Behavior and Philosophy, 33, 17-40 (2005).

THE REFLEXIVE THEORY OF PERCEPTION

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ABSTRACT: The Reflexive Theory of Perception (RTP) claims that perception of an object or property X by an organism Z consists in Z being caused by X to acquire some disposition D toward X itself. This broadly behavioral perceptual theory explains perceptual intentionality and correct versus incorrect, plus successful versus unsuccessful, perception in a plausible evolutionary framework. The theory also undermines cognitive and perceptual modularity assumptions, including informational or purely epistemic views of perception in that, according to the RTP, any X-caused and X-directed dispositions are genuinely perceptual—including affective, attitudinal, and immediately activated purely action-directed behavioral dispositions. Thus the RTP has the potential to provide the foundations for a broadly behavioral counter-revolution in cognitive science.
Key words: behavioral theories of perception, reflexive theories, functionalism

I shall be arguing for a broadly behavioral theory of perception, to be called the Reflexive Theory of Perception, or RTP. Its advantages over previous behavioral theories of perception (e.g., Neisser, 1976; Pitcher, 1971; Taylor, 1962) could briefly be summarized as follows:

A. It can integrate well with a broadly behavioral view of all psychological and cognitive activities, a view that is potentially fully competitive with non-behaviorist accounts.

B. It can simultaneously satisfy all seven of the following requirements of an adequate behavioral theory of perception:
    1. It involves reflexive elements, so that, for instance, perceptual aspects of behavioral conditioning can involve behavioral responses that are specifically directed toward the stimulus that caused them (Dewey, 1896; Gibson, 1950, 1966; Hull, 1943).
    2. It can accommodate facts about the evolutionary development of perception in a wide range of species.
    3. It is based on a functionalist dispositional structure, so it can both support behaviorist insights about perception and

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broader neuroscientific and cognitive science functionalist views (Bennett & Hacker, 2003).

4. It can both accommodate and explain perceptual intentionality or representation in behaviorist terms via use of U. T. Place's intentional analysis of dispositions, familiar to behaviorists, to develop a dispositional analysis of perceptual representation (Place, 1996).
5. It can explain non-representational, active, or interactive aspects of perceptual activities, such as are argued for in recent "sensorimotor" accounts of perception (O'Regan & Noë, 2001; Varela, Thompson, & Rosch, 1991).
6. It can provide a non-modular theory of perception, required in a behaviorist theory because behavioral responses to a stimulus are external factors that could be of many different, module-crossing kinds.
7. It can also explain common perceptual failures such as incorrect perception or unsuccessful perceptually based behaviors.

Thus a significant part of whatever novelty the RTP has is to be found in its integration of all of the above elements. In terms of specific elements, the emphasis on the primacy of reflexive factors in both perception and perceptual evolution seems to be new, as does also the dispositional analysis of perceptual representation and misrepresentation.

In the first two sections of this paper a brief defense of behaviorist approaches to cognition will be supplied, along with a summary of the general theoretical methodology to be employed, before introducing and defending the theory in the remainder of the paper.

How to Rehabilitate Behaviorist Approaches to Cognitive Psychology

It will be no surprise to readers of this journal that broadly behavioral explanations in psychology and cognitive science currently tend to be regarded in one of two ways. Either they are viewed as having been integrated into specialized parts of standard science, so that they are no longer recognizably part of a broad and distinctively behavioral perspective, or they are regarded as having been completely discredited by the rise of cognitive and computational approaches to the study of humans and other higher organisms (e.g., Chomsky, 1959, 1966). As a fairly typical example of the latter view, here is a recent passage from Block (2001):

> Behaviorism in one form is the view that two systems are mentally the same just in case they are the same in input-output capacities and dispositions. There are standard refutations of behaviorism. . . .But what really killed behaviorism was the rise of the computer model of cognition. If cognitive states are computational states of certain sorts, behaviorism runs into the problem that

> quite different computational states of the relevant sort can be input-output equivalent. For example, consider two input-output equivalent computers that solve arithmetic problems framed in decimal notation. One does the computation in decimal whereas the other translates into binary, does the computation in binary and then translates back into decimal. Delays are added to get the two computations to have the same temporal properties. Behaviorism doesn't fit with the computational picture of cognition; that's why it died. (p. 978)

However, behaviorists can and must deny Block's assumption that cognitive states are *computational* states. The whole identity of the kind of behavioral theory being considered by Block, according to which "Behaviorism in one form is the view that two systems are mentally the same just in case they are the same in input-output capacities and dispositions," (p. 978) is bound up with its claim that cognitive states are *dispositional* states of input-output systems and not *computational* states of such systems. Hence the proper reply for dispositional behaviorists to make is that specifically computational states have as little to do with genuine cognition as do a variety of different *neurological* states, each of which might also realize a common dispositional behavioral state of an organism. Or, to put the point in terms of *functional role* (i.e., causal role in an input-disposition-output model) the cognitive operation of calculating that two plus two equals four could equally be realized in either of Block's different computational models, and arguably both of them can be best explained in terms of the *functional role* of the system in transforming, via its internal dispositional structure, two input copies of the number 2 into an output copy of the number 4.

Thus, far from this kind of behaviorism or dispositional functionalism having been discredited, I would argue that much of the central core of our understanding of what is *cognitively* involved in such mathematical operations comes from a behavioral or functionalist model that applies equally well to abstract mathematical models of calculation, computer implementations, and relevant states of biological organisms (which may not even be capable of being in computational states for lack of the right kinds of physical structure). The above points constitute an initial sketch of how a broadly behavioral approach to cognition might be rehabilitated, even in what might be considered to be central or hard-core cognitive areas such as those involved in mathematical thinking.

However, cognitivist opponents of behaviorism likely would switch at this point to an alternative strategy, as follows. Their claim likely would be that even if a behavioral theory or approach to much of cognition is theoretically *viable* or possible—rather than dead or discredited as usually assumed—nevertheless it would be scientifically *redundant*, or unnecessarily complicated, or currently too little investigated, and so on, to be able to adequately compete with entrenched standard cognitive approaches (this could be called the "who needs it?" strategy for rejecting behaviorist approaches).

Or, to put the issue in another way, the challenge to the behaviorist likely would be to show, with respect to some important area of cognition, how a behaviorist or dispositional functionalist kind of explanation would be significantly

superior in explanatory power to competing, more standard cognitive approaches based on computational or other non-behavioral models which otherwise should, it would be assumed, win the theoretical contest by default because of their role as standard entrenched paradigms. It is this challenge that I shall take up in the rest of this paper, with respect to perception and perceptual activities throughout the biological kingdom.

The Behavioral Framework for a Perceptual Theory

To begin with some theoretical preliminaries—only sketched here but elaborated in the rest of the paper—the broadly behaviorist view to be defended has the same full generality and potential explanatory power as any kind of causally structured functional approach to psychology and cognition (e.g., Fodor, 1983, 1990).

Such functionalist approaches explain cognitive activities in terms of the *functional role* of those activities in mediating between sensory inputs and behavioral outputs. The current view will more specifically be a *dispositional* version of functionalism, as recently discussed in this journal (Vanderbeeken & Weber, 2002). Such a view is theoretically flexible in that (as with any dispositional view) the perceptual acquisition of such dispositions need not immediately—or ever—involve an actual behavioral output, in that the right external conditions for the disposition to be manifested may not be present, just as the fact that salt has the dispositional property of being soluble in water does not imply that a given sample ever will be in contact with water. But of course, as a genuine causal disposition it must be manifested if the conditions are appropriate.

Nevertheless, there is a potential danger with such general-purpose functionalist theories in that they may be empirically empty unless constrained in specific ways that would permit substantive verification or falsification. The specific theory to be proposed will be thus restricted by appealing primarily to *reflexive* dispositions, namely those caused by perceived objects or properties X that produce perceptual dispositions directed toward those very objects or properties X themselves. Also, to retain its identity as a broadly behaviorist view rather than just as a commonplace, non-behaviorist kind of functionalism, it will be required that any genuine perceptual state involves at least one *behavioral* reflexive disposition (i.e., a disposition to produce some X-directed behavioral output under appropriate conditions). This would not preclude that a perceptual state might also involve, or at least be closely associated with, non-overt dispositions such as dispositions to classify a perceived object in a certain way or engage in inferential thinking concerning it, as long as at least one overt behavioral disposition is still involved in the state.

As for the bigger picture of cognition on such a view, the general idea is that a broadly empiricist view of psychology and cognition is the right one, according to which all cognitive activity is *founded upon* purely perceptual activities, all of which include, on the present account, a dispositional behavioral component. Nevertheless, the view can be flexible enough to recognize that some cognitive

activities constructed upon this dispositional perceptual base, such as speculative thoughts of various kinds, may not themselves involve any direct behavioral dispositions in spite of their perceptual roots.

One other element in the proposed account should be mentioned since it constitutes a vital part of an adequate, broadly behavioral reply to the attacks on radical behaviorism by Chomsky and others (e.g., Chomsky, 1959). That element is an *evolutionary* component, which could explain how characteristic kinds of genetically determined, and hence *innately structured*, perceptual dispositions could have evolved in a species. A broadly empiricist behavioral theory could still insist that all behavioral dispositions were initially perceptually acquired through the learning history of individual organisms, consistently with postulating evolutionary factors that preserved successful learning while extinguishing unsuccessful attempts, via the evolutionary genetic adaptation of species that included such individual learners. Thus there is still a place for behavioral concepts such as that of operant conditioning, or other kinds of perceptually based dispositional learning concepts applying to the individual history of an organism, while behaviorists may also happily accept a significant role for innate, species-specific dispositional structures such as language-acquisition skills in current human cognition.

The Reflexive Theory of Perception

The theory will now be introduced. The Reflexive Theory of Perception (RTP) claims that perception of an object or property X by an organism Z consists in Z being caused by X to acquire some disposition D toward X itself. The view has an attractive simplicity—being definable with some initial clarity within a single sentence of modest length—while also being a natural outgrowth of a broadly causal (rather than computational[1]) functionalist approach to cognition that seeks to explain perceptual or other cognitive activities in terms that integrally involve behavioral dispositions. In any case I shall defend the RTP here in ways that also emphasize its integral connection with biological evolutionary theory.

In more detail, the theory claims that an organism Z perceives object or property X just in case X causes a *sensory subsystem* z1 of Z to cause Z to acquire or activate some X-related disposition, where z1 is some sensory mechanism such as that involved in human visual perception. Then the simpler formulation initially given follows by the transitivity of causation. Intuitively, the basic idea behind the reflexive theory is that genuine perception of X must involve the acquisition or activation of some state of X-related readiness, belief, or motivation so that Z is ready to do something about X or with respect to X.

As initial support for the RTP, arguably the primary evidence that some organism Z has perceived food item X is if Z attempts to do things such as to *directly causally interact* with X in some way, such as by eating the food X, hiding it for later use, and so on—all of which behaviors are evidence for Z having

[1] See Cummins (1989) Ch. 9 for a discussion of the distinction.

acquired X-related dispositions as part of its perceptual contact with X. Also, "negative" X-related causal dispositions need to be considered too, for example a disposition to *refrain* from causal interaction with X when that interaction would otherwise occur, such as if Z is about to collide with object X, and its perception of X consists in its being caused by X to acquire a disposition, immediately activated, to avoid colliding with X. Thus overall, the best evidence that animal Z has perceived object X is if Z attempts to do something X-related, such as attempting to avoid X or to interact with it. At the same time, the best evidence that Z has *not* perceived X is if Z's behavior shows no manifestation of any X-related dispositions whatsoever.

To be sure, this purely dispositional view of perception, and of the evidence for its occurrence, might initially seem intuitively questionable in that perception is widely regarded as being a process of information acquisition, with any associated behavioral dispositions, whether activated or not, being regarded as separable from, and subsequent to, the intake of such perceptual information.[2] However, the RTP can immediately reply with a counter-challenge to such informational views, as follows: If a pure informational view were correct, it would be possible for an organism to perceive all kinds of things without ever engaging in any subsequent appropriate behavior. But such an intellectualist, pure acquisition of information view would empirically be completely empty in the absence of any concrete behavioral evidence that perception had actually occurred (Dilworth, 2004).[3]

Given that legitimate empirical perceptual theories must explain the role that behavioral evidence plays in establishing that perception has occurred, the simplest explanation of perception itself is that it consists in *dispositions* to behave in the ways that have been observed. Hence a dispositional theory of perception such as the RTP is the simplest available legitimate empirical theory, whereas a pure informational view has no comparable empirical credibility.

Another initial intuitive roadblock to acceptance of a dispositional theory such as the RTP is that the category of dispositions, even when specifically limited to X-caused and X-related dispositions, might seem too unconnected with the standard perceptual and semantic issue of correct versus incorrect, or veridical versus non-veridical, perception. In what sense can some perceptually acquired, X-related disposition be correct or incorrect with respect to X, since any actual behavior toward X that manifests the disposition is simply a behavioral event, having no intrinsic semantic properties?

Nevertheless, here too a supporter of the RTP can appeal to the common empirical currency of behavioral evidence and argue that the only actual evidence we can have as to the correctness or incorrectness of some particular perceptual episode in organism Z's history is broadly behavioral evidence, so that the RTP cannot be any worse off with respect to evidence of semantic correctness than any

[2] See, e.g., Dretske (1981) and Fodor (1990).

[3] As emphasized by many psychologists from Dewey (1887) onward; see also Millikan's point that informational views must consider "consumer" as well as "producer" aspects of information (e.g., 1989).

other broadly empirical theory of perception. If at least some behavioral episodes do provide legitimate evidence of correct or incorrect perception—as they must for those concepts to have any empirical content—then they equally support the attribution of correctness or incorrectness to X-caused and X-related dispositions to thus behave, in conformity with the account of perception offered by the RTP.

As a simple example, the perceptually acquired disposition for a hungry person to eat some nutritious food placed in front of him while being disposed to refrain from eating some rocks similarly placed would, when behaviorally manifested in either case under normal circumstances, provide adequate behavioral evidence of correct perception of the food and rocks on any theory of perception, including the RTP. Or a linguistic example: if, after gazing at a red object X, one says "that is red" while pointing at X, this would be clear behavioral evidence of correct perception of its color on any theory of perception. On the RTP, this case would involve X-caused, perceptually acquired correct dispositions with respect to the color of X, including a disposition to thus demonstratively utter the relevant sentence in appropriate circumstances (for a useful discussion of related behavioral issues in Quine and Davidson see George, 2004).

To sum up this section, perhaps enough has already been said to show that the reflexive theory of perception has at least some initial viability in comparison with other perceptual theories. The following sections will seek to further demonstrate its theoretical strengths.

The Evolutionary Foundations of the Reflexive Theory of Perception

The basic structure of, and rationale for, the RTP will now be outlined. First, a completely naturalistic theory of perception must use no theoretical resources beyond those countenanced by the non-purposive, purely causal theoretical core of biological evolutionary theory, including physical causality itself and causally based behavioral dispositions plus actual behavior toward worldly objects. Thus, in particular, traditional epistemic views of perception as the sensory means of acquiring normatively correct information or knowledge about the world must be completely bypassed—if acceptable at all, such views must be re-established by a later reduction to their evolutionary fundamentals. These naturalistic restrictions do, however, also result in a significant theoretical advantage, namely that it becomes relatively straightforward and uncontroversial to demarcate what it is that perceptual theories are theories *of* (i.e., what perception itself must consist in, as will now be shown).

As a preliminary, two central concepts in evolutionary biological theory are those of natural selection and adaptive evolution.[4] A related causal concept is that of *adaptive behavior* for organisms,[5] in a broad sense of "adaptive" that includes all three categories of successful, indifferent, and unsuccessful behaviors (i.e.,

[4] A recent account of complexities in the concept of adaptive evolution is given by Walsh (2003).

[5] For a survey of relevant literature see Downes (2001).

those behaviors of individuals that tend to promote survival of their species, those that on average make no difference to its survival, and those which are statistically inimical to its survival). In this broad sense all behavior is adaptive in that each item of behavior has at least some minimal potential for changing the level of successful adaptation of its species to the relevant environment.

For theoretical purposes, each item of adaptive behavior can usefully be regarded as being caused by some underlying *behavioral disposition*, initially in circumstances in which the activation conditions for that disposition are immediately realized. Then more subtle and powerful forms of dispositional causality could evolve gradually, given the evolutionary advantages of sometimes delaying a causal response until conditions are more optimal—such as when a predator, primed with a disposition to eat its prey, waits until the prey is most vulnerable. But in order to achieve a more substantive explanation of adaptive behavior, issues of causality must be pushed back one stage further so that the primary issue regarding the causality of adaptive behavior is "what caused those relevant dispositions themselves"? In general terms, it is some environmental factor X that causes such a disposition, whether the factor is an object external to an organism Z or some internal part of Z itself.

Now a second meaning of the term "adaptive" may be introduced that is closer to the everyday meaning of the term "adapt." It involves some changes in disposition D, and hence behavior B, each of which results from some change in the environmental factor X. In this sense an organism Z "adapts" to, or is responsive to, changes in its environment X via a causal mechanism in which the changes in X (i.e., each succeeding changed state of X causes a corresponding change in Z's disposition D, and hence in its behavior B). Clearly this environmentally caused kind of responsive change in dispositions, and hence behavior, will often be required for successful adaptation, in the first sense, of the relevant kind of organism to an environment that is changing in significant ways.

But we still are missing one crucial element that is needed in order to achieve a theoretically useful concept of *perception* as such. So far we have nothing but causal chains and causal correspondences relating Z and its environment. In order for genuine perception to occur in organisms of type Z they must be able to achieve some kinds of adaptively beneficial *control* or *power* over the environmental factors X that cause changes in their dispositions D, in addition to merely being responsive to them. In this manner the responsive changes in behavior in organisms of evolving type Z could become *relevant* (i.e., causally effective, in diminishing environmentally caused threats, or enhancing potential environmental benefits).

But the only way in which this desired result of control over environmental factors can be achieved within the available naturalistic causal parameters is for the relevant X-caused dispositions D of organism Z to cause behavior that itself *causally acts upon*, or *causally interacts with*, those relevant environmental factors X. A typical controlling situation would be one in which an increasing value of X would have negative adaptive value for Z, but in which Z is caused by X to acquire a disposition D that, when activated, in turn leads to a reduction in the value of X

(i.e., a "negative feedback" causal loop, in which an organism achieves adaptive stability with its environment by directly modifying the threatening changes in X).[6] For example, much competitive behavior in animals can be explained thus: an increasing threat to animal Z's food supply from animal X will, if perception in Z's species has been adaptively successful, typically cause animal Z to fight off X's attempt to eat the food needed by Z.

The initial picture of perception that emerges from this account is of perception as one uniquely effective causal mechanism by which evolutionary adaptation can be achieved by a species, in which organisms of type Z are caused by some environmental item of type X to acquire X-related dispositions which, when activated, may improve the adaptive success of type Z organisms with respect to their interactions with items of type X. But this view of perception is none other than the RTP itself, as generalized to apply to adaptively relevant types of causal interactions between a species and its environment.

To be sure, perception as thus characterized is not the *only* adaptively relevant causal mechanism, as the above account makes clear, such as a case in which an item X might cause organism Z to acquire non-X-related dispositions that nevertheless have adaptive value. For example, the scent of a certain plant X might lead to more reproductive behavior between members of the species Z, even though the scent-caused reproductive dispositions in such a case are not themselves scent-related or scent-directed.

However, the evolutionary centrality or primacy of perception as a reflexively defined causal mechanism comes from the fact that in order to be maximally effective in evolutionary terms, the formation of such non-reflexive dispositions must itself be maximized by the perceptual acquisition of *scent-related* dispositions by members of species Z, such as a scent-caused disposition to seek out similar sources of the scent properties in the future, so as to ensure more cases of additional reproductive behavior. Thus in such a manner specifically reflexive, genuinely perceptual dispositions play a vital instrumental, facilitating, or catalytic role in potential adaptive successes, even when other causal mechanisms also have a significant role.

To briefly summarize and explain the argument and broader context of this section, an uncompromising naturalist approach to perception demands that traditional epistemic approaches to perception, viewed as the only sensory, broadly empirical means of acquiring normatively correct information or knowledge about the world, be bypassed completely. In their place, a pluralist view of adaptively relevant causal factors or mechanisms must be postulated. However, one of those mechanisms, namely the reflexive causal mechanism that defines the subject matter of the RTP, is both theoretically and causally primary or central in that it is causally indispensable for some adaptive results while also uniquely facilitative of adaptive success for the other available causal mechanisms.

[6] Such negative feedback analyses can also be used to explain purposive concepts in naturalistic terms (see Falk, 1995).

Also, this reflexive causal mechanism is the closest analog in evolutionary theory for the perceptual processes or mechanisms postulated in other, more traditional theories of perception, whether biological, psychological, or philosophical, and hence it deserves to be described specifically as a *perceptual* mechanism. As mentioned in the Introduction, all such theories must, if they are to have any substantive empirical content, accept the common currency of behavioral evidence that perception of an object X has indeed occurred—evidence which can only be provided by X-caused cognitive activity that results in X-related kinds of behavior. The RTP is a minimalist perceptual theory that adds only a single factor to those central items of behavioral evidence for the occurrence of perception of X, namely that perception consists in the acquisition of X-caused *dispositions* to thus behave in an X-related way.

The Unrestricted Range of Perceptual Dispositions

This section investigates an implication of the RTP, namely that as long as a disposition of an organism Z is both X-caused and X-related it counts as a genuinely perceptual disposition even if the disposition seems to have no specifically informational or epistemic character. Indeed, one would expect such an implication to hold for any genuinely behavioral theory of perception, in that in general there are an indefinitely large number of different kinds of X-related behavioral responses to a given stimulus X, and on the present theory that range is constrained only by evolutionary adaptations. Thus it would be a kind of inexplicable miracle if evolution just happened to have constrained all surviving perceptual dispositions to purely epistemic ones.

It would generally be agreed these days that a theory of perception adequate to characterize and explain the whole range of biological perception must be built on broadly naturalistic causal and biological foundations—but some of the theoretical implications of this point have not yet been adequately reflected in, or absorbed into, competing perceptual theories. A central point is that the concept of perception must have the same full generality as the concept of *environmentally caused adaptive behavior* of organisms in specific response to those environmental causes themselves, for the proper study of perceptual phenomena in a broadly biological context is inevitably the full range of ways in which organisms acquire environmentally caused dispositions to react to those same environmental factors in ways that may, in fact, make a difference to the survival of organisms of the relevant kind.

In particular, since some of these organisms may be low enough on the evolutionary ladder that concepts of informational or conceptual acquisition, intentionality, belief, rationality, consciousness, decision, emotion, desire, and so forth are inapplicable to them, an adequate general theory of perception should not put any limits on the kinds of environmentally caused dispositions to react to the environment that count as being genuinely perceptual. Our usual high-level classification of dispositions is roughly a tripartite one, as perception-related epistemic (rational belief or knowledge) dispositions plus two kinds of non-

perception-related dispositions, namely affective, emotive, or attitudinal dispositions (e.g., as manifested in desires) versus purely action-oriented dispositions that have no specific cognitive or affective components. But this high level, tripartite classification (e.g., as in Wundt, 1897) has no clear or theoretically principled application to more rudimentary cognitive systems. Hence, even if it is true that conscious human perception predominantly relies on a tightly circumscribed range of rational and epistemically relevant dispositions, this fact must not be allowed to bias, in a species-chauvinistic way, the account given of the basic nature of perception in an adequate naturalistic general theory of perception.

Recall that the RTP claims that perception of an object X by an organism Z consists in Z being caused by X to acquire some (i.e., one or more) disposition D toward X itself. A characteristic feature of this view is that it does not limit in any way the dispositions D that might turn out to be thus acquired and hence count as genuinely perceptually acquired dispositions toward X. Thus, for example, the RTP has theoretical room for the possibility that dispositions grounding some *desires*, *emotions*, or *attitudes* toward X, or pure dispositions to act in some X-directed manner, might be directly perceptually acquired in addition to dispositions providing a basis for knowledge or belief. In this the RTP is unlike other views of perception, which typically regard perception as exclusively involving epistemically relevant items such as information or beliefs about the state of the world, even if perception itself is not regarded as automatically being a justified process of knowledge acquisition.[7] However, it seems not to have been realized that this narrow epistemic assumption about the nature of perception, as found in standard perceptual theories, introduces a serious and unwarranted theoretical bias into the very foundations of perceptual and cognitive theories, not just for lower or more rudimentary organisms as discussed above but also for higher mammalian (including human) perception as well, as will now be shown.

The basic problem with such epistemic assumptions is that they foreclose on genuine empirical possibilities and force a hopelessly outdated faculty psychology on to the investigations and findings of contemporary cognitive science (see Fodor, 1983 for discussion of faculty psychology issues). On such views, a cognitive system is assumed to be divided into more or less rigid compartments, with an encapsulated perceptual system whose sole output is information about the world. It is then assumed that there must be independent, higher level cognitive units that further process such purely factual information about the world (including emotive or attitudinal units) that decide, on the basis of the perceptually acquired facts, what emotion, attitude, or value the organism should adopt to, or place upon, those facts, plus decision-making units that decide what actions should be taken in light of the perceptually discovered facts. Thus on such views, all emotions, values, or

[7] For example, Armstrong's 1961 view of perception as belief acquisition does not require that all of the beliefs are true, but it does rule out any non-belief acquisitions, such as attitude or emotion-acquisition, as perceptual. Also, despite the evolutionary foundations of Millikan's theory of perception she also views perception as primarily a matter of information acquisition (see, e.g., Millikan, 2004).

attitudes must involve higher-level cognitive interpretations or decisions about lower level perceptual facts. Similarly, any purely action-related dispositions are assumed to be exclusively the result of high-level rational decisions as to what it is best to do, all things considered, given the basic perceptual facts that are the low level input to high-level decision modules (also see Damasio, 1994 for useful discussion and criticism of such traditional views).

But countervailing evidence concerning many of our emotions and attitudes is available in that they are often completely unreflective and "instinctive," such as when one takes an instant liking, or dislike, to someone when one first meeting them or immediately hates, or loves, a painting on first seeing it. My claim is that the X-caused acquiring of such emotional dispositions toward X can be just as much a legitimate part of a low level, purely perceptual episode as can the acquiring of any other kind of more conventional epistemic perceptual disposition toward X. Similarly, one can "instinctively" or immediately react to something in an appropriate or inappropriate manner, which could equally be the manifestation of one's acquisition of a purely perceptual disposition to thus act. The assumption that all actions must be preceded by a high level decision to act on the basis of rationally evaluated facts rather than sometimes being an immediate manifestation of a pure, perceptually acquired disposition is just another distorting and unwarranted assumption implied by standard perceptual theories.

In the next section an evolutionary argument will be given that offers empirical support for the claim that there is a wide incidence of such non-epistemic, but nevertheless genuinely perceptual, dispositions of such affective or purely action-oriented kinds.

An Evolutionary Argument for Unrestricted Perceptual Dispositions

In the previous section it was argued that the "unrestricted range" implication of the RTP is legitimate—namely that as long as a disposition of an organism Z is both X-caused and X-related it counts as a genuinely perceptual disposition, even if the disposition seems to have no specifically informational or epistemic character. One of the strongest arguments for the actual wide prevalence of such non-epistemic dispositional cases is a broadly evolutionary argument, and it can be introduced as follows.

As discussed in the previous section, traditional views of perception, attitude formation, and action-oriented decision making take them to always be distinct stages of cognitive processing. For example, if one sees an oncoming vehicle and swerves to miss it, on the traditional model of rational action (Brandt, 1983) one first perceives the vehicle by constructing a mental representation of it, then one identifies the object thus represented, then one interprets the object as a danger to oneself on the basis of memories or information about vehicles and collisions, then one decides that the temporary inconvenience of swerving is better, all things considered, than not swerving and getting oneself killed, then one decides to swerve, then one executes an action of willing the swerve to happen, which finally results in the execution of one's decision to swerve. However, according to the

RTP, the relevant or salient aspect of one's perception of the vehicle might be nothing more than the immediate acquisition of a disposition to swerve so as to avoid it, a disposition which is, in turn, immediately activated so that one actually does thus swerve (Damasio, 1994, Ch. 8, gives a related account of such cases, with references).

One main, evolutionarily significant difference between these two different methods of reacting to the oncoming vehicle is very simple: the reflexive disposition procedure will typically be significantly faster than the rational action procedure because it involves much less cognitive processing. The difference in reaction time might seem like a relatively insignificant difference, but its evolutionary significance is profound. This is because over the millennia species that generally organized their short-term reactions to worldly objects and events via reflexive perceptual dispositions would have a significant survival advantage over those that did not. Indeed, this factor alone virtually guarantees that any basic kind of decision-making in organisms that could be thus streamlined would actually be so streamlined. Hence, even if it is theoretically possible for perception to function in a purely epistemic modular way, as traditionally assumed, my claim is that evolutionary pressures alone would probably be sufficient to ensure the disappearance of such slower methods whenever the faster, more direct dispositional methods would be feasible.

This argument is more powerful and versatile than it might seem at first because it potentially applies to *any* kind of disposition, not just to overtly survival-critical dispositions of flight or avoidance of dangers. Given the related evolutionary advantages of an efficient and simple cognitive structure in organisms, the streamlining procedures that optimize survival chances in danger avoidance are also highly likely to work similarly on any other potential cognitive structures. Any initial cognitive organization that functionally separated perception and recognition from various aspects of cognitive decision making would also be very likely to be streamlined into a purely perceptual disposition-acquisition process whenever possible.

Thus, for example, in perceiving an interesting new book in a bookstore, my claim would be that probably at least part of that perceptual event was the acquisition of a disposition to read that book. However, if asked about the event, one is likely, in the grip of the traditional view, to produce a kind of "rational reconstruction" of the event and claim (in effect) that one first saw or perceived the book, then realized that it had the intrinsic property of being interesting, then one decided on that basis that one should read it, then one deliberately formed an intention to read the book that involved a disposition to read it. But in evolutionary terms such convoluted cognitive processes would have no chance of survival in cases where the relevant simple and immediate perceptual disposition-acquisition was also possible.

At this point a possible line of criticism of the RTP handling of the distinction of purely perceptual versus higher-level cognitive decision-making should be discussed. The criticism is that acceptable decision-making requires, in addition to a speedy decision in some cases, also at least a minimum amount of rational

deliberation in all cases, including even in time-critical cases such as a decision to swerve to avoid an oncoming vehicle. Hence, it would be argued that the rational perceiver has to decide, for every perceptual situation with which she is confronted, whether to immediately act a certain way with respect to it or whether it would be better instead to engage in more prolonged deliberations (even if only for another second or so). But such decisions themselves involve a process of higher order cognitive deliberation based on prior, epistemically structured perceptual data, so there cannot be any cases of purely perceptual, immediately activated action-dispositions that are also acceptably rational.

There is a standard kind of evolutionary answer to such questions that provides at least one kind of adequate response to them, as follows.

The overall acceptability or practical rationality of a person's use of their perceptual mechanisms, including their differential use—sometimes in a purely perceptual way and at other times in a more explicitly deliberative way—depends not on the details of their reasoning but instead on the general evolutionary success of the surviving gene pool of the species *homo sapiens*, the members of which have in fact successfully used such differential techniques. From this perspective, normative standards of rational decision-making, as opposed to those actual decision-making practices that have survived the evolutionary winnowing process, are simply causally irrelevant.

As a coda to this section, it is important to note that the above evolutionary argument is sufficient by itself to refute traditional epistemic theories of perception along with their assumption that attitude formation and action-oriented decision making are always distinct stages of cognitive processing. Thus, whether or not the RTP is itself acceptable as an adequate perceptual theory, standard purely modular cognitive architectures cannot be even approximately correct because of the inevitable prevalence of evolutionarily effective shortcuts as discussed above (also see the following two sections for further discussions).

Evolutionary Psychology Considerations

At this stage a useful analogy to the previous arguments for the RTP will be discussed briefly. There is now—inaugurated roughly within the last fifteen years—a new field of *evolutionary psychology*, which claims that many cognitive abilities of humans are innate evolutionary adaptations rather than the results of application of completely general-purpose reasoning mechanisms to any empirical data whatsoever, as in the traditional empiricist "standard social science model" (see, e.g., Barkow, Cosmides, & Tooby, 1992). The basic arguments for such an evolutionary psychological view are quite similar to those invoked in previous sections here, in that both views include a rejection of the primacy or universal applicability of traditional rational models of decision making and an appeal instead to evolutionary factors in shaping human cognition.

However, though the general methodology employed by evolutionary psychologists can provide significant support for the evolutionary arguments invoked here in favor of the RTP, the whole field is currently committed to a claim

that all cognition and perception are fundamentally *modular*, with each cognitive function, including perceptual functions, being performed by a specialized module. But for the reasons already given here, any genuinely behaviorist theory of perception invoking evolutionary factors plausibly should reject a modularity thesis for perception because, for instance, it is extremely unlikely that evolutionary forces alone could have trimmed down the indefinite range of possible reflexive, X-related behavioral responses (to a given perceptual stimulus X) to any specialized subset of a single particular kind, such as that of purely information-related responses. Thus the very strengths of an evolutionary approach condemn as highly unlikely any such purely modular approach to cognition (for related cautionary remarks see Fodor, 2000).

Two Further Non-Modularity Arguments

Fortunately, two independent, non-evolutionary arguments are also available to confirm the non-modularity of perception. An initial overview of the first idea is as follows.

The whole evolutionary psychology movement, as well as earlier modularity supporters using non-evolutionary arguments, such as Fodor (1983) and more recent cognitive science accounts such as Carruthers (2003), invoke computational models of cognition that require a concept of information. If there were a specialized perceptual module in humans, it would presumably have the function of collecting sensory information then passing that information on to other specialized modules for further processing.

However, the relevant concept of *information* (e.g., information that an object is red) is, on any broadly functionalist view of cognition, integrally bound up with a concept of *perceptual representation* of that object as being red. But I shall argue in the next section that both concepts—of information and of perceptual representation—can only adequately be explained in terms of the RTP view that red objects cause a red-related disposition in perceivers of those objects. But such a dispositional structure would inevitably be "module-crossing" or non-modular in that because of its dispositional nature the right external conditions would automatically trigger a behavioral manifestation of the relevant perceptual disposition without any passing of information among specialized modules (e.g., from a perceptual module to a decision module then to a motor control module, etc.).

Thus, perhaps surprisingly, even the most recent evolutionary psychological or cognitive science modularity views about perception end up reproducing basically the same traditional rationalistic views about human cognition as involving a series of independent units or modules, even though in the latest versions such modules are described in computational or information-theoretic terms and are considerably more specialized than in the traditional versions. Only a broadly behavioral perceptual theory can capture the potential variety and immediacy of perceptual responsiveness, free of such unrealistically rigid constraints (a related issue will be discussed later, namely that there are also non-

representational aspects of perception, which modular models cannot capture but which can be explained convincingly by the RTP).

Here now is a second non-evolutionary argument for the non-modularity of perception. Support for the argument was, almost inadvertently, recently provided by Fodor (2000), who has been one of the leading advocates of computational views of cognition over the past thirty years or so but who argues in this work that the modular computational approach cannot capture the actual context sensitivity of many cognitive situations. But cases of context-sensitivity are, from a behavioral point of view, nothing more than the normal behavioral dependence of a response on specific external activation conditions rather than purely on factors internal to a given module, so that such kinds of cognitive context dependence are exactly what one would expect if a behavioral view is correct, while competing modular views are unable to explain them.

Information, Perceptual Representation, and Misrepresentation

A basic fact that all theories of perception must account for is that perception enables us to acquire information about worldly objects and their properties. A perceptual state S caused by the redness of an object X must somehow *represent* object X as being red or provide *information* that X is red. Standard computational or information processing theories claim that perceptual representation is to be explained purely in terms of content provided by incoming sensory information (e.g., red retinal data), but there are a host of problems involved in such "nomic covariance" approaches, which attempt to explain informational content in terms of a lawful relation between a property and the sensory stimulation it causes (see, e.g., Cummins, 1989, 1996).

For present purposes I will focus on just one of these problems, namely that of "the poverty of the stimulus" (Fodor, 1983; i.e., that purely sensory data *underdetermines* its possible distal causes, so that some degree of inference is required in every perception [Mill, 1865]). For example, correct perception of the round shape of an object could occur even when the retinal image of it is elliptical because of an observer's oblique viewing perspective on the object. The current RTP theory would completely reject nomic sensory informational approaches because of—among other reasons—the generally impoverished or partially indeterminate information provided by the senses (also see Dilworth, 2004 on why such information would be causally inert, even if there was any).

Instead, on the current behavioral approach it is the *whole functional process* of perception—involving both causation by the redness of X and an acquisition or activation of a redness-related disposition by the perceiver—that explains acquisition of information.[8] The process is a broadly inferential one in that effective perceivers must have internal dispositional structures that can produce generally accurate guesses as to the likely causes of partially indeterminate

[8] Historical precursors of such a view may be found, going back to Aristotle (350 BC). See also Dilworth, 2004.

incoming sensory data, but the guesses might be incorrect in some cases. For example, a perceiver could give evidence of having correctly perceived an object X to be red by her red-related behavioral response of putting the object into a bin reserved for red objects, or alternatively of incorrect perception if instead she puts the object into a green bin.

Thus, on this account, perception does not involve sensorily acquired information concerning redness that is stored in a perceiver's head; instead it involves a redness-caused perceptual state having the functional role of being dispositionally linked to possible red-related behavioral manifestations, whether of a correct or incorrect kind. An important implication of this view is that a perceptual state is not a *computational* state in that it is not, in and of itself, a pure informational state since it is only its dispositional links to possible red-related behavior that allow it to play its informational role. Thus the current RTP can also provide behaviorists with some principled reasons to reject the widely popular, computationally based "representational theory of mind" held by many cognitive scientists (on which see, e.g., Fodor, 1990 and Sterelny, 1990).

Nevertheless, the everyday concept of a perceptual state being a *representational* one, or of an object being perceptually represented as being red, is still a useful one for many scientific purposes—it is just that an alternative, dispositional (rather than computational) explanation of perceptual representation must be provided. Traditionally, the concept of representation has been closely linked with that of *intentionality*, or of thoughts or perceptions being *about* an object or property or of being *directed toward* such items. The current RTP already initially accommodates directedness toward actual objects or properties X via its X-directed dispositional account. However, because of the importance of the issue, some further discussion will now be provided.

To begin, U. T. Place has argued that the relevant kind of dispositional aboutness (with respect to some possible situation that would actualize an X-related disposition) is an integral feature of any physical dispositional property, so that the relevant kind of aboutness is a purely physical feature of the relevant dispositions, and hence naturalistically unproblematic (see Place, 1996 and Armstrong, Martin, & Place, 1996 as well as the similar view of Molnar, 2003). Thus, as the title "Intentionality as the Mark of the Dispositional" (Place, 1996) suggests, ordinary dispositional properties themselves possess some of the main characteristics of intentional properties, including directedness toward an item X and the possibility that item X might not be actualized if worldly conditions are unfavorable.

The novelty of the present use of Place's theoretical discovery is that it invokes Place's intentional analysis of dispositions in an analysis of perceptual intentionality itself. In other words, if a dispositional theory of perception and cognition can be provided, those dispositional structures will automatically inherit the intentional structures found by Place to be integral features of any dispositional properties. To be sure, some might be wary of Place's analysis since it supports a view of the "intentional objects" of dispositional properties as possibly being nonexistent, since the possible objects or conditions with respect to which a

dispositional property might be activated or manifested might themselves not exist (e.g., see the chapters by Armstrong in Armstrong, Martin, & Place, 1996). However, in the perceptual case a weaker analysis of dispositional aboutness (i.e., one not requiring the possibility of nonexistent intentional objects) will suffice since the relevant object or property X of a perceptual state is guaranteed to exist because it has to cause the relevant perceptual state. Hence the present dispositional, naturalistic analysis of perceptual aboutness may be acceptable even to those who cannot stomach Place's much stronger, unrestricted modal analysis of dispositions in general.

Another important issue about perceptual representation is the possibility of *misrepresentation*, or of perceptually representing an object as having a property that it does not actually have, such as when someone perceives a red object to be green and hence puts it in a bin for green objects. A traditional problem in such cases is that one's perceptual representation seems to be about a property—greenness—that is not present in the relevant object. But how can one have a disposition directed toward a non-present property (i.e., one that is not instantiated in the relevant perceptual situation)?

The RTP has two replies to such concerns. First, the behavioral evidence in either correct or incorrect cases of perception is some actual behavior, a behavior that does manifest the relevant perceptually acquired disposition caused by the actual red color of object X. So only actual properties and actual behavioral responses are required to account for either correct representation or misrepresentation.

Second, we must distinguish what a perceiver's red-caused dispositions are *actually* directed toward—namely, in the present case, the actual red color of object X—from what the perceiver may *think* or *believe* they are directed toward because of her incorrect perception. If the perceiver puts red object X in a green bin this may show that she believes her action is directed toward a green color of X, which is how she perceptually represented X. But on the present analysis her action is directed toward the actual red color of X, with the evidence for her error being the incorrect sorting of the red object into the green bin. In other words, rather than the traditional explanation of perceptual misrepresentation as a kind of special mental correct aboutness with respect to a non-actual or non-present color, on the present analysis it is instead a matter of an incorrect aboutness as behaviorally evidenced with respect to an actual color.

This completes the current dispositional analysis of the concepts of perceptual information and representation. As mentioned in the previous section, an important further implication of the present account of those concepts is that perception is *non-modular* in that the right external conditions would automatically trigger a behavioral manifestation of the relevant perceptual disposition without any passing of information among specialized modules, such as from a perceptual module to a decision module, then to a motor control module, and so on.

However, to avoid any misunderstandings, my claim of non-modularity is specifically one claiming the non-independence or interactive behavioral functioning of perceptual, decision, and motor control cognitive functions. That

issue is distinct from the issue of *perceptual encapsulation* (as claimed by Fodor, 1983, 1990), which instead concerns the extent to which perceptual processing is independent of prior beliefs and background knowledge possessed by a perceiver. The RTP is consistent with, and can be supportive of, perceptual encapsulation, which is one positive factor supporting a broadly realist view of cognitive and psychological information processing. On such an encapsulation view—in an RTP version—behavioral interaction with the world can result in objectively correct scientific knowledge about it without any fundamental interference from prior personal beliefs or prejudices of scientists.

Non-Representational, Interactive Kinds of Perception

In previous sections it has been argued that behavioral theories of perception such as the RTP inevitably violate or undermine the cognitive modularity assumption that has been a staple feature of computational and information processing theories of cognition at least for the last half-century or so and which is emphasized even more strongly in the more recent field of evolutionary psychology. A related, equally central, and far-reaching feature of any adequate behaviorist theory of perception will now be discussed further.

On any behaviorist theory of perception, perception of the world involves at least some *behavioral interaction* with it (see, e.g., Pitcher, 1971). But such concrete behavioral interactions would change the world in some ways, even if only in minor respects, so that behaviorist perception cannot simply be a matter of pure information collection of a kind that would leave the world entirely unchanged. Hence any scientifically adequate behavioral theory cannot be confined to the investigation of pure informational or representational functions; instead it must also provide some account of the ways in which behaviorist perception of the world changes that world—as well as the organism that perceives it.

A related point applies with even stronger force to any evolutionarily based behaviorist theory such as the RTP. In evolutionary terms, a basic function of perception is to facilitate the successful interaction of an organism with its environment so as to confer more adaptive fitness on later generations of the relevant species. But such interactions could be of many kinds, including interactions that change the world—or an organism's relation to it—for the benefit of organisms, in which cases the role of information collection would be confined to the minimum necessary to facilitate such beneficial worldly changes. As a simple example, animal locomotion toward food or mates, or away from predators or competitors, is generally beneficial to organisms, so an adequate behavioral theory of perception must have the theoretical resources to be able to explain the role of skilled perceptual activities, which are only representational in minor or ancillary ways, in carrying out such basic movements that change the relations between an organism and its environment.

Such points have long been familiar to behaviorists, but what is novel about the RTP is that it has the theoretical resources to provide an integrated theory of

perception that can explain *both* its informational or representational aspects *and* its non-representational, worldly interactive elements within a single broadly behaviorist framework while also providing a novel account of how perceptual failures of various kinds are to be explained. The relevant non-representational, interactive elements could be explained as follows.

First, the basic RTP theory already covers all X-caused and X-related behavioral dispositions of an organism so that many perceptual aspects of non-representational interaction with the world are already explained by the basic theory. So rather than needing to define non-representational interactive cases, the theoretical situation is instead that representational cases need to be distinguished as a functionally distinctive subset of all cases, namely those to which standards of correct versus incorrect response may be applied. For example, a perception of food may involve an activated disposition to eat the food, to which normally no issues of correct versus incorrect response would apply, so that this would be primarily a non-representational perceptual interaction case. However, if an animal attempted to eat a pile of stones, the best explanation of its behavior might be that it had *incorrectly* perceived the stones as being food, in which case there is a salient representational or informational perceptual factor in the situation even though there are also non-representational interactive factors.

An additional interactive and non-representational theoretical factor will now be introduced. The representational or informational functions of perception are closely linked to *belief* formation or knowledge acquisition. But organisms also use perceptual mechanisms as a way of satisfying their *desires*—broadly speaking, to change the world or themselves, such as when a bird builds a nest or eats to satisfy its hunger. Now the fundamental functional difference of a desire from a belief is that the functional role of desire-related perceptual states is to behaviorally *change* a perceived object, which currently does not have property F, so that it acquires that property F.

Fortunately, such desire-related perceptual states can still be explained in terms of their satisfying the basic RTP reflexive formula of being X-caused and X-related dispositions. The X in such cases would be some actual property of an object that one desires to be changed, such as a desire to change the red color of an object to a green color. One's perceptual, red-caused perceptual state involves a red-related disposition to change that red color into the desired color, such as by repainting it. Thus, desires for new properties Y are behaviorally satisfied by X-caused desires toward current property X, namely to change X into Y.

In support of this analysis, it has the same theoretical virtue as the analysis of incorrect perception in the previous section (i.e., that no dispositions toward any nonexistent or non-present properties are required). Arguably, that actual-property feature is required in a genuine behavioral disposition account in that in order to be behaviorally effective there must be some actual conditions under which the disposition would be behaviorally manifested. But that causal condition cannot be satisfied unless there is some actual current property of an object toward which a perceiver's disposition is directed. Now, just as belief-related perceptual dispositions can fail by being incorrect in misperception cases, so also can desires

fail, or be unsatisfied, by being unrealizable by a given behavioral disposition. For example, just as one might misperceive a red object as being green, so also one might desire to change a red object into a green one, but manifest that desire with a behaviorally ineffective method which does not produce the desired result. Such failed-desire cases can be explained in a manner structurally similar to that in which incorrect perceptions or misperceptions were explained previously.

In both cases the perceiver has false beliefs about her current dispositions. In the case of misperception of red as green, the perceiver falsely believes that her disposition is green-caused and green-directed when in fact it is red-caused and red-directed. In the ineffective desire case the perceiver acquires red-caused dispositions toward the current red property, which she falsely believes will change it into the desired green property, but her disposition in actuality manifests itself only as a failed attempt to do so.

Thus, to summarize this section, the RTP now has available a comprehensive explanation of the basic elements of perceptual interactions with the world—explanations which are also already closely tied in with other important cognitive concepts such as those of belief, desire, and intentionality, including the more specialized concepts of correct or incorrect perception or belief and of successful or failed perceptually integrated desires.

As for other related perceptual theories, the RTP could provide some much-needed theoretical foundations for recent, and increasingly influential, enactive, or sensorimotor perceptual theories (e.g., see Hurley, 1998 Ch. 10; O'Regan & Noë, 2001), according to which perception should be understood in terms of the skilled interactions of perceivers with worldly items. Such theories currently deny that most perception is representational, but they have no behaviorally adequate interactive theory of perceptual representation with which to explain those cases or aspects, if any, in which perception might be genuinely representational.

Perceptually Related Dispositions

A potentially useful extension of the basic RTP will now briefly be presented. Given the often chaotic and highly varied causative factors in the history of evolution, one would expect that pure reflexive perceptual dispositions would not be the only kind acquired or activated during perception. It seems likely that a perceptual object or property X might cause not only X-related dispositions but also other dispositions that are related to other worldly objects—or even to purely internal states of the perceiver—but which could themselves facilitate adaptive responses to items X, and so which are at least indirectly perceptually relevant. As a simple example, the sudden flow of adrenaline that often accompanies perception of some dangerous item X presumably facilitates fast avoidance behaviors, even though dispositions producing it are at best only indirectly X-related.

Other examples could be of a more conceptual kind. For example, if a scientist sees a predator, her perceptual interest in it might be that of adding it to a head count of predators seen in the relevant area in the present week. The current suggestion is that such possible cases could be handled by distinguishing the basic

X-caused and X-related perception itself from various other possible non-X-related dispositions that might accompany it. In such cases the scientist would still qualify as perceiving X as long as she acquires at least one X-related disposition D—such as a readiness to flee if the predator gets too close—even if that disposition is almost never manifested because of careful selection of safe viewing conditions by the scientist. At the same time, other non-X-related dispositions accompanying that purely perceptual disposition D (e.g., a disposition to add further data to head count statistics) could also be considered to be *part* of the perceptual or observational situation in a broader sense (compare Holt, 1915).

Such perceptually related, but not strictly reflexive, perceptual dispositions could also help to defuse a potential objection to the RTP, namely that we often perceive things, such as distant mountains or stars, to which apparently we acquire no dispositions at all. The current reply is to deny the claim in two ways. First, unmanifested reflexive dispositions may be invisible to casual observers, but they are still genuine, perceptually acquired dispositions. Second, often the purposes of perceiving distant objects are more related to ancillary, non-X-related dispositions (e.g., a desire to find out how far one still needs to drive in the case of perception of distant mountains) than they are to purely perceptual reflexive dispositions. But such dispositions, even if they only accompany X-related reflexive dispositions, may be counted as perceptually based in a broader sense as long as they are dependent on, or can only be acquired as part of, genuine X-related perceptual activities.

Conclusion

The first section of this paper briefly argued that a broadly behavioral approach to cognition is not dead after all, but instead just in need of a broader functionalist defense. A likely challenge in response from standard cognitivist views was subsequently identified, namely that it needs to be shown (with respect to some important area of cognition) how a behaviorist or dispositional functionalist kind of explanation would be *significantly superior* in explanatory power to competing, more standard cognitive approaches based on computational or other non-behavioral models—which otherwise should, it would be assumed, win the theoretical contest by default because of their role as standard entrenched paradigms.

This challenge has been taken up in the rest of this paper for perception and perceptual activities throughout the biological kingdom, with an initial formulation and defense of a behaviorally based *reflexive theory of perception* (RTP). It has been argued, first, that standard modular accounts of cognition, whether of a traditional rationalistic or contemporary evolutionary or computational kind, are hopelessly unrealistic because the perceptual bases of all cognitive activities are fundamentally non-modular in the various ways that have been discussed. Second, standard information processing or computational models of cognition rely on a completely inadequate account of perceptual information or representation, whereas the current RTP can supply a novel and fully adequate behaviorist one,

based on U. T. Place's analysis of the intentionality of dispositions. Third, the RTP can supply an integrated account of all aspects of perception, whether representational or broadly interactive, whereas no competing theories—whether standard cognitivist or behaviorist—have so far been able to do so.

Thus, in conclusion, it has been shown that the RTP is indeed significantly superior to standard cognitivist views, so that given the centrality of perception as a prime shaper of cognitive structure, the way is now open for a broadly behavioral revival in cognitive science, whose currently assumed modular, computational, and rationalistic structures have been shown to be significantly empirically inadequate.

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