

On defining behavior: Some notes

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ABSTRACT: This paper attempts to suggest some conceptual preliminaries to a definition of behavior. I begin by distinguishing some different senses of the notion, with emphasis upon that of behavior as the occurrence of an organism's action or reaction. Subsequently, I provide a brief survey of different types of definition, and try to pick out those among them that can in principle be suitable for the notion of behavior taken in that sense as well as for theoretical concerns. Then, I offer a list of desiderata for a definition thereof framed in any of the types picked out. Finally, I illustrate how the distinctions here established can help the detection of conceptual difficulties in definitions of behavior (in that sense of the concept) found in the literature and, more generally, how they can help determine what behavior consists of and what it does not.

Key words: behavior, definition of behavior, definitions, teleology, conceptual analysis.

There are many definitions of behavior in the scientific and philosophical literature, and scant consensus (apparently even among the practitioners within particular behavior research programs) as to how to define it (see, e.g., Bergner, 2011; Levitis, Lidicker Jr., & Freund, 2009). To give some examples, Tinbergen (1951) defines behavior as “the total of movements made by the intact animal” (p. 2); several authors (e.g., Davis, 1966, p. 2, p. 4-5; Lehner, 1996, p. 8; Pierce & Cheney, 2004, p. 1) define it as “anything an organism does” (or “what an organism does”); several others define it in terms of any activity in which an organism engages (e.g., Donahoe & Palmer, 1994, p. 3; S. T. Watson & Brown, 2011, p. 221); still others (e.g., Jessor, 1958, p. 172-173; Maturana, 1995, p. 151-152), in terms of a relation between the organism and its environment; Dretske (1988, p. 1ss) defines it as a process of an inner entity bringing about a bodily movement or environmental outcome; and so on. (For other definitions of behavior, see, e.g., Bergner, 2011, p. 148-149; Hebb, 1958, p. 2; Holt, 1915, p. 371-372; Hornsby, 2006; Levitis et al., 2009, p. 108; Marken, 1982; Miller & Dollard, 1942, p. 59; Millikan, 1993, p. 135ss; Moore, 2008, p. 66-68; Watson, 1919, p. 14). Among these and other definitions of behavior, which ones, if any, turn out to be reasonable enough? This boils down to the question: what is an accurate set of conditions or criteria that determine what counts as behavior? (As will become clearer later on, I am not assuming that they must be individually necessary and jointly sufficient conditions. Nor am I assuming that there can be only one possible definition of behavior that is plausible enough).

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I take this question to be of considerable importance. First of all, it has a philosophical interest in its own right. *Behavior* is one of those concepts that have a central place in our ordinary interpretative practices and of which, nevertheless, there is usually only a tacit mastery (in contrast to an explicit understanding of its features). Besides, arguably, it has relevant connections to several categories that are of central concern in some areas of philosophy (e.g., connections to ordinary mental concepts, studied in philosophy of mind). So I believe that the availability of one or more accurate definitions thereof may help us avoid some conceptual confusions in these areas and make progress in the analyses of such categories. Similarly, the question is of importance to the empirical sciences. It merits attention as far as we want prevent certain conceptual confusions in scientific practices (see, e.g., Todorov, 2012) and to achieve greater integration among distinct behavior research programs (see Bergner, 2011; Levitis et al., 2009). (I do not assume that such integration depends on there being overall acceptance of a unique definition by different behavior research programs. However, I believe that once we have a larger agreement as to what makes and what does not make sense to say that behavior is, our chances of sharing more common ground increase.)

This article attempts to suggest some conceptual preliminaries to a definition of behavior, thus setting the stage for answering our question. The article is structured in the following way. (1) It starts off by distinguishing some different senses of the concept, to wit: (i) behavior as the occurrence of an organism's action or reaction; (ii) behavior as a class or pattern; (iii) behavior as group behavior; and (iv) behavior as a change or movement of an object. Emphasis is given upon (i), which is overall the intended *definiendum* (i.e., the thing being defined) in the definitions here at stake. I especially try to call attention to certain teleological features thereof. Subsequently, (2) I provide a brief survey of different types of definition, so as to pick out those among them that can in principle be suitable for the *definiendum*, as well as for the context here relevant. I submit that *behavior*, taken in the sense of (i), is not a family-resemblance concept if we assume that family-resemblance concepts require what Cooper (1972) calls sufficiency definitions; though also that a certain kind of disjunctive definition should not be ruled out, at least from the outset, as possibly adequate for it. Then, (3) I devise a list of desiderata for a definition thereof framed in any of the types picked out. I suggest, *inter alia*, that the minimal nuances associated with the typical uses of the concept should be taken into account in such a definition. Finally, (4) I illustrate how the distinctions established throughout this paper may help guide the detection of conceptual difficulties in definitions of behavior found in the literature and, more generally, determine what behavior consists of and what it does not¹.

¹ The study I develop in this paper tries to call attention to some conceptual dimensions of the enterprise of defining behavior. One can privilege other stances to the treatment of the issue of defining behavior, but I believe a pure conceptual analysis has contributions to the issue as well.

Some Different Senses of the Notion of Behavior

First of all, *behavior* is said in many ways. It has at least four different meanings. In the following, I attempt to make explicit some of their minimal nuances, with emphasis upon that which constitutes the *definiendum* here at issue.

(i) *Behavior as the occurrence of an organism's action or reaction.* This is often called *response* in behavioral studies. It is something an organism emits, or performs, at particular moments and places². This sense of the concept encompasses not only things an organism performs in a relatively spontaneous way, such as the raising of a hand to ask a question or a cat opening a door in order to get out of a box; but also things an organism performs in a relatively automatized and rigid way, such as an instance of a rabbit's eye blink reflex³. Thus, behavior, taken in this sense, contrasts with states of the organism (e.g., moods and beliefs) (see, e.g., Kenny, 2003/1963, p. 120ss; White, 1968, p. 1, p. 3), since states are not the sort of thing an organism *performs*, but rather things the organism is *in*. It also contrasts with the bringing about of incidental happenings, such as the typical cases in which an organism brings about shadows, air displacement, attraction of the attention of a predator, and so forth (see, e.g., Wright, 1976). Furthermore, it contrasts with things that happen to the organism entirely because of forces exerted by the immediate external environment; for example, having an arm raised by someone else, the typical cases of falling down, stumbling, drowning, and so on (see, e.g., Allen & Bekoff, 1997, p. 42; Dretske, 1988, p. 1-2; S. T. Watson & Brown, 2011). (I say 'the typical cases' of them because, of course, there are cases of casting shadows, stumbles, slippages and so forth made on purpose instead of accidentally. A caveat: in this paper, unless otherwise stated, the sense of the term 'purpose' which matters is that of 'function', therefore not necessarily implying that something that has a purpose is deliberate. 'Function', by its time, is used here in a relatively neutral way).

One might think that instances of largely innate behavior patterns (such as unconditioned reflexes and modal action patterns) and of other relatively automatized behavior patterns (in particular, conditioned reflexes) – instances of what may be called reactions as opposed to actions – are not really things the organism performs, but rather things that simply happen to it by entire force of immediate external objects or events. However, that is not the case, since they owe

2 I do not necessarily mean to imply that other systems, such as robots, cannot display behavior in the sense of (i). However, the typical cases of behavior in this sense of the concept are of phenomena displayed by organisms. In this paper, I leave open whether or not these other systems exhibit phenomena with the same properties here being pointed out.

3 My use of the concept of action, in this paper, is quite neutral as to the exact nature of actions. I am not assuming at all, for example, the standard causal view of actions, which, roughly speaking, depicts them in terms of bodily movements caused by propositional attitudes taken as entities located inside the body.

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their existence partially to past interactive (ontogenetic or phylogenetic) histories with the environment. If, for example, a rabbit contracted its right forefoot given the presence of, say, a certain sound, and if this was the occurrence of a conditioned reflex, the phenomenon was not the result merely of that environmental impingement. A rabbit that has not passed by an interactive history of association between the sound (in this case, an eliciting conditioned stimulus) and a relevant unconditioned stimulus (e.g., administration of a mild electric shock) would not, everything being equal, tend to contract its right forefoot given the presence of that sound. Hence, despite the differences between instances of actions and of reactions – the probability of occurrence of the latter, differently from the former, being relatively very high given the presence of an associated stimulus –, they all have salient commonalities.

(ii) *Behavior as a class or pattern.* Behavior meaning (i) is an occurrence, that is, an instance of a class or pattern, or at least an entity that, together with entities having one or more similar properties, makes up a class or pattern over time (For an example of the latter view, see Baum [2004]). A behavior *qua* occurrence happens in a specific time and place⁴; for example, the raising of a hand to ask a question, at 3:39 pm of October 3rd 2012 at such and such auditorium. A behavior *qua* class or pattern, on the other hand, is something in principle realizable at different times and places, or at least is made up of things that happen at different times and places, but without itself having such momentariness and localization (cf., e.g., Lee, 1983). So, the raising of a hand to ask a question, *qua* behavior class or pattern, can in principle exist in a person's behavioral repertoire (which can be understood molarly) since his or her childhood and endure throughout his or her whole life. It is the sort of thing of which it makes sense to say that can occur today, tomorrow, and so on, in several contexts. Thus, when we speak about a particular behavior in the sense of (i), we indirectly make reference to a behavior class or pattern, but they are somehow different things. The contrast I am calling attention to can be understood, roughly, in terms of the contrast between episodic and dispositional character in Ryle's (1949) sense.

(iii) *Group behavior.* Not only individual organisms behave, but also groups of them; for instance, worker bees build honeycombs in groups, lions often forage in groups, people sometimes stage demonstrations, scientists often carry out experiments in groups, and so on. Group behavior, like the behavior of the individual organism, can be said either as an occurrence or as a class or pattern. When it is an occurrence, it displays similar features to behavior in the sense of (i). It is something performed at particular moments and places. Besides, it does not make sense to say, for example, that the bringing about of incidental outcomes by the group (such as noises and shadows upon the ground by lions hunting together) counts as a behavior of the group, except in another sense of the concept (as we

⁴ I do not necessarily mean discrete time and space. Of course, the more molar a behavior is, the more time it takes to be performed and, usually, the more space it requires.

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will see in a moment). Nonetheless, occurrences of group behavior display some special features. In particular, they are realized by two or more organisms in cooperation. In other words, they comprise behaviors in the sense of (i) being emitted by at least two organisms coordinately, so that the intended outcome is an effect of such coordination, as opposed to being an effect of the members taken isolated (cf., e.g., Pacherie, 2011, p. 174-175; Searle, 2002/1990, p. 94-95).

(iv) *Behavior as any change or movement of an object*⁵. The concept taken in this sense is typically employed when we ascribe behavior to inanimate objects, such as stones, particles, fluids, projectiles, and the like. For example, an arrow flying in the air is a behavior in this sense. We can say, *inter alia*, that the arrow behaved at a given average velocity. It is coherent to ascribe behavior with this meaning to organisms too. However, such use is quite different from that related to the first sense of the concept. Behavior as the occurrence of an organism's action or reaction, as pointed out above, *contrasts* with things that correspond to the bringing about of mere incidental consequences, as well as with things that happen to the organism entirely because of immediate external forces. So, for example, when a sunflower turns towards the sun, its behavior (in the first sense of the concept) has to do with achievement of sunlight. Its casting shadow upon an ant that happens to be close is no part of what it is performing. Besides, this ascription of behavior implies that movements of the sunflower are not being caused simply by the wind or the like. Hence, the sunflower casting shadow upon the ant and moving toward the sun merely because of a breath of wind count as behaviors only in another, very different sense. In other words, behavior meaning (i) has teleological features – it is something goal-directed, functional or purposive⁶ –, whereas behavior as simple change or movement of an object does not (cf. Millikan, 1993; Taylor, 1964; Wright, 1976)⁷. Therefore, change or movement is not a sufficient (though, of course, it is a necessary) condition for there being action or reaction. Behavior in the sense of (i) comprises change or movement of an object (cf. Rosenblueth, Wiener, & Bigelow, 1943), but it supervenes upon other properties as well.

Main Types of Definition Suitable for the *Definiendum* and the Context at Issue

5 Movement is here understood as a kind of change; namely, as change of position in space.

6 Again, purposes do not need to be interpreted as deliberate things or as causal entities existing inside the body. Purposes can be modeled alternatively. See, e.g., O. Moore & Lewis (1953), Rachlin (1994), Taylor (1964) and Wright (1976).

7 Tolman (1932, p. 4ss) is well-known for stressing the purposive character of behavior, but I think he did not fully grasp the meaning of this feature. He thinks that conceiving of behavior as “anything as organism does” is enough to preserve this feature, but, as I argue later on, that is actually not the case.

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In this section, I attempt to distinguish the main types of definition that can in principle be suitable for the concept taken in the sense of (i) (from now on, 'behavior' or its plural form for short, unless otherwise stated) and for the context here relevant. I make a brief and non-exhaustive survey of types of definitions trying to remain largely neutral regarding divergences existing among the available classifications (for some of them, see, e.g., Copi, 1982, p. 138ss; Gorskij, 1970; Pap, 1964; Robinson, 1954).

The following are three main premises I shall suppose in the arguments of this section:

- (A) The definition(s) we are looking for has (or have) the general function of stating the nature of behavior, or the conditions that determine what is to count as behavior. (Some authors may not be committed to the idea that there is such a thing as the nature of behavior, but all the definitions here in focus are supposed, either explicitly or implicitly, to state conditions or criteria that determine what is to count as behavior.)
- (B) *Behavior* is an ordinary notion, of which we already possess a tacit mastery (i.e., it is not a new concept at all), and we are not looking for an entire new meaning for it, but rather presupposing its basic, minimal nuances.
- (C) There are some relevant (in special, teleological) features shared in common by the items denoted by the concept in question. (This particular claim follows from the previous section.)

Definitions can be classified according to at least three aspects: (1) the purposes they can fulfill; (2) their underlying technique; and (3) their focus (as explained below). In respect to the first aspect (cf. Copi, 1982, p. 138ss), definitions can be subdivided into:

- (1.1) Stipulative definitions, which can serve either to prescribe a meaning to a new term (e.g., as when we establish a meaning to a connective in a system of logic), or to prescribe a new meaning to a term which is already in use (e.g., as the notion of reinforcement is defined in behavior analysis);
- (1.2) Lexical definitions, which serve to increase a person's vocabulary (e.g., as when we teach the meaning of a term to a foreign speaker), or to eliminate ambiguity, that is, to prevent confusion between distinct meanings of a term (e.g., as dictionary entries often attempt to do);
- (1.3) Precising definitions, whose function is to reduce the vagueness (i.e., the imprecise boundaries) of a vague term (e.g., to establish that the notion of personhood is applicable to any human being once it

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- becomes sentient)⁸;
- (1.4) Theoretical definitions, whose function is roughly to express the nature of, or model the items to which the *definiendum* applies, typically within a framework of other definitions (e.g., to define knowledge as true justified belief; water as a substance composed of molecule of two atoms of hydrogen and one of oxygen) ; and
 - (1.5) Persuasive definitions, whose function is to engender a positive or negative attitude as regards items denoted by the *definiendum* (examples of them are easily found in political discourses).

Among the types of definition as to (1), theoretical definitions are the most important for the *definiendum* and the context at issue, given the features pointed out in the premises (A) and (B). Definitions of this type contrast with persuasive definitions, which are inconsistent with (A). They contrast also with *purely* stipulative, lexical and precisising definitions, although not necessarily with those that are *partially* of one or more of these types. Purely lexical definitions are not adequate for the context here relevant, given (B) and the fact that it is clear enough that the *definiendum* is not the notion of behavior in a sense other than (i)⁹. Theoretical definitions may fulfill the purposes of lexical definitions, but the definitions of behavior we are looking for are not primarily devised for them. Similarly, precisising definitions are not of interest here except to the extent that a theoretical definition may partially involve the goal of allowing us to cope better with borderline cases of the *definiendum*. Finally, purely stipulative definitions are also excluded, given (B). However, a theoretical definition that eventually is simultaneously a precisising definition involves (*ipso facto*) partial stipulation of meaning.

The definitions according to (2) (i.e, to the technique employed) include:

- (2.1) Extensional definitions, whose technique is to indicate the items of the extension of the *definiendum* (e.g., to define a given relation by enumerating the ordered pairs that satisfy the relation; this is a case of enumerative extensional definition, in particular);
- (2.2) Synonymous definitions give the meaning of the *definiendum* by replacing it with a (supposed) synonymous term (e.g., to say that 'remembering' means 'recalling');
- (2.3) Definitions by genus and specific difference have as technique the identification of conditions that are individually necessary and jointly

⁸ The examples given in this section as illustrations of different types of definitions do not necessarily intend to be correct definitions.

⁹ Most of the definitions of behavior I have in mind have only (i) as *definiendum*. One exception is Levitis et al.'s (2009, p. 108), who explicitly attempt to encompass both (i) and (iii) at the same time in their definition.

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sufficient for the ascription of the *definiendum* (e.g., as in the definition of knowledge as true justified belief).

- (2.4) Disjunctive definitions specify (inclusive) disjunctions of two or more conditions that are *sufficient* for the application of the *definiendum* (e.g., to define artwork as anything that is an intended product of an activity and has positive aesthetic properties, *or* anything that is an intended product of an activity, expresses emotion and whose interpretation requires imaginative activity, *or* etc.). It is typically motivated by the idea that the *definiendum* does not admit of a definition in terms of individually necessary and jointly sufficient conditions. The items that satisfy the *definiendum* are thereby understood as *not* having a set of common individual properties that render all of them items of its extension (see Kingsbury & McKeown-Green, 2009; Longworth & Scarantino, 2010). Among disjunctive definitions, two subtypes stand out, viz.: sufficiency definitions (in Cooper's 1972 terminology), which give no room for a relevant necessary condition in the *definiens* (i.e., in the set of conditions that make up the definition), not even implicitly (e.g., as an adequate definition of game should be, according to a famous suggestion by Wittgenstein, 1953, §65ss); and (2.4.2) those that give room for some necessary condition in the *definiens*, by not excluding the possibility of there being a condition shared by all the disjuncts, so that the necessary condition can figure, although implicitly, in the *definiens* (as in the example given above concerning the notion of artwork);
- (2.5) Operational definitions specify operations – that is, test and measurement procedures – which, once performed, establish whether or not a given object, process or event falls under the *definiendum* (e.g., to define acid is anything x such that, if x comes into contact with litmus paper, then the color of the litmus turns to red) (see e.g., Gorskij, 1970, p. 323ss; Ribes-Iñesta, 2003); and
- (2.6) Recursive definitions have a technique which comprises the following three steps in sequence: first, identification of initial members of the set being defined; second, specification of a condition stating that certain entities are members of the set if they have certain specified relations to members previously identified; and, third, assertion that nothing else belongs to the set, unless its inclusion is mandated by the previous steps (e.g., the definition of natural number as: 1 is a natural number; if n is a natural number, then $n + 1$ is a natural number; nothing else is a natural number) (see, e.g., Cook, 2009, p. 242).

Concerning (2), I submit that, given (A)-(C), the types of definitions possibly suitable for the concept along with the context here relevant are definitions by genus and specific difference, operational definitions, as well as the subcategory of

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disjunctive definitions that gives room for some implicit necessary condition (i.e., respectively, 2.3, 2.5 and 2.4.2). Extensional and synonymous definitions are here excluded, because they do not help us enhance our understanding of what behavior as such is. As far as that is a concern, it is of no help simply to state (e.g.) that behavior means conduct (a case of synonymous definition), or to enumerate some supposed instances of behavior (a case of enumerative extensional definition). Recursive definitions, by their time, seem to be adequate for *behavior* taken in the sense of (ii) (the usual definition of operant class, e.g., may be interpreted as a definition of this type), but apparently not for the specific *definiendum* at issue; for one can hardly imagine the second step of a recursive definition for it. Anyway, the desiderata suggested in the next section apply to an eventual recursive definition thereof as well.

Among the disjunctive definitions, sufficiency definitions (i.e., 2.4.1) are not to be expected for the *definiendum*, given (C). As a corollary, if we take family-resemblance concepts to be those that require sufficiency definitions, then *behavior* – taken in sense of (i) – is not a concept of this sort. On the other hand, the other subcategory of disjunctive definition should not be ruled out from the outset because, even though the *definiendum* has some core nuances which should in a way or another be expressed as one or more necessary conditions in the *definiens*, it is possible that these conditions are not *jointly sufficient* for an item to count as behavior.

Finally, definitions are also classified as (3.1) nominal and (3.2) real. The former have as focus a concept or predicate (e.g., to say that the *concept* of artwork means such and such sort of thing), whereas the latter define a class of entities at the ontic, extra-linguistic level (e.g., to say that *an artwork* is such and such sort of thing). In many cases, they are interchangeable (for more on this, see Gorskij, 1970, p. 315ss; Robinson, 1954, p. 16ss. Both nominal and real definitions are consistent with (A)-(C) as long as they are purported to specify conditions that determine what is to count as behavior.

Some Desiderata for a Definition of Behavior

A desideratum for a definition is not absolute (or invariable), but rather relative to the purposes and, more generally, to the types of definition one has in mind. The desiderata suggested in the following are relative to the types of definition picked out in the previous section. Here they are:

- (a) *The definition should not be too large*, i.e., the *definiens* should not encompass more things than what the *definiendum* denotes;
- (b) *It should not be too narrow*, i.e., the *definiens* should not encompass less things than what the *definiendum* denotes;
- (c) *It should not be circular*, i.e., the *definiendum* should not appear, even

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- implicitly, in the *definiens*, except in case the circularity is not vicious¹⁰;
- (d) *It should be informative*, i.e., the *definiens* should enhance our intuitive understanding of the *definiendum*;
 - (e) *It should, in general, grasp the basic nuances of the concept*, i.e., the *definiens* should be consistent with the rules underlying the typical uses of the *definiendum*, unless there is some good justification for making a conceptual revision.

Here are some examples. According to (a), a definition of behavior (like Tinbergen's, 1951, p. 211) simply in terms of movements made by an organism turns out to be implausible; for it ends up including in the extension of the *definiendum* entities that count as behavior in the sense of (iv) and not in the sense of (i), such as the event of an animal falling down or turning around the sun together with the Earth. According to (b), a definition of behavior (like Marken's, 1982) implying that it is something necessarily deliberate leaves much to be desired too; for it leaves out from the extension of the concept relatively automatized behaviors, such as instances of (unconditioned or conditioned) reflex patterns. According to (c), a definition of behavior (like, it seems, Dermer's, 2011) in which the concept of action appears in the *definiens*, either meaning a subclass of the concept in the sense of (i) or being a synonym of behavior in the sense of (i), is inadequate, for then it turns out to be viciously circular. Desideratum (d), by its time, helps us prevent the definition from not fulfilling the role of a theoretical definition. Defining behavior (as some authors do) as any activity in which an organism engages is little informative, thus not serving as a theoretical definition, although it may serve as a lexical one.

Finally, desideratum (e) is proposed as an answer to a question that naturally comes up at this moment, viz.: On what grounds are we to put into practice these criteria, in particular (a) and (b)? I submit that the basic, minimal nuances of the notion (which can be disclosed by means of conceptual analysis or, as Ryle would put it, conceptual geography) are a touchstone for the application of these desiderata; they are a fundamental set of parameters for a definition of behavior. (Hence, if I am right, there are some important parameters for a definition of behavior that are quite independent of the commitments of particular behavior research programs). When we say, for example, that a definition of behavior implying that an organism accidentally stumbling counts as behavior is too large, we are detecting an inconsistency with basic nuances of the concept; to wit, an inconsistency with its teleological nuances. Similarly, when we say that a definition of behavior that leaves out instances of (what we scientifically know as)

10 The circularity is not vicious, according to some authors, when it ends up being rather informative; see Burgess (2008).

11 Tinbergen (1951) defines behavior as “the total of movements made by the intact animal” (p. 2).

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modal action patterns from its extension is too narrow, we mean that its basic nuances are actually satisfied by such entities.

Desideratum (e), notwithstanding, does not rule out the legitimacy of conceptual revisions. One or more nuances of the notion of behavior can in principle be legitimately challenged. However, not every conceptual revision is justified, on pain of losing sight of the *definiendum*. So, for example, if someone implies that an organism accidentally falling down or happening to call attention of a predator is behavior, he/she is rejecting the specificities of the *definiendum* and, thereby, in practice, equating it with the concept of behavior in the sense of (iv). In line with ordinary language philosophers such as Ryle and Wittgenstein, I believe that authors often (of course, not always) make conceptual revisions owing to neglect of basic nuances of the notion, instead of out of a real willingness to substantially modify it.

The list of desiderata here suggested does not aim to be complete. A definition of behavior for empirical science, in particular, should probably be somewhat economical or succinct, so as to avoid encumbering usage of the concept, as Levitis et al. (2009, p. 104) point out. Those more interested in a definition of behavior for empirical science may want to add a desideratum of economy or succinctness to the list. However, I submit that such desideratum should not supersede (a)-(e) if we are to have a sufficiently accurate definition.

Problems with some Definitions of Behavior: Further Illustrations

Here are some further illustrations of how we can apply the desiderata previously suggested. Let us first consider Watson's (1919) definition of behavior. According to this definition, behavior is "the total of striped and unstriped muscular and glandular changes which follow upon a given stimulus" (p. 14). By stimulus, Watson means an environmental change that "calls out" the behavior, be it a change in the external environment, or a change provided by one's own muscles and gland secretions. Complex (or molar) behaviors and stimuli are taken by him as sets of behaviors and stimuli understood in these (molecular) terms (cf. Watson, 1919, p. 9-14). This definition of behavior is limited to things that have muscles and glands, thereby apparently implying that (*inter alia*) plants do not behave. However, plants do behave. Well-known examples of plant behavior include those of the sunflower turning toward the sun (in order to achieve sunlight), of the *Mimosa pudica* closing its leaves given stimuli such as touch and blowing, and of the carnivorous plant catching an insect. They are not behaviors in the sense of (iv), since they exhibit teleological features of the typical animal behavior. Hence, Watson's definition fails to fulfill desideratum (b). This problem can be easily overcome by taking into account other sorts of structures in the *definiens*. Nevertheless, this definition runs into a more serious problem, since it is not able to preserve the teleological features of behavior, thereby encompassing in

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the extension of the *definiendum* items that count as behavior only in the sense of (iv). This is so because the total of muscular and glandular changes that follow a given stimulus can be individuated in many ways. For instance, it can correspond to the muscular and glandular changes comprised when an organism falls down, stumbles or slips. Therefore, this definition fails to satisfy desideratum (a) as well.

Similarly, the definition of behavior as “anything an organism does” (or “what the organism does”), which enjoys large popularity, fails to fulfill desideratum (a). It is able to rule out from the extension of the *definiendum* things like the fall of a wisp of hair caused by the friction of the comb and the suffering of a flesh wound, since these are not things an organisms does. Nonetheless, it encompasses in the extension of the *definiendum* some other things that happen to the organism simply because of forces exerted by the immediate external environment, in addition to things that consist in the bringing about of incidental happenings. As Millikan (1993, p.144) points out, active verbs often designate things an organism does. To cast shadows, to attract the attention of a predator, to slip, to trip, and so forth, are all things an organism does. Nonetheless, such happenings typically do not consist of behaviors. It does not make sense to say, for example, of a stumble, that it is something emitted, or performed by the organism, unless it is not an accidental stumble (as when an actor does it in the context of a play). In other words, in the typical cases, they do not have functions or purposes.

According to a particular version of this definition (e.g., Chance, 2003, p. 37, p. 448; Pierce & Cheney, 2004, p. 1; Watson, 1930, p. 6-7) (Watson later came to embrace it; see Watson [1930, p. 6-7]). whatever an organism does which can be measured counts as behavior, no matter whether overtly or “under the skin”. This formulation is motivated by the intent to encompass in the extension of the *definiendum* a variety of psychological or mental phenomena, sometimes including phenomena that have the character of states, such as moods and expectations. However, as I have already remarked, behaviors contrast with states, for states are not the sort of thing an organism emits or performs. (Moreover, it does not make sense even to say that states are things an organism does!) It may be true that certain mental phenomena are behaviors (in the relevant sense here), but it is conceptually confused to say that those which have the character of states are behaviors (even though perhaps they may be otherwise *behavioral*; e.g., fractions of behavior patterns). So, this version of the definition transgresses the rules underlying the notion with heavier damage to desideratum (a).

Marken (1982) suggests that “behavior can be objectively defined as controlled results of an organism's action” (p. 650). By controlled result, Marken means “a result which is kept matching a reference inside the organism for the state of that result. The internal reference corresponds to an intention and is the cause of the intended result” (p. 648). That is, according to Marken, behavior consists in any result caused by an intention, by its time taken (mentalistically) as something inherently inner (and non-behavioral) with the relevant causal powers. The author has as explicit motivation for this definition to prevent accidental side

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effects from counting as behaviors. Indeed, this definition is able to rule out from the extension of the concept things like an animal's incidental production of air displacement while foraging. It proves to be immune, besides, to the other counterexamples concerning (a) that beset the definitions examined above. Things that happen simply by force of immediate external objects or events (e.g., an accidental slippage) are not caused by (the conceived) inner intentions. Nonetheless, these definitions run into other problems. One of these problems, as previously pointed out, is that of excluding from the extension of the concept relatively automatized behaviors (such as instances of reflex patterns). It is also fraught with the problem of considering behaviors as *results* of actions, when actually, first of all, *behaviors* bring about results; and, secondly, the results of behaviors are often – even when intended – not behaviors. For example, the result of carefully brushing the teeth is typically getting the teeth clean, but to have the teeth clean is no behavior. Thus, Marken's definition ends up fulfilling neither (a) nor (b). Moreover, since it includes the term 'action' in the *definiens*, it may be accused of circularity as well; that is, of contravening (c)¹².

One of the most recent attempts at defining behavior was made by Bergner (2011). His proposal runs as follows:

Any behavior [...] is a complex state of affairs that includes as component states of affairs a specific person's acting to accomplish purposes W1...Wn, acting on discriminations K1...Kn, exercising competencies K-H1...K-Hn, engaging in physical processes or performances P1...Pn, achieving outcomes A1...An, expressing personal characteristics PC1...PCn, and engaging in actions having significances S1...Sn. (Bergner, 2011, p. 148-149)

This definition is restricted to persons, thereby failing to fulfill (b). The problem can be somewhat overcome by replacing the word 'persons' by 'organisms' in the *definiens*, but even so this definition turns out not to fulfill (b), because it rules out from the extension of the *definiendum* at least some instances of innate behavior patterns and of other relatively automatized behavior patterns. It implies that every behavior expresses one or more personal characteristics, but instances of such behavior patterns, at least very often, do not express personal characteristics. One could hardly find the expression of a personal characteristic, for example, in a bee dance indicating direction and distance of nectar. Bergner acknowledges that he leaves out from the extension of the *definiendum* this sort of phenomena, under

12 To my view, some of Marken's assumptions about the concept of intention are beset with conceptual difficulties too. I do not think mentalism (even if couched in physicalistic terms) to be the more conceptually coherent and promising way of modeling intentions. However, for the purposes of this article, I can remain largely neutral as regards this particular issue.

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the explicit assumption that they are simply bodily movements (see Bergner, 2011, p. 151); but, as I argued before, this is mistaken.

I would like to give one last illustration to conclude this section. Some authors (e.g., Jessor, 1958, p. 172-173; Maturana, 1995, p. 151-152) conceive of behavior as a *relation* between an organism and the environment. In this definition, behavior is not understood as an *element* of a relation between an organism and the environment, but rather as the relation itself. However, this goes straight against (e), for, as pointed out by Todorov (2012), it does not make sense to say that an organism emits or performs a relation. Behavior supervenes on environmental properties to which the organism bears some relations, since it is not reducible to changes and movements of the organism; but this does not mean that behavior itself is a relation.

Concluding Remarks

Summing up, *behavior* is said in at least four ways: (i) as the occurrence of an organism's action or reaction; (ii) as a class or pattern; (iii) as group behavior; and (iv) as a change or movement of an object. The *definiendum* of the definitions focused upon in this work is (with few exceptions) only behavior in the sense of (i). The types of definition that can in principle be suitable for this *definiendum* and for the context here relevant are chiefly, as to the purposes, theoretical definitions; and, as to the underlying technique, definitions by genus and specific difference, operational definitions and disjunctive definitions consistent with the inclusion of some necessary condition in the *definiens*. A good definition thereof couched in any of these types should: (a) not be too large; (b) not be too narrow; (c) not be circular; (d) be informative; and, in general, (e) grasp the basic, minimal nuances of the *definiendum*. Desideratum (e) is a touchstone for the application of the other desiderata, especially (a) and (b). This list of desiderata, as I illustrated, if properly applied, help us detect conceptual difficulties in definitions of behavior found in the literature. It can be helpful also for avoiding conceptual confusions when we employ the notion in philosophical and scientific practices.

Finally, although it was not a goal of this paper to support any particular definition of behavior, I would like to mention that Millikan's (1993, p. 137-138)¹³ and Moore's (2008, p. 66-68)¹⁴ are two definitions I find highly plausible once

13 According to Millikan (1993), "A behavior is [...] at least the following:

1. It is an external change or activity exhibited by an organism or external part of an organism.
2. It has a function in the biological sense.
3. This function is or would be normally fulfilled via mediation of the environment or via resulting alterations in the organism's relation to the environment." (p. 137)

14 According to Moore, behavior is an event in which a functional relation exists (in the sense of a probabilistic correlation we can establish) between the environment and one or more neural or muscular systems of the organism responsible for movement or posture; and

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slightly modified. Moore's can, roughly speaking, be interpreted (*mutatis mutandis*) as a way of putting the core of Millikan's teleofunctional proposal in operational terms. I think Millikan's fails to fulfill (b) by requiring for something to count as behavior that it is an *external* change exhibited by an organism or part of an organism. Like Moore (and Skinner), I think it is plausible to say that *certain* phenomena not apparent in the outside body are behaviors; for example, an increase of heartbeat given the presence of predator as an instance of a conditioned reflex. Differently from Moore, I would not exclude organisms that do not have neural or muscular systems (such as plants, I suppose), because this makes the definition too restrictive. Besides, since behavior, in this view, has fundamental historical etiologies, certain counterexamples arise, arguably, if we get too much attached to operational strictures. I believe Moore's definition is more plausible when couched in more ontological terms so as to more accurately take into account distant historical process. However, I leave the task of arguing more thoroughly in favor of such suggestions to another work (see Lazzeri, forthcoming).

References

- Allen, C., & Bekoff, M. (1997). *Species of mind: The philosophy and biology of cognitive ethology*. Cambridge, MA: MIT Press.
- Artiga, M. (2010). Learning and selection processes. *Theoria*, 25, 197-208.
- Baum, W. M. (2004). Molar and molecular views of choice. *Behavioural Processes*, 66, 349-359.
- Bergner, R. M. (2011). What is behavior? And so what? *New Ideas in Psychology*, 29, 147-155.
- Burgess, J. A. (2008). When is circularity in definitions benign? *Philosophical Quarterly*, 58, 214-233. DOI:10.1111/j.1467-9213.2007.522.x
- Chance, P. (2003). *Learning & behavior* (5th ed.). Belmont, CA: Wadsworth.
- Cook, R. T. (2009). *A dictionary of philosophical logic*. Edinburgh: Edinburgh University Press.
- Cooper, D. E. (1972). Definitions and 'clusters'. *Mind, new series*, 81, 495-503. DOI: 10.1093/mind/LXXXI.324.495
- Copi, I. M. (1982). *Introduction to logic* (6th ed.). New York, NY: Macmillan.
- Davis, D. E. (1966). *Integral animal behavior*. New York, NY: Macmillan.
- Dermer, M. L. (2011). A definition of behavior. Retrieved August 9, 2013, from <http://www.behavior.org/resource.php?id=609>
- Donahoe, J. W., & Palmer, D. C. (1994). *Learning and complex behavior*. Boston, MA: Allyn and Bacon.
- Dretske, F. (1988). *Explaining behavior: Reasons in a world of causes*. Cambridge, MA: MIT Press.

this functional relation, roughly, must conform to rules that define operant, reflex or other know behavior patterns.

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- Gorskij, D. P. (1970). On the types of definitions and their importance for science. In P. V. Tavanec (Ed.), *Problems of the logic of scientific knowledge* (pp. 312-375). (T. J. Blakeley, trans.). Dordrecht: Reidel. DOI: 10.1007/978-94-010-3393-0_8
- Hebb, D. O. (1958). *Textbook of psychology*. Philadelphia, PA: W. B. Saunders.
- Holt, E. B. (1915). Response and cognition I: The specific-response relation. *Journal of Philosophy, Psychology and Scientific Method*, 12, 365-373. DOI: 10.2307/2013669
- Hornsby, J. (2006). Physicalist thinking and conceptions of behaviour. In J. Bermúdez (Ed.), *Philosophy of psychology: Contemporary readings* (pp. 31-47). London: Routledge. (Work originally published in 1986.)
- Jessor, R. (1958). The problem of reductionism in psychology. *Psychological Review*, 65, 170-178. DOI: 10.1037/h0045385
- Kenny, A. (2003). *Action, emotion and will*. London: Routledge. (Work originally published in 1963.)
- Kingsbury, J., & McKeown-Green, J. (2009). Definitions: Does disjunction mean dysfunction? *Journal of Philosophy*, 106, 568-585.
- Lazzeri, F. (Forthcoming). Um estudo sobre definições de comportamento [A study upon definitions of behavior]. *Revista Brasileira de Análise do Comportamento*.
- Lee, V. L. (1983). Behavior as a constituent of conduct. *Behaviorism*, 11, 199-224.
- Lehner, P. N. (1996). *Handbook of ethological methods* (2nd ed.). Cambridge, UK: Cambridge University Press.
- Levitis, D. A., Lidicker Jr., W. Z., & Freund, G. (2009). Behavioural biologists do not agree on what constitutes behaviour. *Animal Behaviour*, 78, 103-110. DOI: 10.1016/j.anbehav.2009.03.018
- Longworth, F., & Scarantino, A. (2010). The disjunctive theory of art: The cluster account reformulated. *British Journal of Aesthetics*, 50, 151-167. DOI: 10.1093/aesthj/ayq001
- Marken, R. (1982). Intentional and accidental behavior: A control theory analysis. *Psychological Reports*, 50, 647-650. DOI:10.2466/pr0.1982.50.2.647
- Maturana, H. R. (1995). Biology of self-consciousness. In G. Tratteur (Ed.). *Consciousness: Distinction and reflection* (pp. 145-175). Naples: Bibliopolis.
- Miller, N. E., & Dollard, J. (1941). *Social learning and imitation*. New Haven, CT: Yale University Press.
- Millikan, R. G. (1984). *Language, thought, and other biological categories: New foundations for realism*. Cambridge, MA: MIT Press.
- Millikan, R. G. (1993). *White queen psychology and other essays for Alice*. Cambridge, MA: MIT Press.
- Moore, J. (2008). *Conceptual foundations of radical behaviorism*. Cornwall-on-Hudson, NY: Sloan.
- Moore, O. K., & Lewis, D. J. (1953). Purpose and learning theory. *Psychological Review*, 60, 149-156. DOI: 10.1037/h0061820
- Pacherie, E. (2011). Framing joint action. *Review of Philosophy and Psychology*, 2, 173-192. DOI: 10.1007/s13164-011-0052-5
- Pap, A. (1964). Theory of definition. *Philosophy of Science*, 31, 49-54.
- Pierce, W. D., & Cheney, C. D. (2004). *Behavior analysis and learning* (3rd ed.). Mahwah, NJ: Lawrence Erlbaum.
- Rachlin, H. (1994). *Behavior and mind: The roots of modern psychology*. New York, NY: Oxford University Press.

ON DEFINING BEHAVIOR

- Ribes-Iñesta, E. (2003). What is defined in operational definitions? The case of operant psychology. *Behavior and Philosophy*, 31, 111-126.
- Robinson, R. (1954). *Definitions*. Oxford, UK: Oxford University Press.
- Rosenblueth, A., Wiener, N., & Bigelow, J. (1943). Behavior, purpose and teleology. *Philosophy of Science*, 10, 18-24.
- Ryle, G. (1949). *The concept of mind*. London: Hutchinson.
- Searle, J. R. (2002). Collective intentions and actions. In *Consciousness and language* (pp. 90-105). Cambridge, UK: Cambridge University Press. (Work originally published in 1990.)
- Taylor, C. (1964). *The explanation of behaviour*. London: Routledge.
- Tinbergen, N. (1951). *The study of instinct*. Oxford, UK: Oxford University Press.
- Todorov, J. C. (2012). Sobre uma definição de comportamento [On a definition of behavior]. *Perspectivas em Análise do Comportamento*, 3, 32-37.
- Tolman, E. C. (1932). *Purposive behavior in animals and men*. New York, NY: Appleton-Century-Crofts.
- Watson, J. B. (1919). *Psychology: From the standpoint of a behaviorist*. Philadelphia, PA: Lippincott.
- Watson, J. B. (1930). *Behaviorism* (2nd ed.). Chicago, IL: University of Chicago Press.
- Watson, S. T., & Brown, D. (2011). Behavior. In S. Goldstein, S. & J. A. Naglieri (Eds.), *Encyclopedia of child behavior and development: Volume 1, A-D* (pp. 221-222). New York, NY: Springer. DOI:10.1007/978-0-387-79061-9_304
- White, A. R. (1968). Introduction. In A. White (Ed.), *The philosophy of action* (pp. 1-18). Oxford, UK: Oxford University Press.
- Wittgenstein, L. (1953). *Philosophical investigations*. (G. E. Anscombe, trans.). Oxford: Blackwell.
- Wright, L. (1976). *Teleological explanations: An etiological analysis of goals and functions*. Berkeley, CA: University of California Press.

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