

## **ONTOLOGY FOR BEHAVIOR ANALYSIS: NOT REALISM, CLASSES, OR OBJECTS, BUT INDIVIDUALS AND PROCESSES**

William M. Baum  
*University of California, Davis*

*Abstract:* Realism, defined as belief in a real world separate from perception, is incompatible with a science of behavior. Alternatives to it include Eastern philosophy, which holds that the world is only perception, and pragmatism, which dismisses the belief as irrelevant. The reason realism is incompatible with a science of behavior is that separating perception of objects from real objects leads directly to subjective-objective or inner-outer dualism. This dualism, in turn, leads directly to mentalism, the practice of offering inner entities as explanations of behavior. Positing unobservable causes renders a science incoherent. Ontology for behavior requires two distinctions: (a) between classes and individuals; and (b) between objects and processes. These distinctions allow a workable ontology in which behavior consists of activities that are extended in time (i.e., processes) and are ontological individuals—functional wholes with parts that also are activities. Such an ontology provides coherence to a science of behavior.

*Key words:* ontology; realism; pragmatism; Eastern philosophy; activity; discrete response; molar view; multiscale view

---

The author declares that he has no conflict of interest.  
No ethical approval was required, because no subjects were used.

## BAUM

It is indeed an opinion strangely prevailing amongst men, that houses, mountains, rivers, and in a word all sensible objects, have an existence, natural or real, distinct from their being perceived by the understanding... yet whoever shall find in his heart to call it in question may, if I mistake not, perceive it to involve a manifest contradiction. For what are the forementioned objects but the things we perceive by sense? and what do we perceive *besides our own ideas or sensations?* (George Berkeley, 1717/1939, p. 524; italics in the original.)

The prevalence of the belief in a world of things existing independently of our perceptions is “strange” because it has no basis in logic. All we have is our perceptions of objects or our experience of objects. Say, I have a tree near my house; I see it, feel it, climb it, and so on. If the tree I experience has some existence as a real tree distinct from my experience of it, I have no access to that real tree and could never prove it does actually exist separately.

James Boswell (1791/2007), in *Life of Samuel Johnson*, relates that Samuel Johnson (1709-1784), upon hearing about Berkeley’s argument, kicked a stone and said, “I refute him *thus*” (p. 310). The error involved is so obvious that scholars doubt Boswell’s account (Womersley, 2007). Johnson’s foot, the stone, the kick, and the vocalization are all just Johnson’s (and Boswell’s) perceptions. The foot’s engaging the stone need have no reality distinct from those perceptions. Indeed, from Boswell’s viewpoint, Johnson himself is just Boswell’s perceptions.

The physicist Erwin Schrödinger (1887-1961), one of the founders of quantum theory, added to Berkeley’s argument by pointing out that a material existence apart from our experience is superfluous:

...if, without involving ourselves in obvious nonsense, we are going to be able to think in a natural way about what goes on in a living, feeling, thinking being (that is, to see it in the same way as we see what takes place in inanimate bodies)—without any directing demons, without offending against, say, the principle of the increase of entropy, without entelechy or *vis viva* or any other such rubbish—then the condition for our doing so is that we think of *everything* that happens as taking place in our *experience* of the world, without ascribing to it any material substratum as the object *of which* it is an experience; a substratum which ... would in fact be wholly and entirely superfluous (Schrödinger, E. (1961/1983), pp. 66-67; italics in the original).

The present paper aims to discuss three topics: (a) realism and its alternatives; (b) the trouble with realism; and (c) a workable ontology for behavior analysis. By realism, I mean the belief in a world of things that exists independently of our perceptions or experience. Philosophers would likely call it “naïve realism,” because they have proposed other types. Schoneberger (2016), in a discussion of realism and pragmatism, called it “metaphysical realism.” Hereafter, I use “realism.”

## ONTOLOGY FOR BEHAVIOR ANALYSIS

### Realism and Its Alternatives

One alternative to realism may be found in Eastern philosophy, which anticipated Berkeley's skepticism by thousands of years: that our experience seems to tell us of a physical world, but our experience is illusory, like a dream. For example, in the Hindu text, the *Bhagavad Gitā*, we find:

Never is this born, nor does it die, nor having been does it ever cease to be; unborn, eternal, un-decaying, ancient; this is not disintegrated by the disintegration of the body (Chatterji, M. M. (1960), Ch. 2, par. 20.)

A similar view may be found in Zen:

When all these deep things are searched out, there is after all no 'self'. Where you descend, there is no 'spirit,' no 'God' whose depths are to be fathomed. Why? Because Zen is a bottomless abyss (Suzuki, 1964, p. 43).

The spiritual master, Meher Baba (1894-1969) expressed the view:

God alone is real; He is infinite, one without a second. The existence of the finite is only apparent; it is false; it is not real (Meher Baba, 1973, p. 384).

All of these quotes, though differing in choice of words, express the oneness of Reality and the illusoriness of the world of things. The illusion is characterized by the seeming manyness of things, whereas Reality is one.

Probably the principal challenge to Berkeley and Eastern thinking, the observation that seems to compel realism, is the ability of two observers to report about the same object. You and I may both agree that a tree stands before us. How is this possible if the tree is just our perceptions or is part of an illusory world? Wouldn't the tree have to be really there? The question presupposes a separation between you and me that the Eastern view does not. Schrödinger, who was a student of Vedanta, put the matter this way:

For philosophy, then, the real difficulty lies in the spatial and temporal multiplicity of observing and thinking individuals...I do not think that this difficulty can be logically resolved, by consistent thought, within our intellects. But it is quite easy to express the solution in words, thus: the plurality that we perceive is only *an appearance; it is not real*. Vedantic philosophy, in which this is a fundamental dogma, has sought to clarify it by a number of analogies, one of the most attractive being the many-faceted crystal which, while showing hundreds of little pictures of what is in reality a single existent object, does not really multiply that object (Schrödinger, E. (1961/1983), p. 18; italics in the original).

Thus, the answer denies that multiple individuals' similar reports necessitate an independent reality apart from the individuals' perceptions and affirms instead that the multiplicity of individuals itself is part of the illusion; in Reality, all is one.

## BAUM

The world of things is illusory and has no independent real world of manyness behind it. Reality is completely different: one, indivisible, and beyond the illusory world.<sup>1</sup>

Schoneberger (2016) urges behavior analysts to adopt a version of realism that he attributes to the philosopher Richard Rorty (e.g., 1979, 1989). Although still maintaining a real substance that exists independently of our experience, Schoneberger considers this reality to have no intrinsic structure of its own. Instead, it is shaped by what we say and do about it—a sort of blank canvas on which our speech and actions write. It seems to be similar to what Zen calls the “Nameless”—what is real before any thinking (Suzuki, 1964).

Schoneberger’s (2016) proposal might actually resemble Eastern philosophy, because the reality he envisions would be a oneness that contrasts with the manyness of our experience. For example, the existence of giraffes (Schoneberger’s example) is contingent on our having a term “giraffe” with which we carve out giraffes from the non-differentiated (one) reality. The difference is that Schoneberger (and perhaps Rorty) doesn’t suppose that the one reality exists beyond our limited, worldly experience.

Another alternative to realism derives from pragmatism. William James (1907/1974) presented pragmatism as having dual aspects: as a method for settling disputes and as a theory of truth. He pointed out that some questions lead only to endless disputes back and forth, with no satisfactory resolution:

Is the world one or many?--fated or free?--material or spiritual?--here are notions either of which may or may not hold good of the world; and disputes over such notions are unending. The pragmatic method in such cases is to try to interpret each notion by tracing its respective practical consequences. What difference would it practically make to any one if this notion rather than that notion were true? If no practical difference whatever can be traced, then the alternatives mean practically the same thing, and all dispute is idle. Whenever a dispute is serious, we ought to be able to show some practical difference that must follow from one side or the other's being right (pp. 42-43).

In other words, if the answer to a question would in no way change the way science would proceed, then the question itself is at fault and merits no attention. The question of whether there really is a real, independent, objective world out there apart from our experience qualifies as one of those questions about which dispute is idle. James wrote that our conception of an object consists of nothing beyond its practical effects: "--what sensations we are to expect from it, and what reactions we must prepare" (p. 43). What matters about a bicycle is that I see it,

---

<sup>1</sup>For a book-length presentation of the many manifestations of this view in different times and places, see Aldous Huxley’s (1945) *The Perennial Philosophy*.

## ONTOLOGY FOR BEHAVIOR ANALYSIS

call it by its name, may lend it to a friend, may ride it myself. Pragmatism remains agnostic about whether a *real* bicycle exists behind these effects. One alternative to realism, then, is pragmatic agnosticism (Barnes-Holmes, 2000). One would hold that we need not bother about a reality we cannot know and is useless to science; we may concentrate on what we can know and use—our experience itself.

### **The Trouble with Realism**

Should any of this philosophical discussion matter to behavior analysts? I think it should, because realism creates incoherence, and if any behavior analysts subscribe to realism, they should beware. In the physical sciences—physics, chemistry, astronomy, and geology—realism may raise few problems, because the physical sciences deal with nonliving things that may be treated separately from the observer without confusion; whether they exist independently may be of little note. To an astronomer, whether the real universe is really expanding or whether the perceived universe is perceived to be expanding may not matter, because the data are the data.

Realism may present problems in some areas of biology, however. What is true of the physical sciences might also be true of physiology and evolutionary biology, because physiologists can treat living cells as mechanical things, and evolutionary biologists can treat populations of organisms without discussing their individual interactions with the environment. When biology treats behavior, however, problems arise. For behavioral ecology, which deals with individual organisms interacting with the world around, realism creates complications, because questions about consciousness may intrude. For behavior analysis, the matter becomes crucial, because an account of consciousness lies at the heart of its mission, even if that only means explicating why the term is useless.

Realism is disastrous for behavior analysis because it implies dualism with its incoherence. If things have a real existence independent of our perceptions of them, then two worlds must exist: (a) the world of real things; and (b) the world of our perceptions. This follows from the separation of a tree from our perceptions of the tree. According to realism, the tree is “out there,” in the real, independent world, whereas our perceptions are somewhere else, a second world that becomes “in here.” In other words, realism leads immediately to subject-object dualism or inner-outer dualism, in which perceptions are subjective or inner, and things are objective or outer. Once we suppose an inner world of subjective perceptions, we may populate it with all kinds of other subjective things—an inner self with intentions and so on. Once this division exists, behavior seems to be part of an outer world while perceptions and the like are part of an inner world. How does this happen?

Dualism becomes inevitable when I apply realism to myself. Just as I perceive a tree before me, I perceive my own body. I see I have arms and legs. When I look in a mirror I see a body that resembles other people’s bodies. According to realism, my body, like the tree, belongs to the real world. It is made of the same sort of stuff as the tree. I perceive the world of things, and I perceive

## BAUM

my body as part of that world. But, where am I in that picture? Who does this perceiving? The existence of that real, objective world, independent of me, if that is what we study, requires someone separate from it to observe it. That separate observer must be me, my self, but not being in the real world, my self must be somewhere else. That somewhere else is the inner world, the world of perceptions and other mental things. Thus, realism, separating objects from their perceptions, leads inevitably to the inner self and all its problems—that is, to incoherence, because we know of no way that an invisible, non-material thing could cause behavior (Baum, 2016).

Is subject-object dualism benign? Burgos (2016) argued that dualism in itself is no threat to the understanding of behavior; it only becomes a threat when it passes into mentalism, the practice of invoking inner entities as causes of outer events. Burgos may be correct in principle, but in practice, dualism leads inevitably to mentalism, because Burgos's argument neglects the reason for positing an inner world in the first place. Once we suppose dualism, we are likely to explain our saying, "There is a tree" by asserting that the verbal behavior is caused by the perception of the tree. Talk of the inner world exists precisely to "explain" our own behavior and the behavior of others. For everyday discourse, this talk may be benign. For a science of behavior, it is disastrous, because it results in incoherence. Hidden causes become acceptable—even necessary—to explain behavior, not only one's own behavior, but that of others, too. If this holds for me, it must also hold for other people. The inner self, unseen, also called ego or personality, takes in information, processes it, makes decisions according to its intentions, desires, and beliefs, and causes concordant behavior, and a science of behavior becomes impossible. Drawing on Eastern philosophy, Schrödinger put the matter this way:

'There's another one like you sitting over there, thinking and feeling go on in him too.' And now everything depends on how we go on: whether with 'I am over there too, Self is over there, that is myself'; or with 'There is a self over there, like yours, a second one.' It is the word 'a' which differentiates the two ideas, the indefinite article, degrading 'self' to a common noun. It is only this 'a' which...fills the world with ghosts and drives us helplessly into the arms of animism (Schrödinger, E. (1961/1983), p. 35).

Supposing each person to have an inner self separate from the objective world leads inevitably to mentalism ("animism"), to the view that Ryle (1949) called the "ghost in the machine." That is the trouble with realism. If behavior analysts eschew realism, however, what alternative can they pursue? A view rooted in Eastern philosophy is compatible with science, but the philosophical stance of pragmatism may offer the best approach (Baum, 2017).

### **A Workable Ontology for Scientific Study of Behavior**

## ONTOLOGY FOR BEHAVIOR ANALYSIS

Ontology is the branch of philosophy that is concerned with being and existence. It specifies the things that exist to know about and goes hand-in-hand with epistemology, which is the branch concerned with what and how we know about those things. For example, Newton's law,  $F = ma$ , makes the ontological assertion that forces, masses, and acceleration exist, and epistemological considerations would focus on how to study those things.

If one thinks of ontology as based on realism, one might be led to suppose that ontology requires faith, because belief in a real world independent of experience and inaccessible to our senses is an article of faith (Barnes-Holmes, 2000). Thus, in a realism-based ontology, if I see a tree I should have faith that a real tree exists behind my experience of the tree.

Ontology need not be realism-based, however, and need not require faith. Pragmatist ontology is possible (Barnes-Holmes, 2000). Such ontology proposes things available for study that might be useful to making sense of our experience. For example, when the heliocentric view of the solar system challenged the geocentric view of the universe, it introduced new things to be known about: the solar system and satellites. Seen in the light of the verbal behavior of scientists, pragmatist ontology specifies terms that might be useful in understanding our experience, such as "solar system" and "satellite." Such terms are occasioned by invariances and bring together observations that might otherwise seem disparate. In this way, terms like "operant," "reinforcer," and "stimulus control" organize and make sense of our experience of behavior, whether in the laboratory, in applied settings, or in everyday life. The physicist Ernst Mach (1933/1960), who adhered to pragmatism, explained:

To find, then, what remains unaltered in the phenomena of nature, to discover the elements thereof and the mode of their interconnection and interdependence--this is the business of physical science. It endeavors, by comprehensive and thorough description, to make the waiting for new experiences unnecessary; it seeks to save us the trouble of experimentation, by making use, for example, of the known interdependence of phenomena, according to which, if one kind of event occurs, we may be sure beforehand that a certain other event will occur (pp. 7-8).

For Mach, the business of scientists was to describe phenomena in terms that bring phenomena together and reduce our puzzlement over the events in our experience. Accordingly, Mach had a pragmatist view of explanation:

When once we have reached the point where we are everywhere able to detect the *same* few simple elements, combining in the ordinary manner, then they appear to us as things that are familiar; we are no longer surprised, there is nothing new or strange to us in the phenomena, we feel at home with them, they no longer perplex us, they are *explained* (p. 7; italics in the original).

## BAUM

The pragmatist view of truth follows from this approach. James, for example, denied absolute truth of the sort suggested by realism. Instead of supposing that theories approximate some ultimate real world, James regarded truth as comparative. A theory is more or less true insofar as it is useful in making sense of our experience. Kuhn (1970), whose views coincided with pragmatism, maintained that a theory or paradigm that explained more phenomena or explained them more elegantly would gain more adherents among scientists and eventually become dominant for a while, until a superior theory or paradigm appears. Among the aspects of a paradigm, as conceived by Kuhn, are proposals of terms, which may be viewed as ontological claims. “Solar system” and “satellite” are examples.

Two fundamental distinctions have been useful in ontology: (a) the distinction between class and individual; and (b) the distinction between object and process. These may help to understand ontological considerations that apply to the study of behavior.

### **Class Versus Individual**

A book-length explanation of the difference between a class and an individual may be found in biologist Michael T. Ghiselin’s (1997) *Metaphysics and the Origin of Species*. The present discussion draws on that book. A class is an ontological type that is defined by a set of properties. Classes are characterized by having instances that conform to the properties. For example, “pieces of furniture with four legs” would be a class with instances like chairs and tables, and “table” would be a class also, but defined by function instead of structure. The word “individual” is often taken to be synonymous with “organism,” but ontologically speaking organisms are only one type of individual. More generally, an individual is a concrete thing that is situated in time and space and functions as an integral whole. Instead of instances, an individual is made of parts, and these parts are themselves individuals. An organism is made up of parts like appendages and organs. A species of organisms may be thought of in two ways. Thinking of “human being” as the name of a class, we would say that B. F. Skinner and Isaac Newton are instances. Thinking of the species *Homo sapiens* as an individual, we would say that Barack Obama, as a member of the species, is a part of a whole population, which, in evolutionary biology, is defined as a reproductive unit (Mayr, 1970). When he dies, he is no longer a part of the species, but the species goes on; a salient property of individuals is that, in contrast with classes, which are fixed by their properties, individuals can change while still retaining their identity (Ghiselin, 1997). Classes are defined by their properties, are fixed forever, and may even have no instances (e.g., “mental cause” or “person more than 10 feet tall”). For a long time, the class “living coelacanth” was considered to have no instances, but when a live one was discovered, that class came to have instances. If a defining property of the class had been “fossil,” the class would have changed with the change in properties. Individuals, in contrast, have no defining properties, can be defined only ostensively (e.g., “That is my dog Fido”), and can only be described. Individuals have a beginning and an end and occupy a certain



## ONTOLOGY FOR BEHAVIOR ANALYSIS

geographical location. Organisms are born and die. Species result from speciation events, have a certain geographical range, evolve and change, and may ultimately go extinct. Classes themselves cannot do anything, although their instances may be individuals that have functions.

This distinction between class and individual is important to behavior analysis because it applies to behavior. When Skinner defined the operant as a class, he specified the properties a response must have to possibly produce a reinforcer, and responses having those properties were instances of the class. The actually occurring responses that result from requiring those properties, however, are another matter. Those responses do not necessarily even have the required properties. A rat interacts with a lever in a variety of ways, some of which operate the lever, and some of which do not. Catania (1973) distinguished between the “descriptive” operant and the “functional” operant for this reason. The “descriptive” operant is Skinner’s definitional operant. As Glenn, Ellis, and Greenspoon (1992) explained, the “functional operant” is an individual, not a class, because it consists of actually occurring responses, not responses that might occur. Whether one retains the concept of “the operant” (supposedly composed of discrete responses) or not, the distinction between class and individual greatly affects our understanding of behavior, as we will see after we take up the distinction between object and process.

### **Objects Versus Processes**

Firstly, instead of dualism, we may embrace monism or, as Skinner (1945) put it, “the ‘one’ world.” To do this, we must put aside the notion of a real existence independent of our experience. In the spirit of pragmatism, we can aim to make sense of our experience, be it populations of organisms or the behavior of individual organisms.

Secondly, we need to recognize that sciences in general, and behavior analysis, in particular, focus on process—that is, change through time. When we examine all the arguments for and against realism, we discover that almost all have to do with objects. We see propositions like, “I perceive that tree because a real, independent tree is there.” This focus on objects makes a lot of the trouble, because it leads naturally to that separation of the object from its perception.

When people speak of objects, they seem to be discriminating something that has boundaries and remains stable in a changing world. In ordinary speech, a tree seems to be an object. To a botanist, an ecologist, or an evolutionary biologist, however, the tree is a process. It develops from a seed, grows to maturity, reproduces, interferes with other plants, acquires symbionts and parasites, eventually dies, and is finally reabsorbed into the earth. A focus on process is fundamental to the sciences.

The physical sciences focus on process less obviously, because they often examine the structure of things—rocks, stars, plants, DNA, and atoms. The study of structure, however, is not usually an end in itself, because scientists try to understand the way things work or function and how they change or evolve.

## BAUM

Accordingly, the physical sciences aim at understanding volcanism, the life-cycles of stars, growth of plants, replication of genetic material, motion, decay, and transfer of energy—all processes. Whether on a short time scale (atomic physics) or a long time scale (geology or astronomy), sciences aim to understand processes.

The study of living things focuses on process more obviously. Beyond interest in molecular structure and anatomy, physiology concerns itself with processes like metabolism, circulation, cell division, secretion, and uptake. More obvious still, evolutionary biology focuses on process when it concerns itself with changes in populations and speciation. History becomes important, because, ontologically speaking, species are individuals—entities that can change while still retaining their identity (Ghiselin, 1997). Thus, a species may be thought of as a lineage—a population with a history that contains the process of its origin.

When we come to a science of behavior, all ambiguity about process vanishes, because behavior itself is process. The most basic datum, response rate, is a process. Even if one thinks of behavior as composed of discrete responses, a response may be taken as an event, which is a process seen in a small time frame. A response rate is a process seen in a longer time frame. Choice is a process in which behavior is divided among two or more activities. Studying the structure of behavior, often called its “topography,” only illuminates its process, its function. Thus, a pigeon’s pecking at a key that produces food is a different process from its pecking at a key that produces water (Jenkins & Moore, 1973).

The trouble with taking behavior to be composed of discrete responses is that discrete responses are easily confused with objects. The discrete response, borrowed from reflexology, originally consisted of little more than a muscle twitch. Even a muscle twitch is a process in a muscle, but when taken as a discrete event with no variance other than its occurrence or non-occurrence—as in the operation of a switch or not—then it becomes the behavioral analog to an object. Such a punctate unit cannot capture the continuity of behavior, but it was historically embodied in Skinner’s (1938) concept of “the operant.” At best, it seems to be a population of discrete responses. The noun “operant” suggests something like an object—a tree, for example—whereas “operant” as an adjective may be combined with a process, such as “operant activity.” Even when behavior is acknowledged to be continuous, commitment to discrete responses makes the behavioral stream seem more like a series of beads on a string than an actually continuous flow (Schoenfeld & Cole, 1972). When we speak of everyday life, discrete events make little sense. What is the discrete event in the activity of watching television?

One must be careful to distinguish between discrete responses and small-scale processes. As noted already, a muscle twitch is a process, and a pigeon’s pecking constitutes a process with small-scale parts that occupy fractions of a second, like moving the head back and forth, opening and closing the eyes, and opening and closing the beak (Smith, 1974). When behavior is equated to the operations of a microswitch, confusion may arise, because each switch operation might incorrectly be thought of as a discrete response. Attaching a microswitch to a lever or key,

## ONTOLOGY FOR BEHAVIOR ANALYSIS

however, turns out to be a fairly reliable way to measure an organism's interaction with the lever or key (Baum, 1976, 2013).

Two earlier papers argued that behavior consists of activities that are temporally extended and have parts that are themselves activities in a smaller timeframe than the more extended activity to which they belong (Baum, 2002, 2013). An activity is a process. Like a species, an activity may be thought of as a lineage—that is, a process with a history of origin and change. A history of reinforcement is such a history. One's playing tennis, for example, may begin with parts that change over time with practice to the point where the beginning activity hardly resembles the mature activity.

Explicit focus on process avoids much of the temptation to realism. Whereas objects might seem to call for explanation because of their seeming permanence, processes more readily can be taken at face value, because they convey change or a lack of permanence. When we measure a response rate, we need not imagine a real response rate apart from the one we measure. Why not study the process we measure and just that?

### **Ontology for Behavior Analysis**

A workable ontology for studying behavior focuses on processes in the form of activities. Variation and change are inherent in activities. Just as I cannot repeat the same act exactly the same way twice, so the allocation of my behavior among the activities of my life changes from time to time. The resemblance to species in evolutionary theory is no accident. Just as variation is inherent in a population of organisms, so variation is inherent in activities. If I drive to work every day, still my drives to work vary, and my activity of driving to work over the course of a year constitutes a population of varying episodes of driving to work. As the parts change, the activity not only varies, but may evolve. If I sometimes drive on Road A and sometimes on Road B to get to Road C, driving to work may in time include less driving on Road A than Road B—perhaps Road B is smoother than Road A—and my driving to work changes through time. The parts of driving to work may be as detailed as analysis requires, including stopping and starting, slowing and speeding, and so on (Wallace, 1965).

When we take behavior to consist of activities, the key measure of an activity is the time it takes up. For example, instead of considering a rat's interactions with a lever as consisting of discrete presses, we may take the number of operations of a switch attached to the lever to be an indicator of the time taken up by "lever pressing" (Baum, 1976). Time is limited, however, because an experimental session lasts for a certain duration, and a day contains only 24 hours. Since a living organism's activities take up all its time, activities compete with one another for time. Every organism has a time budget that describes the allocation of its time to its activities (e.g., Barnard, 1980). When a rat is not lever pressing or a pigeon is not key pecking, it is engaged in other activities, often called "background" activities (e.g., Baum & Davison, 2014). When I am not working, other activities,

## BAUM

such as spending time with my family or exercising, take up the time (Baum, 2010, 2013).

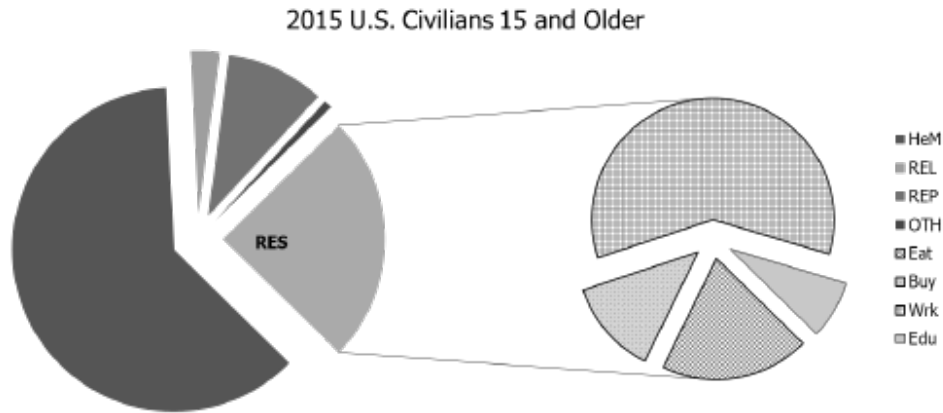


Figure 1. Average time allocation in hours of Americans 15 years and older in 2015. The left-hand pie chart was constructed by combining activities among the 11 most extended activities measured. “Health Maintenance” (“HeM”) combines (BLS labels) Personal care activities and Leisure and sports. “Forming and Maintaining Relationships” (“REL”) combines (BLS labels) Caring for and helping nonhousehold members, Organizational, civic, and religious activities, and Telephone calls, mail, and e-mail. “Reproductive Activities” (“REP”) combines (BLS labels) Household activities and Caring for and helping household members. (“OTH” is a catch-all for activities not otherwise classified.) The right-hand pie chart shows the time taken by activities composing “Gaining and Using Resources” (“RES”) and consisting of its parts (BLS labels): Eating and drinking, Purchasing goods and services, Work and work-related activities, and Educational activities. See text for more explanation. Data are from the United States Department of Labor Bureau of Labor Statistics ([www.bls.gov](http://www.bls.gov)).

One can represent time allocation with a pie chart. Figure 1 shows average time allocation of American civilians 15 years or older in 2015, based on data supplied by the United States Department of Labor Bureau of Labor Statistics ([www.bls.gov](http://www.bls.gov)). The 5 activities in the left-hand pie chart, measured in hours, add up to 24 hours. The most time-consuming activity is Health Maintenance (“HeM”; my label), which combines Personal Care Activities (BLS label; 9.64 h) and Leisure and Sports (BLS label; 5.21 h). The catch-all activity called “Other Activities Not Elsewhere Classified” (BLS label; “OTH”) takes up only 0.19 h. The activity which I label “Gaining and Using Resources” (“RES”; 5.92 h) is unpacked into its parts in the right-hand pie chart (BLS labels): Eating and Drinking (“Eat”; 1.18 h), Purchasing Goods and Services (“Buy”; 0.75 h), Working and Work-Related Activities (“Wrk”; 3.53 h), and Educational Activities (“Edu”; 0.46 h). All of the other activities represented on the left also have parts, and the BLS parts have sub-parts, and many of those have sub-sub-parts.

Figure 1 illustrates two general points. First, the definition of an activity includes its function. For example, buying groceries is an activity that serves the function of bringing home food and other desired items. It cannot be defined only

## ONTOLOGY FOR BEHAVIOR ANALYSIS

by its topography or structure. Thus, walking by itself is not an activity, because one cannot walk without walking somewhere, whereas walking for exercise or walking to the bank would count as activities, because specifying their functions situates them in time and space. Second, every activity has parts that are themselves also activities. Figure 1 shows the parts of “Gaining and Using Resources.” Buying groceries would have parts like driving to the store, collecting items in the store, paying for the items, and driving home with the items. Conversely, except for the most extended activity, “Living,” every activity is a part of some more extended activity. A rat’s food-maintained interactions with a lever consist of lever pressing and eating, less extended activities that are parts of the more extended activity “Feeding” (Baum, 2012, 2013).

I called this way of viewing behavior the ‘molar’ view in the past. The word ‘molar,’ however, connotes for most people a highly extended time scale. A more proper label would be the *multiscale* view of behavior, because activities are measured at different time scales.

A more extended activity is composed of parts that are less extended—on a smaller time scale. The parts of buying groceries are activities at a smaller time scale. Any one of those parts has parts at a still smaller time scale—collecting items in the store is composed of parts like going down the cereal aisle and going through the produce section. Indeed, the time scale can be as brief as one might need it to be for research or discourse, as in a pigeon’s key pecking, discussed above, in which the parts require less than a second (Smith, 1974).

That an activity is defined by its function and is a functioning whole with parts that are also functioning wholes, tells us that activities are individuals. Just as an organism or a species is a concrete functioning whole situated in time and space, so too an activity is a concrete functioning whole situated in time and space. Just as an organism or species can change and still retain its identity, so too an activity can change and still retain its identity. Skilled activities are good examples; someone’s playing tennis can change over time but remains that person’s playing tennis (see Baum 2002, 2013 for more explanation).

### Conclusion

No matter whether many behavior analysts espouse realism, as Schoenberger (2016) claims, realism is an unworkable ontology for behavior analysis, because it leads at once to subject-object or inner-outer dualism, which leads inevitably to mentalism, and behavior analysts should disavow it. Even if Burgos (2016) is correct that one could logically hold dualism without falling into mentalism, nothing is gained by such a position, because the inner, subjective world would be superfluous. In practice, the only reason for holding onto dualism is to engage in mentalism. In contrast with realism, either Eastern mysticism or pragmatism is compatible with the ontology suggested here (Barnes-Holmes, 2000; Baum, 1995, 2017). The molecular view, derived from reflexes (Skinner, 1938), based on discrete responses and contiguity between events has outlived its usefulness. Viewing behavior as composed of activities, instead of discrete responses, allows

## BAUM

us to study them in the laboratory and speak of them in everyday life in a coherent manner. The multiscale view makes ontological sense.

### References

- Barnard, C. J. (1980). Flock feeding and time budgets in the house sparrow (*Passer domesticus*). *Animal Behavior*, 28, 295-309.
- Barnes-Holmes, D. (2000). Behavioral pragmatism: No place for reality and truth. *The Behavior Analyst*, 23, 191-202.
- Baum, W. M. (1976). Time-based and count-based measurement of preference. *Journal of the Experimental Analysis of Behavior*, 26, 27-35.
- Baum, W. M. (1995). Radical behaviorism and the concept of agency. *Behaviorology*, 3, 93-106.
- Baum, W. M. (2002). From molecular to molar: A paradigm shift in behavior analysis. *Journal of the Experimental Analysis of Behavior*, 78, 95-116.
- Baum, W. M. (2010). Dynamics of choice: A tutorial. *Journal of the Experimental Analysis of Behavior*, 94, 161-174.
- Baum, W. M. (2012). Rethinking reinforcement: Allocation, induction, and contingency. *Journal of the Experimental Analysis of Behavior*, 97, 101-124.
- Baum, W. M. (2013). What counts as behavior: The molar multiscale view. *The Behavior Analyst*, 36, 283-293.
- Baum, W. M. (2016). On the impossibility of mental causation: Comments on Burgos' Antidualism and antimentalism in radical behaviorism. *Behavior and Philosophy*, 44, 1-5.
- Baum, W. M. (2017). *Understanding behaviorism: Behavior, culture, and evolution* (3<sup>rd</sup> ed.). Malden, MA: Wiley Blackwell Publishing.
- Baum, W. M., & Davison, M. (2014). Background activities, induction, and behavioral allocation in operant performance. *Journal of the Experimental Analysis of Behavior*, 102, 213-230.
- Berkeley, G. (1710/1939). Principles of human knowledge. In E. A. Burt (Ed.), *The English philosophers from Bacon to Mill*. (Pp. 509-579.) New York: Random House.
- Boswell, J. (1791/2007). *Life of Samuel Johnson*. New York: Penguin.
- Burgos, J. E. (2016). Antidualism and antimentalism in radical behaviorism. *Behavior and Philosophy*, 43, 1-37.
- Catania, A. C. (1973). The concept of the operant in the analysis of behavior. *Behaviorism*, 1, 103-115.
- Chatterji, M. M. (1960). *The Bhagavad Gitā*. New York: Causeway Books.
- Ghiselin, M. T. (1997). *Metaphysics and the origin of species*. Albany, NY: State University of New York Press.
- Glenn, S. S., Ellis, J., & Greenspoon, J. (1992). On the revolutionary nature of the operant as a unit of behavioral selection. *American Psychologist*, 47, 1329-1336.
- Huxley, A. (1945). *The perennial philosophy*. New York: Harper & Row.
- James, W. (1974). *Pragmatism and four essays from The meaning of truth*. New York: New American Library. (Reprinting of editions of 1907 and 1909.)
- Jenkins, H. M., & Moore, B. R. (1973). The form of the auto-shaped response with food or water reinforcers. *Journal of the Experimental Analysis of Behavior*, 20, 163-181.
- Kuhn, T. S. (1970). *The structure of scientific revolutions* (2nd ed.). Chicago: University of Chicago Press.

## ONTOLOGY FOR BEHAVIOR ANALYSIS

- Mach, E. (1960). *The science of mechanics: A critical and historical account of its development*. Lasalle, IL: Open Court. (Translation of the ninth German edition, 1933.)
- Mayr, E. (1970). *Populations, species, and evolution*. Cambridge, MA: Harvard University Press.
- Meher Baba. (1973). *God speaks*, 2<sup>nd</sup> ed. New York: Dodd, Mead.
- Rorty, R. (1979). *Philosophy and the mirror of nature*. Princeton University Press.
- Rorty, R. (1989). Contingency, irony, and solidarity. Cambridge University Press.
- Ryle, G. (1949). *The concept of mind*. Chicago: University of Chicago Press.
- Schoenfeld, W. N., & Cole, B. K. (1972). *Stimulus schedules: The t- $\tau$  systems*. New York: Harper & Row.
- Schoneberger, T. (2016). Behavioral pragmatism: Making a place for reality and truth. *The Behavior Analyst*, 39, 219-242.
- Schrödinger, E. (1961/1983). *My view of the world*. Woodbridge, CT: Ox Bow Press.
- Skinner, B. F. (1938). *Behavior of organisms*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1945). The operational analysis of psychological terms. *Psychological Review*, 52, 270-277.
- Smith, R. F. (1974). Topography of the food-reinforced key peck and the source of 30-millisecond interresponse times. *Journal of the Experimental Analysis of Behavior*, 21, 541-551.
- Suzuki, D. T. (1964). *An introduction to Zen Buddhism*. New York: Grove Press.
- Wallace, A. F. C. (1965). Driving to work. In M. E. Spiro (Ed.), *Context and meaning in cultural anthropology* (pp. 277-292). New York: Free Press.
- Wormersley, D. (2007). Introduction to Boswell's Life of Samuel Johnson. New York: Penguin.

### Author's Note

Address Correspondence to:  
William M. Baum  
611 Mason Street, Apt. 504  
San Francisco, CA 94108  
Email: [billybaum94108@gmail.com](mailto:billybaum94108@gmail.com)