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Affordances and the Body: An Intentional Analysis of Gibson's Ecological Approach to Visual Perception

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The concept of affordance is one of the most controversial and debated features of James J. Gibson's ecological approach to perception. With this concept Gibson offers a new approach to a knotty problem in perception theory; namely, the problem of accounting for meaning in perceptual experience. The controversial nature of the affordance concept stems largely from the fact of its growing out of an approach to perception that is a significant departure from standard formulations. The aims of this paper are two-fold. The first is to provide a detailed analysis of the concept of affordance, and in the process to draw out some of its implicit theoretical claims concerning the nature of perception. This analysis will be presented in the first part of the paper. Exploration of the implicit assumptions of the affordance concept will reveal the underlying *intentional* character of the ecological approach to perception.

The second aim of the paper is to consider the applicability of the affordance concept to features of the human world whose meanings are sociocultural in origin. As will be clear shortly, affordances seem most plausibly applied to features of the environment that have species-specific or transcultural significance. However, the concept of affordance has sometimes been applied to features that have significance only within a particular sociocultural context. These applications have been a source of some debate. I will argue that this extension of the affordance concept is warranted once affordances are carefully grounded in an intentional analysis of perception. Moreover, the resolution of this controversy will provide the basis for maintaining the broad and fundamental character of affordances in perceptual experience. Toward these ends, we will examine in parts two and three of the paper some issues concerning intentionality in perception and its relationship to Gibson's ecological theory of perception.

AN ECOLOGICAL APPROACH TO PERCEIVED MEANING

There is a need to study the perception of surfaces with a realistic attitude as well as a phenomenological attitude. (Gibson, 1979b, p. 112)

If we adopt a phenomenological attitude to perceiving, it is apparent that features of our world have meaning for us. At the simplest level, environmental features are often experienced as attractive, positive, and alluring, or inversely as unattractive, negative, and repelling. Moreover, environmental features are often experienced with respect to their functional significance: we perceive features in terms of the ways we can interact with them. In short, the features of our world are not value-free. Dewey (1934) puts it this way:

The live animal does not have to project emotions into the objects experienced. Nature is kind and hateful, bland and morose, irritating and comforting, long before she is mathematically qualified or even a congeries of "secondary" qualities like colors and their shapes. (p. 16)

How do we account for this dimension of perceptual experience?

According to the standard analysis of perception, meaning is imposed on sensory input by mental processes. Meaning is not inherent in sensory input, nor can it possibly be, because the basis for perception, according to this view, is physical energies that stimulate receptors. Owing to their physical nature, these stimuli themselves cannot convey the meanings of objects, but only, e.g., their intensity, frequency, position, and movement, via light rays reflected from their surfaces.[1]

In Gibson's ecological theory of visual perception, perceiving is not based on stimulation of receptors by physical energies, but on the pick up of higher-order information in reflected or ambient light by a perceptual system. (For a detailed account of Gibson's ecological approach, see Gibson, 1966, 1979a; Reed and Jones, 1982.) In brief, Gibson and his followers have attempted to describe the ways in which light is structured as it is reflected from surfaces of objects, both animate and inanimate. Their focus is on the patterns of reflected light, particularly the invariant structure that is preserved across transformations of the array. This higher-order structure is available in the ambient array of light to be sampled by a perceiver.

What is conveyed by this higher-order structure in ambient light? Formal properties are such as object size, shape, and motion, and in addition, the functional significance or meaning of objects for the perceiver. Let us take a relatively simple example to illustrate the latter possibility of the functional significance of environmental features carried in reflected light. There is a very specific pattern of information perceivable at the edge of a precipice:

as a perceiver stands at the edge of a "cliff", the slightest movement results in a shearing of the texture of the ground on the surface below by the edge of the surface of support (E. J. Gibson, 1969). This transformation in the reflected light — one which is generated by a moving observer in relation to this arrangement of surfaces — conveys information that there is a break in the continuity of the supporting surface; it *means* "here is a falling-off place". This meaning is carried in the structure of reflected light. It is a perceivable ecological fact, not a mental construction that is imposed on sensory input.

The concept of affordance refers to these perceivable functional meanings of objects and events that are carried in the structure of ambient light. Although the stimulus information for the affordance qualities of environmental features have only been worked out for just a few simple cases, [e.g., graspable objects (Hallford, 1984); looming objects (Schiff, 1965); climbable steps (Warren, 1984); seats (Mark, 1987); doorways (Warren and Whang, 1987); also see E. J. Gibson, 1982; E. J. Gibson and Spelke, 1983], the assumption is that, as a rule, the functional meanings of environmental features are available to be perceived in the ambient array of light.

Affordances defined

Gibson (1979a) defines affordances most directly in the following way: "The *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill" (p. 127). The affordances of a given place in the environment establish for an individual what actions are possible there and what the consequences of those actions are. For example, a surface of support at approximately knee height to the individual *affords* sitting on. A seat is a feature of the environment specifiable in terms of properties of the object (i.e., it has a particular mass, height, and width); but its parameters as an affordance are delimited with reference to a specific individual of a particular weight, leg length, and girth. As a result, what constitutes a seat (or affords sitting-on) will vary among individuals with significantly different *body scaling*. The relative nature of seat affordances can be illustrated by the fact that a surface perceived as a seat by a young child may not be perceived as such by an adult. Specifically, a foot stool may be perceived as a seat by a child and not by an adult as a function of leg length, and a cardboard box may be perceived as a potential seat by a child but not by an adult because of their differences in weight.

Affordances, then, are properties of the environment taken with reference to an individual. As such, they have both objective and subjective qualities. They are "objective" in the sense that they are "facts of the environment"; what constitutes, e.g., a seat, depends on the physical characteristics of an object.

> What [an environmental feature] affords the observer is determined by its material substance and its shape, size, rigidity, motion, etc. What it means and what it is are not separate, as we have been led to believe. And the observer who perceives the substance and the surface of anything has thereby perceived what it affords. (Gibson, 1972, p. 410)

However, affordances deviate from a strict meaning of an objective property in that they are not specifiable independent of an individual, as are physicalistic properties such as mass and extension. Because affordances implicate a particular perceiver, e.g., his relevant body-scaling characteristics, they may be considered to have "subjective" qualities. But affordances are not subjective in the sense that they reside in mind, as we have seen; they are ecological facts. Thus, affordances do not fit neatly into either of these two ontological categories; instead they are *relational* in nature.

In the present context of an analysis of the environment and the individual, "relational" may be set in opposition to "dualistic". In a dualistic approach, one draws conceptual, and often ontological boundaries around each domain, separately examines the essential properties of each domain, and considers the mechanisms by which each influences the other. This approach is characteristic of much analysis in psychology, and it is an approach that Gibson explicitly rejects. In contrast, a relational approach focuses on properties that exist only when one simultaneously considers two (or more) entities. Put differently, a relational approach assumes that "no one [constituent of an inquiry] can be *adequately* specified as fact apart from the specification of other constituents of the full subjectmatter" (Dewey and Bentley, 1949, p. 122). With respect to environment-individual analysis, a relational concept refers to a property that emerges out of the interaction between an animal and the environment. Affordances are located at this boundary; they are synergetic properties of an environment-animal system (Shaw and Turvey, 1981). Finally, relational properties are not subjective entities; as Ben-Zeev (1984) succinctly states: "Relational is not opposite to real; it just refers to a certain kind of reality" (p. 79).

Because of the inappropriate tendency of investigators to assimilate Gibson's theory to a dualistic framework (see Heft, 1980, 1982; Reed and Jones, 1981; Wilcox and Katz, 1981), it may be worthwhile to look more closely at the relational approach, which is reflected in the affordance concept.

The relational approach to environment-animal interaction

By now it is commonplace to point out that a living entity, unlike a physical entity, is an open system, meaning that its continued existence and growth are based on an on-going and reciprocal exchange with its surround. Although the animal and the surround may be examined independently, certain critical psychological processes are most clearly revealed within the "conceptual region" that analyses of animal and environment mutually share. That is, some of the most psychologically significant phenomena are relational in nature.

The hallmark of an entity with a relational quality is that its specification implies a second entity. Many of an animal's structural and behavioral characteristics have this quality of pointing beyond themselves to implicate particular characteristics of the environment. For example, the sensory sensitivities of an animal bracket some *types* of physical energy in the environment, among the variety of energies that can be identified, as well as the *range* of energy within those categories to which the animal is responsive. So humans, like all terrestrial animals, are sensitive to electromagnetic radiation, and humans in particular, (and unlike, e.g., some insects) are responsive only to wavelengths between approximately 400 and 700 nanometers. Thus, a description of human visual sensitivities implies a specification of some portion of the total environment, and conversely that particular portion of the electromagnetic spectrum has significance because of its relation to human vision. That is, both factors are relationally specified. The same analysis can be performed for other aspects of the animal's structure, such as other receptor sensitivities.

Likewise, the behavioral capacities of an animal co-implicate particular characteristics of the environment. For example, the behavior of grasping in an animal means that detached objects are potentially significant features of the environment (if, that is, the object is smaller than the handspan). Further, sitting co-implies places that afford sitting-on, striding co-implies places that can be stepped across or stepped up onto, and so on. Each of these actions is only possible with respect to environmental features which permit them, and these particular features are significant in relation to these actions, i.e., each factor is relationally specified.

Many characteristics of an animal do not have this relational quality. Most neurophysiological features, as well as hypothetical mental operations, can be described without simultaneously implicating features of the environment. For example, biochemical characteristics of cell receptors sites or hippocampal functioning, on the one hand, or the functional characteristics of hypothesized memory processes, on the other hand, can be considered independently of environmental conditions. Therefore, only some aspects of an animal's functioning can be characterized as relational, and these relational processes should be the particular province of psychology, (or at least an ecologically oriented psychology), as opposed to neurophysiology or cognitive science, respectively.

It can be seen then that specification of certain structural and behavioral characteristics of an animal implicates and delimits that portion of the total environment comprising the animal's (or the species') *econiche*. These characteristics of an animal have a relational or transactional quality in that they imply a second entity; they point to the surround, and together both "sides"

express the functional compatibility existing between an animal and its econiche. Thus, the environment, in an ecological sense, is fundamentally relational.

Considering affordances more specifically, they too are relational in nature. They are the environmental counterparts to the animal's *behavioral* potentialities. Returning to the examples used previously, objects that are smaller than the handspan (but not too small) are the environmental counterparts of the act of grasping; they afford grasping. The act of grasping is only comprehendible in relation to a thing which may be grasped. Objects that are surfaces of support, relative to the mass of the individual, and that are at approximately knee height, are the environmental counterpart of the act of sitting; they afford sitting-on. In a sense, affordances complete the *unity* of the behavioral act. The affordance and the related behavior *together* specify goal-directed action. Considered individually, an affordance or a specific behavioral act is but one facet of an intentional act (see below). Each facet taken separately necessarily implicates its counterpart. The relationship between an affordance and a behavioral act is characterized by a mutuality, a compatibility, and a fittedness (Turvey and Shaw, 1979).[2]

Finally, the kind of relational approach presented here does not lend itself to the standard dualistic, *causal* analysis typically applied to environment-animal relations. The standard dualistic analysis draws a sharp, and often ontological distinction between the environment and the animal; and it views causality solely in mechanistic terms, with the directionality of the influence, that is the antecedent determining influence, in most cases originating in the environment and impinging on the individual. For example, the standard account of visual perception begins with a physical analysis of the stimulus object in terms of wavelength and intensity of light rays, which impinge on the visual receptors, initiating neural activity, and ultimately, after considerable processing, resulting in a percept. The particulars of this formulation vary considerably among theorists, but this essentially mechanistic account of causality is pervasive in the study of perception and cognition.

In contrast, the relational approach points to reciprocal or mutual influences in the on-going and synergetic transactions of the environment-animal system. A closer examination of the issue of causality in the analysis of animal-environment relations will give us a clearer insight into the nature of the affordance concept.

Causality, environment-animal relations, and affordances

To digress briefly, causality classically encompassed more than a mechanistic explanation based solely on antecedent occurrences or factors. The identification of cause with mechanical causality is a post-Renaissance phenomenon, and it reflects the growing hegemony of the physical sciences for whom such an explanation proved to be very fruitful and perhaps sufficient as well. The fruitfulness and, more particularly, the sufficiency of mechanical explanations for biological phenomena may be another matter.

Classically in the Aristotleian framework, causal categories were invoked, in part, to contribute to our understanding of a thing's *nature*. For Aristotle, the explanation of some occurrence is attributable to: (1) the material character of the features involved (material cause), (2) their structural character (formal cause), (3) their origins (efficient causality), and (4) their immanent or teleological character (final cause; see Grene, 1963). These categories, and those of formal and final causality in particular, emphasize the *distinctiveness* of natural things. In contrast, it is characteristic of post-Renaissance science to apply mechanistic explanation to all entities regardless of their nature. Mechanistic causal explanation, often in combination with materialism, seeks to reduce the diversity of natural things to a common mode of description, if not a common level of analysis. Thus, Newton offers a grand theory of physics applying mechanistic explanation to events in the heavens as well as on earth; in the same vein, Locke and those who follow broadly in his approach propose a Newtonian analysis of mind. The Lockean model has profoundly affected psychological analysis to the present day. Behaviorism, and its contemporary versions, e.g., information-processing, are transpositions of this approach to observable actions and inferred mental operations, respectively.

One might argue, however, that in order to understand the cause of some event, it is necessary to take into account the distinctive nature of the entities involved. Otherwise, all entities are treated identically, and their substantive differences are ignored. This is not a problem if a reductive, materialistic approach to all phenomena is adopted. If, however, one minimally distinguishes between physical ("closed") and living ("open") systems, the nature of the entity in question needs to figure quite prominently in a causal analysis. We may need to adopt a broader view of causality (although not necessarily the above classical categories in particular) precisely because the specific qualities of living systems, and their relationship with their surround, are fundamental to an adequate explanation of psychological phenomena.

In what way is a causal analysis in a relational view different from that in a dualistic approach? Let us consider two differences, and then apply this discussion to our consideration of the affordance concept.

1) As applied to psychology, a dualistic approach suggests that events stop and start in a discontinuous series of jerks (Dewey, 1896). The animal, in effect, is in a state of relative stasis until some environmental occurrence stimulates or goads it into activity. This admittedly sketchy account also applies to many so-called "active" models of perception and cognition that employ *schema* as a central concept. With few exceptions (e.g. Neisser, 1976), environmental occurrences are seen as initiating psychological activity. In this view, the causal

relationship between environment and animal is not substantively different than the relationship between any two physical objects.

In the relational view, environment-animal transaction is an ongoing, largely unbroken process. There is a continuous "stream of behavior" or a stream of transactions between environment and individual. Breaking into this stream of transactions at any particular point to find an environmental cause for some specific behavior is not only typically arbitrary but also potentially misleading. It is arbitrary in the sense of determining when in time to look for an antecedent cause of a behavior, and it may be misleading in that it suggests that "cause and effect" can be limited to a *specific* environmental event and a *specific* behavioral act.

An example will clarify these points. Somewhat early in his investigations of the ecology of child development, Barker (1968; Barker and Wright, 1955) and his colleagues looked to see if antecedent events accounted for a child's behavior. In one case described in detail (Barker, 1968, pp.146–151), Barker observed the behavior of a child named Maud in a drugstore. The sequence of actions the child expressed were noted in detail, as well as the social occurrences in the child's proximity. Barker had assumed that Maud's separate behaviors would largely be responses to discrete "social inputs"; that is, that behaviors would follow from antecedent events, in the manner of stimulus-response occurrences.

> We expected behavior episodes to march along single file preceded by inputs from the environment and terminating in outputs to the environment, as they do when psychologists are operators in psychophysics experiments . . .. We expected to be able to predict with some accuracy from ecological inputs to behavioral outputs. But we were wrong. (p. 147)

In fact, only about one-third of Maud's actions corresponded to immediate social inputs. If one were to base one's judgment of the predictability of her behavior from this analysis, it would have to be concluded that her behavior was largely unpredictable. And yet it was not. Maud's behavior was appropriate to the setting that she was in, and in turn, predictable in relation to that factor. Behavior appeared to be constrained, or "coerced", by the collective social forces that give rise to the setting. This observation was one of several that led Barker to postulate the concept of "behavior setting" as an important *higher-order* ecological phenomenon (see Barker, 1968, pp. 151–166).

To generalize from Barker's data, since a behavioral act is not always predictable from immediate environmental inputs, *when* to look for a cause of behavior *in situ* may be arbitrary. Behavior does not typically correspond to a single environmental event at a moment in time (although it sometimes may), but rather it is compatible with, or constrained by, the environmental setting. There is an overall fittedness between behavior and the immediate environment. In the process of looking for an antecedent event, one is apt to overlook

higher-order, relational factors, such as behavior settings and affordances, which may be in fact the more valuable explanatory constructs.

2) In addition to the on-going nature of the transactions within the animal-environment system, causal influences are reciprocal, with the impetus of fluctuations in the on-going behavior stream having its source in the environment facet *or* in the individual facet of the transaction; and this reciprocal exchange is cumulative in its effects.

Considering the environmental side of the exchange first, occurrences or features of the environment can lead to the initiation of a series of subsequent transactions, as in the case of a telephone ringing in my home, and its transactional aftermath. As with this example, most instances of environmental conditions initiating a subsequent series of transactions are likely to be intrusive in nature (e.g., an unexpected sound or sight in the perceptual field). Further, it is possible that the impact of particular environmental conditions is not immediate, but rather becomes manifested sometime after the individual has been exposed to them (e.g., the effects of some conditions in the home on child development, Wachs and Gruen, 1982). In addition, environmental conditions may have a somewhat pervasive influence, even though we may not always be able to isolate their impact at some specific moment in time. Instead, their impact may reflect the prevailing conditions confronting the individual over a continuing period of time. One example of this view of the environment in terms of prevailing conditions, rather than as temporally discrete stimulus inputs, can be found in adaptation-level theory (Helson, 1964). In this important work, prevailing setting conditions are seen as establishing a perceptual-cognitive frame of reference for the individual's on-going transactions with the environment. (For an excellent application of this approach, see Wohlwill and Kohn, 1973.)

Second, and perhaps more commonly, the stream of behavior is redirected or shunted by intentional acts on the part of the individual. In these cases, the individual engages particular features of the environment in the course of some activity. And significantly, through many of these acts, the individual can modify the environment, e.g., by manipulating objects, by affecting others around him, by constructing tools, or by building shelters. These environmental modifications, in turn, transform the surround, which may influence the individual, and so on in a reciprocal manner (Shotter, 1983). As a result, the individual may take an active role in fashioning his environment in important ways. These on-going reciprocal exchanges form an essential part of the individual's psychosocial history and, consequently, serve as the foundation from which subsequent development proceeds. The reciprocal nature of social interaction in particular has been receiving considerable attention, particularly in the area of child development.

To summarize, in a relational view of environment-animal interaction, the standard causal analysis may have only limited applicability. A mechanistic

model typically imposes temporal discontinuity on environment-animal transactions, and causal influences are usually seen as being unidirectional, moving from environment to the animal. However, the nature of living systems is such that there is an on-going transaction between an animal and its surround, and environmental influences tend to constrain rather than elicit behavior. Further, causal influences will be temporally continuous, reciprocal, and cumulative.

What then is the causal character of the relationship between the affordances of the environment and the perceiver? The relationship between an affordance and behavior is that of fittedness and compatibility. While affordances are features of the environment, they do not "cause" or elicit behavior, although the presence of a particular affordance can sometimes prompt an act that comports with it. More commonly, affordances constrain to a considerable degree what actions may be expressed in a setting; or put in a positive way, they create possibilities for particular activities. Affordances constitute the ecological resources of the environment that may be utilized by the individual. Which particular affordances are utilized in a given environmental setting will depend on intentional processes of the perceiver. In advance of our examination of intentionality below, we can state here that the causal relations between affordance and perceiver are (1) continuous — rather than disjointed or segmented; (2) reciprocal — in as much as typically affordances offer particular possibilities for action, and perceptual functioning, by virtue of its intentional character, realizes one (or more) of these possibilities; and (3) cumulative — in that person-environment interactions at one point in time provide an historical basis for subsequent perceptual development and environmental discovery.

We now turn then to a consideration of one particular aspect of the perceiving process: the intentionality of perceiving. This characteristic of perceiving is only implicitly expressed in Gibson's theory, but drawing out its essential role in the ecological framework will allow us a more substantive grasp of the affordance concept. In addition, this analysis will provide the basis for extending the concept of affordance to the problem of perceiving culturally-derived meaning of environmental features.

AFFORDANCES AND INTENTIONALITY

> Our own body is in the world as the heart is in the organism: it keeps the visible spectacle constantly alive, it breathes life into it and sustains it inwardly, and with it forms a system. (Merleau-Ponty, 1963, p. 203)

As we have seen, the relational nature of affordances points to characteristics of the individual, and in particular characteristics relating to an individual's *body scaling*. Referring back to our previous examples, whether a surface affords sitting-on or an object affords grasping depends on some relevant body dimension. Additional examples of body-scaled affordances include steps (relative to leg length), doorways (relative to height and width), shelves (relative to arm extension), and so on. These body-scaling criteria underscore the "individualistic", and thus the relational nature of affordances.

However, I would like to suggest that the affordances of the environment refer to the body in a much more fundamental manner than merely body-scaling *per se*. Affordances are specifiable relative to what an individual can do, relative to what his potentialities for action are. That is, the environment's affordances are to be identified in relation to the *body* as a means of expressing various goals or intentions.

This broader usage of "body" has been explored by Merleau-Ponty (1963), whose phenomenological analysis of perception shares many features with Gibson's ecological theory (see Glotzbach and Heft, 1982, for a preliminary comparative discussion). For Merleau-Ponty:

> The body is the vehicle for being in the world, and having a body is, for a living creature, to be intervolved in a definite environment, to identify oneself with certain projects and be continually committed to them. (Merleau-Ponty, 1963, p. 82)

In this statement, "projects" can be read as referring to specific goal-directed actions of the person in the world, actions with a directionality and an end implicit in their origins — in other word, intentional acts. Thus, Merleau-Ponty is suggesting here that the body should be viewed more broadly than only in a physical or physiological sense; it is the means by which goal-directed actions that comprise the individual's intentional repertoire are expressed.

Merleau-Ponty goes to considerable lengths to emphasize that intentional acts do not exist *in* the individual in the form of, e.g., a motor representation or schema. Instead, he argues, intentional acts are always *situated*. That is, inherent in an action is a reflection of a situation or a set of conditions. An intention is not describable in the absence of some foreseeable expression of it in the world. In this respect, intention does not refer to a mental representation; it is *not* a mentalistic notion. Rather, it refers to possibilities that are only realizable as situated behavior.

To explore these ideas a bit further, an intentional act as a representation independent of situational factors is at best an abstraction. Instead, intention refers to possibilities that are only instantiated in a particular form in interaction with situational factors (see below). In this respect, it is similar to the concept of genotype. Here also we have a concept that reflects certain possibilities that can be manifested in the presence of particular environmental factors. The biochemical basis for genotype is very real, as is the functional organization of the motor system. But what will be expressed phenotypically is not preordained in the absence of particular environmental conditions, and

likewise, specific motor actions (excluding perhaps certain simple reflexes) are probably not programmed in the nervous system to be expressed without the presence of situational factors that play a direct role in establishing their particular form (Turvey, 1977).

An intentional act is situated with respect to two factors: the functional characteristics of the environment confronting the individual, (i.e., its affordances), and the physical characteristics of the individual's body, (e.g., body-scaling). The affordances of the setting are, in a sense, the ecological resources for behavior. The physical characteristics of the body establish what can be performed (i.e., what the individual can do) as a function of such things as length of reach and stride, breadth of grasp, strength, etc. In combination, the affordances of the environment and the characteristics of the body constrain the range of intentional acts that can be expressed.

To take an example, sitting down is an intentional act with two situational facets: perceiving a surface of support that affords sitting and simultaneously an awareness of one's relevant body dimensions. These two factors jointly create the possibility for the expression of this intention and determine its particular form. The act of sitting down has little meaning as a pure motor representation; it is only meaningful as a situated act.

Both Merleau-Ponty and Gibson emphasize that perceiving simultaneously entails an awareness of both the environment and the body. Just as affordances are perceived properties of the environment, our body is also phenomenally present as we move around and engage the world. While the object or event receiving our attention at a particular time stands out in relief as a "figure" against the background of the rest of the environmental array,

> one's own body is the third term, always tacitly understood, in the figure-background structure, and every figure stands out against the double horizon of external and bodily space. (Merleau-Ponty, 1963; p. 101)

Gibson (1979a) makes a similar point about these two facets of perceptual experience:

> The optical information to specify the self, including the head, body, arms and hands, *accompanies* the optical information to specify the environment. The two sources of information coexist . . .. The supposedly separate realms of the subjective and objective are actually only poles of attention. (p. 116) . . .. The continuous act of perceiving involves the coperceiving of the self. (p. 240)

It is suggested then that both the environment and the body are aspects of the perceptual field, and moreover, that goal-directed actions are realized in relation to these two factors. The body, in particular, is an instrument or tool through which intentional acts that are directed toward environmental objects are expressed. That is, the body needs to be viewed not merely as a set of physical dimensions, but more deeply as a "vehicle for being in the world".

Affordances reconsidered

Adopting the intentional approach to the body suggested in the foregoing invites a modification of our earlier definition of affordances. Instead of solely specifying an affordance relative to the size of some relevant body feature, perhaps we should couch this specification in relation to the body as it participates in a particular goal-directed act. That is to say, an affordance is perceived in relation to some intentional act, not only in relation to the body's physical dimensions. So, for example, whether that object before me affords grasping must be assessed relative to an intentional act (i.e., grasping), and not only with respect to hand size, although this remains an essential factor.

This point may seem to entail a relatively minor definitional revision, but it has significant consequences by broadening considerably the possibilities of what can count as an affordance. If affordance is defined relative to the intentions of the individual, instead of only relative to body-size considerations, we can attribute functional meaning to any environmental feature that is implicated in an intentional, goal-directed behavior.

Consider the following example: Can one justifiably say that a typewriter affords typing? If affordances are limited to body-scaled objects, this claim makes little sense and may seem to be an unreasonable application of the affordance concept. Even though the design of a typewriter keyboard is scaled to the hand, the act of typing goes beyond mere manipulation of keys. It is a structured act both linguistically (in terms of language expression) and motorically (in that a particular manipulation of the machine's parts is critical). At the same time, when viewed as a structured act, typing can be seen as a goal-directed or intentional, *situated* behavior. The act of typing is realized through the body in conjunction with a machine configured in a particular way. *Within the domain of this situated act*, the typewriter affords a specific action, namely, typing. From an intentional perspective, then, the typewriter takes on functional meaning, that is, an affordance, within the context of this goal-directed activity.

We might then reconsider affordances as the functional significances of environmental objects taken relative to what an individual can do with respect to them. Knowing how to do something necessarily implicates (1) the structural characteristics of the objects utilized in the performance of the action and (2) the structural characteristics of the body that engages those objects. In other words, knowing how to do something is situated knowledge.

Is the couching of affordances in an intentional framework consistent with Gibson's theoretical approach? It clearly is appropriate to do so in that the action-oriented definition of the concept of affordances suggests an intentional perspective. In contrast to an emphasis solely on their body-scaled characteristics, an intentional view of affordances may be more in keeping with Gibson's concern with the environment's possibilities for action. Indeed, body-scaling *per se* suggests little, if anything, about action.

Further, Gibson's continual emphasis on the perceiver as a seeker of stimulus information testifies to his intentional leanings: "[Perceiving] is the activity of getting information from the ambient array of light" (Gibson, 1979a, p. 147; also see, Gibson, 1958; Gibson, 1966, Chap.2). However, it is not solely a matter of the perceiver self-directing his exploration of the environment; as was stressed earlier, properties of the environment, especially affordances, constrain and control the discovery process. Gibson points out the reciprocal role that intentional action and affordances play in the on-going process of "keeping-in-touch with the world".

> And what about the "intentionality" of perception when an observer is seeking information instead of simply having it presented to him? . . . What sounds to me promising is to begin with the assumption that active perception is controlled by a search for the affordances of the environment and that active behaviour is controlled by perceiving those affordances. (Gibson, 1974, pp. 387–388)

More generally, there is a broad intentional quality to Gibson's analysis of perceiving. Consider the following comments:

> Perceiving is an achievement of the individual, not an appearance in the theater of consciousness. It is a keeping-in-touch with the world, an experience of things rather than a having of experiences. It involves awareness-of instead of just awareness. It may be awareness of something in the environment or something in the observer or both at once, but there is no content of awareness independent of that which one is aware . . . perception is not a mental act. Neither is it a bodily act. Perceiving is a psychosomatic act, not of mind or of body but of a living observer. (Gibson, 1979a, p. 239–240)

This emphasis on perceptual awareness as always "awareness-of" places Gibson squarely in line with intentional approaches to psychological phenomena, from Brentano and Act Psychology through most phenomenological approaches. At the same time Gibson takes pains to point out that perceptual awareness is not a mental phenomenon. He, like Merleau-Ponty, is seeking an alternative way of discussing these problems that avoids, on the one hand, the arid and value-free world of material processes, and on the other hand, the insubstantial fiction of a mentalism that is not grounded in naturalism. I will have more to say about this point in the concluding section of the paper.

Intentionality and the locus of affordances

An intentional analysis of affordances also brings to the forefront the matter of the locus of functional meaning. This analysis suggests that, strictly speaking, the perceived affordant meaning of an object resides neither in the object, considered independently of an individual, nor in the mind of the beholder, but that it emerges from their relationship.

Let me attempt to be clearer about this point, first by turning again to Merleau-Ponty's (1963) analysis of perception.

> When we say that an animal *exists*, that it *has* a world, or that it *belongs* to a world, we do not mean that it has a perception or objective consciousness of that world. The situation . . . is not entirely articulate and determinate . . . it presents only a practical significance; it asks only for bodily recognition; it is experienced as an "open" situation, and "requires" the animal's movements, just as the first notes of a melody require a certain kind of resolution . . . (p. 78)

By denying an "objective consciousness" of the world, Merleau-Ponty is denying that perceptual experience consists of the passive imposition on the individual of an environment with fully determinate meaning. Rather, perceptual experience entails the participation of the perceiver in bringing to realization some of the potential meanings of environmental features. (See the discussion of actual versus potential affordances below.)

> [The intentional act] does not arise from objective stimuli but moves back toward them, and invests them with a meaning which they do not possess taken singly as psychological agents, but only when taken as a situation. It causes them to exist as a situation, it stands in a "cognitive" relation to them, which means that it shows them up as that which it is destined to confront. (p. 79)

In other words, the perceived meaning of the situation arises from the interaction of the environment's functional possibilities and the intentions of the individual, that is, from its place in a situated, intentional act. Its functional significance is relationally determined.

This claim requires additional explication, and for this purpose let us consider Dewey's (1896) treatment of perceived meaning in his classic critique of the reflex-arc concept in psychology. He argues in this analysis that the perceived meaning of an environmental object emerges from a continuous, transactional interchange between the individual and the environment. This point becomes clearer when it is recognized that often the meaning or value of an object changes with experience and with intention. Let us first consider the case of the modification of object meaning as a function of experience. To use Dewey's example, at one moment a candle flame may appear attractive to a child, who accordingly reaches out to it, but at a later moment, after the child is burned, the candle appears aversive. How can we understand this state of affairs?

The initially *perceived* quality of attractiveness is not solely inherent in the object (i.e., as a thing-in-itself), otherwise how could this quality change with experience? Nor is it held subjectively by the child independent of the object; the object cannot be construed in *any way* by the child. Its possible meanings are constrained by the object's physical properties (e.g., its light and warmth). Instead, the attractive quality arises out of the relationship between the object and the child *at a particular time*. The naive child visually inspects the candle (perhaps we might say, adopts an aesthetic attitude toward it) and in the context of this intentional action, the candle appears attractive. This positive, perceived quality encourages haptic exploration (i.e., it appears to afford

touching). Initially at least, the candle appears attractive to touch, as well as to look at, in relation to the intentional act of exploration.

Following a painful episode with the object, its perceived value as an-object-to-touch changes, or rather this optical-haptic dimension of the relationship between the object and the perceiver becomes transformed. In particular, through the course of exploring the candle's flame, the child discovers an invariant, namely the invariant conjunction of its visual appearance and its cutaneous warmth. Henceforth, the affordance of the candle is "that which burns when touched", even though it remains attractive in relation to visual exploration. Dewey put it this way:

> The burn is the original seeing, the original optical-ocular experience enlarged and transformed in its value. It is no longer mere seeing; it is seeing-of-a-light-that-means-pain-when-contact-occurs. (Dewey, 1896, p. 359–360)

Again, the perceived meaning of the object does not reside solely with the object or the person, but it derives from the intentional relationship between the two, which includes the history of their interaction. The quality of the initial experience is "reconstituted" through the course of interaction with the object. Viewing environment-behavior interaction as being continuous as well as cumulative, as discussed above, the meanings of environmental features naturally become transformed over time (Shotter, 1983).

The claim that the functional significances of environmental features emerge from the relationship between the object and an individual's actions can perhaps be more simply and clearly illustrated by the observation that the perceived affordance of an object also changes as a function of intention. A lighted candle not only affords pain, if you touch its flame, but more positively, it also affords illuminating a dark place as well as heating a liquid such as water. Which of these latter two dispositional qualities is realized *in experience* depends on the individual's behavioral goals or intentions at a particular time. The illuminating quality of a flame emerges from intentions concerning the lighting of a setting; and its heating quality arises out of intentions such as the desire to boil water. Both properties inhere in the object; a candle gives off both light and heat. Which one of these properties is functionally significant and is experienced at a particular time depends on the intentional character of the perceiver's actions at that time. (We will return to the issue of the multiple affordances of an object.)

The apparently mentalistic tone of this intentional analysis may seem at odds with Gibson's consistent criticism of mentalistic accounts of psychological processes. If such a characterization of this analysis was appropriate, then indeed it would be inconsistent with the thrust of Gibson's theory. But such a reading is not necessary, and certainly is not desirable. As we have seen, an intentional approach is generally consistent with Gibson's ecological view.

Further, a recognition of the role of the individual's actions in realizing the functional meaning of an object is compatible with the claim of the independent existence of those affordances relative to the individual. However, rather than take up this matter here, it is best deferred until after we consider how the affordance concept might be applied to the problem of perceiving the sociocultural-based meaning of objects.

Affordances and culturally-derived meaning of objects

Many of the examples of affordances that we have considered up to this point are of a species-specific or transcultural nature; that is, they are applicable to humans as a species, independent of cultural influences. Affordances of this type include surfaces of support, graspable objects, reachable surfaces, traversable chasms, as well as such events as imminent impact of an object moving toward a perceiver, and the imminent collision of a moving perceiver with an obstacle such as a vertical surface. One might grant that the affordance concept, and more particularly, the assertion that functional meaning is conveyed by stimulus information, works well in cases such as these, where the functional significance of an environmental feature is apt to be species-wide. However, much of the functional meaning in our perceptual experience is not of this nature; it is culturally-derived. And extending the concept of affordances to meanings that are specific to a culture may seem unwarranted, or at the very least, a careless and inconsistent application of the concept.

Can the affordance concept be applied to cases of culturally-derived meaning, or is it to be limited only to those meanings of a more transcultural or species-specific nature? When affordances are viewed narrowly as body-scaled features, in the manner discussed above, then indeed the concept will have little to say about the culturally-derived meaning of objects. In this case, the concept would have interesting, but somewhat limited usefulness in tackling the problem of meaning in perception. However, if affordances are specified relative to the individual's intentional repertoire, the prospects for a wider applicability are promising.

The intentional acts that a person acquires within a sociocultural context, like any goal-directed actions, are situated with respect to particular objects, and those objects are invested with a functional meaning in relation to these actions (as discussed in the previous subsection). For example, in this culture, forks afford skewering food and transporting it to the mouth, pens afford writing and drawing, mailboxes afford sending correspondence, telephones afford verbally communicating at long distances, and so on. The functional meanings, or affordances, of objects such as these reside within the relationship between a specific object (the properties of which are specified by higher-order information in the ambient array) and a particular intentional act. The fact that another person teaches the perceiver the behavioral significance of an

environmental feature, or that a feature has a socially-shared and conventional meaning, does not make its significance any less real from a functional standpoint. If affordance is defined relative to the body in an intentional sense, then an extension of the concept to this type of functional meaning is warranted.

Let us consider this argument through an example. Gibson (1979a) has suggested that a mailbox affords mailing a letter (cf. p. 139). In what sense do mailboxes have this functional meaning? They do to the degree that a person knows what it means to mail a letter; that is, to the degree the act of mailing a letter is a part of an individual's intentional repertoire. If this knowledge is acquired in the United States, then essentially rectangular-shaped blue objects with four legs and a curved top will perceptually mean "a letter can be mailed here". In Great Britain, a particular red cylindrically-shaped object will afford the expression of this intentional act. In either case, there is information in the ambient array specifying a container which is invariantly linked to the intention "mailing a letter". This intentional act is situated with respect to this object, and its affordance emerges from the relationship, as designated by the culture, between this particular object and this intention.[3]

This analysis suggests that the extension of affordances to the culturally-based meanings of objects is justified if we view affordances in relation to what an individual can do, or rather what an individual knows how to do. Much of this situated knowledge is acquired within a specific sociocultural context. Moreover, the process of enculturation can be viewed, in part, as one of acquiring a repertoire of acts, each act being situated with respect to a particular set of environmental features, the functional significance of which are socially conveyed.

Perceptual learning of affordances

How does an individual learn about environmental affordances whose functional significances are culturally-derived? We might speculate that these kinds of affordances are revealed by other members of the culture, particularly parents, siblings, relatives, friends, and other valued sources of information. By receiving direct instruction, or probably more typically through observing others' actions, the individual can learn the culturally-specific uses for particular objects.

To be more specific, the individual learns particular situated, *intentional acts in social contexts*. In this process, there is *simultaneously* a patterning of motor behaviors expressing a particular intention and (and in relation to) an enhanced sensitivity to the information in the ambient array specifying the related affordance. Developmentally, both facets of the affordance-behavior relationship change over time. The individual's intentional repertoire expands and differentiates, and concurrently, invariants specifying new affordances in the environment are discovered. In the course of this kind of perceptual-motor development, the individual learns about the affordances specific to a particular culture, and this learning forms a significant part of the enculturation process more generally.

Of course, one does not need others to convey the affordances of objects whose functional significance is not culturally specific. In order to provide a more complete account of affordance learning, let us briefly consider two other ways in which intentional skills are differentiated and new affordances are revealed:

a. Perceptual learning that accompanies maturation and other sources of physical change

Some of the affordances of the environment are discovered as the individual changes physically through maturation. Changes, for example, in height or strength, permit new actions in the environment. The individual can perform actions that were previously not possible. Conversely, in the case of aging or significant changes in motor ability due to accident or disease, the individual can no longer perform certain actions. The physical state of the body and motor proficiency (and the accompanying awareness of these body factors) are one set of factors that establish what one can do, that is, what intentional acts are possible.

In turn, (as argued earlier), intentional possibilities invest the world with functional meaning. For example, when the child develops the motor abilities to grasp small objects and to make controlled arm movements, objects such as pencils, pens, and crayons take on new functional significance; namely, they afford marking, scribbling, drawing, etc. The discovery of new affordances is made possible by the maturational change, and more deeply by enhancement of the intentional repertoire.

Loss of function, or of intentional possibilities, through aging, disease, or accident also results in changes in the possibility of realizing particular affordances. For example, in the case of some disabilities, stairs may no longer afford locomotion, but instead signify an obstacle. As the intentional capacities of an individual change, the affordances of the environment change concurrently.

b. Perceptual learning through exploration

New affordances can also be discovered through exploration by the individual, apart from maturational changes. In the course of exploring objects and places in the environment, the child fine tunes motor skills and simultaneously learns more about environmental features. Put in another way, exploration and motor skill refinement enhances the intentional repertoire and concurrently leads to the uncovering of new environmental affordances. To carry over the example used above, a child with some minimal motor skills for drawing may discover through personal exploration that lipstick tubes, like pencils and pens, also

afford drawing. Likewise, an individual who experiences some loss of a particular motor function may learn new affordances as the existing motor skills become more highly developed and differentiated.

Age-related changes in the visual world

Whether through maturation or learning, or more precisely through their interaction, age-related changes in the way in which the environment is experienced have long been noted by developmental psychologists with a phenomenological orientation.[4] For example, Werner (1948) describes the child's world as a "world of action, a behavioral sphere in which everything is framed in terms of handiness and unhandiness, of efficaciousness and inefficaciousness" (pp. 382–383), and the functional properties of this world become transformed with age. He offers as an anecdote the likely changes in the "world of action" of a young boy who

> at the age of eight no longer recognizes the sea which he knew at the age of four. At that time the sea was determined by different things-of-action. Such small objects as mussels and little stones, butterflies, and the wet sand ready to be molded into simple forms — these made up the world of the seashore for the four-year-old, whereas the eight-year-old conceives this same region as an arena for sports and swimming, and no doubt thinks of the tremendous surface of the water as an invitation to adventure. (p. 383)

Among the other examples Werner offers is a summary of the pioneering, empirical research of Muchow (Muchow and Muchow, 1935; also see Wohlwill, 1985), who conducted one of the earliest observational studies of children's activities in a city. One site that was examined in the study was a canal loading dock. Werner points out that observation at this site suggests how different it must have been experienced by children as compared to adults.

> For the adult the principal features of this place would be the street, the path down, and the landing place. The child, particularly at an earlier school age, pays little attention to these elements. For him the main features are the wooden fence and the slopes. The fence which, for the adult, has the negative character of stopping movement, is for the child, exactly to the contrary, the very signal of movement. It invites the child to climb or jump on it or over it. Similarly, the slopes, which would have an indifferent or negative value for the adult, represent a provocative field of action for the child. (pp. 386–387)

Putting this passage in the terms of the present discussion, it would seem that the affordances of features at the loading dock site were different for adults and children. Moreover, Muchow noted that the site was probably experienced differently by children of the various ages observed. In particular, the fence and the slope were perceived as affording different activities at successive age levels:

> The child of two to three years old frequently apprehends fence and slope as areas of independence, as a means of affording a temporary, pleasurable separation from the mother standing on the other side of the rails. Children of kindergarten age use the fence as something on which to sit and balance themselves, whereas six- to eight-year-olds use it as a gymnastic device. For the three- to four-year-old the slope is something to be apprehended in awe and curiosity as a field of danger. Somewhat older children try to master this danger zone by sliding down it on their seats. (Werner, 1948, pp. 387–388)

These phenomenological accounts illustrate some possible age-related changes in the manner in which individuals experience aspects of the environment. Further, they also serve as examples of the claims that affordances of the environment are relationally specified and independent properties of the environment (see below), and that environmental features may have multiple affordances. With regard to the latter, as the child discovers affordances of environmental features, either through exploration, instruction, or modelling others' actions, she comes to recognize that objects can afford not only one particular action, but also that they often have multiple affordance possibilities. Let me conclude this section with a brief consideration of this matter and its implications.

Multiple affordances of objects and the actual-potential distinction

Most objects can be used in many ways. A book is a common multi-purpose object in the adult world. Not only is it a source of information, but it can also be used to prop open a window, to stop a door, to support a table, to decorate a shelf, and so on. One of the delightful experiences of childhood is probably the discovery of new uses for familiar objects, or put in other words, the discovery of a new affordance in a familiar object. This type of discovery was, in fact, used by Köhler (1925) as one type of evidence for intelligence in primates in his famous studies of insight learning.

The child can discover new affordances of an object by using the object in new ways, as well as by observing others doing so. Spoons can not only be used for eating, but also for digging in the dirt. Boxes can be used to store other objects, but they can also be used as enclosures to hide in. Particularly popular among children are those environmental features that have many possible use functions, for example, sand and clay, as can be seen in Barker and Wright's (1951) observations of one boy's activities during the course of a day (for example, see pp. 338 ff.; also see Heft, in press).

The notion of the multiple affordance possibilities of an object is consistent with the intentional analysis offered above. The affordances of an object are realized in relation to some intentional act in the individual's behavior repertoire. For example, if an individual's goal or intention is to cut an object, a second object that has a sharp edge and is graspable will be perceived as affording "cutting-with". If the individual's intention is to pry open a lidded

object, that same "cutting-with" object will be perceived as affording "prying-with". If the intention is to tighten a screw, this same object may afford that particular action. In each of these cases, the various affordances of the object arise from a relationship between a particular intentional goal and the properties of an environmental object, as discussed at length above.

Typically, an environmental object offers a variety of potential affordances, one (or more) of which is realized in conjunction with a particular intentional act. The multiple affordance possibilities of an object highlight a crucial distinction between *potential and actualized affordances*, a distinction that has its counterpart in potential and actualized intentional acts. At any given time, the individual is perceiving-utilizing only a subset of the potential affordances of an object. In addition to the potential affordances of a *single object*, more generally the individual is experiencing few of the affordance possibilities in the total environment at any particular time. The remaining environmental affordances exist as possibilities to be realized in relation to the individual's intentions.

Following Turvey, Shaw, Reed, and Mace (1981), we can distinguish between dispositional and occurrent properties of objects. Dispositional properties refer "to a thing's potentialities — to what can happen. As such they are to be distinguished from occurrent properties, the properties that a thing is currently exhibiting" (p. 261). The dispositional properties of objects considered at a behavioral level are their functional possibilities — what an animal can potentially do with them or in relation to them. These properties can be specified as environmental potentialities, apart from their occurrence or realization, but in relation to some animal (see below). Accordingly, functional possibilities, or potential affordances, like any dispositional (e.g., the solubility of sodium chloride), are real properties of objects or substances. "The ecological approach . . . focuses on real possibility; for it takes possibility to be an ontological category" (Turvey, *et al.*, 1981, p. 262). Thus, the environment for a particular perceiver can be considered to consist of "permanent possibilities" for perceptual-motor experience. We will pursue this issue further in the next and concluding section.

ECOLOGICAL INDEPENDENCE AND THE RELATIONAL NATURE OF AFFORDANCES

As we have seen, there is a tension in Gibson's theory between two apparently competing claims: On the one hand, the properties of the perceived environment, including affordances, are considered to be *independent* of the perceiver; they constitute "ecological reality". Perceiving is seen as a process of keeping in touch with environmental conditions through the pick up of information in the ambient array unequivocally specifying these conditions, as opposed to being a "ratiomorphic" process of making inferences, hypotheses, or best guesses about the environment from equivocal, sensory cues. Thus, Gibson's theory of perception provides possible grounds for the epistemological position of direct realism as an alternative to the indirect realism assumed by the standard constructivist approaches to perception (Gibson, 1967).

On the other hand, Gibson advocates a *relational* approach to perception, as is most clearly reflected in the affordance concept. The environment's affordances are specified relative to an individual, or put in another way, attributes of the perceiver contribute to the specification of psychologically significant environmental properties. This approach would suggest that environmental features, and affordances in particular, do not exist independently of a perceiver.

Is there a fundamental contradiction between these respective claims that environmental features, and affordances in particular, exist independently and that they are relational in nature? If not, what is the basis for this apparent contradiction, and how can it be resolved?

Noble (1981) has cogently discussed this dilemma, and he sees the problem arising from Gibson's failure to acknowledge and to develop sufficiently the pragmatist tendencies in his own theory.

> Gibson's whole theoretical program has derived much of its power from insistence on the organism as an active investigator of its environment . . .. But his distaste for idealism makes him overlook the pragmatic nature of the act . . . in the production of an organism's perceptual world. He can see that organismic activity is vital in any valid account of perceptual experience, but he can't see that the act itself — what the organism is doing, is *intending* to do, can do and can't do — is . . . bound up in the generation of its perceptually experienced world. (p. 70)

Whereas Gibson stresses the critical role played by the perceiver's actions in the perceptual process, specifically in the pick up of invariants in the ambient array, he is wary to promote more fully the pragmatic or intentional role of action in perceptual experience. The reasons for this are all too obvious. Gibson wants to avoid the appearance of introducing mentalistic concepts into his account of perceiving so that he cannot be read as advocating a mentalistic or dualistic approach, or an "enrichment" theory (Gibson and Gibson, 1955). Accordingly, he seems to limit his discussion of the perceiver's role in the perceiving process, particularly (but not solely) through the language that he employs.

Noble feels that Gibson has unjustifiably drawn away from the pragmatic and intentional character of his own position, and

> that Gibson's neglect of the pragmatist tradition . . . has meant a lack of access to *nonmentalistic* concepts of "the organism's role" in the creation of its experience. Notions such as intentionality, for a *psychologist*, belong to "motivation", and for Gibson, I suspect, that would be classed as part of the baggage for mentalism and put to one side. (pp. 70–71; emphasis added)

Noble contends, and I concur, that one can adopt an intentional approach to perceiving, and with it acknowledge more fully the individual's participation in

the perceiving process, without necessarily falling into the camp of mentalism (also see Ben-Zeev, 1984). Gibson could have articulated more explicitly this facet of his theory without being overly concerned about this latter possibility (but not the possibility of being misinterpreted). Indeed, in the preceding section of this paper I tried to develop the intentionality in Gibson's theory, while attempting to remain faithful to the nonmentalistic commitment of his position. Moreover, it is only by explicating the intentional strain in Gibson's ecological theory that the apparent tension can be resolved between the "independence" and the "relational" claims concerning affordances.[5]

Before demonstrating why this contradiction is more apparent than real, let us first consider this intentional approach more broadly. If one is inclined to assimilate all psychological concepts to a dualistic framework, then intentionality will seem to refer to a mental process. This assimilative tendency toward dualism is commonplace in perceptual analyses; indeed Gibson's theory has often been misread or failed to be understood because it does not fit into a dualistic framework (Heft, 1980, 1982; Wilcox and Katz, 1981). But intentional approaches to perception are typically viewed by their proponents as offering an *alternative to dualism*, and more particularly, as an alternative to the two manifestations of dualistic thinking in psychological theory: behaviorism and mentalism. Commenting on Merleau-Ponty's intentional analysis of behavior, Wild (1963) states:

> Human behavior is neither a series of blind reactions to "external" stimuli, nor the projection of acts which are motivated by the pure ideas of a disembodied, worldless mind. It is neither exclusively subjective nor exclusively objective, but a dialetical interchange between man and world, which cannot be adequately expressed in traditional causal terms . . . . It is out of this dialectical interchange that human meanings emerge. These meanings are neither passively assimilated from an external, cosmic order that is already fixed and established, as the realists have imagined nor constructed *de novo* by a creative mind, as the idealists have supposed. (pp. xiv–xv)

Similarly, as we saw above, an ecological approach to perception rejects both a physicalistic-mechanistic account of animal-environment relations and a mentalistic account that is not grounded in naturalism. Instead, "what is needed is a *single* theoretical language — in the spirit of animal-environment synergy — that manages to incorporate both the objectivity of the physical language and the agent orientation of the phenomenal language" (Shaw and Turvey, 1981, p. 365). With the concept of affordance Gibson sees himself as offering the kind of alternative theoretical language referred to in the preceding passage.

> An affordance, as I have said, points two ways, to the environment and to the observer. So does the information to specify an affordance. But this does not in the least imply separate realms of consciousness and matter, a psychophysical dualism . . . . This is only to re-emphasize that . . . to perceive the world is to coperceive oneself. This is wholly inconsistent with dualism, in any form, either mind-matter dualism or mind-body dualism. The awareness of the world and one's complementary relations to the world are not separable. (Gibson, 1979a, p. 141)

And

> But, actually, an affordance is neither an objective property nor a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behavior. It is both physical and psychical, yet neither. (Gibson, 1979a, p. 129)

How then does this alternative approach, reflected in the affordance concept, allow us to reconcile the tension between the "independence" and "relational" claims? In the ecological approach, the environment for an individual is delimited relationally in terms of what is potentially significant, in a functional or an intentional sense, for that individual, such as what the potential affordance properties of the environment are for a particular individual. As suggested above, an emphasis on the individual's potential for activity, i.e., the character and range of her intentional repertoire, specifies particular environmental features with respect to which these actions are *situated*. Although these environmental features are relationally specified, they can be considered to exist independently of the perceiver in at least two (related) respects.

First, as argued above, affordances can be viewed as dispositional properties of environmental features taken at a behavioral level of analysis; and viewed in this manner, affordances can be appropriately considered to inhere in environmental features. That is, the affordance properties that an object can take on are constrained by the physical characteristics of the object. Affordances are not imposed on objects by perceivers' mental processes. Second, and importantly, as a property of an object, an affordance is carried by the information in the ambient array. Thus, an affordance like any other object property specified by information in the ambient array, is "always there to be perceived".[6] For these reasons, Gibson (1979a) is justified in stating:

> The affordance of something does *not change* as the need of the observer changes. The observer may or may not perceive or attend to the affordance, according to his needs, but the affordance, being invariant, is always there to be perceived. An affordance is not bestowed upon an object by a need of an observer and his act of perceiving it. The object offers what it does because it is the object it is. (pp. 138–139)

We can describe, then, a domain of relationally specified affordances, and within that domain, these affordances can be properly said to exist independently of a perceiver as *potential* functional properties of the environment (also see Ben-Zeev, 1984).

Further, as discussed previously, in the course of the individual's on-going activity, particular affordances will be experienced (i.e., actualized) in conjunction with particular intentional actions; these affordances both complement and constrain these intentional processes. That is, the expression of intentionality will bring to psychological realization, at a particular time,

certain affordances that are compatible with these intentional acts. "Needs control the perception of affordances (selective attention) and also initiate acts" (Gibson, 1975, p. 411). Thus, among the affordance possibilities of the environment, which are ontologically real, some affordances will be realized in the course of the individual's interaction with the environment.

As the foregoing considerations indicate, by bringing out the intentional quality of Gibson's theory, the apparent contradiction between the independent and relational nature of affordances is resolvable. An emphasis on the pragmatic and intentional character of perceiving allows one to claim that the functional significances of objects are to be specified relative to an individual perceiver, while at the same time preserving the independent status of object meaning (i.e., direct realism). Further, it can be seen from the foregoing analysis that this tension grows out of a tendency to view perceptual processes from a dualistic perspective, in which relational concepts such as affordances, are inappropriately viewed as *either* objective, and independent of perceivers, *or* subjective, and dependent on perceivers.

CONCLUDING COMMENTS

I hope that this discussion of affordances has promoted a deeper understanding of the concept by detailing its explicit features and by drawing out some of its implicit theoretical roots. Further, by developing the latter, particularly the intentional character of Gibson's ecological theory, I hope to have made a convincing case for the possibility of extending affordances to instances of culturally-derived functional meaning. In all of this, I tried to remain consistent with the spirit of Gibson's intentions for his theory, as I have come to understand them.

Of course, many of these theoretical arguments demand empirical validation. Some support for the affordance concept has appeared already, but considerably more research is required to lend weight to its validity. Apart from its ultimate validity, if consideration of this concept leads researchers to investigate the meaningful dimensions of perceptual experience — a heretofore largely neglected topic — then the concept of affordance will have made an important contribution to the study of perception.

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NOTES

[1] To simplify the discussion, I will focus primarily on vision throughout the paper.

[2] Turvey and Shaw (1979; also see Shaw and Turvey, 1981) discuss the compatibility relations between environment and animal in terms of affordances and their complement, on the animal side of the ledger, *effectivities*. Their emphasis on an animal's potential for action and its relationship to affordances is broadly similar to the intentional analysis presented in this paper. Although the Shaw-Turvey approach influenced my thinking in a general manner, I chose to develop the present form of intentional analysis, rather than follow their lead for several reasons; most notably because this intentional approach seemed more readily to offer an avenue to the problem of perceiving the culturally-based meaning of environmental features (see below).

[3] This perceptual knowledge does not include an understanding of how the postal system works (Noble, 1981). Such understanding is of an abstract, cognitive nature in that it entails at least a rudimentary knowledge of the workings of this institution. One can know that a particular environmental object affords the mailing of correspondence, without an understanding of what happens after the envelope disappears down the chute.

[4] For a preliminary discussion of the role of affordances in the development of environmental knowing in children, see Heft and Wohlwill (1987).

[5] See Noble (1981) for a suggested resolution of this contradiction by drawing on the work of G. H. Mead.

Shotter (1983) is critical of Gibson's theory on similar grounds as Noble (1981), arguing that Gibson's account lacks an intentional analysis of the perceiver's activities in perceiving processes. Toward this end Shotter presents a stimulating application of Gidden's (1979) concept of "structuration" to individual-environment transactions (whereas Giddens is primarily concerned with social structures). While I agree that the intentional aspects of perceiving need to be articulated in Gibson's ecological theory, I contend (as I believe Noble does) that this aspect of perceiving is already implicit in Gibson's account (see above and subsequent comments in this section). Shotter fails to recognize this.

Moreover, Shotter misattributes "a hidden Platonism" (of all things!) to Gibson's theory. According to Shotter, Gibson views perception as a two-step process: first the animal perceives an affordance, and second the animal decides how to make use of it (p. 28). Shotter offers no evidence for the validity of this account of Gibson's theory, and his justification for this strange rendering is unclear to me.

[5] It is important to reiterate the critical distinction in Gibson's account between potential information in the ambient array, which is available to be picked up, and information that is picked up at a particular time; and thus between potential affordances and affordances that are perceived at a particular time.

Practically speaking, a description of the environment in terms of the potential actions that can be taken within it is a product of the architectural design process. Ideally, at least, architectural design provides functionally suitable places for a particular user group (i.e., users with particular functional needs). Functionally successful designs require anticipation of what an environment affords an individual prior to any action taken within it, indeed independent of whether anyone is there in the environment to perceive its affordances or not.

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