Realism, Instrumentalism, and the Intentional Stance*

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One of Dennett's principal arguments for an instrumentalistic construal of intentional attributions (e.g., attributions of belief, etc.) is that such attributions are environment relative. I argue that one can and should adopt a realist perspective toward such attributions, but accommodate their environmental relativity by treating intentional properties as relational properties. By doing so one acquires a useful perspective on experimental cognitive psychology; in particular, one can overcome the temptation to treat ecological accounts and information processing accounts as incompatible alternatives and come to see them as mutually supportive. Treating intentional properties as relational may be counter-intuitive, but I provide examples of how other sciences have had to treat what seem to be intrinsic properties as relational.

Many philosophers have argued that a major difference between the explanations offered in psychology (and the social sciences) and those offered in physics, chemistry, and biology is that the former often employ intentional idioms while the latter do not. Examples of intentional idioms are expressions like "believes that" and "fears that." Such expressions typically characterize a subject as having an attitude towards a proposition. What makes intentional idioms seem problematic is that the proposition toward which the attitude is held may in fact be false. Some philosophers have seen intentional idioms as posing an obstacle to developing a science of psychology (see Rosenberg, 1980). As a result, numerous attempts have been made to show how one can do away with intentional discourse. Dennett (1978), however, offers us a different approach, one that grants a role to intentional discourse and then directs us to consider how the design of a system could

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cause it to behave in the manner characterized by the intentional idioms. The power of this approach and its import for cognitive science, however, has not been fully appreciated. This is in part due to the fact that Dennett ultimately adopts an instrumentalist perspective with regard to intentional idioms and denies that intentional discourse describes states in the world.

My goal in this paper is first to show that Dennett's instrumentalism is unnecessary and then to exploit his approach to produce a potentially illuminating perspective on the endeavors of contemporary cognitive psychology. One benefit of this perspective is that it shows that cognitive and ecological information can be germane to information processing psychology. The conception of mental activities that emerges, however, is somewhat counter-intuitive since it will turn out that what mental state one is in will depend on the environment one is in. However, I will try to dispel the counter-intuitive aspect of this approach by showing how a similar approach has been adopted successfully in other sciences.

1. DENNETT'S INSTRUMENTALISTIC TREATMENT OF INTENTIONALITY

The foundation of Dennett's approach is his distinction between "stances" that investigators can adopt in trying to explain the behavior of systems they encounter. When operating from what he calls the "intentional stance," an investigator treats a system as rational and tries to explain and predict its behavior by assuming that it has appropriate beliefs and desires and that it reasons rationally from these beliefs and desires.\(^1\) When operating at the subpersonal or design stance,\(^2\) on the other hand, an investigator tries to

\(^1\) Dennett's approach of treating a system from the intentional stance finds a close correlate in Newell's (1982) notion of the knowledge level as one amongst a hierarchy of levels in a system.

\(^2\) Dennett seems to equate the design stance and sub-personal psychology. But there is significant tension between them. The task of a sub-personal psychology is to analyze the subject into a set of homunculi, each of which performs a specific task and whose interaction produces the person's behavior. But, as Dennett points out, these homunculi may still need to be characterized from the intentional stance. One continues this analysis until one reaches homunculi whose tasks are so simple that it is transparent how mechanisms could perform them. These homunculi can be described from both the intentional and the design stance. Moreover, as long we are clever enough, we will be able to give both intentional and design stance accounts of homunculi anywhere in the hierarchy of homunculi. This seems to show that the intentional-design distinction is not a matter of levels of analysis as is the personal-sub-personal distinction. Dennett, however, often conflates the two distinctions, treating a design analysis as a lower level analysis of how an intentional phenomenon is produced. The account will offer of intentional ascriptions will give a means of distinguishing intentional and design ascriptions without appealing to analyses at different levels. Intentional ascriptions will make essential reference to the system's environment while design level ascriptions will describe processes occurring totally within the system.
figure out how the system has been designed so as to approximate (in a given range of environments) the rationality attributed to it from that perspective. By distinguishing these stances, Dennett differentiates the account of persons that employs intentional vocabulary from the design stance account that ascribes nothing scientifically suspect. What is of greatest interest is the way in which he proposes to relate these two stances. His goal is not to reduce intentionality to something nonintentional by identifying intentional descriptions with nonintentional ones. Rather, subpersonal analyses are to explain how a mechanism could perform as something intentional—that is, as something fully rational (Dennett, 1981a). Dennett thus shifts the problem of intentionality away from the problem of reduction, yet tries to provide a framework in which researchers can explain intentional behavior by showing how a mechanism behaves as an intentional system would.

Later, I will discuss the virtues I see in this way of treating the relations between the processing account given from the design stance and the intentional analysis offered from the intentional stance. We are now in position, though, to see how Dennett’s approach treats the intentional stance instrumentally (a feature that has aroused consternation in a number of philosophers (e.g., Searle, 1980). Dennett treats the intentional stance as a perspective from which one can describe a system but, while he allows that adopting such a perspective may prove useful to us, he claims that it does not describe properties of the system. Thus, Dennett characterizes an intentional system as simply “a system whose behavior is reliably and voluminously predictable via the intentional strategy” (Dennett, 1981b, p. 55). Our success in using the intentional stance is our only license for continuing to use it. We cannot further vindicate our use of intentional predicates like “belief” and “desire” by a demonstration that such terms refer to processes to be found in the individual.

The nature of Dennett’s instrumentalism is actually rather complex (he, in fact, does not like the label “instrumentalist,” although he seems to have acceded to it in Dennett, 1981a and 1983). Some philosophers would take the denial that there are entities or events corresponding to the terms in an intentional psychology as showing the vacuousness of that psychology and the need to replace it with a properly scientific psychology (cf. Churchland, 1979; Quine, 1960; Stich, 1983). That, however, is not the message Dennett intends to convey when he denies that the intentional idiom can be interpreted realistically. In many passages Dennett contends that we need to use the intentional idiom since we cannot predict the behavior of humans and other higher organisms as well as of some computers without it.

Sometimes the need for the intentional stance seems to be merely a result of our limited reasoning capacity. Thus, he argues that in dealing with

Below the design stance there is yet another—the physical stance—at which one examines the materials in which the design is instantiated. Dennett’s treatment of the physical stance, however, will not concern us in this paper.
a highly complex computer (e.g., one that plays a fair game of chess) we cannot follow through all the steps in its information processing and so our best hope for predicting its behavior is to assume that it is rational and to try to figure out what would be the rational thing for it to do in its position. If this were the only justification for the intentional strategy, it would seem to be dispensable, if not in practice, at least in principle. (One needs to be cautious of such in-principle claims. Richardson [1982], describes cases from the history of science where in-principle claims have obscured critical incompleteness in scientific proposals.) If intentional accounts were dispensable, even if only in principle, a strong instrumentalist stance might still be justified. Although we might be curious why such short cuts worked as well as they did, we would not be compelled to think they characterized how the system actually worked.

Dennett's instrumentalism, however, is more complex than this. He does not treat the intentional stance as merely an expedient means of calculating. While he denies that being in an intentional state is a "perfectly objective internal matter of fact" like being infected with a particular virus, Dennett maintains nonetheless that "belief is a perfectly objective phenomenon" (Dennett, 1981b, p. 55). If beliefs are objective, they are not mere calculating devices. Dennett tries to explain what this objective status comes to in the course of answering charges that his approach renders intentional ascriptions vacuous and ubiquitous.

The vacuity charge stems from the perception that Dennett's intentional stance does not seem to offer additional explanatory power beyond what one would have if one possessed a complete physical description of a system and a complete physics or a full account of the system's design and knowledge of the design principles involved. Dennett, however, contends that an intentional characterization conveys additional information that, at least for certain purposes, cannot be ignored. For example, the intentional stance allows one to abstract from details of an action (e.g., whether one uses one's left or right hand) to determine the type of action (e.g., picking up the telephone receiver) a person will perform. Many of our explanations and predictions about human behavior employ such higher level generalizations (e.g., the prediction that someone will answer the telephone when it rings). Thus, Dennett claims that intentional ascriptions describe "something perfectly objective: the patterns in human behavior that are described from the intentional stance, and only from that stance, and which support generalizations and predictions" (Dennett, 1981b, p. 64).

Dennett also rejects the alleged ubiquity of intentional ascriptions. This charge results from Dennett's own demonstration that one can attribute beliefs and desires to nearly anything, just so long as one jury-rigs these attributions so that they correctly predict the object's behavior. (For example, the thermostat believes it is too cold and so turns on the furnace.) But such ascriptions lack any theoretical bite and so can be dismissed. In th
case of humans, however, Dennett sees an important theoretical contribution of the intentional stance. He claims that his “apparently shallow and instrumentalistic criterion of belief puts a severe constraint on the internal constitution of a genuine believer, and thus yields a robust version of belief after all” (Dennett, 1981b, p. 68). Dennett explicates this point by noting that in some of the cases where intentional ascriptions seem troubling, such as ascriptions of beliefs to thermostats, the real difficulty is that the intentional ascriptions are not constrained by the entity. Simple devices can be put to multiple uses without any internal changes; all one must do is change the interpretation of its internal states. Complex systems like humans, however, must change their internal states to deal with a new environment. (Notice that to provide alternative interpretations for the intentional states of human beings one often has to resort to exotic examples like Putnam’s (1975) twin earth case.) This, Dennett claims, is what leads us to treat humans as having internal representations with determinate contents: “There is a familiar way of alluding to this tight relationship that can exist between the organization of a system and its environment: you say that the organism continuously mirrors the environment, or that there is a representation of the environment in—or implicit in—the organization of the system” (Dennett, 1981b, p. 70).

Many would see in Dennett arguments against extreme instrumentalism the basis for an endorsement of realism. The tight connection between internal and external states, in particular, seems to support a realist treatment of the posited representations. Dennett, however, does not view these arguments as supporting realism with respect to intentional states. At times his rejection of realism seems merely an endorsement of agnosticism: he seems to allow that it might turn out that there is a discrete internal state corresponding to each intentional ascription (e.g., he seems to allow that there might be a language of thought à la Fodor, 1975), but treats this as a proposal whose vindication can only come with subsequent research. When he speaks in this way, Dennett seems to reduce the question of instrumentalism versus realism to an empirical issue about how the human cognitive system is structured—if there turns out to be a reasonable mapping of intentional idioms unto processing states, then realism will be vindicated, while instrumentalism will be justified if there is no such mapping. Other threads in Dennett’s argument, however, raise far more serious objections to realism.

2. DENNETT’S REASONS FOR REJECTING REALISM

In addition to expressing agnosticism towards schemes like Fodor’s proposal of a language of thought, Dennett marshalls more basic conceptual arguments for rejecting realism with regard to intentional ascriptions. In
this section I will set out three of those reasons, holding evaluation until later.

The first of these reasons, the most significant for psychology, I will call "the argument from the environmental relativity of intentional ascriptions." It claims that the correctness of an intentional ascription to a system depends on the environment in which the system is embedded. The role of the environment in making intentional ascriptions is made clear in Dennett's distinction between viewing the mind as a semantic engine and viewing it as a syntactic engine. In adopting the intentional stance we treat the mind as a semantic engine, interpreting the symbols it is employing as referring to features of the world. Thus, from the intentional stance, the system is viewed as having knowledge about the world. But, when we seek to explain how the mental system works, Dennett claims that we must recognize that "all it can do is discriminate its inputs by their structural, temporal, and physical features" so that "its entirely mechanical activities [are] governed by these 'syntactic' features of its inputs" (Dennett, 1981a, pp. 53-54). The way the mental system processes these symbols is determined exclusively by these formal features and the aspects of the environment that are represented by these features plays no role. (The terms 'syntactic' and 'semantic' are used here with special senses. The semantic component of a symbol is its external referent while the syntactic component is the way the symbol exists in the mind. The role of a symbol in a semantic network in the mind, in terms of this distinction, counts as syntactic since these network connections link formal features of the symbols.)

Given that the two views construe the symbols of the mind differently, it is possible that they will categorize these symbols quite differently. The intentional account may classify symbols together because they have similar referents while the design approach will classify symbols together because, as a result of their syntactic features, they are processed alike by the mind. Stich (1983) advances a number of arguments to show that intentional psychology ("folk psychology") may classify symbols differently than a processing account (what he calls a "narrow causal account") which concerns itself only with the syntax of symbols. He points to cases where syntactically we can assume that two individuals are in identical states, but where we ascribe different beliefs because we identify different objects as the referents of their syntactically described states. One of his clearest examples involves two persons living in different centuries who attach the same minimal set of properties to the term "Ike," but where external connections lead us to say one is speaking of Eisenhower and the other a Victorian public figure Angell-James. In this case we would view the symbols as the same when we view the mind as a syntactic engine but treat them as different when we view the mind as a semantic engine.

I suggest that the major factor in Dennett's treatment of intentional ascriptions as instrumentalistic is just the recognition that an organism's en-
vironment figures significantly in determining the truth of intentional ascriptions but not in giving a design account. To use Stich's example, it is the environment the 20th century person is in that makes it true to say that person has a belief about Eisenhower, not the person's internal states. Because the relation to the environment affects the truth of intentional ascriptions, these ascriptions cannot be treated as descriptions of the internal workings of the system alone.

Dennett's second argument I will call "the argument from the normative character of intentional ascriptions." Throughout his writings on intentional ascriptions, Dennett presents them as attributing ideal rationality to a subject. When we adopt the intentional stance toward a chess playing computer, we assume it will choose the optimal strategy for winning and will not neglect obviously relevant information. We realize, however, that no entity, computer or human, is ideally rational since each deviates sometimes from what it (normatively) "ought" to do. Hence, real systems only approximate the normative standard and never really instantiate it. Thus, we come to see our intentional ascriptions as fictions—fictions that are more or less useful depending on how well the entity approximates ideal rationality. But as fictions, they are not really true and there are no states corresponding to the states ascribed in the intentional stance.

A third thread in Dennett's case for the instrumental nature of intentional ascriptions I will call "the argument from the indeterminacy of belief ascriptions." Ascriptions of belief are often very imprecise attributions, leaving much to be specified. For example, Dennett points out that we would ascribe to both him and a chemist the belief that salt is sodium chloride, but since the chemist's knowledge in this area is far more extensive, Dennett argues that the chemist's belief state is quite different from his own (1982, p. 49). Dennett denies that it is possible to find a basis for interpersonal comparison of such intentional states and so argues that the quest for precision in attributions of mental states is misguided. Because they cannot be specified in such a precise way, Dennett concludes that intentional ascriptions do not really describe states of subjects. Stich (1983) again offers examples that help to substantiate Dennett's case. The starkest case is Mrs. T, who resolutely affirms that McKinley was assassinated, but cannot answer questions about what assassination involves (e.g., whether McKinley could still be alive). He argues that ascribing beliefs lacks precision. Our willingness to ascribe the same belief to another shades off as the person becomes more different from us. Further, he argues that our willingness to ascribe beliefs depends on our purposes—for some purposes we might say that Mrs. T does believe that McKinley was assassinated but not for others. Given this imprecision in belief ascription, Dennett contends that beliefs are not states of a person.

In this section I have reviewed three principled reasons for Dennett's instrumentalism toward intentional ascriptions. Before considering how
these arguments might be answered, I will first examine some competing arguments that urge us to endorse realism.

3. RICHARDSON'S CASE FOR A REALIST TREATMENT OF THE INTENTIONAL STANCE

Richardson (1980a) advances two arguments for adopting a realist's position toward the intentional stance. His first argument is based on a claim about how we deal with incorrect predictions made from a particular stance. Consider first failures of predictions made from the design stance: When a system does not behave as it was designed to, Dennett claims we must appeal to the physical stance—we must find the part or parts which are in some way incapacitated and not performing their function. Richardson strongly endorses this approach: "This is a crucial and fundamental insight for which we are indebted to Dennett: one of the primary drives—perhaps the primary drive—behind reductionist programmes is that only by adopting such a programme have we any substantial hope of explaining behavior that would otherwise be deemed anomalous or simply inexplicable" (Richardson, 1980a, p. 129). Richardson argues that we ought to proceed similarly when a system fails to perform as predicted from the intentional stance. Then one ought to turn to the design stance and inquire in what way the design was inadequate to allow the system to perform in the rational manner that the intentional stance projects. To illustrate this, Richardson introduces Weizenbaum's ELIZA program and contends that, when one finds ELIZA producing inappropriate answers, one should look to the program and see that it is not suited to produce appropriate responses in those circumstances.4

Accepting this view of how one explains failure of predictions made from the intentional stance, Richardson contends, commits one to the reality of the intentional stance:

Such a recognition would undermine the commitment to Intentional instrumentalism; for just as compositional identities between physical and design stances were simultaneously vehicles for the explanation of malfunction and warrants for the reality of functional states, the explanations of error from the design stance would demand vehicles which would simultaneously warrant us in endorsing the reality of Intentional...
States. Some systems would be inherently Intentional systems. (Richardson, 1980a, p. 130)

Richardson’s reasoning here seems to be that appealing to one stance to explain the failures of another stance requires that we take the activities described from the first stance to explain how the process characterized from the second stance is normally performed. Only if the physical units under normal conditions actually performed the task described at the design level could one appeal to facts about them in explaining failures of predictions made on the basis of the design. Similarly, only if the functions described from the design stance would (if the design were appropriate) actually result in rational behavior (as characterized from the intentional stance) could one use the failure of design to explain the failure of rationality. But then the rational performance described from the intentional stance must really occur (when the design is appropriate). So, Richardson concludes, one ought to be a realist about intentional ascriptions.

Richardson’s second argument for realism with regard to intentional ascriptions focuses on how intentional ascriptions are employed in explaining the behavior of intentional systems. We are committed, he argues, to treating intentional properties as real insofar as, in explaining the behavior of intentional systems like human beings, we appeal to such properties. Richardson describes two psychological studies where the contents of psychological states (which are captured only in the intentional stance) figured centrally in the explanation of the phenomena studied. The first is Lackner and Garrett’s (1973) dichotic listening study, where subjects were instructed to paraphrase what they heard through one ear. Through the other ear subjects were given a message whose content they typically could not report. When asked to paraphrase ambiguous sentences, however, subjects preferred the interpretation supported by that information, indicating that to some degree they had processed it. The natural explanation for this result is that subjects were partly aware of the information provided in the unattended channel and screened it out because it was irrelevant to the task at hand.

In the other study, Neisser (1979) superimposed images of two ball-toss games over one another and asked subjects to record the number of tosses in one of the games. Neisser then added a third superimposition of a woman walking across the scene. Those not engaged in the task readily noticed this superimposed image, but those engaged in the task typically failed to notice it unless something quite unusual happened (e.g., the woman began to dance). Neisser interprets these results as showing that the humans do not simply filter out certain kinds of stimuli but are able to select on the basis of content what information to attend to and can ignore information not relevant to the task at hand. The natural explanations of both of these studies requires reference to the contents of mental states. But, in so
appealing to contents of psychological states in an explanation of behavior from the intentional stance, Richardson contends, we have adopted a realistic approach to intentional ascriptions by including them in our explanations.1

Richardson's arguments against treating intentional ascriptions instrumentally parallel the kinds of arguments that are often used to motivate a realistic perspective on theoretical entities in philosophy of science. One typically argues for the reality of a particular entity by showing (1) that the kinds of relations it stands in with respect to entities already granted real status suffice to grant it equal status, and (2) that the use of these entities in explanations commits one to their reality. The difference is that intentional ascriptions do not name entities but ascribe properties to entities, so what Richardson's arguments constitute are claims for treating intentional properties as real. If one is to follow Richardson's advice and adopt a realistic perspective toward intentional properties, however, one must respond to Dennett's arguments for instrumentalism discussed in section 2.

4. A REALIST RESPONSE TO DENNETT'S ARGUMENTS FOR INSTRUMENTALISM

In this section I will return to Dennett's three arguments for instrumentalism and show how a realist can respond to each of these.

The Argument from the Environmental Relativity of Intentional Ascriptions

This argument maintained that the correctness of intentional characterization of a system depends on the environment in which the system is located. The realist can accept this claim, but to do so, the realist needs to treat intentional ascriptions as ascribing relational properties, not intrinsic properties. That is, intentional ascriptions relate a system to its environment.2

1 Dennett does not find these two examples of Richardson's to count against his position. He views them as intentional ascriptions at the sub-personal level in that activities within the system are being characterized in intentional terms and he says "I have always been a realist about sub-personal intentional psychology" (personal communication, 1984). Dennett (1981a) does emphasize the need to characterize internal operations intentionally, but it would seem that the same arguments he advances for instrumentalism with regard to intentional attributions at the personal level would apply with equal force to those made at the sub-personal level. Conversely, if homunculi can really have beliefs, why cannot whole systems? Dennett (personal communication) maintains that it is "realism with regard to beliefs as 'discrete internal states' that has been my chief stalking horse." In that respect my sympathies are with Dennett, but I would express this by saying that beliefs are real properties of systems (or humunculi) but the having of these beliefs is not to be explained by assigning them to components of the system.

2 Ulric Neisser (personal communication, 1984) responded to this suggestion by recommending that the intentional stance be called "the ecological stance."
suggest that this is the right move for the realist to make, but it is one that has quite far reaching consequences. It implies that some of what is necessary to make it appropriate to apply a particular intentional ascription to a system exists outside the system and that it is correct to think that beliefs and other intentional states depend only on what is contained within a person's head.

According to this proposal, treating intentional ascriptions as expressing monadic properties involves a functional localization error, much like what has been called the "fundamental attribution error in social psychology" (which involves assigning a character trait to the person when the person has shown a propensity for a certain response only in particular environments, cf. Nisbett and Ross, 1980) or the erroneouslocalizations of functions often criticized in genetics and neurophysiology (Wimsatt, 1980; Richardson, 1980b; Bechtel, 1982a, 1982b). Treating relational properties as monadic properties is a serious mistake in developing scientific explanations; the remedy, however, is not to attribute monadic properties instrumentalistically, but to recognize that relational properties are involved.

Wimsatt's (1972) analysis of function statements offers a useful schema upon which to model this account of intentional properties as relational. Wimsatt argues that an ascription of a function to a part of a system is relational in that it involves reference to the purpose that part provides to the system. According to Wimsatt's analysis, not any causal effect of a part counts as a function (e.g., the sounds made by the heart), but only those (e.g., the heart’s pumping blood) that serve a purpose for the system. To explicate the notion of purpose, Wimsatt invokes an evolutionary analysis and identifies the purpose served by a component in terms of the contribution the component makes to the adaptedness of the system. Since what makes an organism adapted depends on its environment, attributing a function to a component of a system on Wimsatt's analysis always makes implicit reference to the environment. If we model the attribution of intentional properties on Wimsatt's analysis of the attribution of functional properties, then we similarly must include at least an implicit reference to the environment in such attributions. What we will do is attribute intentional properties like beliefs and desires on the basis of the way the system interacts with its par-

1 Wimsatt's treatment actually allows two different relations between the functional entity and natural selection. With Wright (1976) and Short (1983), he allows for an aetiological reading according to which something is functional if it has been selected by previous selection. (For another discussion that employs an evolutionary account of the origin of features of language to ground a general account of the intentionality of language, see Millikan, 1984.) Wimsatt, however, also allows that something is functional if it meets current selection forces even if it did not arise via natural selection. In Bechtel (1985), I endorse the later view. I argue that while we may explain the occurrence of a functional entity by showing that it is an adaptation (i.e., by showing that its current existence is due to a process of natural selection), its being an adaptation is not what makes it functional. Rather, what makes it functional is its being adaptive (i.e., its serving current needs imposed by the environment).
ticular environment. We will recognize that such attribution will have to be changed if the system interacts with different environments, even if the system remains internally the same.

There is an obvious and potentially serious objection to the proposal that intentional properties involve a relation between a system and its environment. Perhaps the most salient characteristic of intentionality is the possible non-existence of the object, state, or event represented in an intentional state. How, the objection goes, can an intentional property relate a system to an entity that does not exist? This objection would be serious if we wanted to atomize intentional attributions, treating each belief and desire as involving a discrete relation to an aspect of the environment. But that is not my proposal. Rather, my proposal is that we attribute intentional properties to a system in terms of how the system as a whole interacts with its environment, treated as a whole. To answer the above objection, then, what is required is an account of how we might attribute beliefs to a system that do not relate it to the actual environment. Wimsatt's account of function statements again provides a model. We are led to recognize some traits as disfunctional when a system is not perfectly adapted to its environment. Similarly, we may be led to attribute intentional properties that do not correspond to features of the actual environment (e.g., false beliefs) when a system's mental activity does not perfectly equip it to deal with its environment.

Dennett himself introduces a concept, that of a notional world, that is useful in accounting for intentional attributions that do not relate the system to its existing environment. A notional world is a fictional world that would be perfect niche for a system with a particular set of internal states (i.e., a world in which the system would be perfectly adapted). The notional world of a system will usually partly correspond to the world the system actually inhabits (otherwise the subject would not survive on its own) but it may differ in some respects. One way to characterize ascriptions of intentional states that are not connected with features of the actual world is to view them as relating the system to a notional world. What we are doing in such cases is tantamount to saying that the internal states of the system make it best adapted to a world which differs in various ways from the one it inhabits. However, it must be recognized that this is a procedure of limited use. Most of the time we ascribe content in terms of the actual environment the system is inhabiting. It is only when we cannot make such a set of ascriptions consistently that we resort to making attributions that do not relate it to the actual environment.

Robert McCauley (personal communication, 1984) has pointed out that some individuals, for example, those mentally deranged or not yet fully developed, are not even approximately adapted to the real world. In such cases we may have a very difficult time determining the nature of the appropriate notional world to use in ascribing intentional states to that individual. Moreover, if the notional world departs radically from the actual world, then the individual typically must depend on someone else to insure his or her survival.
The Argument from the Normative Character of Intentional Ascriptions

This objection consisted in pointing out that no actual system meets the normative standards imposed in the intentional stance and arguing that therefore intentional attributions cannot really describe actual systems. The realist can respond by noting that, although in adopting the intentional stance we often begin by assuming ideal rationality, this does not mean that we cannot also employ the intentional stance descriptively in a way that acknowledges shortcomings from the ideal. All that is required is that we have ways of modifying our intentional ascriptions to make them appropriate to actual contexts. Dennett himself discusses ways in which we systematically modify intentional ascriptions when they fail to characterize a system’s behavior. We can recognize the limitations of the subject’s epistemological position (ignorance of particular facts or lack of education in certain theories) and figure out how one could be rational under those limitations. Another possibility along the same lines is to hypothesize that the subject has desires we do not share and then to try to understand his or her actions as directed toward those desires.

There is yet an additional strategy for understanding shortcomings in rationality—we can appeal to the design of the system and show how its operating principles lead to systematic errors. Dennett himself makes this move when he tries to show how he can accommodate the kind of data Tversky and Kahneman (cf. their papers in Kahneman, Slovic, & Tversky, 1982) present concerning typical errors in human judgment. Dennett points out that evolution is not an optimizing procedure (i.e., one that seeks out the best solution to a problem) but, to use Simon’s phrase, only a satisfying procedure (i.e., one that accepts the first solution that meets a certain minimal standard until a better one appears) and thus the solutions at which it has arrived may be imperfect in various respects. (Even though our reasoning procedures may not be optimal, that does not entail that they are irrational. They should still be deemed rational if our reasoning resources are limited and these procedures make the most effective use of these limited resources.) Far from leading to a non-realist position, this approaches fits well with one of the arguments for realism advanced by Richardson. What it does is appeal to the design stance to show that the system has certain rational capacities and not others. This is no different than appealing to the physical constitution of the system to show how it has realized certain design properties and not others.

Thus, Dennett’s own strategy for dealing with human irrationality shows how to answer the argument from the normative character of intentional ascriptions. Although we begin with an ideal standard of rationality, we do not treat it as an absolute standard but relativize it to a context. This is just what one would expect if intentional ascriptions are viewed as a realist would view them. The ideality of the intentional stance is like the
ideality of the gas laws. In both cases, the ideal gives a schema for an explanation that must be modified to account for the departures from the ideal. The description that takes account of these shortcomings, though, can be interpreted realistically.

The Argument from the Indeterminacy of Belief Ascriptions

This objection pointed out that we lack precise identity conditions for intentional states like belief and so we cannot treat such states as real. Dennett raised the question as to how one could evaluate whether his belief and a chemist’s belief that salt is sodium chloride were the same. Notional worlds, however, can provide such a vehicle for comparing beliefs. A notional world will not be as detailed as the actual world—in particular, it will not be detailed in all those features of the world that could change without the subject typically noticing them. But in this respect the chemist’s and Dennett’s set of notional worlds presumably differ. There are possible worlds in which the chemist’s beliefs would clash with his or her experience but in which Dennett’s would not. These possible worlds are consistent with Dennett’s notional world but not with the chemist’s. In terms of this difference in notional worlds we can distinguish Dennett’s and the chemist’s beliefs. (Of course, for other purposes we might want to show how the beliefs are basically alike. We can also do this, though, by showing the similarities between the notional worlds).

It may seem odd to invoke a non-real world in developing a realist account of intentional states. However, there is nothing problematic about this move. The concept of a notional world is simply a convenient way of expressing the conditions to which a system is ideally adapted. Even if such conditions do not exist, they are fully determinate: from knowing a system’s constitution we can identify the situation in which the system would be perfectly adapted. So we are still dealing with a real property of the system in treating it as ideally adapted to a notional world and fortunately, for most of us, the notional world is quite similar to the actual world.

5. CONSEQUENCES FOR PSYCHOLOGY

Having argued that Dennett’s case for instrumentalism can be accommodated by a realist scheme that treats intentional attributions as environment-relative attributions, I will turn to consequences this perspective has for psychology. The consequences I envision are quite different from those Stich (1983) draws on the basis of arguments similar to Dennett’s. Stich argues that the intentional approach (his “folk psychology”) should be je
tisoned from psychology in favor of pursuing a causal theory that identifies mental states in purely syntactic terms. In contrast, I will argue that when treated realistically, Dennett's intentional stance provides useful guidance for empirical research that occurs mostly at the design level.

To begin with, when we treat intentional attributions as ascribing real relational properties, we can clarify the relationship between the design stance and the intentional stance. When, from the design stance, one is trying to explain how something satisfies a particular intentional ascription, what one is doing is explaining how its internal design prepares it to make responses appropriate to its niche. It is this adaptation which is characterized in intentional ascriptions and explained from the design stance. From this perspective, there is no need to try to replace the intentional account with one that does not employ intentional ascriptions.

A second consequence is that this perspective does not require us to assume that there are discrete internal states corresponding to each property attributed from the intentional stance. We do not even have to assume that the system operates by manipulating representations in a computational fashion. Although computational or information processing accounts are the best developed proposals at present, all the internal structure must do is make the external fit possible. An account that does this without proposing any processing of formal symbols would be just as acceptable. (See Rumelhart and McClelland (in press) for a comprehensive discussion of an approach called "connectionism" or "parallel distributed processing" that does not involve formal operations on symbols.)

Since computational accounts have been the most popular, and the points to be made below apply equally to them and to non-computational approaches, I will assume for the sake of argument that the correct account at the design level is a computational account. Another consequence now follows: If intentional properties are real relational properties and the task at the design stance is to show how internal processes allow the system to stand in these relations, we can see how computational or information processing theories should interface with ecological ones—they should be directed to explaining the behavior of a system which an ecological approach endeavors to describe.

Before developing this positive proposal in more detail, I need to say more about the position that is being rejected. Although most psychologists have not made a principled point of rejecting an ecological perspective, many have pursued the development of psychological theories without particular regard for the environmental contexts in which their subjects normally function. One reason is a straightforward, pragmatic one: In order to develop a scientific account of how a system functions, one needs to be able to impose experimental control. In an ecological context, such control is lacking. Laboratory tools like the tachistoscope, though, can provide such
control. I will respond to this objection to employing an ecological perspective when I develop my positive proposal below.

Fodor (1980), however, has offered an additional reason for not employing ecological information. He argues that the only possible psychology at present is rationalistic psychology and that what he calls “naturalistic psychology” is, at least for now, impossible. Rationalistic psychology maintains that psychological processes are computational and that it is only the formal or syntactic properties of representations that govern how they are computationally processed (this condition is known as “the formality condition”). The formality condition itself does not require ignoring environmental constraints in which psychological systems function or denying these environmental constraints a place in psychological theorizing. Fodor, however, argues that psychology cannot connect these formal operations with events occurring outside the system (it is this stronger contention that justifies the label “methodological solipsism”). His argument for this strong claim is that we do not have the right set of categories for describing the external events so that they can be linked with mental representations in a lawlike manner. That is, we do not have projectable descriptions of the objects which provide the input for forming a mental representation. For Fodor, then, psychology must restrict itself to the features of the mental representations themselves and discover how the mind makes computations by manipulating these representations.

Fodor’s proscription against incorporating any environmental relationships into psychology seems overly strong, for it rules out any experimental psychology. The method of psychological experimentation depends on providing stimuli to subjects and assessing their responses to such stimuli. The success of psychologists in developing theoretical models on the basis of such experimental manipulations should speak to the possibility of the enterprise. Moreover, Fodor’s proposal for rationalistic psychology itself faces a serious conceptual difficulty, for it is very difficult to see how psychologists can identify mental states in terms of their formal conditions alone; rather, they must use environmental stimuli to evoke mental representations in subjects.

Dennett provides additional reasons for rejecting methodological solipsism. Fodor’s distinction between rationalistic psychology and naturalistic psychology closely corresponds to Dennett’s distinction between the design stance and the intentional stance. Although Dennett differentiates

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McCauley (in press) has provided a further reason that might justify downplaying the ecological context. He contends that for many aspects of cognition, it is the cognitive system that is controlling the behavior. If this is so, then one can develop much of the account by looking only at the internal operation of the cognitive system. However, recently evidence has emerged suggesting that the mental system is very context sensitive so that even the concepts it is employing vary depending on contextual circumstances (see Barsalou, in press).
these stances, he views the intentional stance as critical for developing the account from the design stance. Even if the objects processed by the mind are formal or syntactic objects, he claims that we must use semantic information to identify the features in the mind-brain that fulfill these syntactic roles: "We may be able to determine the 'shape' of an item—an event type, for instance—in the brain but we can't determine its syntactical forms (as distinguished from its merely decorative—however distinctive—properties) except by determining its peculiar powers of combination and cooperation with the other elements, and ultimately its environmental import via those powers of interaction" (1982, p. 30). His claim here is that we use our account of what the system is doing to determine what activities within it are relevant in explaining its behavior. More generally, Dennett also claims that by adopting methodological solipsism, psychology gives up its hope of providing useful explanations. Psychology based on methodological solipsism, he claims, "would not be able to provide an explanation of the regularities it is psychology's peculiar job to explain: the reliability with which 'intelligent' organisms can cope with their environments and thus prolong their lives" (Dennett, 1981a, p. 56). To accomplish this requires using the intentional account to guide the development of the design level account. (Burge, 1982, offers a related argument.)

Having rejected the principled arguments for excluding ecological considerations from psychological theorizing, let us now consider how a realistic treatment of Dennett's intentional stance accommodates an ecological perspective. As I have noted, experimental psychologists have tended to limit their focus to highly constrained environments for pragmatic reasons. What I want to develop now is a framework in which they can make use of ecological information in developing psychological theories without reducing the rigor of experimental endeavors. One approach is to develop more rigorous studies of the behavior of systems in their ecological niche, formulating hypotheses and altering the niche just enough to allow tests of these hypotheses. This approach is developed in Dennett (1983). Another approach, and the one I will develop, is to maintain many of the same experimental techniques now used in information processing psychology, but to insist that the experimental results be interpreted in light of how the system behaves in its normal ecological setting.

The relationship between experimental studies and the system's normal environment is the same as that between in vitro and in vivo studies in physiology. Experimental physiologists prefer in vitro experiments because they allow control over the factors affecting the behavior of a particular system and so the discovery of the basic principles underlying its operation. But, as Bernard (1865) long ago pointed out, the particular environment in which a process occurs often plays an important role in determining the nature of that process. The in vitro conditions always distort the in vivo
conditions, and one must always inquire whether the distortion has led one to misrepresent the real process. Similarly, but perhaps even more seriously, in psychology, laboratory environments, insofar as they are discontinuous with the subject’s normal environment, change the relations between subject and environment that determine the intentional attributes that are to be explained.

One prominent psychologist who has argued that psychology ought to take seriously the actual environment of an organism is Gibson (1979). Gibson contends that we must examine the actual environment subjects confront, and not just the artificial and poverty stricken environment of the psychological laboratory, if we are to understand the perceptual process. In the natural environment, he claims, subjects are responding to a far richer set of cues than we ordinarily suspect. The world presents itself to a subject, according to Gibson, in coherent sets of stimuli—what he calls “affordances.” Subjects still need to process the stimuli of these affordances (thus Gibson should not deny, as he does, that information processing occurs—see Fodor and Pylyshyn, 1981), but it is to such affordances and not to isolated stimuli like those presented on a psychologist’s tachistoscope that subjects are normally responding. If Gibson is right that the information individuals are normally responding to is quite unlike that presented in the laboratory, then we need better descriptions of the information as it is in the environment in order to develop accounts of information processing that correctly characterize our normal mental activity.

When one considers the tasks humans had to solve in their evolutionary history, it seems plausible that they may have been designed to respond to whole arrays or patterns of stimuli as groups and to process such groups differently than they process individual stimuli. There is some evidence that this is the case. One feature of naturally occurring stimuli is that they endure and move and Johannson (1973) has shown that particular patterns of movement are readily recognized. He attached lights to the limbs of human figures and showed that subjects looking only at the lights could recognize that they were seeing humans when the figures moved, but not otherwise. Recognizing the movement of conspecifics would clearly have evolutionary advantage. This makes it plausible that the perceptual mechanisms of an organism are specially tuned for such tasks as detecting moving members of their own species and illustrates one kind of ecological information that psychology should consider in developing its processing accounts. (See Glotzbach and Heft (1982) for a related argument.)

In recognizing the importance of considering a subject’s normal ecology in developing psychological explanations, one should not go to the extreme of dismissing laboratory studies, including tachistoscopic studies. One cannot come to understand how a system works by merely observing how it functions normally. One must also see how it responds in various ab-
normal predicaments. But the intent of these studies is to discover how the system normally operates and to do this one must compare the system's behavior in the artificial environment with its behavior in its natural environment. By comparing the similarities and differences between normal and laboratory behavior with the differences between the natural and laboratory setting, one can gain information about the processes used by the mental system in determining behavior. By ignoring the ecological information, however, one is liable to misconstrue what the system is doing in the experimental context and pick out the wrong internal states as the psychologically relevant ones.

There is an additional reason for attending to the ecological context in which a psychological system functions. Model builders in cognitive psychology and artificial intelligence have assumed that cognitive systems must represent to themselves all relevant features of the external world. Dreyfus (1979) objects to this strategy, maintaining that we deal successfully with our world not because we possess an internal representation of it but because we are continually situated in it. Dreyfus' appeal to being situated in the world has seemed mysterious to some, but sense of it can be made by considering Simon's (1969) account of the motion of an ant. In his account, the ant's complex trajectory is not due to the ant using a complicated internal map but to its having a simple set of routines which it invokes in response to stimuli from its environment. These stimuli causally affect the ant, but the ant does not construct representations of them. Dreyfus' objection need not be taken as repudiating information processing models, but only as rejecting the claim that all that is involved is processing done on a representation of the world. Thus, Pylyshyn (1981) treats Simon's example as showing how control of a system can be partly located in the system's environment. (See Winograd, 1981, for a similar argument.) If control is located partly in the environment, information processing psychologists, by neglecting the environment, doom their effort to give a correct account of human information processing. By treating intentional ascriptions as relational in character, though, one would be more likely to appreciate the significant roles the environment itself might play in determining behavior.

There are areas beyond perception where treating intentional attributions as relational may be important. One is the burgeoning area of reasoning studies directed toward the heuristics and biases of human reasoning. The major strategy for discovering the heuristics humans employ has been to devise circumstances in which humans violate what are taken to be normative principles of reasoning (see Kahneman, Slovic, & Tversky, 1982). This is in accord with the principle that perhaps the best way to discover the processes through which a system works is to induce it to malfunction. When one does this, however, one must remember that the objective is to discover the principles that have allowed humans to succeed on the reason-
ing tasks that they have typically confronted and mastered. To do this, one must focus not only on the biases elicited but also on the reasoning demands made by the environments in which humans have dwelt. Humans only needed to perform a select set of reasoning functions to survive. For these tasks, responding to simple but reliable cues in the environment may have sufficed and humans may not have needed to use normatively correct reasoning processes which would have been more costly. When one maintains a focus on the ecological demands of reasoning, one can employ the results of laboratory studies on reasoning biases to suggest heuristics that would suffice for the problems normally confronted and yield the biases under laboratory situations.

The claim for which I have argued in this section is that a realistic perspective on Dennett's intentional stance, when that stance is viewed as recognizing the environmental relativity of intentional ascriptions, shows how one can employ an ecological perspective in viewing experimental endeavors in psychology. As Dennett characterizes the design stance and the intentional stance, they are not alternatives for one another, but complement each other. The objective of the design stance is to explain how something is able to behave in its environment in the way characterized by the intentional stance. Thus, the intentional stance provides a framework for guiding and interpreting research at the design level.

6. THE COUNTER-INTUITIVE ASPECT OF TREATING INTENTIONAL PROPERTIES AS RELATIONAL

The proposal that I have been advancing for being a realist about intentional properties by treating them as relational may strike some as seriously counter-intuitive. Beliefs and other intentional states have typically been thought of as states in the heads of subjects, not as states dependent on how the subject is related to its environment. In this last section I will try to counter this assumption by showing how what seem to be intrinsic properties of objects have often had to be treated as relational properties in other sciences.

A common tendency in evolutionary theory has been to define the traits of species and the niches species seek to occupy independently of one another. Individuals of a species appear to have various traits and it seems to make sense to ask how they influence the fitness of the species. This view, as classical and intuitive as it is, has nonetheless been criticized. Gould and Lewontin (1979) maintain that the identification of traits for purposes of evolutionary theory depends on considerations about the environment, in particular, the identification of the selection forces acting on a species. Those
features of a species that, in a certain environment, give it a selective advantage or disadvantage, constitute its traits for the purposes of evolutionary theory. Here traits are being defined as relational properties. Conversely, they also maintain that the description of a niche requires a specification of the type of organism that might occupy it.\(^\text{10}\)

In some discussions of evolutionary theory these restrictions on thinking about niches and traits are violated. Sometimes the traits of an organism are independently defined and one asks in what niche they would have proven advantageous. At other times, theorists follow Wright in defining a niche space and try to predict how species will adapt and so move through this niche space. Neglecting the relational character of traits and niches, however, can easily lead one into error. Gould and Lewontin (see also, Lewontin, 1978) argue that the adaptationist programme, which has characterized much of evolutionary thinking since Darwin, is in error since it forgets the importance of this interaction. They illustrate their point by considering an analogous treatment of the spandrels of cathedrals that would treat them as designed for their artistic significance. This would be erroneous since these spandrels are only secondary consequences of more basic design features that the architects had selected, not traits figuring in the selection of the design at all. Likewise, Gould and Lewontin claim that biologists have been led to see each feature of a species as a trait that was selected for, when it might have only been a necessary consequence of the species' underlying physiology or anatomy or a feature that arose quite by chance without making any contribution to fitness. When biologists proceed to make up stories to tell how such features enhanced the species' fitness, they have fallen into the trap of defining a trait independently of environmental interaction. To determine whether something is a trait for purposes of evolutionary theory one has to consider it in relation to the organism's environment and determine whether it contributed to the adaptiveness of the organism.

In physiology, as well, researchers have accepted that even the defining properties of organs may be relational. Bernard was clearly aware of this when he contended that a salivary gland is only a salivary gland because of the relation in which it stands to other parts of the organism: "A salivary gland, for instance, exists only because it is in relation with the digestive system, and because its histological units are in certain relations one with another and with the blood. Destroy those relations by isolating the units of

\(^{10}\) This seems to result in a circularity, but it is not a vicious one. As a matter of practice, what evolutionary theorists do is to start with actual organisms interacting with their environment. Then they consider changes that are biologically open to these organisms (given their current physiology) and consider how these changes would affect organisms' fitness in their current environment and those readily available to it. The traits they focus on are features of the organisms that would affect their fitness in these environments and the niches they contemplate are, in turn, specified in terms of these features of the organism.
the organism, one from another in thought, and the salivary gland simply ceases to be" (Bernard, 1865, p. 67). "Two points lie behind Bernard's remark. One is that physiological units often produce the effect that one wants to explain only when the right environment is present. To understand how they produce that effect, therefore, one must discover how the unit is interacting with the environment. The second is that only some of the unit's properties are relevant to physiology. A unit's mass or color may often be irrelevant to understanding the unit's physiological activity. To answer the questions physiology wants answered, one needs to know what a unit is taken to be doing in a system. Then one can try to explain how the unit performs that task. For example, if one takes the task of the kidney to be the maintenance of pH, one can look at the mechanisms by which the kidney filters acids and generates or regenerates bicarbonate to buffer hydrogen ions in the blood. We would not focus on these mechanisms, though, if we did not so identify the function of the kidney.

The claim that the kidney's interaction with the rest of the organism is relevant to defining the kidney's operation is, of course, the same as Dennett's point that the interaction with the environment is necessary for specifying even the syntactic properties of the mental system. In neither case does one know what factors are relevant without knowing the environment. In physiology, the need to identify an entity in relational terms in order to explain how it operates has not created any special problems. It has been those who have neglected this interaction that have been hindered. Martius, for example, had all the information necessary to develop the account of the citric acid cycle, but failed to do so. Krebs claims his own success was due to his focusing on what physiological activity needed to be explained (Krebs, 1970, p. 167). Thus in physiology the idea that an important aspect in developing an explanation of a unit's behavior is determining its contributions to a larger system has been well established. (In Bechtel, in press, I have explored how a focus on the broader context of biochemical reactions played an important role in Embden and Meyerhof's work leading to the discovery of the phosphate cycle.)

The purpose of these examples from evolutionary theory and physiology has been to try to undercut the assumption that something must be wrong with the proposal to treat intentional properties as relational in character, dependent on the relation between a system and its environment. In these disciplines researchers have also needed to treat important concepts as relational. Although construing beliefs and desires in a similar manner may seem counter-intuitive at first, there is solid scientific precedent for so doing.

11 In a similar vein, Bernard argued that life is not a property of an organism but of the interaction of an organism and its environment: "life results from contact of an organism and its environment; we can no more understand it through the organism alone than through its environment" (Bernard, 1865, p. 75).
7. CONCLUSION

In this paper I have concerned with Dennett that intentional ascriptions are crucial for psychology and with Richardson that we ought to be realists about the intentional stance. I have tried to show that what lies behind Dennett's instrumentalism with regard to the intentional stance is the relational character of these ascriptions, but I have argued that we can be realists about the intentional stance if we admit that intentional properties are relational. Just as evolutionists and physiologists have learned to treat important properties that at first seem to be determined by the internal constitution of a unit as actually relational in character, one can treat intentional properties as relational. Moreover, I have suggested that doing so may have significant consequences for psychology, particularly by showing how to integrate an ecological perspective with computational or information processing perspectives.

REFERENCES


