

What Counts as Behavior? The Molar Multiscale View

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Because the definition of behavior changes as our understanding of behavior changes, giving a final definition is impossible. One can, however, rule out some possibilities and propose some others based on what we currently know. Behavior is not simply movement, but must be defined by its function. Also, our understanding of behavior must agree with evolutionary theory. I suggest 4 basic principles: (a) only whole organisms behave; (b) behavior is purposive; (c) behavior takes time; and (d) behavior is choice. Saying that parts of an organism behave is nonsense, and, moreover, evolutionary theory explains the existence of organisms mainly through their adaptive behavior. Behavior is purposive in that behavior is shaped by its consequences, through an organism's lifetime or through interactions with the environment across many generations of natural selection. Behavior takes time in that behavior is interaction with the environment that cannot take place at a moment. Moreover, at a moment in time, one cannot definitely identify the function of behavior. Identification of an activity requires a span of time. Behavior is choice in the sense that a suitable span of time always includes time spent in more than 1 activity. Activities include parts that are themselves activities on a smaller time scale and compete for time. Thus, behavior constitutes time allocation. An accounting problem arises whenever any behavior is attributed to multiple consequences. In the molar multiscale view, this raises the question of whether 2 activities can occur at the same time. The question remains open.

Key words: evolution, function, molar view, multiscale view, purpose, time allocation

We need to recognize at the outset that any attempt to define *behavior* is bound to be invalidated in time. The more we know about behavior, the more our definition changes. In a real sense, the whole aim of a science of behavior is to define behavior. That said, I still want to explore what I think can be said about behavior at this time.

First, we understand enough to rule out some possibilities. Behavior is not simply movement through space or otherwise. As Skinner (1969) pointed out, one might flip a light switch to be able to see or to warn a prowler; even though the motion of flipping the switch is the same, the two are different actions, because the consequences are different. Skinner argued that specifying an operant activity requires both *topography* and *function*, that is, something about the physical description of the activity and something

about what useful the activity does (e.g., flipping the switch and warning the prowler). A person running along the street might be fleeing the police or running in a race. A rat pressing a lever and eating differs from a rat pressing a lever and drinking. The difference between a pigeon pecking a key and eating and a pigeon pecking a key and drinking has been documented (Jenkins & Moore, 1973).

Somehow the consequences of the activity must be included in the label. The examples above drive home the point that an activity must be defined in a large enough temporal context to include its controlling consequences, whether immediate or remote. Thus, “getting light,” “warning a prowler,” “running a race,” and “fleeing the police” are all legitimate labels of activities, whereas “running” and “flipping the light switch” would not be legitimate.

Guerin (1997) went further than Skinner (1969), arguing that behavior consists of “getting things done.” For example,

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I can put a nail in the wall with a hammer or a rock, although once I have a hammer

available, it is more effective to use than a rock. ... I could also get someone else to put the nail in the wall. (p. 234)

His point resembles Skinner's, but what Guerin would consider "topography" may be broader. Putting a nail in the wall with a hammer differs empirically from putting a nail in the wall with a rock, but they are both instances of "putting a nail in the wall." Even in getting another person to do it by speaking to that person, that verbal behavior (although empirically different from doing it yourself) is an instance of "putting a nail in the wall." The topography differs from instance to instance, but the function remains the same; they both get the same job done.

Both Skinner (1969) and Guerin (1997) implicitly assume that even though function or outcome defines an activity, agency plays no part. Behavioral events are natural events, to be understood in relation to other natural events, such as rain, sunrise, gravity, and fire (Baum, 1995b). In commonsense folk psychology, behavior is done by an agent, and behavioral events or actions seem to be a different category, separate from other events for this reason. "Rat 3 pressed the lever" seems to be an unproblematic statement, but only if we recognize that the rat did nothing. Lever pressing occurred, and it is assigned to Rat 3. The same applies to all behavior, including utterances. If I say, "Behavioral events are natural events," that utterance is assigned to me, but I did nothing. The organism, we may say, is only the medium of the behavior, as water may be the medium of a chemical reaction. This aspect of behavior analysis puts it at odds with common sense and most philosophy of mind.

Second, our understanding of behavior should be based on, or at least compatible with, evolutionary theory. Behavior analysts, with a few exceptions (Baum, 2005; Catania, 1992; Hall, 1983), have ignored evolution,

with the untoward result that behavior analysis lies outside the mainstream of contemporary biology; few biologists seem even to be aware of its existence let alone its relevance.

The reason that behavior analysis lies outside the mainstream is that it grew within psychology and has a tortured relation with psychology. Typically, behavior analysts are found in psychology departments, and the department treats behavior analysis as an area within psychology. Behavior analysis, however, is not a part of psychology, as long as *psychology* is defined as the science of mind. Being a science of behavior, behavior analysis is really an alternative to psychology, as psychology is usually conceived.

The unfortunate emphasis on discrete responses as the units of behavior derives from psychology. Associationists of the 19th century and reflexologists of the early 20th century thought of ideas and responses as discrete units primarily connected by their contiguity in time. The emphasis on discrete events and contiguity has handicapped behavior analysis. The time is overdue to leave behind Pavlov and to embrace Darwin instead.

DEFINITIONS OF BEHAVIOR

Many definitions of *behavior* have been offered, some more carefully thought through than others. A recent survey by behavioral biologists Levittis, Lidicker, and Freund (2009) noted disagreement and inconsistencies about what counts as behavior. They sent out a questionnaire to other biologists, with a list of statements about behavior and a list of ambiguous examples, and analyzed 174 responses. (Note that no behavior analysts were invited.) The respondents largely agreed on four points: (a) A developmental change is usually not behavior; (b) behavior is always influenced by the internal processes of the individual; (c) behavior is something whole individuals do, not

organs or parts that make up individuals; (d) behavior is always in response to a stimulus or set of stimuli, but the stimulus can be either internal or external (Levitis et al., p. 106).

On the basis of their data and their own thinking, Levitis et al. (2009) suggested the following definition: “Behavior is the internally coordinated responses (actions or inactions) of whole living organisms (individuals or groups) to internal and/or external stimuli, excluding responses more easily understood as developmental changes” (p. 108). They comment that developmental processes are excluded because “they are generally much slower than phenomena considered as behaviour, and are primarily based on ontogenetic programmes specified by the individual’s genetic makeup” (p. 108). They try to exclude “strictly physiological activities” with the guideline, “If the response can most simply and usefully be explained by cellular-, tissue-, or organ-level processes alone, it would fall outside our definition of behaviour” (p. 108).

Even this carefully thought-out definition remains ambiguous around its edges. For example, Levitis et al. (2009) exclude a person’s sweating in response to high blood temperature, but apparently include a dog’s salivating just before feeding time. First, they leave open how one should define *action*, a crucial term, because action differs little from behavior. Second, the inclusion of inaction as behavior seems odd, because a live organism is always behaving somehow. Third, the term *internal stimuli* is fraught with possibilities for mentalism.

Four Basic Principles

I will try to give a tentative answer to “What counts as behavior?” by starting with four principles, which I will explain in order: (a) Only whole living organisms behave; (b) behavior is purposive; (c) behavior takes time; and (d) behavior is choice.

Only whole living organisms behave. The grounds for limiting behavior to whole organisms may be considered either logical or theoretical. The logical basis is discussed at length by Bennett and Hacker (2003). For example,

Psychological predicates are predicable only of a whole animal, not of its parts. No conventions have been laid down to determine what is to be meant by the ascription of such predicates to a part of an animal, in particular to its brain. So the application of such predicates to the brain ... transgresses the bounds of sense. The resultant assertions are not false, for to say that something is false, we must have some idea of what it would be for it to be true—in this case, we should have to know what it would be for the brain to think, reason, see and hear, etc., and to have found out that as a matter of fact the brain does not do so. But we have no such idea, as these assertions are not false. Rather, the sentences in question lack sense. (p. 78)

What Bennett and Hacker say in this quote about “psychological predicates” applies to behavior in general, not just thinking, reasoning, seeing, and hearing. To speak of the behavior of inanimate things or parts of living things (anything other than whole living organisms) “transgresses the bounds of sense.”

For our present purposes, the more important reason for ascribing behavior only to whole organisms resides in evolutionary theory. If we ask, “Why is there any such thing as behavior?” the answer has to be, “Because there are organisms.” Without organisms, there would be no behavior. Indeed organisms exist largely because they behave.

Why is the earth populated by animals, plants, protozoa, bacteria, and so on? Why didn’t the first DNA remain in the primordial soup in which it originated? In a word, the answer given by evolutionary theory is selection. If some variants in the genome made for cells, groups of cells, tissues, and so on, and those variants reproduced more than their competitors that had other effects, then the advantageous variants in-

creased in numbers and the competitors decreased. Dawkins (1989a, 1989b) pointed out that a replicated entity, to be successful, must possess (a) fidelity, (b) longevity, and (c) fecundity. The more faithfully it is copied, the longer it lasts to be copied, and the more it is copied, the more successful is the replicated entity, which, in this context, is a genetic variant. If DNA housed in an organism (what Dawkins calls a “survival machine”) is copied more frequently than DNA not in an organism, then the variant DNA that makes for an organism will be selected by outreproducing the other. This is the reason that organisms exist, and why organisms tend to be optimally adapted to their environments (Dawkins, 1989a; Krebs & Davies, 1993).

And how would organisms confer their advantages? Most likely they would improve longevity and fecundity, partly by surviving long enough and partly by reproducing often enough. Although physiological mechanisms contribute to these advantages, the most important contributor, particularly in more complex organisms, is the ability to interact with the environment in ways that advance reproductive success, that is, behavior. Organisms produce offspring, sexually and asexually, obtain resources necessary for reproduction, avoid predators and parasites, and interact socially. Such activities are what we mean by behavior, and they occur only in whole organisms.

Behavior is purposive. When we say behavior is purposive, we mean that behavior is shaped by its consequences (Baum, 2005). The consequences that matter are the ones that affect reproductive success. A sponge filtering nutrients out of the water, a fish eating insects in a stream, a bird hunting worms, a lion hunting zebras, and a human working to “put bread on the table” are all obtaining resources and may do it well or poorly. If they do it poorly, their

chances of reproductive success decrease. The extent to which their behavior may change in response to variations in obtaining resources varies. The sponge’s behavior may be able to change little, the fish may be able to move to a better part of the stream, the bird may move to a better patch, the lion may improve its skills, and the human may improve his or her income by working more hours or changing jobs.

The more proximate consequences that ultimately affect reproductive success are the events we recognize by various labels: reinforcers, punishers, unconditional stimuli, aversive stimuli, releasers, inducers, and so on (Baum, 2012). I call these *phylogenetically important events* (PIEs; Baum, 2005, 2012). They are important in the sense that they affect reproductive success, and they are effective due to natural selection. Types of individuals whose behavior responded insufficiently to presence of potential mates, food, predators, harsh climate, and so on, produced fewer offspring and tended to disappear from the population. The effectiveness of such events arises because they usually enhance or reduce reproductive success in the long run. Food and other resources may make production of offspring possible, but they don’t guarantee success. The relation between those more proximate events and ultimate reproductive success is imperfect, but it is sufficient for selection to render PIEs effective.

Relative success and failure occur over time. Any particular individual may perish without leaving offspring, but if those of its kind produce more offspring on the average and in the long run, then the frequency of that type increases in the population. Any particular action may fail or succeed immediately, but if that action belongs to a type that usually produces superior results in the long run, then it increases as part of the overall behavior of the organism at the

expense of its competitors. In the early days of automobiles, people passing a broken down car in a horse and buggy would shout, "Get a horse!" but in the long run, driving proved to be the better option. Similar considerations apply to fitness-reducing activities. The immediate effects of smoking crack cocaine may seem beneficial, but in the long run the deleterious effects become clear.

Thus, the reason behavior should be considered purposive derives from evolutionary theory. If organisms exist largely to interact with the environment, that is, to affect the environment in ways that improve reproductive success, then it follows that, if behavior varies in its success, the more successful variants will be selected. The selection may occur in two ways, both of which are dependent on genes: either across generations, by phylogeny, or within generations, by ontogenetic mechanisms, which encompass development and environmental feedback.

Distinguishing changes in behavior due to development from changes in behavior due to interaction with the environment may be difficult (Levitis et al., 2009). Indeed, attempting to distinguish may be futile, because in a larger context both may be seen as examples of phenotypic plasticity that enhances individuals' responses to a variable environment. For example, the caterpillars of a moth may have entirely different camouflage depending on variation in chemicals in their diet when they begin to feed (Alcock, 1998). This is interaction of a sort, but not the kind of phenotypic plasticity we think of when we eat a food that makes us sick and avoid that food afterwards.

Yet the caterpillar's phenotype is just as purposive as our tendency to avoid poisons. We may suppose that the means for either type of phenotypic plasticity are selected by their effects on reproductive success in the long run. We do not say that the

caterpillar's camouflage changes "on purpose," whereas we might say that we avoid poison on purpose, but the principle involved is the same.

Behavior takes time. Behavior extends through time; it cannot occur at a moment. Two sorts of reason support the nonexistence of momentary behavior: ontological and epistemological.

We have already seen the ontological reason. If behavior consists of interaction with the environment, behavior cannot occur at a moment, because interaction with the environment can only occur over time; the term *momentary interaction* would be an oxymoron. A rat's lever pressing affects the programming equipment, which may deliver food. Even if every operation of the lever produces food, the pressing and eating take time. For intermittent schedules and for more naturalistic examples, such as courtship and mating, the exclusion of moments is still more obvious. Even if we say that at a particular moment courtship was occurring, still the courtship necessarily took time beyond any moment.

The epistemological reason that behavior cannot occur at a moment is that the only way we know what activity was occurring at a particular moment is to have observed the activity over a span of time including that moment. We may say that an individual was courting a mate at that moment, but how do we know? We know only by observing an episode of courtship that took an interval of time that included that moment.

A photograph captures a moment. If I show you a photograph of a person sitting with an open book in front of him, what can we say about his behavior? He is not running or jumping rope, to be sure, but many possibilities exist: He may be reading, pretending to read, daydreaming, looking for something in the book, and so on. Our uncertainty is maximal at the moment, but if we can

observe him over a span of time, we become more certain about whether he was reading or doing something else. For example, he may continue for some time and then comment on what an interesting book it is and why. Similarly, if I show you a photograph of a rat with its paw on a lever, you cannot be sure the rat is pressing the lever; you have to observe over a span of time to see if the rat approached the lever directly and the lever actually operated. Even then, you would need a still larger time span to rule out the possibility that the rat was exploring the chamber and merely blundered onto the lever.

A principle analogous to the Heisenberg uncertainty principle applies (Baum, 1997). In Heisenberg's principle, one can pin down the position of an electron only at the expense of certainty about its momentum, and we can be certain about its momentum only if we relinquish certainty about its position. At a moment, the position of an electron could be compatible with any of a large number of momenta, but if we measure the electron's momentum, we lose track of its position. At a moment, we can see what an activity looks like (its topography) but we are maximally uncertain as to the job it gets done (its function). If we observe over a span of time, we gain certainty about the function of the activity, but we lose certainty about its topography or structure. A momentary act (flipping a switch) could be compatible with a large number of functions (reading, warning a burglar, etc.). At a moment, we see how the person sits holding the book, but over time we see him move around, flip pages, scratch his head, look up from the page, and so on; we become more certain that he is reading, but less certain about exactly what that looks like. With a complicated activity like courtship, the moment may tell almost nothing (a man and a woman appear together), but our certainty

TABLE 1

Comparison of possible measurements or observations at a moment and over a time span for behavior and for an electron

At a moment	Over a time span
Structure	Function
Topography	Effect
Appearance	Purpose
Looks like	Job getting done
Position	Momentum

about what the activity is grows as we see more of it over time.

Table 1 may help to summarize the epistemological reason that behavior can be known with certainty only as it is extended through time. At a moment, we can be relatively certain about the structure, topography, or appearance of an activity and the position of an electron, but we have little certainty about the function, effect, or purpose of an activity and the momentum of an electron. Over a span of time, however, we become certain of the function, effect, or purpose of an activity and the momentum of an electron, but we lose certainty about the structure, topography, or appearance of an activity and the position of an electron.

The discrete response, useful though it may have been in the early history of behavior analysis, was a myth. It resulted from the ease of attaching a switch to a lever to automate the recording of a rat's interaction with the lever (Skinner, 1961). If, instead of counting switch operations, one records the amount of time the switch is operated, the two measures prove to be equivalent (Baum, 1976). Rats' interactions with the lever include activities other than pressing it with a paw; activities like licking it, biting it, and jiggling it with both paws, all of which operate the switch (Baum, 1976).

All behavior takes time, but some activities take more time than others. As reading a book takes more time

than reading a chapter in it, or playing a baseball game takes longer than playing an inning, so loving someone takes longer than kissing someone, believing the death penalty to be wrong takes longer than averring that belief, and a pigeon's pecking on concurrent schedules takes longer than pecking at the left or right response key. In all of these examples, the relation of the briefer activity to the more extended activity is the relation of part to whole (Baum, 1995a, 2002). Kissing someone is part of loving someone, averring that the death penalty to be wrong is a part of believing the death penalty to be wrong, and pecking at the left key is a part of pecking on a concurrent schedule. The part-whole relation becomes clearest when we think of people observing someone's behavior. Part of what makes us say that John loves Sally is that we see him kissing her, part of what makes us say that Jane believes the death penalty is wrong is that she says so, and part of what makes us say that a pigeon has a preference for the left key is that the pigeon pecks at the left key. Every activity is composed of parts that are themselves activities (Baum, 1995a, 1997, 2002, 2004). Wallace (1965) devoted a whole article to cataloging the parts of "driving to work."

When one activity takes longer to occur than another activity, they differ in scale (Baum, 2002; Himeline, 1984, 2001). Kissing occurs on a shorter time scale than loving, and averring a belief occurs on a shorter time scale than believing. In general, any activity occurs on a longer time scale than any of its parts. Depending on one's purposes or the practicalities of measurement, one may analyze behavior on a longer or shorter time scale. Indeed, much may be learned by analyzing the same behavior on multiple time scales (Aparicio & Baum, 2009; Baum, 2010; Baum & Davison, 2004). For that reason, the *molar* view of behavior is also aptly

called the *multiscale* view (Himeline, 1984, 2001).

Behavior is choice. "Life is full of choices." This commonplace saying means that, regardless of what you are doing, you could be doing something else. No situation in the world is so constrained that it precludes multiple possible alternative activities. Herrnstein's (1970) application of the matching relation to performance on single schedules was based on the insight that even in highly constrained laboratory conditions, animals bring their own alternative activities with them (e.g., exploring, grooming, resting, etc.). Creating a situation without multiple activities is impossible.

Viewed over a sufficient time span, most situations include not only possible alternative activities but also actual alternative activities. A priest sworn to celibacy may never marry, but most of us alternate between celibacy and intimate relations.¹ Viewed on too short a scale (e.g., seconds), a pigeon's performance on a concurrent schedule will appear to be exclusive pecking at one alternative, but on a longer scale (e.g., hours), the performance will include switching and pecking at both alternatives. When responding occurs in bouts separated by pauses, response rate within bouts is relatively constant, but on a longer scale (e.g., an hour), response rate varies according to the time spent in other activities (i.e., pausing; Gilbert, 1958; Nevin & Baum, 1980; Shull, Gaynor, & Grimes, 2001). Viewed in a day, John's loving Sally may seem doubtful, because he is critical of her and unforgiving, but viewed over a year, all doubts may vanish, because his loving activities are so much more frequent than his unloving activities.

¹If we accept reincarnation and include multiple lifetimes, then even the priest will marry in some lifetimes and not others (Meher Baba, 1973). He will not be a priest in every lifetime.

Because being alive is behaving, every organism is always behaving. Even sleeping, being in a coma, or hibernating may be considered behavior, but these are marginal cases; in general, to be alive is to be active. For every organism, a 24-hr day includes 24 hr of behavior. If we record a creature's behavior over the course of an hour, a month, or a year, we record an hour, a month, or a year of behavior.

Because an activity takes a certain amount of time, its parts together take up that time, and therefore the parts must compete for portions of that time. Alternative activities that are parts of the same more extended activity may be said to be on the same scale. Because total time is finite, activities on the same scale compete. If Jane's time spent working increases, other activities, such as sleeping or interacting with her children, must decrease. If a pigeon's time pecking on the left key increases, its time pecking on the right key or in background activities must decrease (Davison, 1993).

The relative times spent in a set of competing activities is what I have called *time allocation* (e.g., Baum, 2010; Baum & Rachlin, 1969). It measures choice. One may say that the pattern of an individual's choice is the allocation of time among the competing activities. For example, the pattern of Jane's time allocation among work, family, friends, and other activities over the course of a month may be said to be her choice. Such a usage runs counter to most everyday uses of *choice*, such as in "making a choice." The difference resides in the use of the indefinite article *a* or the pluralizing of *choice* to *choices*. Seen as a discrete event, a choice means a switch. "I chose or decided to take the job at Company A rather than Company B" means that a switch occurred from a mix of present activities to a new mix including working at Company A, although a switch to a third mix

including working at Company B seemed possible.

Competition among parts of an activity is crucial to shaping or optimizing the activity. A girl studying ballet receives approval and applause when her dancing is good. She may get some parts to applause level before others. She spends time repeating a form again and again. The variants in her executing the form compete and, one hopes, the better variants increase in frequency, thereby decreasing the frequency of the poorer ones. Optimizing and the acquisition of skills are not absolutely separable. Effective time management at work may be thought of as a skill, but it is also directly time allocation.

Moving from an unhealthy lifestyle to a healthy lifestyle entails reallocation of time among daily, weekly, or monthly activities and may entail time allocation to new activities too. If someone is spending relatively little time exercising and sleeping, a lot of time eating a poor diet and little time eating a good diet, relatively little time enjoying good health, and a lot of time suffering poor health (being ill, feeling bad), then moving to a healthy lifestyle will mean increasing the time exercising and sleeping, decreasing time eating junk food, increasing time eating fruits and vegetables, increasing time enjoying good health, and decreasing time suffering poor health. In this way, one would move from a whole pattern of time allocation to a different, presumably better, pattern.

THE ACCOUNTING PROBLEM

An unsolved problem that plagues any view of behavior, not just the molar multiscale view, is figuring out how to assign behavior to its consequences. Suppose a rat's lever pressing sometimes produces food and sometimes water. Which part of the lever pressing should be considered controlled by food, and which part controlled by water? The question

cannot be answered entirely by empirical study. However one varies the food and the water, the rat is pressing just one lever. Let us say that two distinct types of presses appear (perhaps longer and shorter in duration), and the longer ones increase in rate as water increases in rate, whereas the shorter ones increase in rate as the food increases in rate. We might then guess that the rat's pressing alternated between two activities, pressing for water and pressing for food. The supposition seems plausible, but the reasoning is circular.

In the molar multiscale paradigm, the accounting problem takes a slightly different form, because the question becomes, "Can two activities occur at the same time?" People often seem to "multitask," that is, to work on two different projects (e.g., to talk while driving or to prepare a meal while listening to the radio). If the two activities literally occur at the same time, then the simplicity of time allocation comes into question, because then perhaps the amount of behavior that fills an hour or a day may sometimes be more and sometimes less.

Perhaps the amount of behavior in a given time period can vary, but other possibilities suggest themselves, some of which have empirical support. The simplest solution is the one suggested by the hypothetical rat's lever pressing above: that, even though the activities seem to be simultaneous, their performance actually consists of rapid alternation between the two. Working on one project might occur briefly, followed by a brief bout of working on the other project, back and forth. Driving and talking appear often to occur simultaneously, but when a tricky situation comes up, talking ceases and driving becomes exclusive for a while. Talking on a cellphone while driving increases the likelihood of an accident fourfold. This line of reasoning seems to point to selective attention; one would have to suppose that some of the time driving and

talking were on automatic. Some thinking about divided attention and task interference supports such an interpretation (Atkinson & Birch, 1970). Evidence of interference between dual tasks abounds (Pashler, 1994), but with practice, time sharing between tasks may become perfect (Schumacher et al., 2001).

Possibly, too, simultaneity is confined only to speaking and listening. Most examples in which activities appear to occur simultaneously include as one of the activities either speaking or listening. When conversing with someone in my car, I seem to listen while driving and speak while driving. Perhaps speaking and listening are unlike other activities this way; perhaps they involve not only different effectors but also different neural equipment. Such decoupling would be supported by counterexamples: Swimming and speaking are incompatible because they both involve breathing.

Another possibility is that the apparent simultaneity of activities doesn't matter, because all behavior serves only one ultimate purpose: reproductive success. If maintaining relationships and eating are both important this way, and I have lunch with a friend, does it matter if I am eating and relating at the same time? Perhaps, while we are having lunch together, speaking, listening, and eating rapidly alternate; I might stop eating if I have to listen carefully, and I usually refrain from speaking when I have food in my mouth. But does that matter? Different consequences result in the short term from the conversing and the eating, but in the long term they are both important (on average and in the long run) to reproductive success. Seen this way, "having lunch with a friend" might be a legitimate label for a single activity, and that activity takes up the time it takes up. This solution raises other questions, however. How are conversing and eating related to each other and to "having lunch with

a friend”? If they were parts, they ought to compete, but we are supposing here that they don’t compete. How do eating alone and conversing without eating relate to “having lunch with a friend”? Is “having lunch with a friend” a variant of “having lunch” or of “conversing with a friend”? Perhaps these questions will prove to be unimportant, because they raise no practical problems, but at present I don’t know.

CONCLUSION

For behavior analysis to escape the limitations of its origins in psychology and move into the mainstream of contemporary science, behavior analysts need to reframe their concepts in the light of evolutionary theory. Otherwise, only applied behavior analysis will be taken seriously by the intellectual community, and that only because it works in modifying behavior, not because it offers much understanding of ourselves in relation to the universe. Behavior analysis, more than psychology, has the potential to elucidate human nature and the nature of behaving beings in general, but it cannot realize that potential if behavior analysts cling to the associationistic framework that psychology inherited in the 20th century, with its emphasis on discrete ideas and responses and temporal contiguity. The molar multiscale paradigm offers a path to reformulating behavior-analytic concepts to make them more plausible and more compatible with evolutionary theory. It doesn’t offer a final answer to “What counts as behavior?” but it points the way to a greater understanding of what counts as behavior.

REFERENCES

Alcock, J. (1998). *Animal behavior: An evolutionary approach* (6th ed.). Sunderland, MA: Sinauer.

Aparicio, C. F., & Baum, W. M. (2009). Dynamics of choice: Relative rate and amount affect local preference at three

different time scales. *Journal of the Experimental Analysis of Behavior*, 91, 293–317.

Atkinson, J. W., & Birch, D. (1970). *The dynamics of action*. New York, NY: Wiley.

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. (1995a). Introduction to molar behavior analysis. *Mexican Journal of Behavior Analysis*, 21, 7–25.

Baum, W. M. (1995b). Radical behaviorism and the concept of agency. *Behaviorology*, 3, 93–106.

Baum, W. M. (1997). The trouble with time. In L. J. Hayes & P. M. Ghezzi (Eds.), *Investigations in behavioral epistemology* (pp. 47–59). Reno, NV: Context Press.

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. (2004). Molar and molecular views of choice. *Behavioural Processes*, 66, 349–359.

Baum, W. M. (2005). *Understanding behaviorism: Behavior, culture, and evolution* (2nd ed.). Malden, MA: Blackwell.

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., & Davison, M. (2004). Choice in a variable environment: Visit patterns in the dynamics of choice. *Journal of the Experimental Analysis of Behavior*, 81, 85–127.

Baum, W. M., & Rachlin, H. C. (1969). Choice as time allocation. *Journal of the Experimental Analysis of Behavior*, 12, 861–874.

Bennett, M. R., & Hacker, P. M. S. (2003). *Philosophical foundations of neuroscience*. Oxford, UK: Blackwell.

Catania, A. C. (1992). *Learning* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.

Davison, M. (1993). On the dynamics of behavior allocation between simultaneously and successively available reinforcer sources. *Behavioural Processes*, 29, 49–64.

Dawkins, R. (1989a). *The extended phenotype: The long reach of the gene*. Oxford, UK: Oxford University Press.

Dawkins, R. (1989b). *The selfish gene* (new ed.). Oxford, UK: Oxford University Press.

Gilbert, T. F. (1958). Fundamental dimensional properties of the operant. *Psychological Review*, 65, 272–285.

Guerin, B. (1997). How things get done: Socially, non-socially; with words, without words. In L. J. Hayes & P. M. Ghezzi (Eds.), *Investigations in behavioral epistemology* (pp. 219–235). Reno, NV: Context Press.

- Hall, G. (1983). *Behaviour: An introduction to psychology as a biological science*. London, UK: Academic Press.
- Herrnstein, R. J. (1970). On the law of effect. *Journal of the Experimental Analysis of Behavior*, 13, 243–266.
- Hineline, P. N. (1984). Aversive control: A separate domain? *Journal of the Experimental Analysis of Behavior*, 42, 495–509.
- Hineline, P. N. (2001). Beyond the molar–molecular distinction: We need multiscaled analyses. *Journal of the Experimental Analysis of Behavior*, 75, 342–347.
- 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.
- Krebs, J. R., & Davies, N. B. (1993). *An introduction to behavioural ecology* (3rd ed.). Oxford, UK: Blackwell Scientific.
- Levitis, D. A., Lidicker, W. Z., Jr., & Freund, G. (2009). Behavioural biologists do not agree on what constitutes behaviour. *Animal Behaviour*, 78, 103–110.
- Meher Baba. (1973). *God speaks* (2nd ed.). New York, NY: Dodd, Mead.
- Nevin, J. A., & Baum, W. M. (1980). Feedback functions for variable-interval reinforcement. *Journal of the Experimental Analysis of Behavior*, 34, 207–217.
- Pashler, H. (1994). Dual-task interference in simple tasks: Data and theory. *Psychological Bulletin*, 116, 220–244.
- Schumacher, E. H., Seymour, T. L., Glass, J. M., Fencsik, D. E., Lauber, E. J., Kieras, D. E., & Meyer, D. E. (2001). Virtually perfect time sharing in dual-task performance: Uncorking the central cognitive bottleneck. *Psychological Science*, 12, 101–108.
- Shull, R. L., Gaynor, S. T., & Grimes, J. A. (2001). Response rate viewed as engagement bouts: Effects of relative reinforcement and schedule type. *Journal of the Experimental Analysis of Behavior*, 75, 247–274.
- Skinner, B. F. (1961). A case history in scientific method. In *Cumulative record* (enlarged ed., pp. 76–100). New York, NY: Appleton-Century-Crofts.
- Skinner, B. F. (1969). Operant behavior. In *Contingencies of reinforcement: A theoretical analysis* (pp. 105–132). New York, NY: Appleton-Century-Crofts.
- Wallace, A. F. C. (1965). Driving to work. In M. E. Spiro (Ed.), *Context and meaning in cultural anthropology* (pp. 277–292). New York, NY: Free Press.