Animal Communication:
What do the vocalizations of monkeys mean?

(Cheney-Seyfarth 1990)

1. Vervet monkeys alarm calls.

- Description of the calls.
  Vervet monkeys in Amboseli give acoustically different alarm calls in view of at least three types of predators: leopards and other cat species, eagles, and pythons.

- The escape response to these calls.
  Each kind of call typically elicits a different escape response in the other monkeys:
  - To the leopard alarm: When vervets on the ground hear a leopard alarm call, they run into trees.
  - To the eagle alarm: Eagles hunt monkeys from the air, taking monkeys in trees and on the ground. Vervets on the ground respond to the eagle alarm by looking up and running into bushes; vervets in trees look up and may also run down to hide in a bush.
  - To the snake alarm: Pythons hunt monkeys on the ground primarily by approaching them through the grass inadvertedly. Vervets' response to the snake alarm call is to stand up bipedally, spot the snake's location, and make sure they are far enough from it.

- Questions:

  1. Are monkeys' vocalizations simple automatic reflexes displayed in view of danger? Or, to the contrary, do these vocalizations have a meaning? That is, are they mere involuntary reflexes or are they linked to a mental representation (in the broad sense) in the monkey's mind?

  2. If monkeys vocalizations mean something, what precisely do they mean?
     - Are they goal oriented or content oriented?
     - How specific are they?

2. Intentional states and Dennett's levels of intentionality.

- Intentional states.
  Humans have intentional states like believing, fearing, wanting (something possible), wishing (something impossible), etc. These are all mental stances or attitudes, and they involve *internal mental representations*.

- Dennett (1987) proposes a three-level classification of intentional systems:

(1) Intentional systems:
  (i) Zero-order intentional systems.
  (ii) First-order intentional systems.
  (iii) Second (or higher) order intentional systems.

The attribution of each intentional system to monkey communication gives us three possible hypotheses, described in the following three bullets.

- HYPOTHESIS 0: Vervets have a zero-order intentional system.
  Monkeys have no beliefs or desires. They only display involuntary, automatic responses in front of different types of danger and different escape strategies in front of different acoustic stimuli.

- HYPOTHESIS 1: Vervets have a first-order intentional system.
  Vervets have beliefs and desires (but not beliefs about beliefs). Calls have some meaning. A call may express the belief that there is a python around (content oriented) or it may express the desire that the audience follows escape strategy x (goal oriented).

(2) Predictions:
  a. Monkeys that see a predator can choose whether to give a call or not, and how.
  b. Monkeys that hear an alarm call can choose whether to escape or not.

- HYPOTHESIS 2: Vervets have a second or higher order intentional system.
  Vervets have some conception of their own mind and of the mental states in other monkeys' minds. For example, a call meaning "I believe there is a snake around" may be given not because the caller believes so, but because he *wants* the others to *believe* that it is so.

(3) Prediction:
  Calls may be use for deception.

- In the following section, we will review evidence that vervets have at least a first order intentional system. Whether they have a second order system is a complex issue that has not been resolved yet.

3. Evidence for voluntary signaling.

- Solitary Rosebery case (by Phillis Lee, 1978-9):

(4) A adult male vervet monkey, Rosebery, was alone feeding on an island in the middle of a swamp, half kilometer far from the rest of the group. A leopard approached him and, for about one hour, pursued him around the trees. No alarm call was uttered at all.

⇒ A monkey may choose not to give an alarm call if no audience is present.

- Sepulveda Veterans Administration Hospital, California (Cheney-Seyfarth 1985):

(5) Adult female monkeys were locked in a cage either with their own offspring or with some similarly aged unrelated juvenile. When a "predator" appeared (a human carrying a net), females gave alarm calls at higher rates when they were with their own offspring than when they were with someone else's offspring.

⇒ A monkey may choose to modify its call depending on the type of audience.

- This behavior is difficult to explain if alarm calls are involuntary automatic reflexes. They suggest, instead, that monkeys recognize the relation between a particular acoustic signal and the escape behavior of the audience. Hence, this is our first evidence to reject hypothesis 0 in favor of hypothesis 1: monkeys have at least a first-order intentional system, vocalizing at least goal oriented messages.

4. What precisely do alarm calls mean or denote?

- Are vervets' alarm calls goal oriented or content oriented? That is, does the eagle alarm call mean something like "Escape strategy x!" or rather like "There is an eagle around"?

  - The behavioral response to a predator alarm call is quite diverse. Vervets that hear an eagle alarm call may act in at least four different ways: if they are on the ground, they may look up and run into a bush or they may do nothing; if they are in a tree, they may run down or they may do nothing.

  - Vervets do not give eagle alarm calls to other dangerous eventualities that could be avoided with the same escape pattern. E.g., falling branches.

⇒ This suggests vervet monkeys' vocalizations are content oriented.