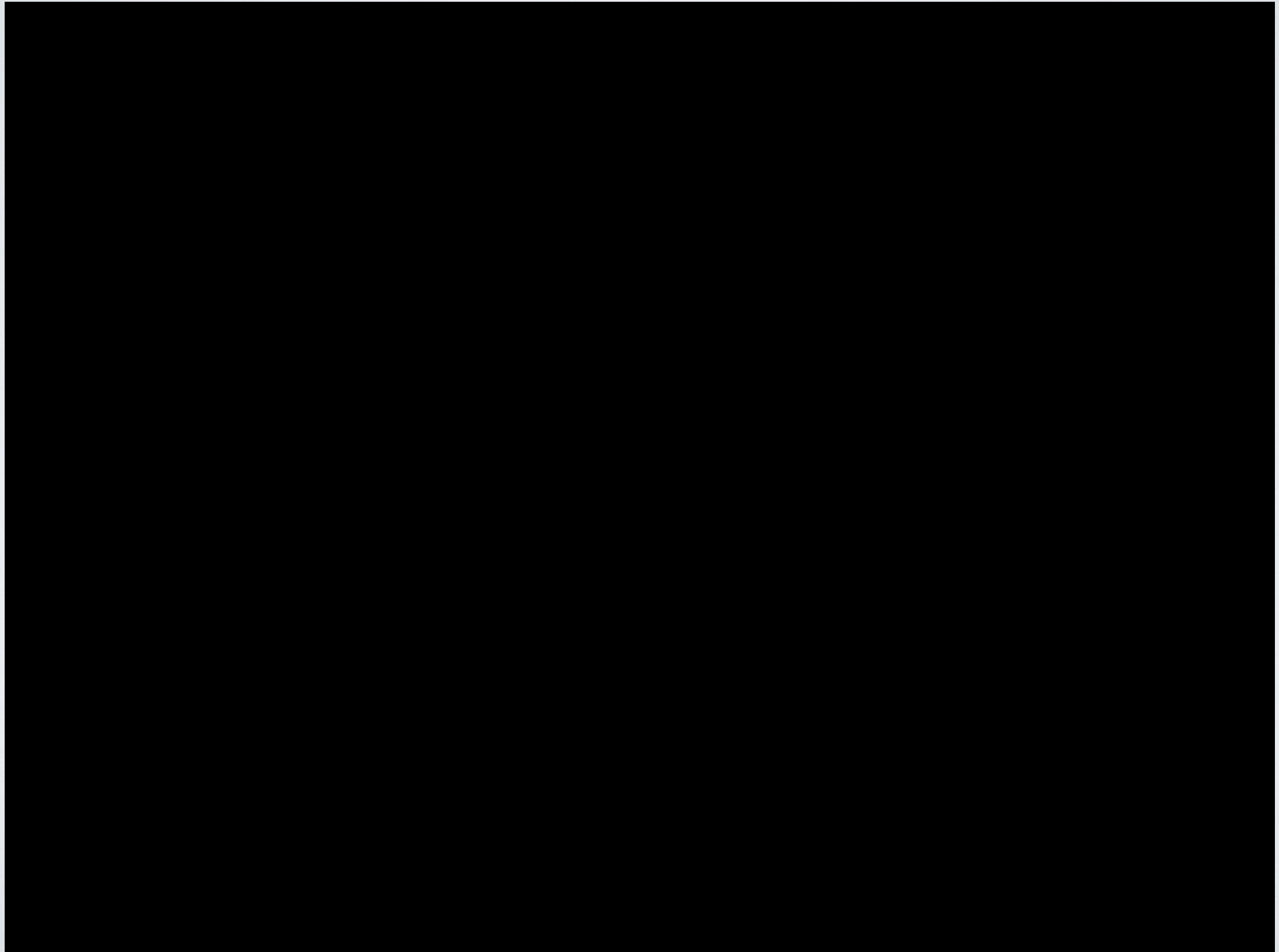
“... when the sensorium is strongly excited, the muscles of the body are generally thrown into violent action; and as a consequence, loud sounds are uttered, however silent the animal may generally be, and although the sounds may be of no use.”

-Charles Darwin

“Chimpanzee calls are, for the most part, dictated by emotions.”

-Jane Goodall

VERVET MONKEY ALARM CALLS



- What do vervet alarm calls mean?

- ‘Rudimentary language’!?

[illegible]

TODAY

- Call meaning (receivers):
 - Semantics
 - Pragmatics
- Call production (senders):
 - Learned or innate
 - Intentionality

THE MEANING OF MEANING

- meaning=information acquired by individuals who hear a call
- Information acquisition can be indirectly observed in listener behavior

SIMIAN SEMANTICS

- Semantics: information encoded in the sound of a call

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NECESSARY COMPONENTS FOR SEMANTIC MEANING?

SIMIAN SEMANTICS

NECESSARY COMPONENTS FOR SEMANTIC MEANING?

- Predictability
- Specificity
- Distinctiveness

PREDICTABILITY

- Does A reliably signal the presence of X?

SPECIFICITY

- How specific is X (the signified thing)?

DISTINCTIVENESS

- Can A be distinguished from other signals?

PREDICTABILITY

- Does A reliably signal the presence of X?

Vervet alarms reliably signal presence of predator

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- How specific is X (the signified thing)?

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Vervet alarms are specific to predator type

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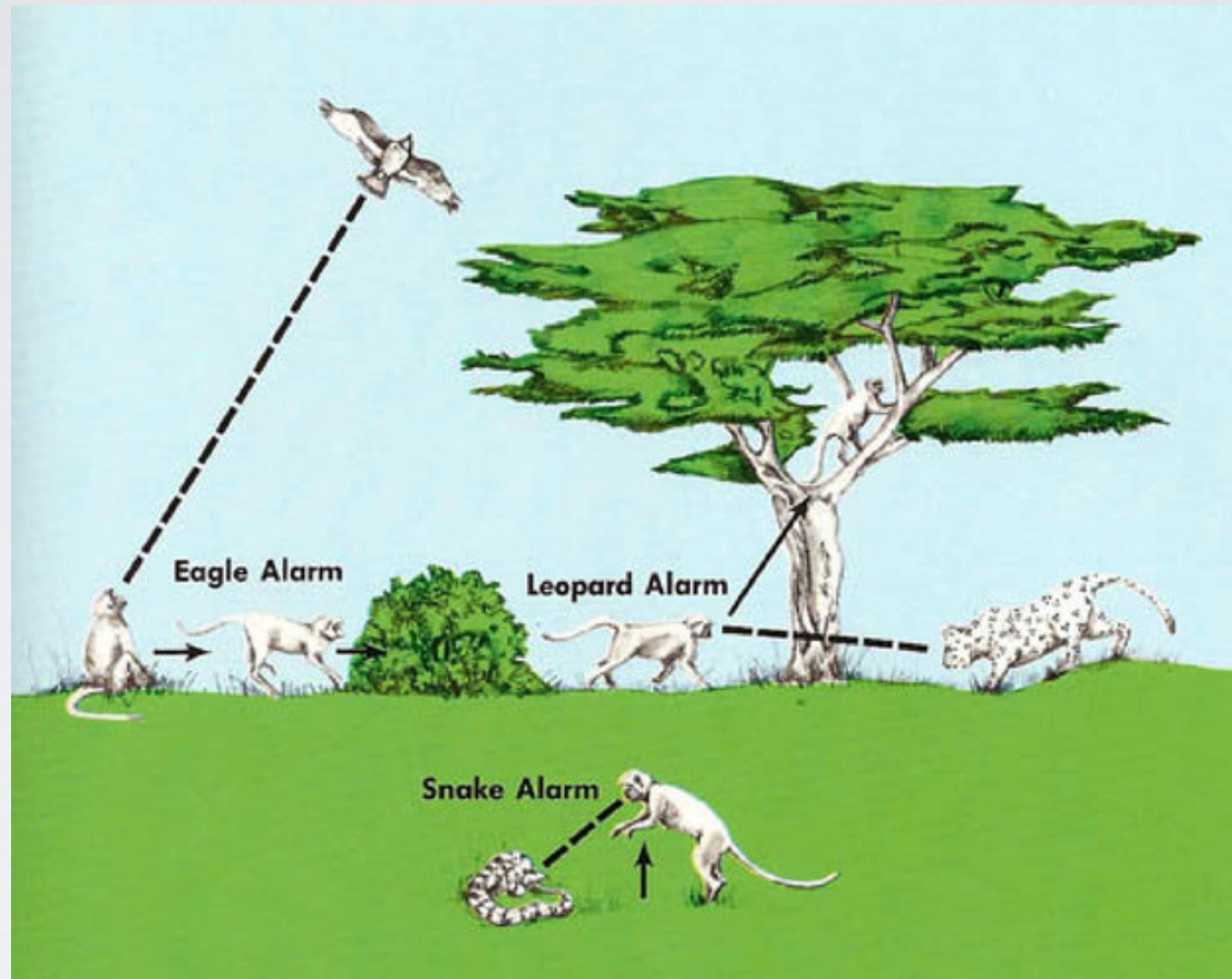
Vervet alarms are specific to predator type

DISTINCTIVENESS

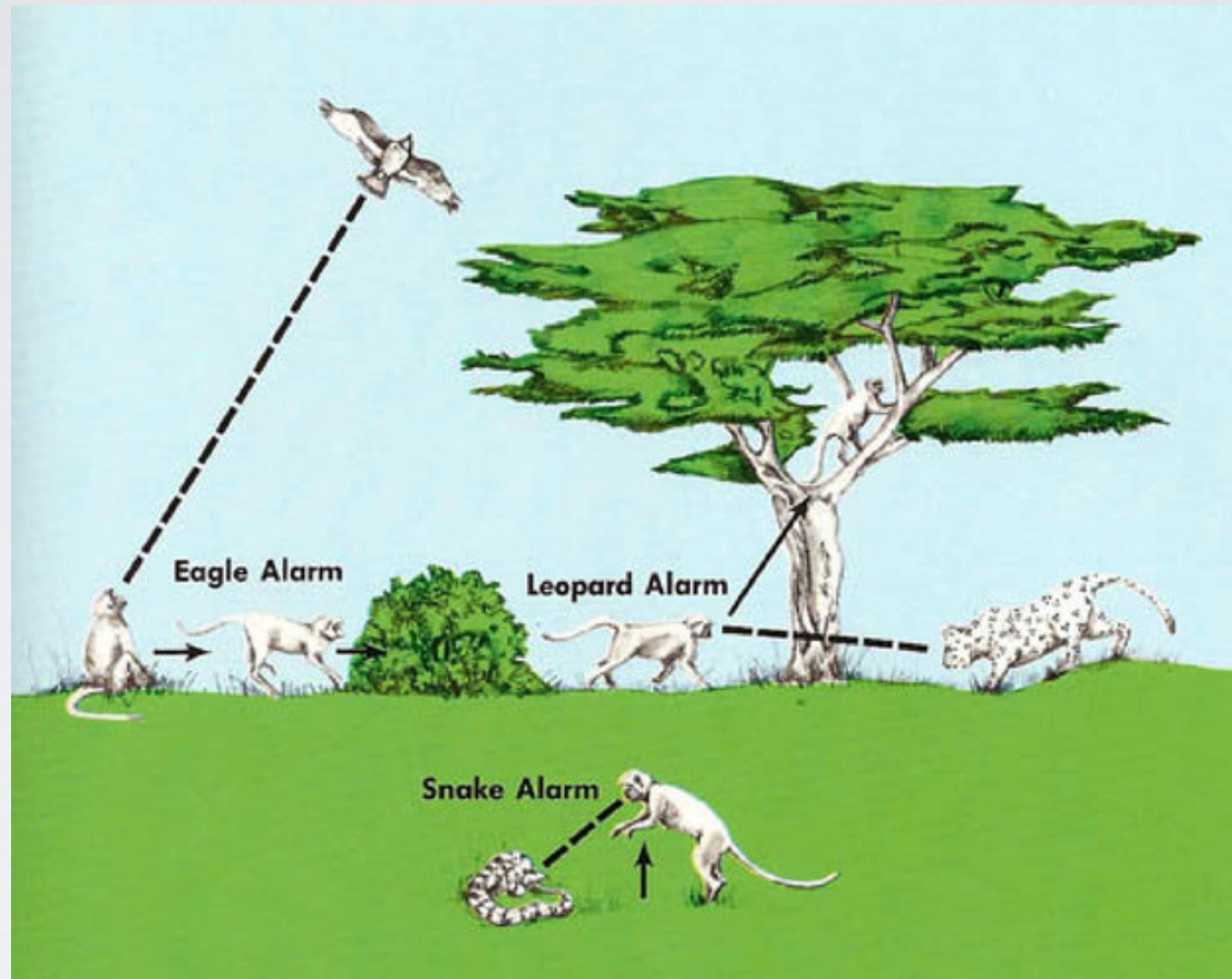
- Can A be distinguished from other signals?

Vervet alarms are distinct from each other

RESPONSES TO ALARM CALLS

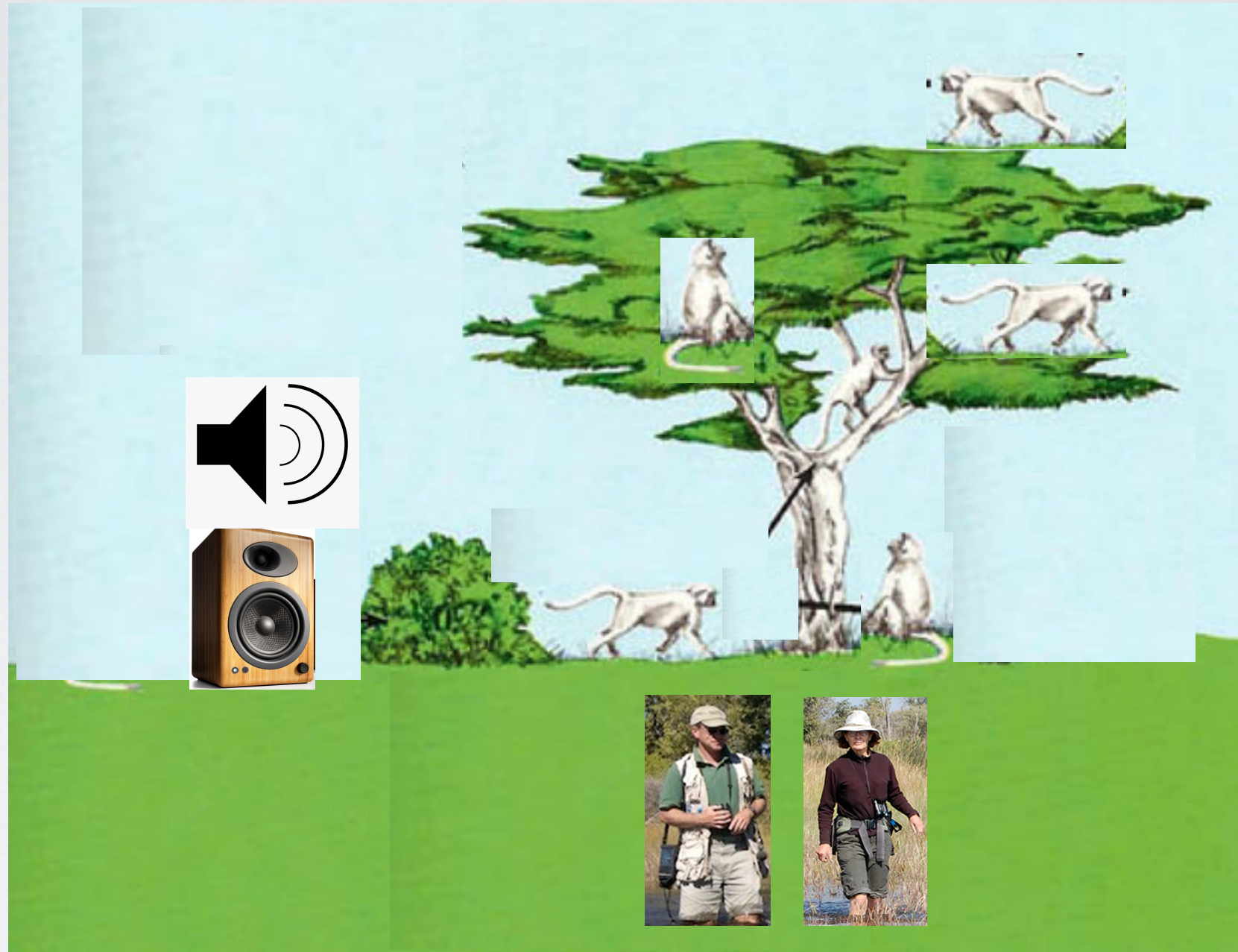


RESPONSES TO ALARM CALLS



Are the responses a result of hearing the call or seeing a predator?

PLAYBACK EXPERIMENTS



- Play a recording of each alarm call in the absence of the predator
- What do the monkeys do?

MEANING OF VERVET ALARM CALLS

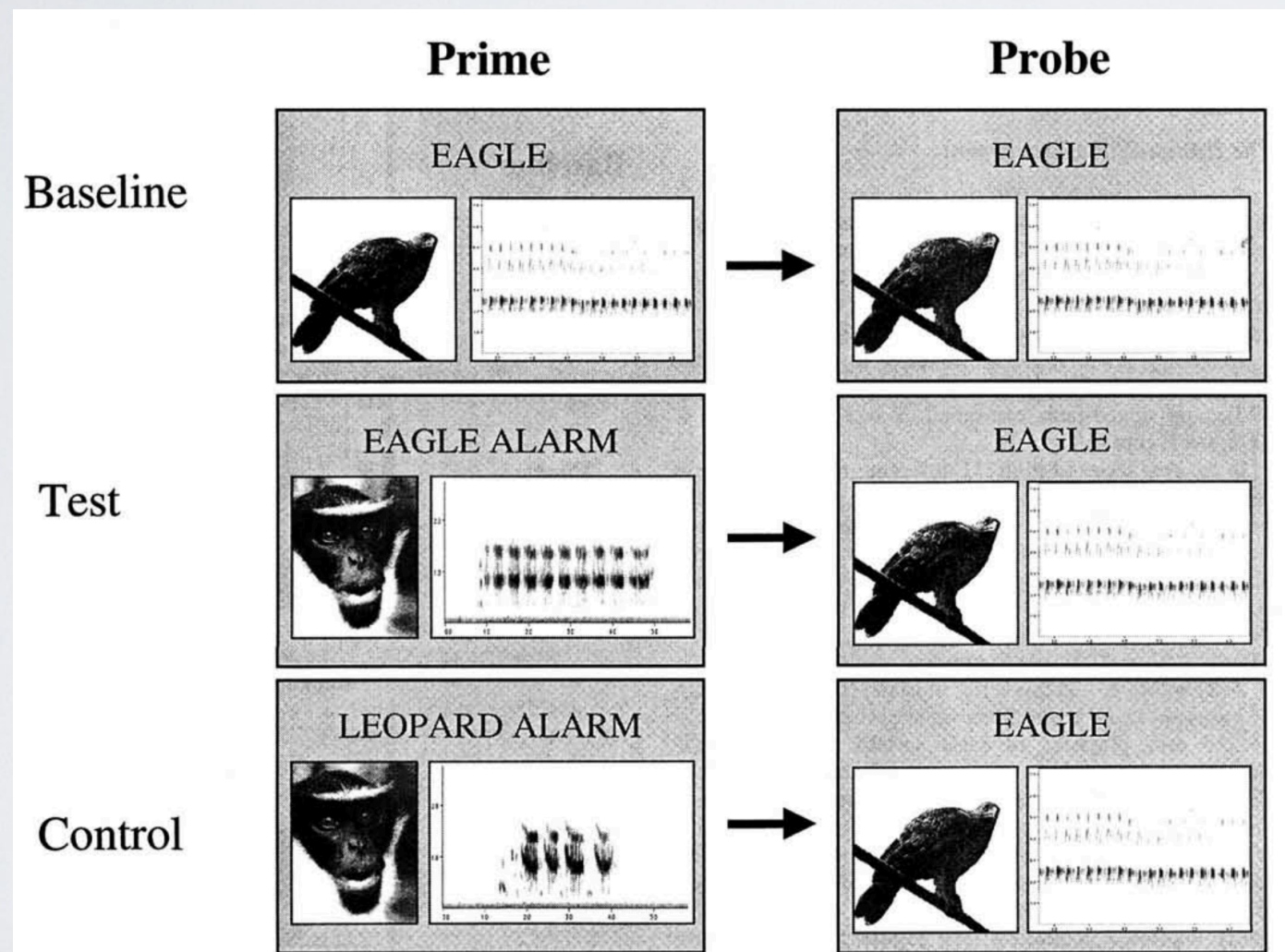
- Calls by themselves (i.e., in absence of actual predator) elicit appropriate escape strategies
- Alarms contain semantic information about predator type

WHAT INFORMATION ARE MONKEYS EXTRACTING FROM ALARM CALLS?

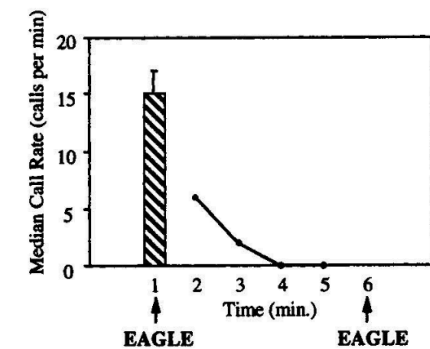
- Zuberbuhler et al. (1999) use habituation-dishabituation paradigm to answer question



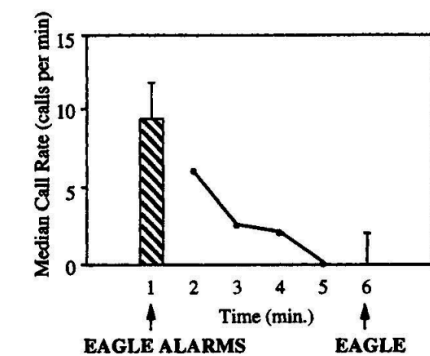
WHAT INFORMATION ARE MONKEYS EXTRACTING FROM CALLS?



Baseline
N = 11



Test
N = 10



Control
N = 9

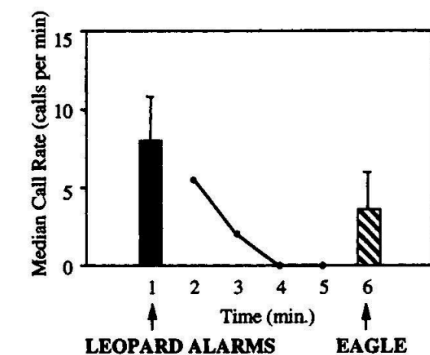


Figure 4. Females' responses to eagle call probes as a function of priming history. In the baseline condition, females are primed with eagle shrieks; in the test condition, females are primed with male monkeys' eagle alarm calls; and in the control condition, females are primed with male monkeys' leopard alarm calls. The x axis represents the length of time after starting the first playback stimulus. The y axis represents the median number of calls per minute. Error bars indicate the third quartile. Female monkeys' leopard alarm calls are represented by solid bars; female monkeys' eagle alarm calls are represented by hatched bars. N = number of groups.

WHAT INFORMATION ARE MONKEYS EXTRACTING FROM CALLS?

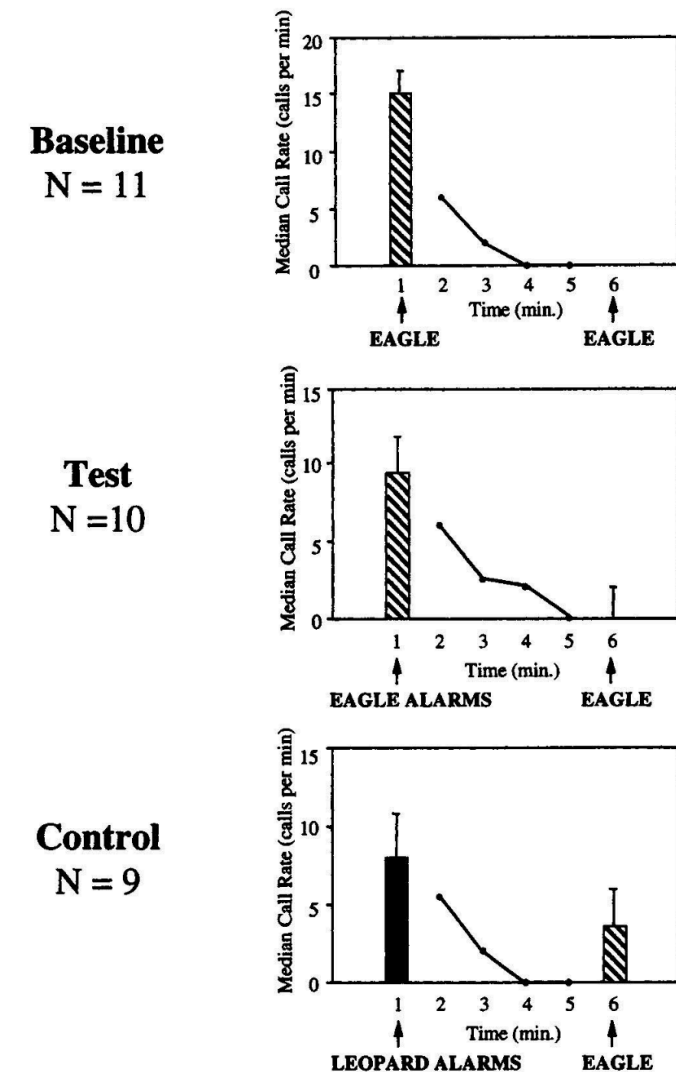
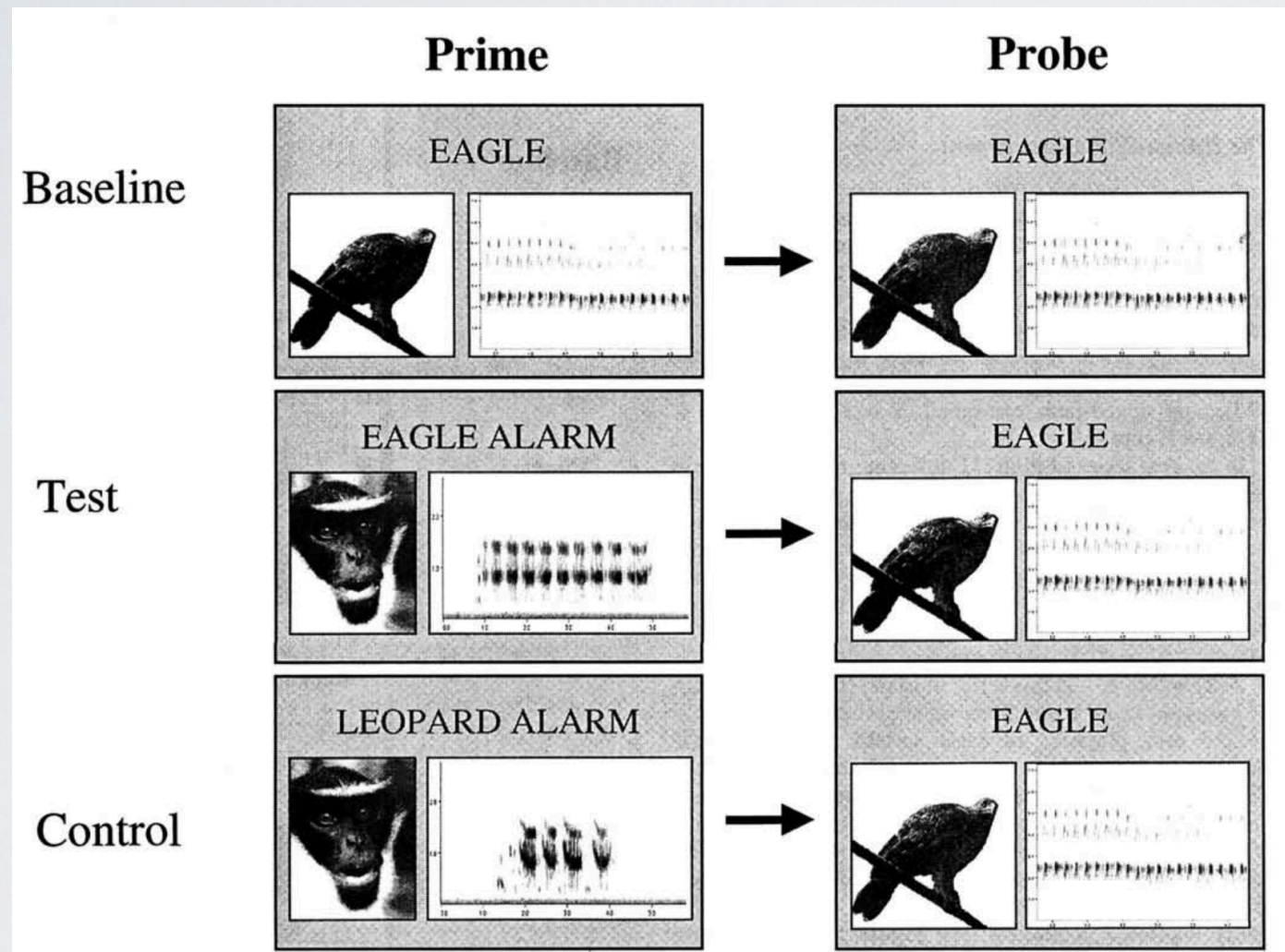


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Alarm calls create mental representation of predator in listener's minds

TODAY

- Call meaning (receivers):
 - Semantics
 - **Pragmatics**
- Call production (senders):
 - Learned or innate
 - Intentionality

PRAGMATICS

- The effect of context on meaning
- Same signal can have opposite meaning, depending on context

Yeah



Yeah

YOU TALKING TO ME?

Playback experiment: subjects were played threat-grunt from dominant individual in two conditions:



YOU TALKING TO ME?

Playback experiment: subjects were played threat-grunt from dominant individual in two conditions:

1) after aggression

2) after grooming



YOU TALKING TO ME?

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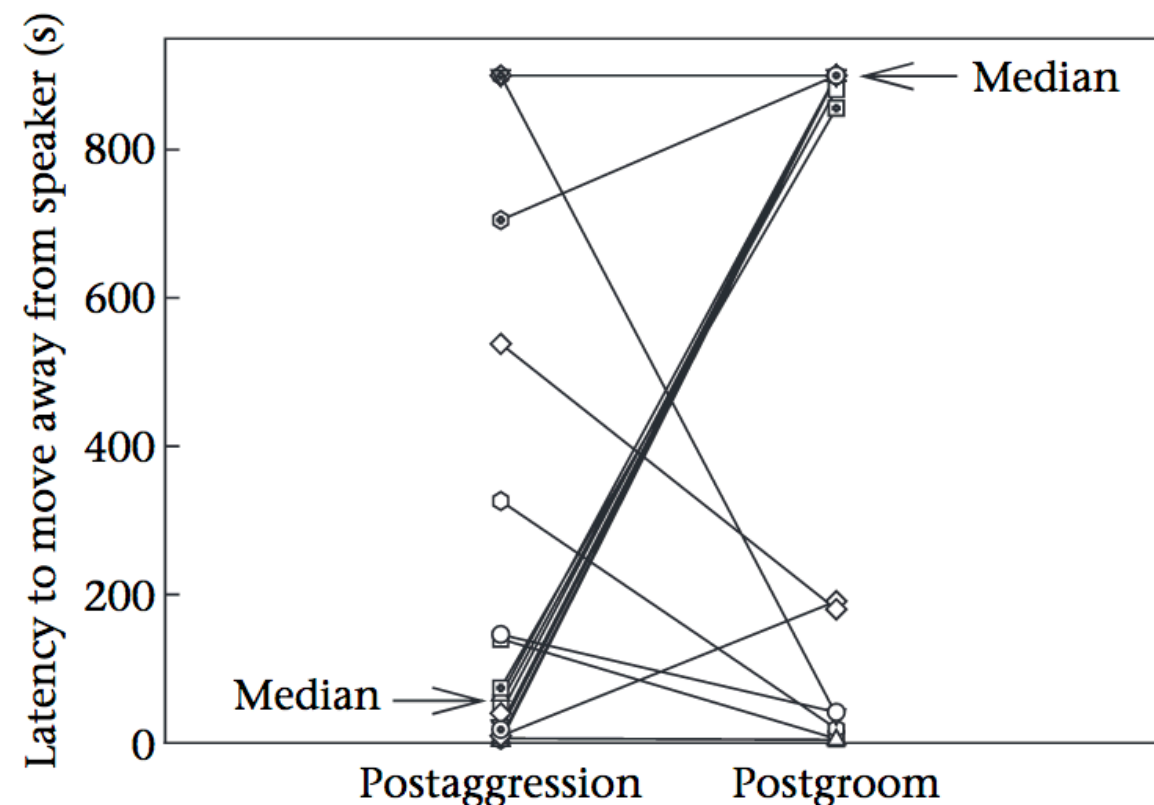


Figure 2. Subjects' latency to move more than 2 m away from the speaker after hearing the threat-grunt of a dominant female who had recently threatened or groomed them. $N = 21$ dyads in each paired trial. Each subject has a unique symbol.

DIVISION OF LABOR BETWEEN SEMANTICS AND PRAGMATICS

- Signals used to reduce uncertainty
- If no uncertainty, signal unnecessary
- ex. Baboon mothers don't grunt to their daughters

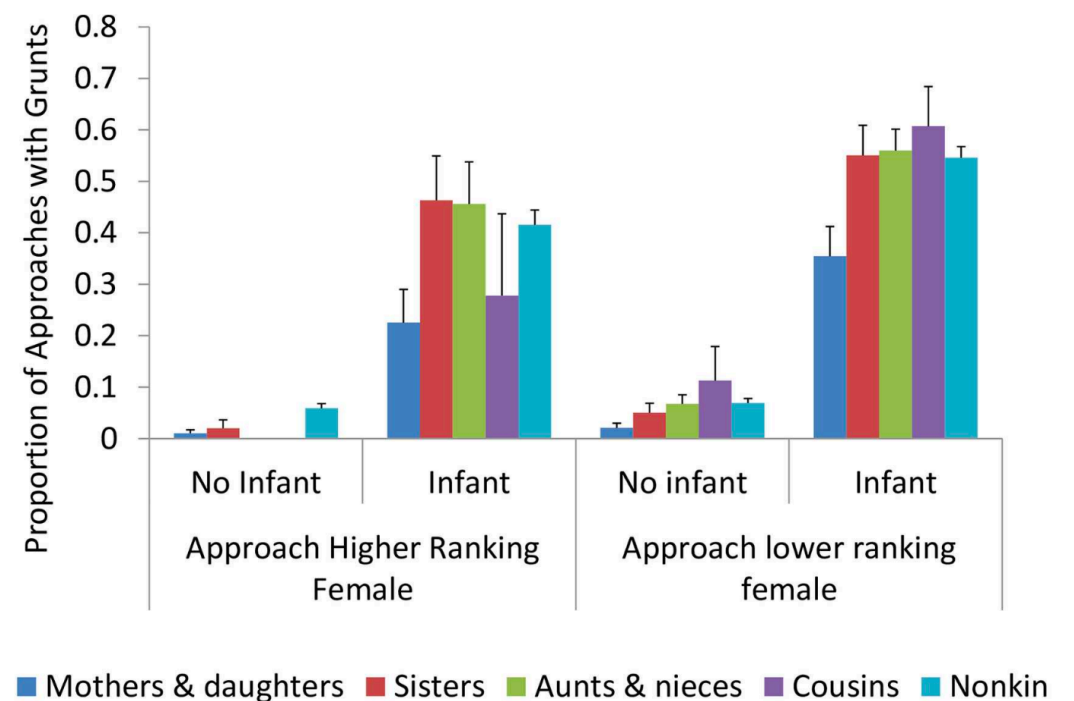


Fig 1. The proportion of approaches that were accompanied by grunts. Females grunted as they approached other females 28% of the time overall.

DIVISION OF LABOR BETWEEN SEMANTICS AND PRAGMATICS

- If semantic information clear, pragmatics relatively unimportant
- Ex. Vervet alarm calls

DIVISION OF LABOR BETWEEN SEMANTICS AND PRAGMATICS

- If semantic information ambiguous, pragmatics important
- Ex. Baboon threat grunts

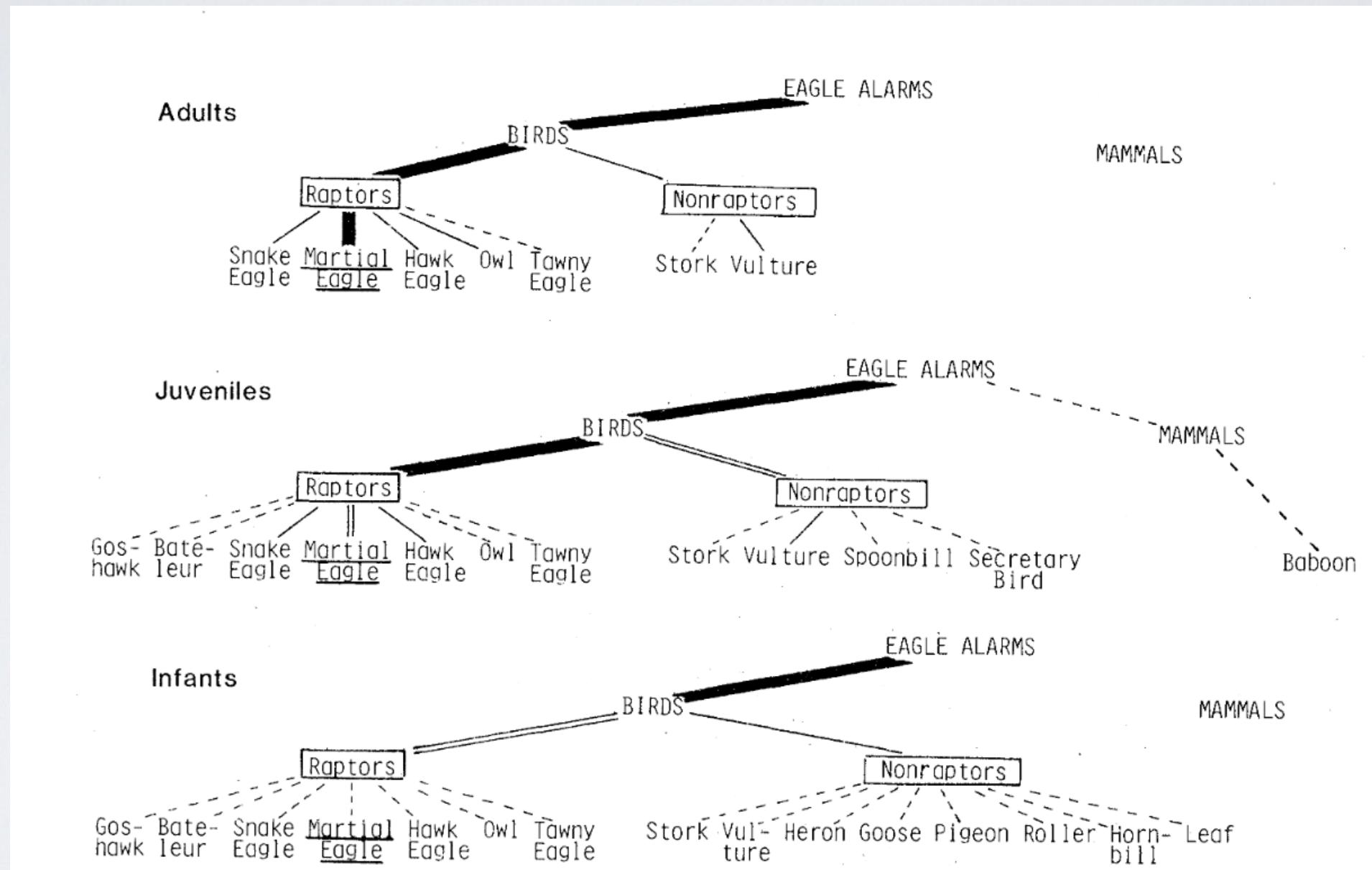
TODAY

- Call meaning (receivers):
 - Semantics
 - Pragmatics
- **Call production (senders):**
 - Learned or innate
 - Intentionality

WHAT ABOUT THE CALLER?

- Are the calls learned?
- Intentionality of the caller?

VERVET ALARM CALLS: LEARNED?



VERVET ALARM CALLS: LEARNED?

- Infants produce correct-sounding alarm calls
- All vervet monkeys in the world have same alarm calls
- Call usage is learned

CAN PRIMATES LEARN TO PRODUCE NEW SOUNDS?

- Limited evidence of vocal learning or modification in cross-fostering experiment
- Again, flexibility exhibited in call usage

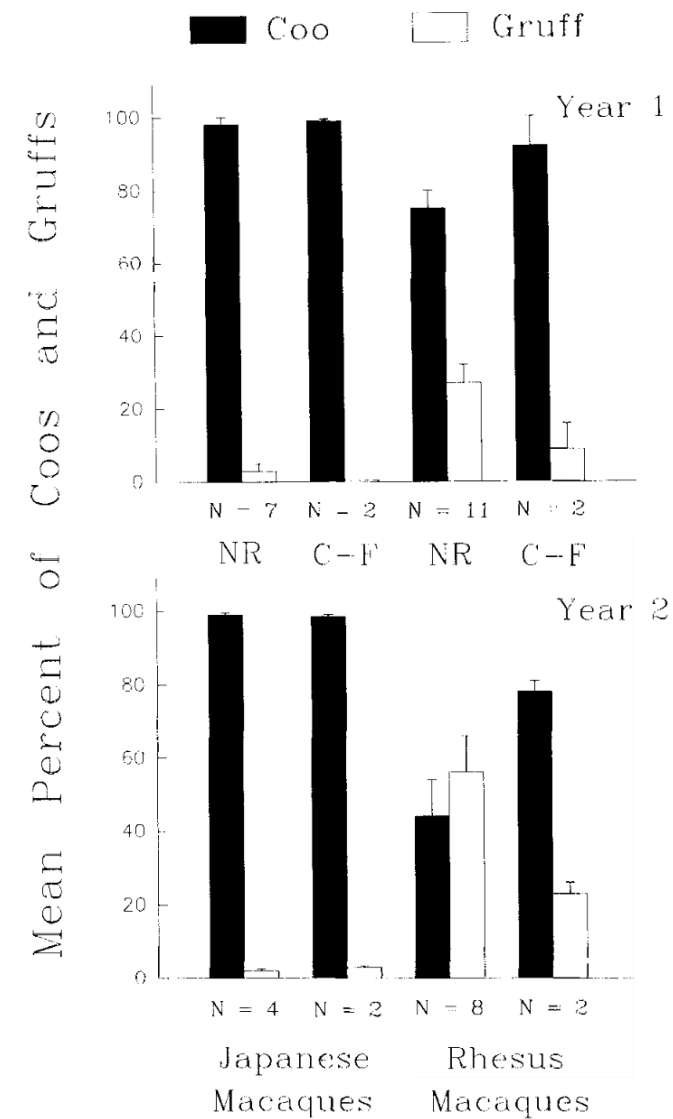


Fig. 4. Relative percentage use of coo and gruff calls by normally raised and cross-fostered rhesus and Japanese macaques in the first 2 years of life. Means and standard errors are shown for overall use across all social contexts.

TODAY

- Call meaning (receivers):
 - Semantics
 - Pragmatics
 - Combinatoriality
- Call production (senders):
 - Learned or innate
 - **Intentionality**

**WHAT IS GOING THROUGH A VERVET'S
MIND AS IT GIVES AN ALARM CALL?**

INTENTIONALITY

- Zero-order: Signaler has no intentions (desires, goals, motivations) to when vocalizing. Signal is automatic (e.g., a thermometer)
- First-order: The signaler wants to achieve something through their vocalization
- Second-order: The signaler wants to achieve something by changing the knowledge of another being

BABOON CONTACT BARKS

- Baboons produce 'contact barks' when lost or separated from their group
- Sometimes 'contact barks' answered; sometimes ignored



BABOON CONTACT BARKS

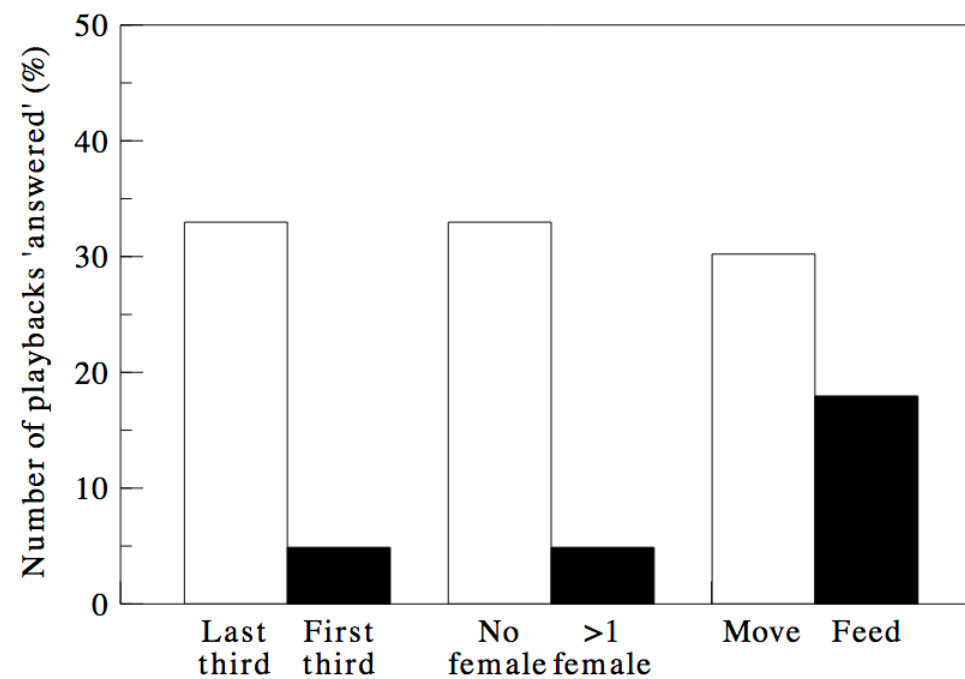
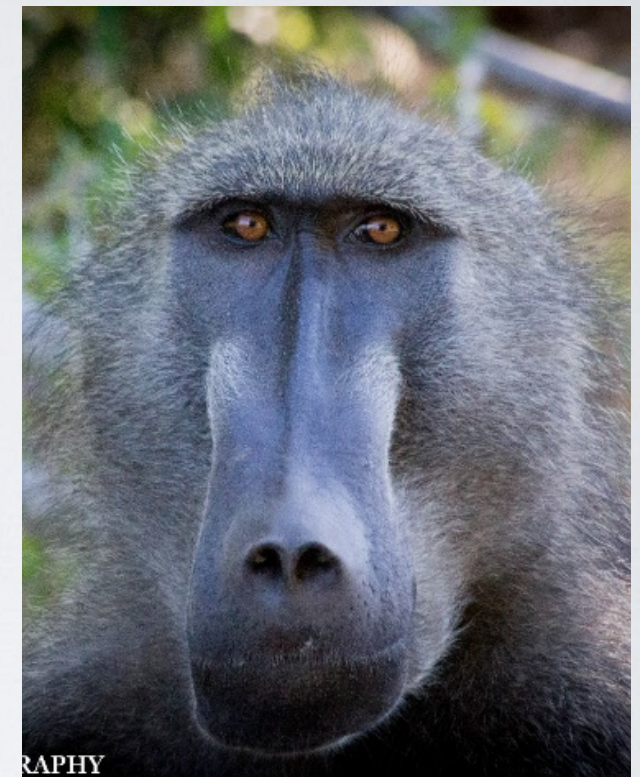


Figure 4. The proportion of playback experiments that elicited answering barks from subjects in different contexts. Histograms compare subjects in the last third versus the first two thirds of the group progression, in the vicinity of no other versus at least one other female, and moving as opposed to feeding. Data are based on 36 trials involving 18 subjects.



BABOON CONTACT BARKS

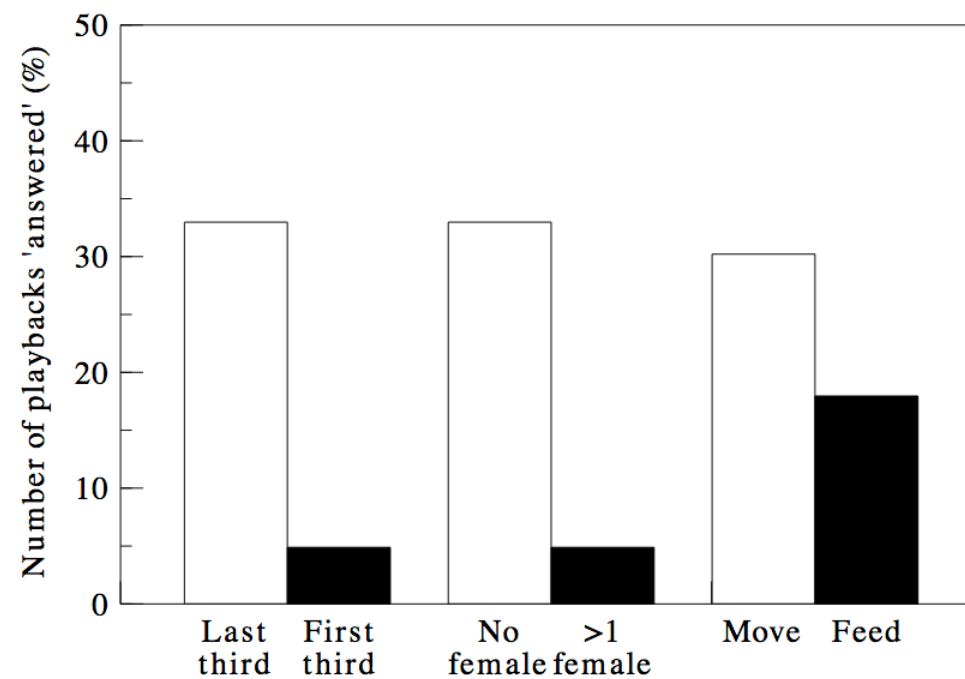
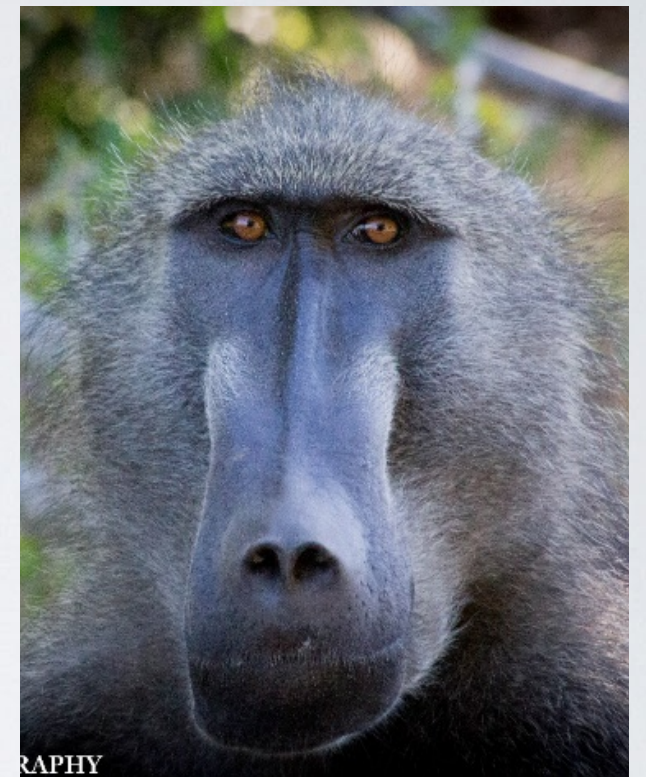


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- 'Lost' calls only answered if caller is also lost
- Not given in order to inform others
- 1st-order intentionality

INTENTIONALITY

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- First-order: The signaler wants to achieve something through their vocalization
- Second-order: The signaler wants to achieve something by changing the knowledge of another being

Applied to vervet alarm calls?

INTENTIONALITY

-“Zero-order: Tom (like other vervet monkeys) is prone to three flavors of anxiety or arousal: leopard anxiety, eagle anxiety, and snake anxiety. Each has its characteristic symptomatic vocalization. The effects on others of these vocalizations have a happy trend, but it is all just tropism, in both utterer and audience.”

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-“First-order: Tom wants to cause Sam to run into the trees (and he has this noise-making trick that produces that effect; he uses the trick to induce a certain response in Sam).”

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- “First-order: Tom wants to cause Sam to run into the trees (and he has this noise-making trick that produces that effect; he uses the trick to induce a certain response in Sam).”
- “Second-order: Tom wants Sam to believe that there is a leopard, and, should, therefore, run into the trees.”**

VERVET INTENTIONALITY?



VERVET INTENTIONALITY?

- Don't alarm when alone
- More likely to alarm when kin nearby



VERVET INTENTIONALITY?

- Don't alarm when alone
- More likely to alarm when kin nearby



- Either first- or second-order intentionality
- Hard to distinguish between in vervets

SECOND-ORDER INTENTIONALITY?

How could you demonstrate 2nd-order intentionality?

CHIMPANZEE ALARM CALLS

- Is chimpanzee alarm calling sensitive to audience knowledge?

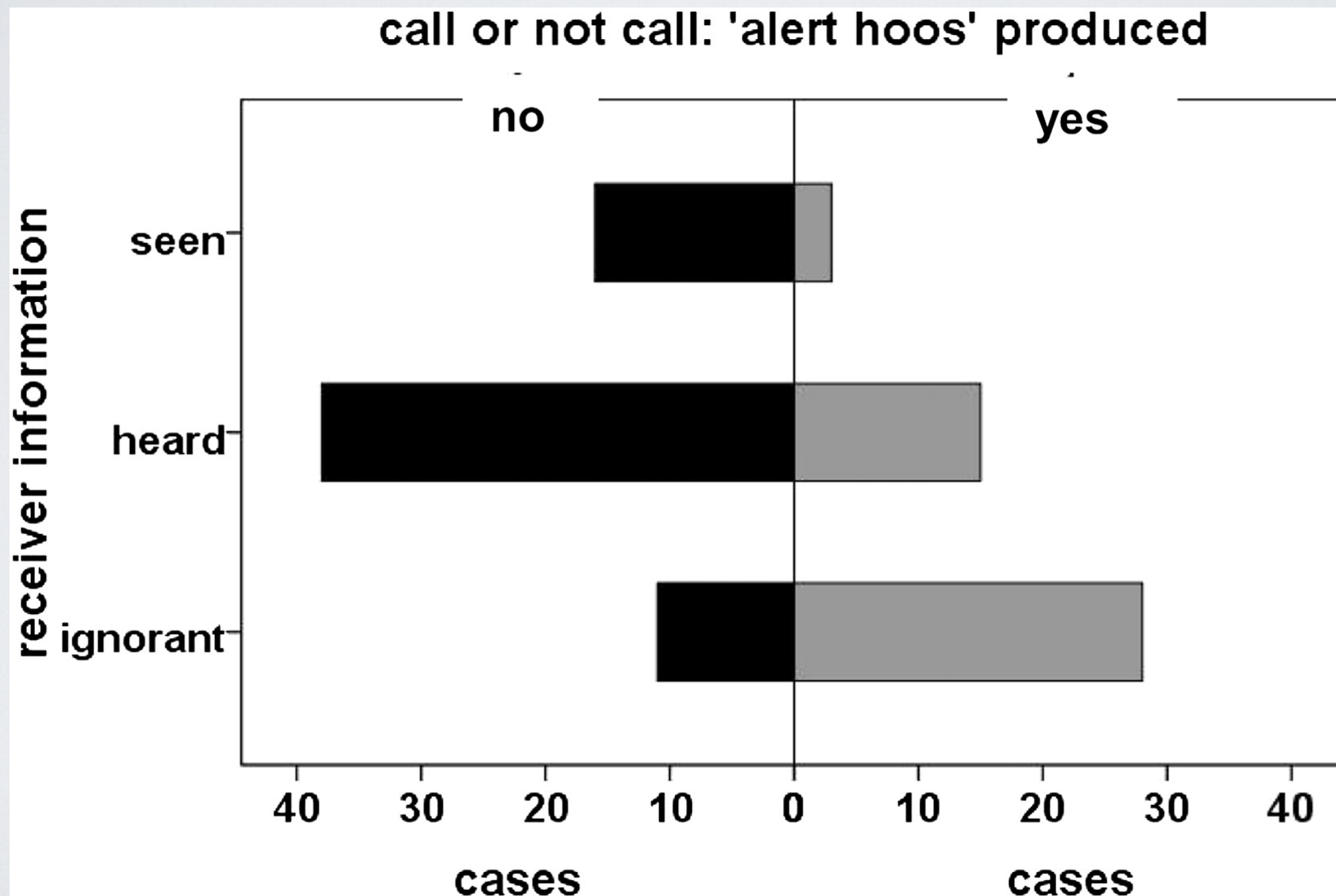


Crockford et al (2012)

CHIMPANZEE ALARM CALLS



CHIMPANZEE ALARM CALLS



SUMMARY

- Sender/receiver distinction
- Information=reduction of uncertainty
- Call+context = meaning
- Sounds innate and constrained; usage learned and flexible
- Zero-, first-, and second-orders of intentionality

QUESTIONS?