

Animal Vocal Communication: Say What?

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Researchers interested in animal cognition have sometimes viewed communication as a privileged source of insight into animal minds (Griffin 1976). This view is inspired in large part by analogy to human experience, where language both reflects and affects thought and so provides a window into the workings of our own minds. Not surprisingly, cognitively oriented research in animal vocal communication has also been requisitely influenced by other analogies to human language. Without a doubt, the *sine qua non* of language is *meaning*, communicated via arbitrarily structured words. Proceeding by analogy, researchers in animal communication have thus sought meaning in arbitrarily structured vocalizations, the overarching question being, "*What* are they saying?"

On the one hand, relying on linguistic analogy is perfectly natural. The concept of meaning is certainly familiar to us from language (even if it is sometimes difficult to pin down very precisely) and it makes sense to think that animal vocalizations, like human words, have meaning and are *about* things. On the other hand, the approach is a bit peculiar in using a single, recent and potentially highly derived system of communication (language) to model scores of other phylogenetically older and evidently simpler systems -- thereby inverting scientific common sense. Furthermore, by shoe-horning a potentially wide array of communicative phenomena into a single linguistic frame, the approach risks seriously underestimating the diversity of potential mechanisms and functions of animal communication.

For the last few years, we have been pursuing a different approach (Owren and Rendall 1997, in press; Rendall and Owren, in review). In keeping with basic ethological and evolutionary principles, we assume only that the function of communication must ultimately be to influence the behavior of others in ways that are, on average, beneficial to signalers (and potentially, though not necessarily, also to listeners). While such influence may be exerted through a variety of simple mechanisms, none need involve meaning per se. Consistent with other features of organismal biology, however, they probably DO involve intimate connections between signal structure and function. The approach can perhaps be most simply summarized as emphasizing that it may not be so much *what* is said that matters, but rather *how* it is said, and *who* says it .

A Non-Linguistic Approach to Animal Communication

A. "How you say it" -- Direct effects of vocalizations on listener attention and affect

"It's not *what* you say but *how* you say it!" The point of this familiar refrain is that information content may be less important than the manner of presentation. This principle is manifest in animal communication in the fact that, for many taxa, certain kinds of sounds have direct and marked influences on listener behavior. One extreme but ubiquitous example is the acoustic startle reflex. This involuntary response is particularly triggered by abrupt (i.e., rapid onset) sounds, producing immediate attentional shifts and the interruption of ongoing activity. It also induces a host of basic nervous system responses, including stimulating reticular formation nuclei in the brainstem that help to regulate overall brain activation. The phenomenon is thought to occur in every hearing species (Eaton 1984), demonstrating that sound can have direct access to low-level, nervous-system mechanisms that guide behavior. Other examples of sounds with direct effects on listener behavior are common. For instance, handlers and herders of various domesticated animals have long capitalized on the impact of sounds like whistles, tongue clicks, and lip smacks to manage their charges (McConnell 1991). Here, rapidly repeated pulses and signals with dramatic frequency upsweeps are used to increase motor activity, while smooth, continuous signals with gradual, descending pitch help to decrease activity. Humans themselves are responsive to the same patterns, with frequency upsweeps being used to capture receiver attention and increase arousal in both infant-directed speech