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# PSYCHOLOGICAL VS. BIOLOGICAL EXPLANATIONS OF BEHAVIOR

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ABSTRACT: Causal explanations of behavior must distinguish two kinds of cause. There are (what I call) triggering causes, the events or conditions that come before the effect and are followed regularly by the effect, and (what I call) structuring causes, events that cause a triggering cause to produce its effect. Moving the mouse is the triggering cause of cursor movement; hardware and programming conditions are the structuring causes of cursor movement. I use this distinction to show how representational facts (how an animal represents the world) can be structuring causes of behavior even though biological (i.e., electrical–chemical) events trigger the behavior.
*Key words*: triggering cause, structuring cause, biological explanations, psychological explanations, behavior

Causal explanations are context-sensitive. What we pick out as the cause of E depends on our interests, our purposes, and our prior knowledge. Almost any event, E, depends on a great variety of other events in such a way that makes any one of them eligible, given the right context, for selection as the cause in a causal explanation of E. The multiplicity of conditions on which the effect depends has both a synchronic and a diachronic dimension. At any given time there are a variety of synchronous events and conditions without which E would not occur. Any one of these can be singled out as the cause of E. Furthermore, because any cause of a cause of E is also a cause of E, a more remote cause, there is a diachronic aspect to this multiple dependency. Temporal chaining of causes gives rise to proximal as opposed to ultimate (or more distal) causes, and, once again, any one of these events can be featured in a causal explanation of E. There is no privileged vantage point, no such thing as *the* causal explanation of E.

I think these facts are reasonably well understood. When the event being explained is a piece of animal behavior, no one thinks that there is only one correct causal explanation of it. Functional explanations, the sort we get from evolutionary biology, are surely consistent with the more proximal explanations of neurophysiology. Both can be correct, and both reveal part of the truth. They do not compete with but complement one another. They merely deal with different sets of causally relevant factors.

Nonetheless, there seems to be a widespread feeling that such harmonious coexistence is not possible between neurophysiological and commonsense psychological explanations of behavior (in speaking of "psychological"

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explanations of behavior I will always mean *commonsense* psychological explanations of behavior—those that appeal to what the subject believes, desires, fears, expects, etc). Here, it seems, there is a tension, perhaps even a conflict arising from the fact that both explanations appear to describe proximal events and conditions. Beliefs, desires, expectations, and fears—the sorts of factors mentioned in commonsense psychological explanations of behavior—operate alongside and are concurrent with the neuronal activities featured in biological explanations of bodily movement and change. Hence, the apparent competition between these explanations cannot be relieved, as it is in other cases, by appealing to a proximal-remote difference. Nor is it much help to think of psychological explanations as describing causally relevant conditions that are synchronous with the biological processes controlling muscles and glands but that can be ignored in neuroscientific explanations of behavior, because if the psychological factors are causally relevant they cannot be ignored with impunity. If they are relevant, *qua* psychological, then the explanatory resources of physics, chemistry, and biology must be essentially incomplete. Dualists may welcome that conclusion, but it is not likely to gain much favor in the naturalistic framework of contemporary cognitive science.

My purpose in this paper is to describe a difference between two types of causes—triggering and structuring causes—that I think is useful for understanding the difference between biological and psychological explanations of behavior. The difference might, at first, appear to be an instance of the familiar distinction between a proximal and a remote cause, merely a difference in the temporal location of the causal factors featured in the explanation, but the differences, I think, run much deeper. They run deeply enough to show promise of reconciling, within a naturalistic framework, the apparent conflict between explanations of behavior that invoke and those that ignore an agent's beliefs and desires. My ultimate purpose is to show that psychological and neuroscientific explanations of behavior are not only compatible but complementary.

## Triggering and Structuring Causes

An operator moves the cursor on a screen by pressing a key on the keyboard. Pressure on this key causes or (as we sometimes say) *makes* the cursor move. Though other events can make the cursor move, pressure on this key causes the cursor to move if, given existing conditions, the cursor would not have moved without the key press.[1] It is this kind of causal relationship that allows us to speak of the operator as moving the cursor *by* pressing the key, and I shall speak of such causes as triggering causes of their effect.

[1] I will not go much beyond this in my general statement of what it means for one event to cause another, though I rely on David Lewis's account in "Causation" (and postscripts) in Vol 2 of his *Philosophical Papers* (1986) and J. L. Mackie (1974). My purpose in this paper is not to analyze the general notion of cause, but, assuming we already have a workable notion of cause, to make a distinction between different types of causes hence types of causal explanation. For this reason I also ignore complications having to do with overdetermination and causal preemption, probabilistic causal relations, etc. These complications, though relevant to clarifying the general idea, are not relevant to the distinction I seek to make because they apply equally to both sorts of causes I distinguish.

As opposed to this kind of cause, we sometimes speak of events that produced hardware conditions (actual electrical connections in the computer) and programming (software) as the causes of movement. This is especially evident when cursor movement in response to pressure on a certain key is unexpected or unusual. Imagine a puzzled operator, watching the cursor move as he pokes the key, asking "Why is the cursor moving?" Because the operator knows that pressure on the key is making the cursor move (that, in fact, is what he finds puzzling), a different explanation of cursor movement is being sought. The operator is looking for what I will call a structuring cause ($C_S$).[2] He wants to know what brought about or caused the machine to occupy a state or to be in a condition in which pressure on the key has this effect. He knows, or can easily be assumed to know (after a few presses of the key) that E (cursor movement) is being caused by the triggering cause $C_T$ (pressure on the key). What he wants to know is *why* it is. Who or what made E depend on $C_T$ in this way?

A terrorist plants a bomb in the general's car. The bomb sits there for days until the general gets in his car and turns the key to start the engine. The bomb is detonated (triggered by turning the key in the ignition) and the general is killed. Who killed him? The terrorist, of course. How? By planting a bomb in his car. Although the general's own action (turning on the engine) was the triggering cause, the terrorist's action, wiring the bomb to the ignition, is the structuring cause, and it will surely be the terrorist's action, something that happened a week ago, that will be singled out, in both legal and moral inquiries, as the cause of the explosion that resulted in the general's death.[3]

Specifying the structuring cause of an event yields quite a different *kind* of causal explanation than does specification of its triggering cause. The two causes exhibit a much different relation to their effect. For those who think of causal relationships in a Humean way, in terms of constant conjunction, the triggering cause, $C_T$, produces E in a familiar way: in the circumstances that exist at the time of its ($C_T$'s) occurrence, events of type $C_T$ are regularly followed by events of type E. A triggering cause of E merely tops up[4] a preexisting set of conditions, a set of conditions that, together with $C_T$ (but not without it) are sufficient for E. Because

[2] Mackie (1974, p. 36) uses the term "triggering cause" and contrasts it with what he calls a "predisposing cause." This is close, but not quite the same, as my own distinction. For Mackie the predisposing cause is part of what he calls the "field" for the triggering cause, part of the existing background (standing) conditions relative to which the trigger becomes necessary (and often sufficient) for its effect. The spark is a triggering cause, whereas the presence of flammable material is a predisposing cause of the explosion. A shift in interest and purposes could promote the standing condition, the presence of flammable material, to a triggering cause. A structuring cause, as I use the term, is best understood as a triggering cause of one of Mackie's predisposing causes (i.e., one of the standing conditions).

[3] By changing the constellation of intentions and knowledge on the part of the bomber and bombee we can, without changing any of the causal dependency relations, change the context in such a way that the victim's actions become the cause of death. Imagine an unsuspecting mechanic wiring what he takes to be an emission control device to a car's engine. Unknown to the mechanic, but known to the car's owner, the device is actually a bomb. The suicidal owner, pleased by this convenient development, waits until the bomb is wired, climbs in the car, starts the engine, and blows himself up. In this case the owner causes his own death—kills himself. In this case the triggering cause, not the structuring cause, is *the* cause of death.

[4] This is Jonathan Bennett's language (Bennett, 1988).

these conditions exist at the time of $C_T$'s occurrence, triggering causes of E give rise to causal regularities of the following sort: whenever $C_T$ occurs in *these* conditions (i.e., the conditions existing at the time of $C_T$'s occurrence), E occurs. Structuring causes, however, occur in conditions that, generally speaking, are (even together with $C_S$) in no way sufficient for E. Later events, events that are independent of $C_S$, must conspire to promote $C_S$ into a structuring cause of E, and these later events might or might not occur. If the general never gets in his car and turns on the ignition, then the plot fizzles. But if the general does behave in the way expected, then the terrorist succeeds in killing him—succeeds, that is, in causing his death. Unlike a triggering cause, therefore, there are no regularities between a structuring cause and its effect of the form. When events of type $C_S$ occur in *these* conditions (i.e., conditions existing at the time of $C_S$), events of type E also occur. Tom can wire the computer so that pressure on a certain key will move the cursor, but if no one ever presses that key then Tom's activities will never explain why the cursor moves. Nonetheless, if someone, by chance, presses the key, then Tom's action becomes a structuring cause of cursor movement.

There is another important difference between structuring and triggering causes. The structuring causal relationship is a one–many relation, whereas the triggering causal relationship is one–one. Each movement of the cursor is produced by a distinct (token) press of the key. With triggering causes, distinct effects are produced by distinct causes, and distinct causes produce distinct effects. This is not so with structuring causes; distinct effects might have the same cause. Our terrorist example is unsuitable for illustrating this point because the explosion of the bomb destroys the condition the terrorist created, the condition that made the explosion depend on turning on the ignition. But consider a similar case in which this condition persists. I wire a switch to a light so that I can—again and again—turn on the light by throwing the switch. The structuring cause of the light going on *Saturday* is the same as it going on *Sunday*—viz., my wiring the switch to the light on *Friday*. The triggering causes are different each time the light goes on because the movement of the switch on Saturday is different than its movement on Sunday, but the structuring cause of each lighting is the same: my activities on Friday.

Some might object to this way of describing things. They might prefer to say that what I am calling the structuring cause of E is not a cause of E at all. It is, rather, a good, old-fashioned cause of those background or standing conditions (call them B) in which $C_T$ causes E. So instead of having two different types of cause for E, a triggering and a structuring cause, we have one sort of cause, a triggering cause, for different effects. $C_T$ (what I am calling the triggering cause of E) causes E, but $C_S$ (what I am calling the structuring cause of E) causes B, the conditions (or one of the conditions) in which $C_T$ causes E. $C_S$, if you like, is the cause, not of E, but of $C_T$'s causing E or, if you prefer, the conditions that enable $C_T$ to cause E.

I have no objection to this way of putting things. Quite the contrary. For certain purposes this is the way I prefer to think about matters. For these special purposes, structuring causes of E are best thought of as causes, not of E, but of conditions, B, in which certain other events (what I am calling a triggering cause)

cause E. From this vantage point, the designers, builders, and programmers of word processors do not cause individual (i.e., token) movements of the cursor. Keyboard operators do that. Instead, as designers, builders, and programmers they cause the machine to be in a condition that allows, or enables, an operator to move the cursor by pressing a key. Structuring causes of E are, in reality, causes of more or less persisting conditions (B) that make (events of type) E depend on (events of type) $C_T$ in such a way that tokens of $C_T$ (if and when they occur) cause tokens of E.[5]

Nonetheless, although I think that, for certain purposes, this is a better way to describe the relation of a structuring cause to its effect, I will continue to speak of these causes as causes of E out of deference for those (and I think this is most of us most of the time) who think that a cause of E is an earlier event on which E is counterfactually dependent in the right way,[6] a way that allows us (given a suitable context) to single it out as the cause of E in causal explanations of E, for (as the above examples are meant to show) it seems clear that structuring causes of E are earlier events on which E depends and which are often singled out in causal explanations of E. The cursor would not have moved (just now, when the operator pressed the key) if the wires had not been changed earlier. The terrorist killed the general by planting a bomb in his car. The light came on because Tom fixed the wiring. So, in deference to these facts, I propose to continue speaking of events that "configure" circumstances so as to make (tokens of) $C_T$, when (and if) they occur, cause (tokens of) E, events which (in this sense) cause $C_T$ to cause E, as themselves causes of E. There is some danger in speaking this way, a danger of confusing causes of different (sorts of) things with different (sorts of) causes of the same thing, but as long as one is aware of just what I am calling a structuring cause of E and just how it differs from a triggering cause, this way of talking will, I hope, do no harm.[7]

One final point about the distinction before we attempt to apply it. Triggering and structuring causes, although always distinct, might sometimes appear to "fuse." Suppose a dim-witted terrorist forgets that he planted a bomb, or he forgets

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[5] One can think of a structuring cause as producing a certain disposition in a system, a disposition to do E when $C_T$. However, this way of thinking about them should not prevent one from thinking of them as causes of particular behaviors, those that realize the disposition. If $C_S$ makes X soluble, then $C_S$ causes X to dissolve when it is put into water.

[6] *In the right way* because we want to rule out "backtracking" counterfactuals that make two events "depend" on each other (counterfactually) when they are related, not as cause to effect, but as common effects of a single cause. When B and C (slightly later than B) have a common cause, A, and we allow a backtracking interpretation of the counterfactual (expressing the dependency between B and C), we can say that if B had not happened, then (because that would mean—and here we are backtracking—that its cause, A, did not occur), C would not have happened. Once again, I ignore these complications as irrelevant to the point I am making. Both triggering and structuring causes are causes, so we need to understand or assume that in both cases the dependency relations (whatever they are) are right.

[7] In *Explaining Behavior* (Dretske, 1988) I identified behavior with a causal process (some internal event, $C_T$, causing bodily movement, M). A causal explanation of behavior was then a description of (what I am now calling) the structuring cause of M: the earlier event or state that caused the system to be in the condition in which tokens of $C_T$ cause tokens of M. I still think this is the right and proper way to proceed, but I have changed the way I express the point to avoid unnecessary complications.

in *which* car he planted a bomb. A few days later, needing a car, he steals the wired car and blows himself up. Is the terrorist both the triggering and structuring cause of his death? He created the conditions that enabled him to (unintentionally) blow himself up, yes, but that only means that one and the same individual was involved in both causes. It does not show that the causes are the same. *What he did* to trigger this outcome is different than *what he did* to structure it. It was his *turning on the ignition* that triggered the explosion; it is was his *wiring the bomb to the ignition* (a week ago) that structured it. Though both events (actions) *involved* the terrorist, they were quite different. One and the same object figures in both triggering and structuring causes, but it is its having one property that triggers the effect and its having another property that structures it.

## External Structuring Causes

I will use a botanical example to illustrate the way triggering and structuring explanations exist comfortably alongside one another in the explanation of an organism's behavior. In the case of plants, the structuring causes, unlike those with which I will eventually be concerned, are external, temporally remote, *extrinsic* to the system whose behavior we seek to explain. Though this is not what we are after in the case of psychological explanations of behavior (beliefs and desires, if they act as causes at all, are presumably internal causes), it will, I think, serve to clarify the differing explanatory roles of structuring and triggering causes. I return to *internal* structuring causes, psychological causes, in the next section.

A plant, the Scarlet Gilia, changes color during the summer. This is something the plant does, a piece of plant behavior. A plant does not have thoughts and desires or intentions and plans, but it does things, sometimes very interesting things, and botanists are interested in explaining why plants behave in the way they do. Why does the Scarlet Gilia do that—change from red to white in the middle of June?

One explanation is that the plant changes color to attract pollinators.[8] Early in the flowering season hummingbirds are the pollinators, and hummingbirds are attracted to red blossoms. Later in the season the hummingbirds migrate and hawkmoths, preferring whiter blossoms, become the principal pollinators. The flower changes color "in order to" exploit this seasonal alteration in its circumstances. It sets more fruit by changing color, and this, in the words of the botanists from whom I take the example, is why it does it.

This explanation of the plant's behavior appeals to factors in the evolutionary history of the plant, to events and circumstances that existed long ago and probably far away.[9] It is, nonetheless, a perfectly respectable explanation of why the plant changes color—at least evolutionary biologists and botanists will regard it as a

[8] This is the explanation given by the botanists from whom I take the example: Paige & Whitham (1985).

[9] I do not think that these evolutionary explanations are explanations of *individual* (plant or animal) behavior, but this is a technical point that I skip over here. The analogy is useful, I think, even if selectional explanations are not quite the same as developmental explanations of behavior.

perfectly acceptable explanation, an example of a functional or teleological, an ultimate as opposed to a proximal, account of the plant's behavior.

Suppose, then, someone observes the plant changing color in, say, June of 2001. She wants to know why it is changing color. At least two causal explanations are available. Which one we give will depend on a variety of factors, the most important of which is, perhaps, what the questioner is presumed to already know. One answer we might give is in terms of the events, whatever they are, that induce the chemical changes that produce a change in pigment. These events—let us suppose they have to do with longer daylight hours—trigger a change in color. Let us suppose, however, that our observer already knows (or thinks she knows) what triggers the behavior. Her question about why the plant is changing color is then a different question. It is like the question I ask when I ask why certain trees shed their leaves each fall. What I want to know is not what makes them shed their leaves—I already know that—it is, or so I believe, the colder weather. What I want to be told is not that winter is approaching but why trees do that—shed their leaves—at the approach of winter. If that is the kind of question our hypothetical observer is asking about the Scarlet Gilia, then she is looking for a structuring, not a triggering, cause of color change, and she has to be told what (if any) adaptive benefits are secured by such behavior.

Imagine that a molecular twin of Scarlet Gilia, Twin Plant, evolved in quite a different environment, an environment in which, in the midst of its flowering season, rapacious beetles arrived that were attracted by red blossoms. As a result of this selection pressure a slow change occurred. The plant evolved into a form in which it changed color, from red to white, in the midst of every flowering season. The beetles hate white blossoms, and thereafter they avoided Twin Plant and it flourished.

Twin Plant, let us suppose, is physically indistinguishable from the Scarlet Gilia. It therefore behaves in exactly the same way. Furthermore, the triggering cause of this behavior is exactly the same. Nonetheless, the structuring cause is much different in the two cases. This makes a difference in why these plants behave the way they do. Scarlet Gilia changes color to attract hawkmoths; Twin Plant changes color to repel beetles. Examining today's plants would never tell you that they had much different reasons for behaving the way they do. Their behavior is a physical event, to be sure, and it is produced by well-understood chemical changes inside the plant, but the explanation of the plant's behavior nonetheless requires going outside the plant to something that happened in the history of the plant (or the history of this *kind* of plant).

This illustrates something very important: even if you know what physical events inside the plant produced the change in color, even if you also know what events outside the plant triggered these internal changes, you do not necessarily know why the plant changes color. The changes in the Scarlet Gilia and the Twin Plant were produced by exactly the same chemical changes, and these chemical

changes were induced by exactly the same triggering cause—the lengthening days of summer—yet these plants did not change color for the same reason.[10]

I have taken great liberties in describing these plants. I have, for dramatic effect, spoken of them as having reasons for behaving the way they did, as having some purpose for changing color. The plants, of course, do not have reasons in the sense in which humans have reasons for behaving the way they do. The plants do not have purposes, thoughts, desires, and intentions. None of them have a mind. Although misleading, I nonetheless used a figurative way of speaking to make a point about the explanation of behavior. In explaining a system's behavior we are often looking not *inside* for the physical cause of external change but *outside* for the events that shaped that internal structure, that made the system into what it is today. We are looking for what I am calling structuring causes of behavior, not the events, either internal or external, neither proximal nor remote, in the sequence of causes that trigger that behavior.

When we turn from plants to animals an important difference appears. Structuring causes are sometimes, in the case of the intentional behavior, *internal*. Let me turn to animal behavior and that special subclass of animal behavior, intentional behavior, which is explicable in terms of the animal's beliefs and desires.

## Internal Structuring Causes

A bird I will call Robin, as a result of a few taste tests, learns to avoid a noxious type of bug Nox. It not only avoids Nox, but, understandably enough (what else does it have to go on?), everything that looks like a Nox. Knowing none of this, you observe Robin foraging. Robin spots a tasty Benny bug, a bug on which it used to feast, but then, to your surprise, Robin ignores it. Why? Robin is obviously hungry. Why didn't he eat the Benny bug?

Benny bugs look just like Nox bugs, of course, but we cannot explain Robin's behavior by saying that the Benny bug looks like a Nox bug. That is true, and surely part of the right explanation, but Benny bugs have always looked that way, and a few days ago, before his unpleasant encounter with a Nox bug, Robin ate them with great relish. The fact that Benny bugs look like Nox bugs cannot therefore be the explanation you are looking for because this fact was true, and you might even have known it to be true, before, when Robin ate the Benny bugs.

Seeing a bug that looks like a Nox bug is the type of event that triggers the behavior we are trying to explain. You can convince yourself of this by a little patient observation. That, though, would not tell you what you want to know. What you want to know is why Robin ignores the bugs, especially the tasty Benny bugs that look like Nox bugs. He ate them before. Why doesn't he eat them now? In seeking an explanation of Robin's behavior, what we are seeking is an explanation of the triggering potential of various stimuli. We did the same thing with the plant.

[10] For those familiar with Hilary Putnam's Twin Earth (Putnam, 1975) example, this is reminiscent—and I deliberately made it so—of a situation in which molecular duplicates with different histories have different beliefs and, therefore, potentially different reasons for doing the things they do.

Before it evolved the Scarlet Gilia ignored the longer days of June. Now it responds to them by changing color. When we seek an explanation of its behavior, we seek an explanation of why this event triggers this reaction.

As I said, it is clear that at least part of the explanation for this behavior is Robin's past encounters with Nox bugs, bugs that look exactly like Benny bugs. Robin learned something in his encounters with Nox, something that, together with the perceived resemblance between Nox and Benny bugs, explains Robin's present reaction to Benny bugs. This sort of explanation is, once again, an appeal to Robin's history, to events that helped configure the motor circuitry responsible for Robin's current response to Nox-looking bugs. By talking about this learning process we are, just as with Scarlet Gilia, explaining a system's behavior by describing the historical events that helped structure it. There is an important difference between these two cases, however. Unlike the plant, there is something in Robin, the organism whose behavior we are trying to explain, that helps structure the behavior. The plant's behavior is structured by an evolutionary process in which the individual organism whose behavior we are trying to explain played no part. This is not true of Robin. In Robin's case not only is the triggering cause internal (the most proximal triggering cause of behavior is *always* internal), a structuring cause is also internal.

To see why this is so, why Robin's own internal states, unlike those of a plant, figure in the restructuring process, consider Robin before learning occurs. Robin can see Benny bugs; when hungry, he is relentless and unerring in his pursuit of them. Because Robin can see Benny bugs, we must suppose that there is, inside Robin, some internal state that represents, indicates, or somehow signals (use whatever word best suits you) the presence of Benny bugs in Robin's immediate environment. Call this internal state $R_B$ (representation of a Benny-looking bug). $R_B$ is the some state (think of it as a sensory state) in Robin that is caused by and (normally) only by Benny-looking bugs (this includes Nox bugs). If we let E stand for Robin's behavior after his unpleasant encounter with Nox bugs, then what has happened during this brief learning episode is that Robin has been rewired in such a way that $R_B$ now produces E. $R_B$ (and, of course, anything capable of causing $R_B$—e.g., Benny and Nox bugs) has become a triggering cause of E.

This situation is depicted in Figure 1. The change recorded in this figure is a change brought about by Robin's experience with Nox bugs. In looking for the structuring cause of Robin's behavior, why he is reacting in this way (E) to Benny bugs, we are looking for the cause of that internal condition responsible for $R_B$ (his perception of a Benny bug) causing E (avoidance), something it did not cause before.

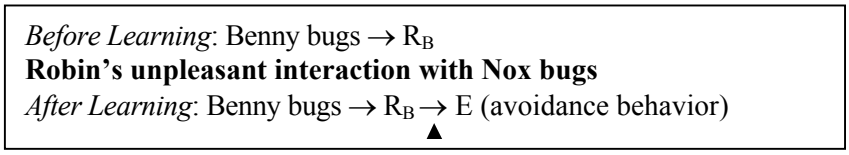


Figure 1. Change brought about by learning.

As noted earlier, for any event there are a great many other events that might be singled out as its cause. This case is no different. Nonetheless, it does seem clear that an important factor in the restructuring of Robin, an important contributing cause in the transformation of $R_B$ into a cause of E, was a fact about $R_B$ itself, the fact that it signaled the presence of (represented or indicated) a bug of a certain kind. If $R_B$ did not represent or somehow indicate the presence of an Benny-looking bug, there would be no point in modifying its causal role, no point in making it into a cause of E. If Robin is to change the way he reacts to Benny-looking bugs, what is required to implement this change is the way the internal state that signals the presence of an Benny-looking bug functions in Robin's control circuits. Hence, if Robin is to avoid Benny bugs (and Benny-looking bugs) successfully (something we observe him doing), what must change is the causal role of whatever it is *in* Robin that signals the presence of Benny-looking bugs. This, of course, is $R_B$. The causal role of $R_B$ was changed precisely because it was a representation (indicator) of Benny-looking bugs.

What this means is that $R_B$ comes to be a cause, a triggering cause of behavior E because of some fact about it, the fact that it is a representation of the kind of environmental condition with which behavior E must be coordinated. Hence, this fact about $R_B$, the fact that is a representation of Benny-looking bugs, plays the role of a structuring cause. The same internal condition, $R_B$, is involved in both the triggering and structuring causes of behavior E, but as we saw in our terrorist example (when a dim-witted terrorist blew himself up), the causes, though involving the same element, are different. It is $R_B$'s possession of one set of properties, the intrinsic electrical–chemical properties that triggers the behavior. It is $R_B$'s possession of quite a different property, a representational property, the fact that it indicates the presence of a certain environmental condition (the presence of a Benny-looking bug) that structure this behavior. That, I submit, is precisely the difference between a biological and a psychological explanation of behavior. Unlike biological explanations of behavior, commonsense psychological explanations appeal to extrinsic, representational facts about the internal causes of bodily movements.

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