July 21, 2009

BASICS

When 'What Animals Do' Doesn't Seem to Cover It

By NATALIE ANGIER

Certain things should never be taken for granted, among them your spouse, your mother, the United States Constitution, and the precise meaning of words that are at the heart of your profession.

Daniel Levitis was working as a teaching assistant for an animal behavior course at the University of California in Berkeley, and on the first day of class, the professor explained that the shorthand definition of a "behavior" is "what animals do."

O.K., that's the freshman-friendly definition, Mr. Levitis thought. Now how about the unabridged, professional version? What is the point-by-point definition of a behavior that behavioral biologists use when judging whether a particular facet of the natural world falls under their purview? After all, animals digest food and grow fur, yet few behavioral researchers would count such physiological and anatomical doings as behaviors.

Mr. Levitis asked the professor for the full definition of a behavior. She referred him to their textbook, with its promising title, "Animal Behavior." To his surprise, neither that textbook nor any other reference he consulted bothered to spell it out. "It was assumed that everyone knew what the word meant," said Mr. Levitis, who is completing his doctorate at Berkeley.

Mr. Levitis decided to ask the people who should know best: working behavioral biologists. The provocative and crisply written results of his quest, carried out with his colleagues, William Lidicker Jr. and Glenn Freund, appear in the current issue of the journal Animal Behaviour. Among the highlights of the report: biologists don't agree with one another on what a behavior is; biologists don't agree with themselves on what a behavior is; biologists can be as parochial as the rest of us, meaning that animal behaviorists tend to reflexively claim the behavior label for animals only, while botanists sniff that, if the well-timed unfurling of a smelly, colorful blossom for the sake of throwing your seed around isn't the ultimate example of a behavior, then there's no such thing as Valentine's Day; and, finally, words may count, but thoughts do not.

The researchers acknowledged that biologists had not been crying out for a canonical definition of the term. Marlene Zuk, an animal behaviorist at the University of California at Riverside, contrasted that casual attitude with the often acrid debates now under way on how to define

the term species. "What you think a species is means a lot for the way you think about evolution," she said. But with behavior, she added, "there doesn't seem to be an existential crisis." Then again, nothing can be more insidious than the wallflower you ignore.

Walter D. Koenig of Cornell University, who helped Mr. Levitis in the early stages of the project, said his interest was piqued when he moved from the study of bird behavior to an investigation of the birds' primary food supplier, oak trees. Why is it that trees dispersed over great distances end up releasing their acorns, or masting, en masse, he wondered. "Are the trees responding to something produced by other trees?" he said. "It's entirely possible." And if you designate this sort of inter-arboreal chemistry a behavior, he added, "it ends up pushing the boundaries" of what you think plants can do.

To perform their linguistic investigation, the researchers composed an online survey with two basic parts. In the first, they presented 13 "potentially diagnostic" statements about behavior, compiled from their sweep through the scientific literature, with which respondents could either concur or not. "Behavior always involves movement," for example, and "is always an action, rather than a lack of action." Or, "behaviors are always the actions of individuals, not groups" and "something whole individuals do, not organs or parts that make up an individual." Or, "a developmental change is not a behavior."

In the second part, Mr. Levitis and his co-workers offered 20 instances of natural phenomena and asked, Behavior, yea, nay or can't say? "A sponge pumps water to gather food," for example, or "a plant bends its leaves toward a light source" or "a beetle is swept away by a strong current." Does a flock of geese flying in V formation count as a behavior? How about when a person decides not to do anything tomorrow in the event of rain, or when a female ant that is physiologically capable of laying eggs doesn't do so because she's not a queen? (If you'd like to take the survey and see how your responses compare with scientists' and other readers', please go to nytimes.com/science. Warning, spoilers ahead.)

Nearly all of the items were designed as borderline cases that tested the validity of one or more statements in the first half of the survey. "Flocks of geese fly in V formation," for instance, contradicted the notion that behaviors are the actions of individuals rather than of groups. A person deciding on inactivity in the event of rain and an ant forgoing reproduction because she's not royalty both flouted the premise that a behavior is always an action. One offering, "a spider builds a web," contradicted none of the 13 stipulations about behavior and thus served as an experimental control.

Tallying results from 174 respondents, the researchers found an impressive lack of accord. "We didn't have complete consensus for any item on the survey," said Mr. Levitis, and that includes the little eight-legged control spinning its web. There were some harmonic notes. All but one participant deemed geese flying in V formation to be a legitimate behavior, while more than 95 percent turned thumbs down to the beetle swept away in a stream.

Amusingly, more than half the scientists contradicted themselves, some of them multiple times, by designating as behaviors items on the second list that defied the set of rules they had chosen from the first list.

Despite the overall lack of concordance, the researchers sought to extract from the results a trial definition for a word their peers bandy about with abandon. As they pitch it, a behavior is the internally coordinated response that an individual or a group makes to a stimulus. The response can be action or lack of action. The stimulus can come from inside or out. By this definition, masting oak trees, bacterial colonies creeping across a sugar gradient, zebra herds fissioning and fusing, are all displaying behaviors. Dogs that bark are behaving, dogs that obey a trainer's signal and choose not to bark are most definitely behaving.

Yet a favorite human sport fails to meet the new lexical guidelines. Thinking, it seems, is not a behavior. If you think about going for a walk and then go for a walk, that's a behavior. If you think about going for a walk but then decide it's too cold, that's a behavior. Walk or not, just make up your mind. It don't mean a thing till you get off that swing.