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COMMENTARY

An Ontology of Affordances

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Certain ontological questions arise naturally from the ecological approach to visual perception, and these questions have been tackled with varying degrees of commitment. J. J. Gibson himself offered some tantalizing hints, and as the years went by and his ecological approach matured, these hints became more persistent. His most telling metaphysical suggestions are to be found in Gibson (1979/1986), and in Reed and Jones (1982). I have tried to document the impressive complementarity of Gibson's metaphysical suggestions with the work of Maurice Merleau-Ponty in Sanders (1993), and I have tried to trace similar themes back to Berkeley in Sanders (in press b).

Since Gibson's early remarks on the subject, some of the best known writers in the field of ecological perceptual psychology have turned their attention to the issue (see, especially, Turvey, 1992). Unfortunately, the tendency has been to think of ecological realism as being somehow founded on a materialist basis. This is unfortunate because it reinvigorates the very subject–object dichotomy that the ecological approach so brilliantly overcomes.

In what follows, I argue that a much more promising approach takes affordances themselves as ontological primitives, instead of treating them as dispositional properties of more primitive things, events, surfaces, or substances. These latter are best treated as coalescences of affordances present in the environment (or "coalescences of use-potential," as in Sanders, 1994, and Hilditch, 1995). On this view, even the ecological approach's stress on the complementary organism–environment

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pair is seen as expressing a particular affordance relation between the world and the analyst. That the world is parsed in *any* way among events and objects, perceivers and worlds, and so on, reflects equally features of certain real or possible perspectives on the world and features of the world itself.

In section 1, I begin by contending that, contrary to the apparent expectations of some in the field, the bare existence of affordances is surely quite uncontroversial. In section 2, I argue that the most reasonable approach to foundational ontology is a relativistic one. In section 3, I address the claim that affordances must be ontologically complemented by effectivities for the sake of completeness, and I argue against that claim on grounds that I take to reflect some of Gibson's most important insights. This work will help to clarify the way affordances are to be used in the fourth and final section, where I argue that ontological work, even within special sciences, should not be merely "regional," and that the most attractive general approach to ontological questions is one that is based on affordances, rather than upon things, events, surfaces, and the like.

THE EXISTENCE OF AFFORDANCES

Ontology is traditionally taken to be the study of being. Another way of putting this is that it is the study of existence. This can be taken in a variety of ways. One particularly difficult and characteristically philosophical perspective understands ontology to involve inquiry into the nature of existence as such. What is it for something to exist? What is nonexistence? What may be said of the relation between what might be thought of as different modes of existence, like the kind of existence that billiard balls have as compared to the kind of existence that hope or love has? As it happens, the concept of "affordance" sheds considerable light on these complicated and unavoidable questions, but it is best not to delve too deeply into this matter in an initial foray into ontological issues (there will be room for some brief discussion of the bearing of affordances on deep ontology later in this essay, but the issue is explored more fully in Sanders, in press-a).

Far more illuminating at the outset of one's ontological investigations is the relation between affordances and a quite different, less philosophically perplexing array of ontological questions. For while ontology is traditionally held to be the study of the *nature* of existence, it may also be taken as the study of exist*ents*. That is, one may enter the study of ontology by way of questions about which things there really are.

What comprises the basic furniture of reality? The question whether there are gods or not is an ontological question, as is the question whether quarks or black holes really exist, whether unicorns really exist, whether egos and ids really exist, and so on. As may be plain, these questions about what really exists and what doesn't rely heavily on some understanding of the more fundamental questions about the nature of existence mentioned briefly above, but they may also be approached directly, without worrying, for the time being, about the deeper philosophical

questions. Natural scientists characteristically work in this way, and deal with deeper questions only when specific problems arise that make it unavoidable.

I recommend this course in the present context. Let us ask ourselves what there really is in the world. Well, there are tables and chairs, pumpkins and candles, llamas and penguins ... perhaps I should spare the reader the entire list, given the paucity of space. There are also ideas and emotions, though, and beliefs and dreams too. And to make matters more confusing, there are fictional characters like Calvin and Hobbes and Sherlock Holmes. These latter things don't exist in reality, we may say, but rather only as fictions ... or sometimes we say they exist only in the mind. Or—and here is the confusing part—we may say they don't really exist. And then we argue about the status (or is it the existence?) of God and justice and perfect triangles or circles.

The existence of some things ought to be entirely uncontroversial, as far as bare reality goes. Animals and plants are real, and so are rocks and oceans and those annoying phone calls that we get from computers right around dinner time. Their reality is uncontroversial because they are right out there in front of us, getting in our way sometimes. We certainly don't make them up ... if we were making them up, we could probably arrange things a lot more congenially than they are arranged now. We'd probably eliminate those disruptive computer phone calls altogether, for example.

Among the things the existence of which ought to be quite uncontroversial at this level of analysis are affordances. As a start, let's define these in a typically Gibsonian way: Affordances are opportunities for action in the environment of some animal. We've got to be careful to remember to include dangers as well as opportunities among "affordances," but that's not difficult to remember. Surely it is as peculiar to deny that there really are opportunities and dangers present in the environments of organisms as it would be to deny that there are rocks and trees. Thus the assertion that affordances are real should be about as uncontroversial a contention as can be found.

M. T. Turvey appears to think, it is true, that this contention needs quite a bit of defense (see, for example, Turvey, 1992, pp. 176–78). But surely whatever controversy there may be arises not so much over the question of the bare existence (in some sense or other) of opportunities, dangers, or possibilities, but rather at a different level of analysis—a more "theoretical" level. Certain things that plainly and uncontroversially exist may nevertheless be viewed as existing only in some derivative sense. Thus, part of what is going on even in relatively straightforward, unphilosophical musings about ontology involves arranging the things that there are in the world in some hierarchical way. It is commonplace then to contend that some things are more basic than others, ontologically speaking, and it is not a far leap from there to actually denying the "genuine" existence of some things that plainly do exist, on the grounds that their existence is entirely dependent in some way upon the existence of other things. The color blue, for example, may be held not to exist. All there are are blue *things*. And there aren't any minds or thoughts, it might be

contended: only thinking (or subverbal behavior). And in this vein, it might be contended that there aren't any affordances, really. There are just surfaces, events, and the like, and these afford organisms with certain opportunities. I suspect that readers of this journal are familiar with this argument, or at least with this contention.

Now, in this kind of exploration of ontological issues, it is perfectly reasonable to examine the opposite (and similarly unjustified) claim: that there aren't any things and events, really, only affordances. I think there are facts to be found in this realm, but surely this isn't one of them. I do not mean to give up the admission, made a few sentences ago, that the existence of surfaces and events, chairs and tables, llamas and penguins, ought to be uncontroversial. But it is interesting to call attention to the unfoundedness of the claim that affordances aren't real simply by making the complementary claim about things and events. It is important to see that there is parity here. At the level of analysis I have sought to focus on up to this point, the bare and obvious reality of affordances—opportunities and dangers in the environments of organisms—really ought not to be denied, any more than the reality of rocks and trees ought to be denied. To deny the reality of affordances would be to say that there (really) are no opportunities or dangers in the environment, and this seems absurd.

But the conclusion that affordances are (barely) real, rather than fictional, may appear to be unilluminating. At the level of analysis where attempts are made to establish dependencies and hierarchies among existents, things get more interesting. And it is to this level that I now proceed.

THE RELATIVITY OF ONTOLOGICAL FOUNDATIONS

It is not always easy to tell, in the work of scientists who address themselves to what they call "ontological" questions, just what level of analysis they are working at. On the one hand, it may seem that they seek mere lists of entities that exist (see, for example, the closing pages of Kadar & Effken, 1994, especially p. 331, where "things" are listed among the elements of the "regional ontology" they are attempting to sketch). Thus, if this is how work in "ontology" is conceived, the main job for Gibsonians might seem to be primarily the establishment of one or more new categories of existents—like affordances—that had been previously neglected, and just adding them to the traditional list. In the preceding section I contended that this should not be a particularly difficult task.

On the other hand, though, such authors also frequently devote at least some attention to desiderata like parsimony in their ontological work (see, for example, the same essay by Kadar & Effken, p. 300, where Turvey's basing his ontology on "things" is criticized because of the "derived character" of these latter). This raises the special question of the present section.

Among acknowledged existents, which are most basic? This has been a very popular ontological question throughout history. There is an interesting presupposition here: namely, that nature has somehow arranged itself in a nice orderly array, "basing" itself on some small set of principles or elements. On this view nature has a way in which it is organized, and it just sort of sits there, waiting for us to uncover the organizational principles.

Here is a similar question, similarly popular until rather recently: Which things are really in motion? There have been times when this question didn't stir much interest because people were sure they knew the answer. For example, there have been times when, in certain circles, people were sure that the earth, at least, was not in motion. Or at least that it was not moving very much. This was replaced, for a time—and, again, in some circles—by the view that it was the sun that was at rest. Once European cosmological views began to incorporate grander ideas of galactic motion, things became confusing. In awe of just how much was moving in the universe, some people came to think that it really wasn't going to be possible to figure out which things were really in motion and which ones really at rest. The whole question just seemed too complicated.

For entirely independent reasons, with the advent of the special theory of relativity, it has become clear in the twentieth century that the very question of which things are "really" moving just doesn't make sense.

Einstein was by no means the first to make this case—indeed, when Newton argued that there was such a thing as absolute motion, he plainly thought that he was arguing against a relativistic view that had gained popular ascendancy in the seventeenth century. And this is correct. The views of Galileo and Descartes, to name just two, were relativistic. And so, as is well known, was the view of Leibniz.

But the special theory of relativity showed that only a relativistic understanding of space–time made systematic sense in understanding the regularities uncovered by the development of scientific theory in the nineteenth century, and subsequent experimentation has given powerful evidentiary support to the relativistic conception of motion. The particular conclusion about motion yielded by a contemporary relativistic conception of space–time is this: It makes no sense to say that this or that is moving period; one must specify also a frame of reference.

This foray into the history of physics is important for present purposes because a similar approach must be taken to the ontological question. Among the things that really do exist (and for present purposes it is best to stick with things like tables and chairs, ideas and dreams, opportunities and dangers), it makes no sense to ask which ones are basic period. Instead, one must also specify a frame of reference.

Different ways of organizing the array of things that are real might be thought of as different parsings of the world. If you are an organism that has particular needs, some parts of the environment will be more important to the fulfillment of those needs than others. You will find that your hard wiring will have evolved in a direction that simplifies picking up the necessary information. Thus, to some extent, how the environment gets parsed by a particular organism will be determined by

biology. One might say that, given the needs of a particular species, parsing the environment in a particular way is superior to other possible ways. One cannot say it is truer ... just superior for these purposes.

In a recent article, M. T. Turvey defined his ontological ambitions in this way:

> I define *ontology* as the study of generic (nonspecific) features of reality. The proposed analysis ... is intended to be so general as to apply with equal validity to all of the affordances and all of the instances of ... [prospective control] at the scale defined by living things and their niches (Turvey, 1992, pp. 173–174; it is interesting to note that a similar interest in prospective control has been picked up by a number of recent thinkers within the cognitive science community. See, for example, Clark, 1995, and the sources cited there.)

This is admirably general. Turvey proposes here an ontology that is so general as to be applicable to the study not only of the human condition, but of the circumstances confronted by all living things. The main thesis of the present section appears to be implicit within this proposal: that different living things will parse their worlds differently, even at the most basic level, and that this is a function not only of facts about the environmental niches occupied by the several kinds of organisms that there are, but of their several sets of basic characteristics as organisms, as well.

Curiously, though, the very general approach to ontology proposed by Turvey might be less useful, in the end, than would an approach taken at a slightly greater degree of generality. For if Turvey means that we are to limit ourselves to scales defined by existing living things, then we must know which living things there are. And every time we encounter some new living thing at (perhaps) some new scale, we may have to revise our account. It would be good if we could avoid this necessity.

The ambitions of general ontological theory are likely to be better served by an analysis that is sufficiently general as to accommodate all possible perspectives; it should examine the way in which particular decisions about ontological hierarchies and/or dependencies are functions of perspective as such. In this way, ontology can avail itself of the methodological stratagem brilliantly wielded by Einstein and his relativistic predecessors.

Before addressing this issue, though, it will pay to look at an issue that has arisen throughout the recent discussion of foundational ontology among ecological psychologists. I have in mind the distinction between "affordance" and "effectivity," along with attempts to give some kind of ontological status to "intention." It is important to discuss this matter first because the distinctions in question have, I believe, obscured some of the most important insights that are to be found in Gibson's original work. Once I have clarified a bit further, in the next section, the very deep and unique role that affordances play in Gibsonian thought, it will be possible to promote the main theme of this article: that because of their very general applicability not only to all possible perceivers and thinkers, but to all possible—even all contemplatable—perspectives, affordances are ideal primitives for general ontology.

AFFORDANCE/EFFECTIVITY/INTENTION

Perhaps in part because of criticism from members of the cognitive science community, perceptual psychologists pursuing the Gibsonian paradigm began some years ago to feel that something was "missing" from Gibson's own framework of analysis. (For the earliest criticism of Gibson from cognitive scientists, see especially Fodor & Pylyshyn, 1981, and Ullman, 1980. For early reactions from Gibsonians, see Turvey, Shaw, Reed, & Mace, 1981.) What was deemed missing was something on the subject side of perception that would balance what was increasingly perceived to be too much of the object side inherent in the idea of "affordances." After all, an affordance was an opportunity for action *in the environment*. That seemed to place it plainly *out there* somewhere. This understanding of affordances led, among Gibson's critics, to a perception that Gibson was really just a new kind of behaviorist. Among Gibson's followers, this same understanding led to the idea of the "effectivity" (see especially Shaw & Turvey, 1981, and Shaw, Turvey, & Mace, 1982),

An effectivity was held to be the necessary subject-side counterpart to an affordance. While an affordance was an opportunity for action in the environment of a given organism, an effectivity was the predilection, disposition, tendency, even bodily-embedded ability of the organism to take advantage of the affordance. It was contended that these two lean more or less toward one another, that they complement one another in the sense in which Niels Bohr used the term in his attempts to clarify the physical significance of the quantum revolution in physics (for what I hope is a fairly accessible overview of Bohr's view on the subject of complementarity, along with a suggestion about the relation of complementarity to affordances as deployed ontologically, see Sanders, in press-a). Consideration of related issues has even led to a deployment of quantum mechanical formalism in an attempt to bring mathematical rigor to ecological psychology (see Shaw, Kadar, & Kinsella-Shaw, 1994).

Now I have no doubt at all that affordances, conceived at least in the way now common among Gibson's critics and followers alike, really do have an interesting complementarity relation with effectivities so defined. And I don't even wish to argue against the view that quantum mechanical formalism might profitably be used to display certain interesting features of ecological relationships vital to perception. I must say, though, that I am deeply doubtful about the ultimate value of wholesale incorporation into theoretical perceptual psychology of tools forged so precisely in the study of such an entirely different area of inquiry as subatomic physics. It is understandable that psychologists would want to mimic the success of physics. It would be unfortunate indeed, though, if they chose a path whose attractions led them away from interesting questions concerning perception in favor of questions concerning (first and foremost) mathematics.

Such concerns need not detain us at present, however. It is certainly true that a given mathematical formal system may fruitfully be deployed in wildly divergent areas of research, provided only that there be certain isomorphisms—dependent upon the character of the formal system chosen—between the areas. D. Gabor once suggested, in particular, that quantum mechanical modeling requires only that (1) two kinds of questions may be asked about one and the same phenomenon or array of phenomena, and (2) these two kinds of questions are neither fully identical nor fully independent. See Gabor (1947). I personally suspect that these requirements are too spare. For complementarity relations, for example, not any old nonidentity *cum* nonindependence will do.

My problem with all this discussion of affordances and effectivities, though, and of possible complementarity relations among them, is not that it yields anything incoherent or that it leads down useless roads. My problem, instead, is that it loses sight of the most important insights offered by Gibson, throwing out not only baby and bath water, but tub as well.

Gibson's attitude toward affordances is well expressed in the following quotation, from an exchange with Gunnar Johansson that was originally published in 1970.

> it is false to put into opposition the contribution of the perceiver and the contribution of the external stimulation. It is impossible to weigh the subjectivity of perception against the objectivity of perception. They are not commensurable. If perception is essentially an act of attention, as I maintain, and is not to be confused with imagination, hallucination, or dreaming then the perceiver does not *contribute* anything to the act of perception, he simply *performs* the act.
>
> There is a subjective aspect and an objective aspect to every phenomenal experience, but this does not mean that there is some degree of subjective *determination* of objective perception. The old idea that a perception is determined partly from the outside and partly from the inside is nothing but a muddle of thought. (Gibson, 1982b, p. 89)

Now, I am sympathetic to the complaint that there is some unclarity in all of this. It is true that it is easy to understand affordances as features strictly of the environment, however organism-indexed they might be. But surely differentiating between affordances on the outside and effectivities on the inside is precisely the kind of thing that Gibson thought to be a muddle of thought. And it is plain that such muddles are just what Gibson thought of himself as clearing up.

While there may very well be unclarity in the idea of affordances, it at least seriously undermines Gibson's main cause to seek clarity in exactly the direction he so consistently renounced. It may be that this is the only direction in which clarity can be found, of course—and that is the main contention of Gibson's critics. But I think that the critics are wrong and that Gibson was right. Consequently, my own inclination is to try to clear up the idea of affordances in a way that allows it to fall neither too far to the object side nor too far to the subject side of perception. This, I think, is truer not only to the description and explanation of perception, but to much else as well (The original complaints about the "missing" subjective element in Gibson seem to have arisen among cognitive scientists. For what appear to be genuinely Gibsonian approaches to cognitive science, whether consciously Gibsonian or not, see Dreyfus, 1993; Haugeland, 1978; Taylor, 1985; Sanders, 1985; and Sanders, 1996. The approaches taken to cognitive science in all of these sources share Gibson's antipathy to rigid subject–object distinctions).

As Harry Heft has argued in an excellent analysis of the subjectivity issue, the idea of affordance already has in it the requisite subjective aspects, and (indeed) the requisite intentional aspects (Heft, 1989; while I don't agree with everything in this piece, it is definitely well worth studying carefully for those interested in understanding affordances). As "opportunities for action in the environment of the organism," it is the "action" part that bears intentionality clearly on its face.

One must acknowledge, of course, the difficulty here. It stems from our deep intuitive commitment to the traditional "Cartesian" distinction between subject and object. It seems to me best to understand Gibson not as contending that no such distinction could be made, and not even that such a distinction could never be useful for any purpose.

Rather, it seems to me that he was making an important priority claim of a certain subtle kind. In particular, he was trying to argue that perception could not adequately be understood if one imagines that there has to be a meeting of some sort between two initially distinct realms, the subjective and the objective. What there is is activity, perceptual activity playing an important (but probably non-distinct) role in the total activity of the organism. Such activity is fluid, interactive, manipulative. It is rarely (if ever) truly passive. One can surely analyze the lived situation into subject–object sides, and into physical factors–organismic factors. This might even be useful for some purposes within perceptual psychology. But one should never imagine that these analysands are primary terms. They are the product of the theorist's analysis. The truly accurate, nonabstracted view of perception understands it, according to Gibson, as going on in a lived world that is importantly prior to such subject–object analysis. That's the first crucial point.

The second point is a vital corollary of the first point. Since physical factors that allow for grasping (for example) truly are on the object side of the subject–object gap, and since Gibson really couldn't have been more emphatic in saying that affordances definitely are not over there (rather, they bridge this gap), it seems clear that Gibson could not have imagined either that affordances should be understood as nothing more than object-side characteristics of the environment, or consequently that he could have accepted the idea that something was missing—like "effectivity"—on the subject side. This move is antithetical to Gibson's entire campaign.

The point of this section, then, is that affordances, properly understood, do not need to be ontologically complemented with effectivities, and that the certainly vital role of intention in perception—and in activity generally—is already implicit in the idea of affordance.

BASING GENERAL ONTOLOGY ON AFFORDANCES

As mentioned in section 2, it frequently seems that the interests scientists have in ontology are local, or "regional." They seem to be interested in knowing to which entities they need to refer to express most perspicuously the things that they have learned within their special fields. Thus, at this level, they may seem most interested in questions of expression, of language, or of modeling.

Even at the level of expression, the issue of perspicacity may suggest something like a principle of parsimony in the deployment of different entity terms. Fewer is better. And then, in deciding which terms might be eliminable for the sake of parsimony (and thus of perspicacity), questions of reducibility and axiomatizability arise. Thus is generated all the sticky philosophical issues that occasionally irritate scientists so much. It all begins to seem like a linguistic exercise, and genuine contact with the area of inquiry seems to fade into the distance.

That's why choosing ontologies that are merely of "regional" usefulness will probably never be satisfactory in the sciences. Such a strategy might be valuable in certain purely theoretical exercises in philosophy or in mathematics, but not in science as such. Scientists characteristically don't think of themselves as primarily interested in figuring out how to *say* things, first and foremost. Expression is important, but it is not the core of the enterprise. The core is, instead, an attempt to understand the world.

This fact has important consequences. One cannot entirely neglect, in serious scientific work, what others have learned in other disciplines. The implication of this for ontology is that "regional" constraints on ontology-building are not the only ones. There are wider global constraints as well. Some of these external constraints are provided by other scientific disciplines (like physics and biology, in the case of ontology-building in psychology), and some of them may be provided by considerations that may not seem to be so "scientific" in origin. Some constraint, indeed, may be provided by common sense (although it is also true that common sense may ultimately get corrected by overwhelming scientific reasons, whether these are evidentiary or not).

There are lots of levels of ontologies that might be generated. Here, for example, are four:

1. An ontology might be generated strictly for the purpose of expression within ecological psychology, with no claim to any other application.
2. An ontology might be generated for the purpose of expressing the extra-psychological presumptions of ecological psychology.
3. An ontology might be generated that is limited in neither of these first two ways, but which attempts to provide perspicuous systematic vocabulary for both of them.
4. An ontology might be generated that is even more general, providing means for expressing facts about (say) the expression of facts in general.

The reason for being interested in the fourth kind of ontology is that getting ontology right at that level might very well ward off conflicts among ontologies independently generated at other levels, and with the ontological efforts of other inquirers. It would not be good if perceptual psychological issues were being examined and resolved in terms of ontological presumptions that were actually in conflict with the presumptions of other disciplines. Such things do happen as sciences develop. But they are to be avoided, where possible. Ongoing attention to the deeper levels of ontology is useful precisely insofar as it may help to avoid conflicts that are unnecessary (this, then, is the reason for what Kadar & Effken refer to as my "somewhat traditional" approach to the ontological question. See Kadar & Effken, 1994, p. 307).

The important thing here, though, is that Gibson's notion of affordance might very well provide the kind of deep tool that can bridge the gap between ontologies of various "regional" kinds. In what follows over the next paragraph or two, I am influenced I am sure as much by Maurice Merleau-Ponty as by Gibson. But, as I have argued before, they are really very close in many ways (Sanders, 1993). A parable might help: the Parable of the Infant and the Electron Microscope.

Imagine an infant, as young as you please, who has been placed in the vicinity of an electron microscope. Now I venture to say that most Gibsonians would agree with Merleau-Ponty that this infant will be confronted with affordances of various kinds. The electron microscope will offer opportunities for grasping, deployment in conjunction with other parts of the immediate environment, and so forth. Perhaps the lines of demarcation between microscope and surround are not clear, but perhaps this makes no difference, given the capacities of the infant. Perhaps, for example, the electron microscope is too heavy to budge; then its separability from the surface it sits on will not necessarily present itself as an affordance to the infant and, again depending on earlier factors in the experience of the infant, the boundary between microscope and surface may not be detected as a boundary at all.

No true Gibsonian, of course, would be likely to say that a child is *ever* confronted with purely neutral stimuli, stripped of all meaning (to think that perception begins with the apprehension of neutral stimuli appears to have been William James's mistake, in an otherwise intriguing understanding of human perceptual psychology. See James, 1890/1902, Vol. 2, pp. 7–8. For discussion, see Sanders, in press b). Perception is always an activity that goes on in a world of significances-to-the-organism, and these latter are to be understood in terms of opportunities for action. That is, they are to be understood as affordances.

As the child grows, exploration and experimentation will reveal significances previously undiscovered. But it is also the case that as the child grows, affordances that were available previously in the environment around the electron microscope no longer are. Tipping over the device presents less danger, for example, given the increasing size and strength of the child. Affordances that were not presented in that part of the environment before become present (not just noticed, not just available)—they come into existence—as the organism grows, matures, and learns.

Eventually, for some such children—grown large and sophisticated—the electron microscope affords such peculiar and abstract things as exploring the inner structure of the cell, or even (yet more abstractly) of winning the Nobel Prize.

Harry Heft proposes on the basis of an extremely compelling argument that the idea of affordance need not be limited to physical "body-scale," although this is what has preoccupied much research in perceptual psychology and ergonomics (see Heft, 1989, pp. 11ff). It should be capable of supporting discussion of human perception and action in a much wider array of behavioral possibilities. Indeed, all that counts is that affordances retain essential reference to what the organism "can do," regardless of the area of activity. Affordances are possibilities for action in the environment of an organism. What is it that is possible? Anything that the organism "can do." What, then, is the environment? Interestingly, the environment is in this context not limited to the physical surround. As referred to in the definition of affordances that we are considering, the environment appears to include the entire realm of potential "action."

Just as caves afford hiding and chairs afford sitting, just as electronic microscopes may afford holding open the door or winning the Nobel Prize, symbolic entities—words, concepts, notions, theories, and the like—offer a variety of affordances for organisms able to notice them and whose experience prepares them to perceive their potential. The environment in which affordances present themselves to human beings is thus extraordinarily complex, and includes not only a physical component but symbolic components, even purely imaginative and conceptual components. To summarize: affordances are opportunities for action in the environment of an organism, the opportunities in question include everything that the organism can do, and the environment includes the entire realm of potential activity for that organism. If the organism in question can think and imagine, that expands the horizon of activity astronomically into the realm of the conceptual and the realm of imagination.

A fully general ontology must address an infinite array of quirky potential perspectives, centered sometimes on real organisms and sometimes not. It must do this because human conceptual capacity includes an ability to occupy an endless array of peculiar perspectives in imagination, in conception, and in theory. There is no need, if one is to understand the affordances that would be available in such-and-so an environment, for actual creatures to exist that could occupy that environment. Indeed, there is no need for the environment itself to exist anywhere else but in the imagination. All that is needed for such thought experiments to work is some meager conception of the characteristics of the environment, along with some specification of the characteristics of the point of view from which the environment is encountered.

It is useful to envision some of the admittedly odd perspectives that would need to be covered in a fully general ontology. Doing so helps to clarify the need for a move to something like affordances as primitives appropriate to these general ontological purposes.

It is obvious that in an environment with no light, nothing could be seen. In environments with no vibratory medium, there could be no sound. These are clearly perceptual issues, and their connection to specifically ontological issues is not obvious. But there are ideal potential perspectives so small (for example) that what to human perspective is presented as surface or substance simply vanishes; this would be the case for a subatomic perspective. Such a perspective is clearly an idealization, since it can be taken by no real organism. Such perspectives are useful to think about, though, because they reveal the importance of perspective, and because they demonstrate the limited validity of any proposed ontological array of "things" or "events" that themselves are best characterized as coalescences of use-potential, or coalescences of affordances.

Imagine, then, this ideal subatomic perspective. While it is not possible to imagine physical sensation in such a peculiar milieu, it is nevertheless still possible to appreciate how the logic of perception—and of ontological parsing—would work, on a Gibsonian analysis. Or rather, it is at least easy to see what would not work. There would plainly be no place for discussion of surfaces as such, or objects as such. There aren't any such things at that level. Surfaces and objects are macro-level phenomena, requiring macroscopic (that is, big and blunt) detection devices (fingers, eyes, and so forth) that could have no possible correlates at the level we are thinking about. Electrons are not themselves reasonably characterized as objects. They have some object-like properties, but they also have properties that conflict with the interpretation that they are objects. They frequently behave more like waves of energy.

Now, whatever electrons are, they certainly interact with other things in the subatomic environment. Thus, there are relations at that level between different phenomena, there are exchanges of energy in quantum packets, there are law-like regularities (although some of these are statistical), and so on. Even at the subatomic level, there is information to pick up, and there are physical systems—atoms, for example—that routinely do exactly that.

Now, again: There is plainly no likelihood at all that subatomic creatures that small could exist (although it must be noted that nanotechnology of a somewhat larger scale is not unrealistic, and microbiology at that somewhat larger scale is a manifest reality). While the environment we are considering may not therefore be a truly available ecological niche for organisms, there is no good reason to doubt that it is a possible perspective. Indeed, the reader and I have just now been considering it as an interesting thought experiment within which the constraints upon ontology-building may be explored. Hypothetical creatures that small would need to be able to pick up opportunities for action in that environment, there is no dearth of such information to pick up, and—this is the crucial part—there is no possibility at all that they could pick such information up from surfaces or optical arrays. From perspectives like that, surfaces, objects, and optical arrays simply don't exist. This is therefore an ontological issue.

Surfaces and optical arrays may have vital roles to play in human ontology, but that is because they are vehicles for passing information to the particular sensory apparatuses characteristic of our species. Although surfaces and optical arrays are important to understanding human ontologies, this is because of their importance to the human part of the quest. They should not be taken as central to ontology, as such.

But our story about ideal teeny-weeny subatomic life forms offers another, deeper lesson. It is that affordances have a vital role to play in the understanding of ontology-building all the way down. Indeed, parsing the environment in this ontological array or that, taking one arrangement as more foundational than another, and, for that matter, embarking on almost any of the traditional ontological missions—whether in psychology, in physics, or more generally in metaphysics—may be understood as fundamentally involving affordances, since these missions all involve the purposes and intentions of the parser in a fundamental way, and these are in turn inevitably implicated in the affordances that confront organisms that can have purposes and intentions.

An ontological approach with the right degree of generality might even offer an explanatory framework within which differences among ontologies, from perspective to perspective, might be accounted for. This is comparable to the situation in relativity theory, wherein different assessments of motion from perspective to perspective are fully (and precisely) predictable.

CONCLUSION

It should perhaps not come as a surprise that psychological theory should lead to results with such wide (even universal) application. Psychology, after all, is the discipline that aspires to explaining how we do what we do, regardless of the particular domain of activity. It aspires to explain human activity as such. In physics, with the advent of at least Niels Bohr's understanding of the quantum revolution, we have learned that questions of the intent or purpose of the investigator may not be ignored in the analysis of physical phenomena. This doesn't mean that intent or purpose fully determines what happens in the world at the quantum level, but rather that what does happen (perhaps since parsing the world into things and events that interact and influence one another is primarily an activity that requires a frame of reference), objective though it may be, happens within a frame of reference that is implicit in the way the experimenter sets things up. Performing this experiment obtains this result, performing that experiment obtains that not altogether compatible result.

Gibson contended in 1970 that "the objects in the world outside are not just objects, strictly speaking. Some of them are places and some of them are persons, who are not quite objects, and some are events. And I don't think we can describe an event as being an object" (Gibson, 1982a, p. 93).

Objects, events, properties, substances, relations ... all these may be understood fruitfully as categories that derive their utility from their capacity to exploit the information found in the environment in such a way as to further the ends of the exploiter. Seeing the world in terms of objects and events, properties and substances, does the same kind of work as seeing the world in terms of tables and chairs. It is just that the level of generality is different. But the work done in all of these ways of seeing is that of coalescing and organizing affordances—opportunities and dangers in the environment—in a manner useful to the organism. Thus, the idea of affordances itself provides us with the most general access to ontology or, perhaps one should say, to ontologizing.

As important as human perspective is to our ontologies, ontology proper must seek a broader base. Although the right approach—the ecological approach—is a full-fledged realism, it is not to be equated or even associated with either materialism or idealism. The ecological approach is precisely the abandonment of both of these semi-abstracted ontological points of view.

Modern relativity theory not only shows us that there is no truth about what is in motion period, it also explains just why both the heliocentric and the geocentric theory should seem right from certain perspectives, and just why neither theory can be refuted experimentally.

The ecological approach to ontology, with its reliance upon affordances, does something similar. It is only by way of the ecological approach that one can understand just why both materialism and idealism seem right from certain carefully delimited perspectives, and only by way of the ecological approach that one can see clearly why neither was ever capable of refutation.

Thus the ontological basis for the ecological approach cannot be any version of materialism or idealism. And what's most important about all of this is that affordances themselves seem like excellent candidates not only for primitive terms in the explanation of perception, but as primitive to the deeper tasks of ontology itself.

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