4 BEHAVIOR

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How can we know anything about nonlinguistic others? One answer is that we can learn about these others by studying their *behavior*. Ethologists study animal behavior in natural settings; comparative psychologists note resemblance (or lack of resemblance) of mental function of different species based on their observed behavior; Animal Studies often takes as its subject the interaction, or result of interaction, between two or more species.

In each case, *behavior* is the empirical anchor: the fields revolve around the identification and analysis of independently verifiable acts of organisms. Thus, any meaning discovered therein must emerge from an understanding of what, exactly, this phenomenon called "behavior" is. Yet the term is often not defined, even in textbooks of "animal behavior" and "human behavior." The opening pages of the *Encyclopedia of Human Behavior* (Ramachandran 2012) introduce behavior only as "complex, quixotic, and difficult to fathom" (xxix). The influential behaviorist and psychologist B. F. Skinner did not bother to define behavior at any point in his *Science and Human Behavior* (1953). He wrote only that researchers must "observe human behavior carefully from an objective point of view" (5), which certainly raises the question of what, exactly, it is to be observed and whether the particular "point of view" might get in the way of observing it, if we leave the definition to the observer/subject.

Animal behavior texts often do one better. One suggests that behavior "includes a wide range of responses, from simple movements of a limb to complex social interaction" (Barnard 2003, 31). Those movements may range, another specifies, from a "series of muscle contractions, perhaps performed in clear response to a specific stimulus" to "enormously complex

activities, such as birds migrating across the world, continuously assessing their directions and positions with the help of various cues from stars, landmarks and geomagneticism" (Jensen 2009). Behavior, with this lens, is some kind of movement, either reflexive and simple or complex. While these definitions seem straightforward, each introduces an implied precursor: the movement is done as a *response*—presumably to a stimulus provided by the behaver's environment. In that way, a behavior is prompted by, in some cases, another behavior: an egg caused by a chicken caused by an egg.

While even those behavior textbooks that define the term soon leave the topic of definition and continue on to analysis of examples, in this chapter I will linger on the alleged meanings and use of the term in an attempt to explicate it. By considering the issues, especially methodological, raised in the study of behavior, the complexities of the concept and the slippery use of the word are highlighted.

Studying Behaviors

The name for the study of behavior is not *behaviorism*. Behavior is the studied datum in fields as varied as economics and anthropology. But the field of behaviorism, which dominated psychology and much study of animals in the early twentieth century, is a good place to begin a consideration of behavior studies. As advocated by psychologists John Watson and, later, B. F. Skinner, behaviorism was driven by a rejection of "mind" or "mental states" as the topic of psychology—especially where nonhuman animals[1] were concerned. As late nineteenth-century books on animal intelligence (George Romanes) and animal emotions (Charles Darwin) gained audiences, the study of animal "mind" was given credibility (see chap. 16). Watson and Skinner saw these usages as overattributions. Given that *states of mind* as such are not externally verifiable, Skinner, for instance, described them as unfit subjects for scientific inquiry. Further, he suggested, given the seeming success in behavioral explanations, alleged properties of the mind of human and nonhuman animals could be simply "fiction": a kind of convenient but inaccurate explanatory story for seen actions. As a field, behaviorism demoted the subjective and promoted an (ostensibly) objective understanding of a subject.

1. Herein also "animals."

While "mind" remains, to this day, more seemingly complex than "behavior,"[2] the use of behavior as a description for "what animals do" only came into currency in psychological literature around the turn of the twentieth century (Barnard 2003, 2). The term, glossed as the "manner in which a thing acts under specified conditions or circumstances, or in relation to other things"[3] was uncommonly used of any animal, including human animals. Surely "behavior" of animals had been observed and at least adventitiously studied ever since there were humans to observe animals and animals to observe each other. For behavior begets other behaviors, and thus, observing behavior allows for prediction of future behaviors—such as behaviors of a predator that may threaten a prey animal's life, or behaviors of a prey animal that would allow a predator (such as a human) to capture them.

But behaviorism coincided with, and arguably contributed to, a change in that usage. Behaviorists argued that animals *only* exhibited behavior and that there was not necessarily a corresponding mental state behind any behavior. Animals were mere responders to stimuli. Concurrently, the field of *ethology*, without those sorts of judgments, elevated the study of behavior for its own sake. And it is in these studies that the complexity of the term becomes clear.

Konrad Lorenz, the ethologist and Nobel Prize winner, wrote that "description is the foundation of all science" (1988, 7), by which he meant description of *behavior*. To design an experiment, to even begin to generate a viable hypothesis, one needs to begin with observation of behavior and description of what one observes.

Behavioral description is especially common in—though not exclusive to—investigation of nonverbal subjects, such as animals and infant humans. Ethology, the study of animal behavior in natural settings, is more formally described as aiming to address the "what, when, how and why" of a behavior—while the "where" and "who" are premised, though not trivial (Lehner 1996). Broadly, the aim is to describe, detail, explain, and sometimes predict behavior. Niko Tinbergen (also a winner of the Nobel Prize with Lorenz) characterized four questions that an ethologist

2. *Mind* is associated with *brain*; while *behavior*, while often derivative of mental activity, arises from muscular movement. Mind requires the central nervous system; behavior may be due to just peripheral nervous system activation. Humans have minds; even a jellyfish shows behavior.

3. *Oxford English Dictionary*, 2nd ed., s.v. "behaviour."

might ask of behavior: its ontogeny (how it developed in an individual), its evolution (how it developed in the species), its causation (the mechanisms giving rise to the behavior), and its function, what he originally called its "survival value" (the behavior's consequences and adaptive value; Tinbergen 1963). Thus, beyond describing the behavior, its origins (proximate and ultimate) are being investigated through detailed observation. The "to what end" nature of the behavior can vary, as illustrated by the varying emphasis that could be brought to a question of behavior:

> *Why* do dogs wag their tails? (How is it useful, what purpose does it serve?)
> Why do *dogs* wag their tails? (How did this behavior arise in the species?)
> Why do dogs *wag* their tails? (What mechanism causes the behavior?)
> Why do dogs wag their *tails*? (Why tails and not some other body part?)
> (After David McFarland)[4]

It is an open question whether a complete reckoning of a behavior along the above-described dimensions is possible or necessary to achieve a sense of "understanding" of the behavior.

Nondefinitive Definitions

What counts as behavior to be studied is variously formulated—but in most cases, the formulation is, at its core, quite broad. "It will include all types of activities in which animals engage, such as locomotion, grooming, reproduction, caring for young, communication, etc." (Jensen 2009, 3); "The blinking of an eye, the sudden movement of a limb as it is withdrawn from a sharp object, the cacophonous display of a male blue bird of paradise . . . the care shown by a female chimpanzee . . . to a distressed infant, our own cultural etiquettes" (Barnard 2003, 3). It spans the internal and the external, "the bridge between the molecular and physiological aspects of biology and the ecological . . . the link between organisms and environment and between the nervous system and the ecosystem" (Snowdon 1991). In some sense, the gloss given as nearly a parenthetical in a methodology handbook—"the actions and reactions of whole organisms" (Martin and Bateson 1993, 3)—is the simplest summary. Behavior is "everything we do that can be directly observed" (King 2013, 2), "what an animal does"

4. Based on David McFarland's example cited in Lehner (1996, 9).

(Levitis, Lidicker, and Freund 2009, 106)[5]—but note that what "do" or "does" means is left unexplored.

These definitions assume the doer of the behavior—the "behaver"—to be an animal. While this may not be presumptuous for organisms on the human scale—no one questions whether a dog is an individual animal—eusocial species, such as bees, wasps, and ants, may verily be considered organisms at the group level: the hive, swarm, or army. In these cases, who is the behaver: the bee or the hive?

Implicitly, behavior is contrasted with unobservable internal processes, especially mental processes. Surprisingly, though, behavior is often seen as an inroad to "seeing" those mental processes insofar as a thought—such as a plan or an emotion—may be represented in the thinker's actions—such as voluntary activity toward a goal or physical expression of an emotion.

We might ask, is anything *not* behavior? Levitis, Lidicker, and Freund (2009) conducted a survey of 174 members of scientific societies that publish behavioral research (with expertise ranging from professional researchers on the one hand to those less well acquainted with behavioral science on the other) and found consensus in affirming some kinds of phenomena as "behaviors": "a spider builds a web," "flocks of geese fly in V formations," "a dog salivates in anticipation of feeding time." By contrast, "a rabbit grows thicker fur in the winter," "a cat produces insulin because of excess sugar in her blood," and "a person sweats in response to hot air" were all rejected.

While there seemed to be consensus around some doings, there was a terrific lack of consensus about the status of most plausible behaviors. "Ants that are physiologically capable of laying eggs do not do so because they are not queens" was controversial: there was no agreement about whether this constitutes "behavior." Similarly with a rat's "dislike for salty food" and a chameleon changing color. While the former, for instance, may be expressed *via* a behavior (choosing a sweet food over a salty one), the preference itself may be considered not a behavior. In the latter case, an appearance-based, involuntary physiological response, while it may prompt a behavior in another animal, is not necessarily a "behavior" by the bearer. If not, neither would aposematic markings or other evolved anatomical strategies generally considered to be behaviors.

5. Citing Davis 1966.

The contradiction inherent in the respondents' assessments is striking. For instance, while a rabbit's fur growing and a human's sweating, both visible if reflexive/automatic events, were not considered to be behaviors, a dog's reflexive salivation was. The ambivalence shown about a rat's dislike for salty food was not shown about a person's decision "not to do anything tomorrow if it rains," which was granted "behavior" status.

Psychologist Ogden Lindsley proposed the "dead-man test for behavior": if a dead person could do the act under consideration, "it wasn't behavior" (Lindsley 1991, 457). So fur growing, sweating, or camouflaging color changes would be animal behaviors; "acts" of "not doing anything tomorrow," lying still, failure to react, and so forth, would not.

While commonsensical, there is good reason to suspect that Lindsley's rule is an oversimplification, in particular as regards "absence of behavior." Paradoxical though it may seem, even the absence of a behavior is also veritably a behavioral response in some cases. For instance, a nonresponse to a stimulus, such as "playing dead," by a dog, a possum, or a hog-nosed snake—lying supine or on one's side, unmoving—is a suppression of other possible (mobile) behavioral acts. In the case of the dog, it is also, most probably, a learned response to specific training (Lindsay 2001). In other cases, an untrained absence of response—failure to respond to a play signal directed to one dog by another—is considered a communication and thus may be a behavior (Horowitz 2009a). Recently, some researchers have argued that "stillness" is an action that requires as much of muscles as movement (Noorani and Carpenter 2017). They have identified various kinds of stillness, including "active immobilization" (freezing), inhibition of responses to stimuli, and halting a movement in progress, all of which require inhibitory brain responses and thus could be considered behaviors.

As a result of their survey, Levitis et al. proposed that behavior could be defined as "the internally coordinated responses (actions or inactions) of whole living organisms (individual or groups) to internal and/or external stimuli," excluding developmental changes (Levitis, Lidicker, and Freund 2009, 108). Such responses would be "externally visible"—observable and measurable.

Acknowledging the conflicts that surround all attempts to define the term, another approach, to which I now turn, is to explicate the term through analysis of how behavioral science *in fact* observes and measures *behavior*.

Levels of Behavior

Two decades ago a group of researchers examined what chimpanzees and human children did after witnessing a demonstration of how to open a so-called artificial fruit: a locked box that held a fruit or candy inside (Whiten et al. 1996). The study was designed to gauge, through analysis of matching of behaviors specified by the experimenters, whether these subjects "imitated" the demonstration. Their result—that chimpanzees imitated to a limited degree, while children were much more imitative—was of interest to those who allege that imitation may be linked to an understanding of the another person's *intentions* (Tomasello 1996) insofar as those who imitate may be seeing the demonstrator's specific actions as necessary to her (unspoken) goal.

Before any such conclusion can be drawn, it is worth considering what counts as "imitation." Can we specify actions by the demonstrator that must be repeated in order for a subject to be considered to have imitated her demonstration? That is what Whiten et al. did in their coding, in which they enumerated the presence or absence of various behaviors by the subjects (1996).

When a different subject group—adult humans—was given the same task, however, the difficulty of such a specification became clear. By the Whiten et al. analysis, the adults often behaved more like the chimpanzees—less imitatively—than like the children (Horowitz 2003). Certainly, though, normally functioning human adults are not expected to have any trouble imitating a simple task; similarly, they would be expected to be the highest-performing group in their understanding of the rough intentions of the demonstrator. Highlighted is the fact that what part of the demonstrators' behavior should be imitated is seen differently by these different age groups and species. Indeed the very scope of the demonstrator's "behavioral act" is in question: a number of adult subjects not only opened the box to retrieve the candy inside but also reclosed the box, as the demonstrator presumably had to do after her demonstration.

These results should prompt us to consider that the subjects' actions can be seen at many different levels of specificity. In ethology, the "levels" on which a behavioral act is analyzed must be clearly identified—and are nontrivial (Lehner 1996). While "imitation" of the Whiten demonstration might be gauged, at the broadest level, by whether the subject opened the box or not, one might also look at more detailed levels of analysis

(Horowitz 2003): does the subject match the demonstrator's hand or finger shape, handgrip, repeat the same sequence of actions, and mimic the precise number of times each subaction is done?

Similarly, the level of behavior on which any behavioral study is conducted can vary from macro to micro (Lehner 1996): from species or population-level behaviors (as the V-formation of geese) to muscular or neuronal behaviors (those implicated in each goose in the coordination and flying in such a formation). An analysis of a greeting between dogs could take place on the level of "dyad," where two dogs come proximate to each other (or not); or on levels of "behavioral type," such as the presence or absence of "tail-wagging" and other high-level behaviors; or on the level of "behavioral act," such as "lateral and sometimes rotational movement of the tail, extended upward (dorsally)." Depending on the level that is specified in observation and analysis, a very different record of the animals' behavior could appear. For instance, a proximate approach could be friendly, examinatorial, or aggressive; a "wagging tail" could be either an affiliative greeting or a measure of excitement of a nongreeting sort, such as precopulation or between bouts of fighting or play, or even used in nonsocial situations, such as waiting for food or hunting (Kiley-Worthington 1976).

That there are many levels on which to consider "a behavior" reflects the varying descriptions even a single behavior may have. The level reflects the methods being used: a microscope "would be useless . . . for reading a novel" (Martin and Bateson 1993, 9). Since much observation is of animals of recognizable size behaving in ways visible to humans with our sensory equipment, we are naturally limited in the behaviors that we see. Also, the level chosen will determine the data that are gathered.

Naming

After a behavioral level has been specified in an observational study, "sampling" methods are used to reduce a lifetime of behaviors to a measurable subset (Altmann 1974): of only a single, recognizable animal; of instances of a single kind of behavior; of the actions happening at a fixed period. Such an approach implies that one can take a snapshot (of varying lengths, frequencies, and so forth) and have it "stand in" for the behavior of the same individual at another time or for other members of the species.

Research aiming to describe the form or context of "dyadic play," for

instance, would aim to record behaviors of or around play bouts and would include an ethogram that lists the relevant behaviors for that context. An ethogram is a listing of all the relevant behavioral patterns of the subjects and a description of each. No ethogram is exhaustive; that is, given the levels of behavior and the varieties of behaviors in a species' repertoire on each level, the ethogram does not aim to delineate all. Instead, a study designates a behavior or set of behaviors of focus.

For this purpose, a continuous stream of behaviors is subdivided into bouts of behaviors, which themselves are describable using the ethogram (Lehner 1996). The behaviors may be considered "events" (with a measurable duration) or "states" (conditions): "standing up" is an event; "standing" is a state. They are both "behaviors" (Altmann 1974; Lehner 1996). In addition to describing a movement or posture, a named behavior may include a function: a primate's "pant threat" or "fear grimace," for instance. What were once undifferentiated phenomena become coherent through giving names to the types of behavioral events seen.

Names need not be without humor, originality, or subjectivity. But the definition of what "counts" as an example of that behavior should be clear. In a study of dyadic dog play, I included an attention-getting behavior, *in-your-face*, glossed as "position body or face inches from other's face" (Horowitz 2009a). While droll, the use of the term was specific. The caution here is not to let the particular characterization of the behavior slip into the interpretation of the behavior. For example, one ethogram, for a study of stickleback fish, includes the entry "sneaky swimming," defined as "smooth swimming usually along the bottom using caudal and pectoral fins with dorsal and ventral spines lowered" (Lehner 1996, 116). Given the research's aim to examine the fish's antipredatory behaviors, the adjective "sneaky" may be apt. But care needs to be taken to ensure that one not slip into saying that the fish, therefore, "are sneaky."

With functional descriptions, which give the proximate or ultimate use of the otherwise simply physical act, it is easiest to see the danger of naming. Inclusion of an alleged "function" of an act can be presumptuous: if a certain musculature of a primate's face is described not as such but as a "grimace" of "fear," some of the question of the emotion, experience, or intent of the animal is begged. Is a dog described as "urinating" or as "marking"—thus elevating his relieving himself to a social act?[6]

6. In "marking," an animal leaves urine apparently intended for others—including territory challengers, predators, and possible mates—to investigate (which "intent" is determined by the subsequent olfactory investigation by conspecifics).

Familiarity with an animal's behavior could be described as the ability, earned over time and repeated viewings, to carve behaviors into functional and empirical types. The expert dog-behavior observer recognizes the actions "mark" and "urinate" as having different physical or spatial features, different durations, appearing in differing contexts, and having, over time, different consequences. The expert primatologist identifies the grimace that appears in contexts of aggression by others as distinguishable from similar grimaces in other contexts. Thus, one could argue, there is nothing inappropriate about functional descriptions of behavior if one has some (unspecified) amount of experience observing—presumably guided by other ethograms. Knowing "what the animal is doing" thus relies on being not just a person with eyes and an ethogram, but a person with a certain type of expertise wrought of hours of watching guided by certain characterizations of the types of behaviors that could be seen. These characterizations must, therefore, be revised over time as experience is gained. By the same token, novice observers and expert observers may not be equally well equipped to use the same ethogram. Behavior is, in part, observer dependent.

Effect of Observer and Means of Observation

As used, the ethogram is the observational science's means of operationally defining behavior units: an identification of what counts as the behavior. Such identification is necessary for interobserver and also intraobserver reliability. For two observers to agree that they have both witnessed "dyadic play" behavior, the action or set of actions—including either necessary or sufficient—that count as play must be clearly defined. The necessity of gauges of "observer agreement" (see, e.g., Altmann 1974) highlights the fact that it is quite likely that two observers, looking at the same behavioral acts in context and given the same behavioral units in an ethogram for which to look, may still disagree about what was seen. Even in cases in which two observers agree sufficiently for analysis of the data to continue, agreement is often not 100 percent.

"The role played by the observer in biological research," Lewis Thomas wrote, is that "he or she simply observes, describes, interprets, maybe once in a while emits a hoarse shout, but that is that; the act of observing does not alter fundamental aspects of the things observed, or anyway isn't supposed to" (Thomas 1979, 88). This professed "simplicity" is undermined by an examination of the role that technologies, both uncomplicated and

sophisticated, play in framing and revealing behavior. What an observer will see as "behavior" relies on a spatial and a time component. The spatial component—is the behaver close or far from the observer—circumscribes what can be observed. Even among conspecifics, interanimal distance also demarcates what they may consider the behavior to be. Indeed, the behaver himself, given his spatial identity with the behavior, may consider the behavior to be something different than any observer, human or non, does.

Any technology that changes the spatial resolution of a behavior to observers thus has a part in changing *the behavior* insofar as its description serves as a substitute for the act. The ethologist Adrian Kortlandt suggested that when researchers could finally obtain inexpensive field glasses after the first world war, the practice of ethology changed substantially: distant, small, or distant and small animals could be observed; their behavior was now accessible and thus subject to scientific examination (Allen 2004).

A time component is also relevant to considering behavior. For along the vector of time, life is a continuous stream of "behaviors," overlapping and continuous, within organisms and among organisms. If one wants to speak of "a behavior," it must be extracted from that stream. A photograph, enabled by a camera, "stops" time, giving the illusion (or providing the opportunity for insight) that a behavior could be captured within a frame. Video playback of a videotaped set of actions allows one to slow down or speed up time, enabling the observer to see what one otherwise might not. Animal "trap" cameras, which are triggered to operate by nearby motion, are often set to capture images of animals too shy or too wary to allow humans to approach. Such cameras engage both the spatial and time components of observations. Relatedly, recent satellite technology and GPS radio tracking enable a macroscopic view allowing observers to watch movement from such a distance as to widen perception (Yong 2016).

Impediments to Observing Behavior

The methods of observational science come with built-in impediments to objective analysis of behavior. Each of these impediments in turn reveals intrinsic difficulties with any discussion of or definition of *behavior*. One might be looking at behavior at the wrong level of analysis to see what is happening; incorrect sampling may mischaracterize behavior. Naming itself is an art that can enable or hamper viewing.

Humans' anthropocentric perspective may also hinder our ability to see the behavior of nonhumans. An animal's *Umwelt*, or worldview, defined by her sensory and cognitive capacities as well as the environmental niche she fills, differs from that of humans (Von Uexküll [1934] 1957). What appears to be a seen behavior may thereby be incorrectly interpreted, its context misunderstood, or its meaning or extent misperceived. A dog's appearing to stare blankly into space, for instance, may be characterized as "doing nothing"—or that dog, who can detect high-frequency sounds, may be hearing something and being "vigilant" or smelling the odor of another dog drifting toward him on the breeze.

Relatedly, anthropomorphisms can be impediments to seeing behavior clearly: what looks like a dog's "guilty look" to the human companion who is sure of her dog's understanding of right and wrong, and similarity of emotional experience, is actually revealed to be a learned submissive behavior on closer examination (Horowitz 2009b). But, too, avoidance of anthropomorphism in interpreting behavior can be as much of a bane: in the absence of an identifying "behavior" correlating with guilt, one might declare the absence of the emotional experience. Such a declaration would be hasty.

Indeed, the mere fact of human presence may change the behavior seen—a kind of uncertainty principle for ethology. This "observer effect" can be seen in studies where a behavior is noted only when an observer is either present or absent. For instance, researchers working with nonhuman primates found that observer presence correlated with a "decrease in appetitive behavior" and an increase in "rest" in macaque monkeys (Iredale, Nevill, and Lutz 2010). This is called the "Hawthorne effect" in sociology and psychology, where a person's awareness of being observed leads to a behavioral change in accord with the behaver's expectations about what the researcher is looking for.

The Science of Behavior

Curiously, even after decades of success of behaviorism, B. F. Skinner (1953) felt the need to defend behavior "as a scientific subject matter": he titled the first section of *Science and Human Behavior* "The Possibility of a Science of Human Behavior." This "possibility," seen sixty years hence, after psychological science has flourished, seems to be underplaying the case. Of course the study of behavior could be scientific. On the other hand, its seeming familiarity—after all, we experience, witness, and produce behavior all

the time—may make it seem at times less scientific than something—neural or other microscopic activity—that requires at minimum a tool (microscope, MRI machine) to view and perhaps an intervening level of interpretation (as with MRI, in which brain activity—brain behavior—is *deduced* by virtue of the flow of blood in the brain when in the presence of specially situated magnets). "Science," a popular conception holds, involves laboratories, controlled settings, lab coats. Science is present when there are extractions, controls, conditions, test tubes, high-powered visualization technology.

When performed with awareness of the impediments to accurate observation, though, the study of behavior is not only an art, it is truly the most straightforward of sciences.

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