

What We Perceive When We Perceive Affordances

Commentary on Michaels, "Information, Perception and Action"

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Abstract: In her essay "Information, Perception and Action", Claire Michaels reaches two conclusions that run very much against the grain of ecological psychology. First, she claims that affordances are not perceived, but simply acted upon; second, because of this, perception and action ought to be conceived separately. These conclusions are based upon a misinterpretation of empirical evidence which is, in turn, based upon a conflation of two proper objects of perception: objectively with properties and affordances.

In her recent essay "Information, Perception and Action", Claire Michaels (2000) reaches two conclusions that run very much against the grain of ecological psychology. Based upon neuropsychological work done by Milner and Goodale (1995) and her own research (Michaels et al, to appear), she argues that affordances (Gibson 1979) are not perceived, but simply acted upon. This conclusion, damaging enough on its own, leads

her to a further and deeper-cutting conclusion for ecological psychology: perception and action, Michaels argues, should be thought of separately. I argue here that these consequences come from one oversight: Michaels assumes that environmental properties are always properties of environmental objects, or what I will call *predicational properties*. Predicational properties are the sort of properties we invoke when we say of some particular object that it has a certain property, as in the case of most declarative sentences of English. For example, 'that apple is ripe' says of some object, an apple that it has a certain property, ripeness; that is, it applies the predicate 'ripe' to the named object 'that apple'. Ripeness, therefore, is a predicational property. The assumption that all environmental properties are predicational misses one of the most important aspects of James J. Gibson's work: the recognition of the existence of affordances, environmental properties specified only in terms of a particular type of animal and its behavioral repertoire (1979). Affordances, I will argue, need not inhere in any particular environmental object; they need not, that is, be predicational. I will trace Michaels' oversight through the essay, and in so doing show her conclusions do not follow.

Start by considering Michaels' discussion of "Direct Perception and Specificity" (pp.246-7). In that discussion, she points to two distinct specificities that must exist for direct perception to occur. First, there must be a 1:1 relation between detectable (possibly higher order) variables and perceivable properties; second, there must be a 1:1 relation between perceivable properties and detectable (possibly higher order) variables. Because the presence of the to-be-perceived property is always accompanied by the detectable variable, the detectable variable can be said to *bear information* about the presence of the perceivable property. Because of this, an animal can (directly)

perceive the presence of the property by detecting the variable. Following a distinction recommended by Milner and Goodale (1995), Michaels illustrates these two specificities with two different examples: one concerning vision for perception, another concerning vision for (control of) action. The first of these examples is the relationship between the detectable variable cardiodal strain and the perceivable property human age (see Pittenger and Shaw 1975). Here the perceivable is an objective property of the environment, one which has no necessary connection to action. Note also that human age is a predicational property: when one perceives what Sally's age is, one perceives that Sally (a particular object) has a particular property. The second example Michaels discusses is the relationship between the optical variable \square and the perceivable property time to contact. In this case, the percieveable property is not used to learn facts about objects in the environment *per se*, but rather to control action of some kind, such as elbow flexion when striking a falling ball (Lee et al, 1983; Michaels et al, 2000).

Michaels then argues that the Milner and Goodale distinction between vision for perception and vision for action brings out problems concerning the relationship between optical variables and perceivable properties of this second, action-oriented type. What is it, she wonders, that we perceive when we take advantage of the specificities between optical variables and opportunities for action? In particular, Michaels wonders what environmental properties are perceived by subjects in her own experiments, in which subjects take advantage of the 1:1 relationship between \square and time to contact to punch a falling ball (Michaels et al, 2000). In the Michaels et al experiment, it was found that expansion velocity is the crucial optical variable that subjects use to control the punching of a falling ball. That is, if r is the size of an image

of the falling ball on a plane at a fixed distance from the subject, then \dot{r} , the rate of change of r , is the optical variable used to control the punching behavior. For particular values of \dot{r} to be used in perception, Michaels points out, they must specify some environmental property. But in the case of \dot{r} , she has a hard time deciding what the environmental property is. Indeed, she says that "the answer to the question of what the optical quantity of, say, $\dot{r} = -.01$ specifies is nothing, really. There is no property, as it were, to be perceived." (p.248)

This is not to say that the values of \dot{r} don't specify anything: Michaels claims that after learning, they come to specify "it's time to flex the elbow." But, Michaels claims, "an \dot{r} of $-.01$ specifying its time to flex seems to have an aboutness that refers only to the animal." (p.248) And it is here that the conclusions ecological psychologists find unwelcome start to pile up. First, because direct perception requires that optical variables specify environmental properties, nothing is perceived when \dot{r} is used to guide action. That is, following Milner and Goodale (1995), seeing \dot{r} (if 'seeing' is even the right word for what one does with \dot{r} on this view) is vision for action, not vision for perception. Assuming that \dot{r} specifies an affordance, it begins to seem that affordances are not perceived but simply acted upon. (p.253)¹ Second, and consequently, there is no longer a necessary linkage between perception and action. If we can act without perceiving (as when we use \dot{r}) and perceive without acting (as in Milner and Goodale's vision for perception), then perception-action coupling goes by the wayside. (p.253-4)

¹ Michaels doesn't specify whether she means that affordances are usually, sometimes, or always not perceived but simply acted upon. Given her lack of qualification, we should assume she means 'always'.

To see the magnitude of the changes to ecological psychology wrought by these two conclusions, consider Figure 1 (Figure 2 in Michaels (2000)), which depicts the differences between Helmholtz's, Gibson's, and Michaels' theories of perception. Both Gibson (1966) and Michaels reject the assumption that Helmholtz has in common with most psychologists and philosophers since the 1600s: that perception is sensation + inference of some kind. But where Gibson (1966) argued that stimulation could lead to both sensation and to perception, with only the latter leading to action, Michaels posits direct links from stimulation to sensation, perception and action. Michaels' view is a different from Gibson's and Gibson's is from Helmholtz's inferential view.²

insert figure 1 about here

Fortunately, we don't have to accept these conclusions, and can leave ecological psychology more or less as Gibson envisioned it, despite Milner and Goodale (1995) and Michaels et al (2000). This is the case because Michaels overlooks the possibility of non-predicational environmental properties, properties that exist in the environment without being properties of any particular object. There are such things as non-predicational environment properties, and "it's time to flex" is one of them. Consider sentences such as "It's raining," "It's too cold in here," and "It's dinnertime". In each case, a property is being ascribed to the environment without being assigned to any particular object in the environment. Sentences of the form "It's X" are called *feature placing sentences* (Strawson, 1959; Smith 1996). What they do is say that a certain

² An important consequence of this that I will not pursue here is a worry that re-conceiving ecological psychology to fit Michaels' prescriptions would quash a growing and potentially very fruitful alliance between ecological psychology and situated robotics, the practitioners of which tend to favor a necessary and direct connection between perception and action. See Brooks 1999 for example.

property is present in the environment, but do not say that the property inheres in any particular object. The existence of such sentences shows that Turvey's denial of objectless properties (1992) can't be correct: placed features are such properties. What is the 'it' that's raining, after all? As Smith (1996) has pointed out, this is not a sensible question to ask. Uttering a feature placing like "it's raining" is rather like saying "Rain! Here! Now!"

Notice, first, that although all the examples of feature placing sentences above are about the status of what's outside, in the environment, despite the fact that they are not about particular objects in the environment. Notice, second, that Michaels expresses her preferred gloss of what is specified by \dot{r} by using a feature placing sentence. This at least hints that "It's time to flex the elbow" is also about the environment, without being predicational. And indeed it is. When one says "It's time to flex the elbow" one is not talking about just oneself as Michaels suggests, but is rather placing a feature in the local environment; one is saying something like "Elbow-flexing opportunity! Here! Now!", or perhaps "Need to flex the elbow! Here! Now!" This is the environmental property about which the optical variable \dot{r} bears information, and it is the property that is perceived when subjects (who have learned to complete the task) detect particular values of \dot{r} .

So "It's time to flex the elbow" is not about the animal alone. As is characteristic of affordances, "It's time to flex the elbow" is about both the animal and the environment: only an animal that with a particular type of body and particular interests and that has learned to punch the falling ball will perceive that a particular type of environmental situation affords particular actions. And as mentioned above, it is about the environment without being predicational: no property is ascribed to any object in

the environment. Furthermore, what is perceived is about both the animal and the environment without being merely a conjunction of predicational properties, some of which ascribe properties to the person, others of which ascribe properties to the environment. That is, one can utilize values of \dot{r} to control activity concerned with ball-punching without perceiving “The ball is falling now AND I want to punch the ball AND I can punch the ball by flexing my elbow now.” Indeed, when one utilizes values of \dot{r} to control ball-punching activity, one doesn’t perceive any predicational properties at all.³

Given this, we should not accept Michaels' conclusions. What is perceived in the Michaels et al (2000) experiment is the presence of an environmental property--not a property that is attached to an environmental object, and not a property that can be specified in the absence of a perceiving animal type, but a property nonetheless. The error Michaels has made is in her assumption that for an optical variable to bear information about the environment, it must bear information about a particular object in the environment. That is, she has failed to take feature placing into account. This is unsurprising, really: how many practicing psychologists read forty-year-old books in the philosophy of language? But it is important that we realize that non-predicational properties do exist, and are perceivable. In most cases, it is just such properties we perceive when we perceive affordances.⁴ So affordances are perceived, not merely acted upon, and if this is the case, we can maintain a tight coupling between perception

³ This is also true of Millikan’s “pushmi-pullyu representations” (1996), which were conceived in part as internal representations of affordances. Pushmi-pullyu representations lead to activity without requiring an inferential connection to be made between separate purely fact-stating and purely intention-stating representation. Furthermore, like affordances, pushmi-pullyu representations need not be predicational.

⁴ Of course, not all affordances are non-predicational. “That gap is crossable” and “That step is too high” are both things that are perceived as affordances, but say of some particular object that it has a particular property.

and action. We need not follow Michaels in her proposed changes to ecological psychology. As Gibson thought, stimulation from the environment can lead to either sensation or perception, but never directly to action. Action is preceded by perception of a particular sort of environmental property, one that need not inhere in an object--an affordance.

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Figure Caption

Figure 1. Figure 2 from Michaels 2000. The top picture depicts Helmholtz's theory of perception, the middle depicts Gibson's, the bottom depicts the changes Michaels proposes to Gibson's theory of perception and action.

Figure 1

