

An Ecological Approach to Cognitive Science

John T. Sanders

Polish Academy of Sciences

[1] Cognitive science is ready for a major reconceptualization.[\(1\)](#) This is not at all because efforts by its practitioners have failed, but rather because so much progress has been made. The need for reconceptualization arises from the fact that this progress has come at greater cost than necessary, largely because of more or less philosophical (at least metatheoretical) straightjackets still worn - whether wittingly or not - by those doing the work.

[2] These bonds are extremely hard to break. Even some of those who have directed powerful arguments against them have failed entirely to shake them off. The bonds are often attributed to the work of René Descartes, but they are really much older than that. If even in the present effort, I fail entirely to remove the straightjacket myself (even though I am making every attempt to get it off), this will testify to its tight grip.[\(2\)](#)

[3] The straightjacket I am thinking about, of course, is the vague picture of the human situation that imagines centralized, internal minds in control of bodily machines. While almost no one in the contemporary cognitive science arena imagines minds to be the kind of thing Descartes took them to be - instantiations of a unique, fully non-material substance - there is nevertheless a deep resistance, even among the most fervent professed "materialists," to giving up this picture.[\(3\)](#)

[4] In what follows, I shall try to offer an approach which on the one hand capitalizes on the excellent progress that has been made in cognitive science in the last few decades, and which on the other hand offers a general approach that may help at some level in the attempt to shake "Cartesian" bonds. The approach, as the alert reader already knows from the title of the essay, is an "ecological" approach.

The Ecological Approach

[5] The "ecological approach" to this-and-that follows a pattern that was probably first recommended for evolutionary biology. It encourages attempts to understand particular areas of interest through emphasis of the importance of large(r) interacting systems. Thus to fully understand a biological organism, one must (at least) understand that organism as a member of a species which is itself the product of a long process of natural selection within a changing environment. How we characterize the "environment" will be a function of which organism we are examining (the "environment" will be the set of all factors, past and present - and perhaps, in some sense, the future - which exercise some influence over the development of the organism, both as a genotype and as a phenotype). And the "organism" is understood as, in an important sense, both shaped by and shaper of this environment. It is this system orientation, with its emphasis upon symbiotic relations among elements within the system, that is to be emphasized in any "ecological" approach.

[6] The perceptual psychologist J. J. Gibson urged his own discipline to take up an "ecological" approach, which he conceived as being quite revolutionary.⁽⁴⁾ Indeed, his attempt to apply the ecological approach led eventually to dispute with thinkers best known as representatives of the cognitive science community.⁽⁵⁾ Given further developments in cognitive science over (especially) the last decade and a half, it is wise to reconsider that earlier discussion and to take it a bit further.

[7] The ecological approach is offered as an alternative to approaches which tend to be more "analytic" in one important sense. Now, I was personally trained, as far as I know, as an "analytic" philosopher. I am a bit uncertain about this because I remember, back there in graduate school, that one of the questions that arose (in the face, as it happens, of virulent attacks from people who emphatically did not think of themselves as Analytic Philosophers) among my small circle of close philosophical friends was this: What on earth is "analytic" philosophy? We considered many options. We didn't understand ourselves to be constantly trying to take things apart - busting philosophical problems into little pieces as it were (perhaps the grown-up equivalent of what my male children always seemed to like best to do with their Lego constructions) - so that didn't work. In the end we decided (in our graduate student wisdom) that "analytic philosophy" meant nothing more than "careful philosophy." Our primary motive was not to exclude anyone - we meant to include everyone who actually did careful philosophy - but rather just to figure out what we thought we meant in calling ourselves "analytic philosophers." Back then, for example, I would have been prepared (if I'd read him then) to call Merleau-Ponty an analytic philosopher (perhaps especially in *The Structure of Behavior*).

[8] But when you adhere to a label like that, you can't help but exclude people. Much better, surely, to avoid such labels. The term "analytic" really does have a heritage that is opposed, with one degree of severity or another, to "holistic" approaches. That this problem deserves some attention, when thinkers on one side of the philosophical aisle are tempted to throw bricks at those on the other side, is demonstrated by the fact that there doesn't seem to be any contradiction in the expression "holistic analysis." In this context, anyway, the word "analysis" appears to be doing something like the modest work envisioned in our graduate student conclusions about our own noble selves: it invokes not the idea of any particular method of attack (the word "holistic" fleshes that out a bit), but rather just the idea that the work that is going to be done will be done carefully, or in detail, or something like that.

[9] In any case, "ecological" approaches are like "holistic" approaches in that they urge (at the very minimum) that it is relatively more important to look at entire systems than to take those systems apart and look at the pieces. The *difference* between "ecological" and "holistic" approaches varies among the thinkers who are inclined to deploy such terms. They *can* be used in such a way as to be interchangeable. I personally prefer to use the term "ecological" to describe the approach I recommend for two reasons.

[10] First, I like it because it seems to me to emphasize the importance of understanding the larger "wholes" that are to be looked at as being dynamic, as changing.

[11] Second, I prefer it because the term "holism" seems to suggest that we have to look at some entire picture, while I am quite confident that there are no "entire" pictures worth worrying

about. Instead, there are various ways to shed light on particular areas of inquiry, some of which stress trying to understand how things are constructed (i.e., what their parts are) and how they work taken one by one (i.e., how they work internally), and some of which stress how (perhaps) these very same things may be understood in their interactions in larger systems.

[12] These are in no way inconsistent, it might be surprising to notice. They may very well call for precisely the same skills. It's just that, for any one topic (cognition, for example), what I am *now* going to refer to as the "analytic" approach (meaning not just "careful" but rather "focussing on parts and internal workings") suggests we look in one direction while the "ecological" approach suggests we look in another. Thus, at least on this characterization, the issue of what is "analytic" and what is "ecological" is strongly relativized to the topic of discussion. An "analytic" approach to understanding cognition may very well involve an "ecological" approach to understanding (say) sensation. An "ecological" approach to understanding cognition, on the other hand, may look very "analytic" as it distinguishes aspects of the environment (say) within which cognition goes about its business.

[13] Where "analytic" and "ecological" approaches may actually bang into one another is on the issues of importance and value. Which approach is the right approach to some (given) area of inquiry? I do not believe that this is a question that has no answer. But I believe that the answer must be relativized to particular problem settings in a normal, non-controversial way. In short, whether an approach is the right approach depends upon your objectives. These different approaches plainly accomplish different ends, and thus must be evaluated in terms of the ends they aim at.

[14] So in recommending an ecological approach to cognitive science, the claim (at least in my case) is just this: at the present time, under the circumstances of the problem situations that dominate the discipline (at least to the extent that there is any coherent direction that the discipline is taking), it is relatively more important to try to understand cognition in terms of its role in its broader environment than it is to try to further understand its internal construction and its basis in matter-energy. Indeed, as many have argued in the spirit of the mode of "analysis" (this time: "careful work") of the theory of natural selection, it may be that the details of the ecological picture will themselves provide clarity on many of the structural questions.

Materialism

[15] Is this an "idealistic" approach, as opposed to a "materialistic" one? Certainly not, if "idealism" is taken to make reference to some non-natural realm. But there is an ambiguity in the word "materialism" that hides an important problem. This problem needs to be addressed.

[16] If "materialism" is the doctrine that what we are is (nothing more than) the matter-energy that makes us up, it has been (notoriously) refuted. A consequence of *this* version of materialism is that it wasn't me who was born in Chicago in 1945. It wasn't even me who purchased that house in the suburbs of Rochester in 1987, so I guess I should (on this theory) feel free to stop paying the mortgage if I care to. These problems, and replies to them, are well known. I'm personally sure that *this* spare version of materialism (shall we call it "barefoot materialism"?) is mistaken. I'm not just the matter-energy that presently makes me up (although I certainly am

reluctant to part with certain arrays of it). None of it has been part of me for more than (about) seven years, and in another seven years I'll be (one way or another) some other collection of matter-energy.[\(6\)](#)

[17] How to improve on this picture of what we are has not been a simple question. I do not have any degree of confidence in any of the "theories of personal identity" with which I am familiar, and there are lots of them out there. All have, in my view, very serious problems.

[18] But maybe "materialism" is not to be understood in such a limited way. Karl Marx called his theory of economics "dialectical materialism." He did not particularly mean to stress the reducibility of economics to physics and chemistry, to questions of the movements of matter-energy. He meant, simply, to distance his theory of economics from theories which were, in his view, too "idealistic." He wanted, among other things, to construct a *scientific* socialism, to be distinguished from the more preachy versions that were associated with people like Pierre-Joseph Proudhon.

[19] If this is what is meant by "materialism" in cognitive science - that it is a theory which aims to distance itself from "idealism," from disembodied spirits or souls, from magical explanations of all kinds - then the "ecological" approach is emphatically materialistic. It just doesn't seek its answers in issues of internal construction and composition. It is inclined, at whatever level of question-asking it is invoked, to look outward, rather than inward, and to see the "larger" environment as a dynamic system - or even a nested array of such systems - in which cognition takes place.

[20] Thus the ecological approach does not oppose "materialism" in this broader sense, while it is in apparent conflict with "materialism" in the narrower, reduction-to-matter-energy sense. To avoid confusion, I myself prefer to sort my terms in such a way as to characterize the ecological approach as *naturalistic* but not *materialistic*. And to avoid further confusion, the opposition of the ecological approach to "materialism" in the narrower sense is not opposition come-what-may, in all contexts of inquiry; rather, again, the claim of the ecological approach is only that, at the present time, under the circumstances of the problem situations that dominate cognitive science, it is relatively more important to try to understand cognition in terms of its role in its broader environment than it is to try to further understand its internal construction and its basis in matter-energy.

Why, Then?

[21] Why should one prefer an ecological approach to cognitive science, then, over a more "analytic" approach, which focuses more attention on internal structure and activity?

[22] One reason is that the internal approaches still appeal to an unacceptable extent to deep intuitions concerning what Daniel Dennett calls the "Cartesian Theater" (see Dennett 1991, especially pg. 107). The idea of the Cartesian Theater is just the idea that there is one central place somewhere inside each of us - whether it is Descartes's pineal gland or whether it is some control center in the cerebral cortex - where all sensation flows to and all control flows from. The simple problem with the idea of the Cartesian Theater is that there is no one in there to look at

the "images" that are supposedly passed up the line, and no one is home to do the ordering around of muscles and the like. The more sophisticated evidence is that the best neurophysiological evidence points away from this central processor idea.

[23] Arguments against this general idea are not new, but Dennett has done an absolutely brilliant job of re-raising all the old complaints, bringing together lots of new ones from neurophysiological evidence, and delightfully raising brand new problems with the model of the Cartesian Theater that no one else had thought of. You would think that this would be enough to demolish the idea for good.

[24] But Dennett himself continues in the same book to speak favorably (albeit cautiously, on occasion) of the idea that what brains do with information is to *represent* it internally. This usage immediately conjures up the question "to whom?," and Dennett is thus forced several times to remind the reader that there is no one at all to whom these internal representations are directed. These "representations" are nothing other than: whatever happens in the brain when we see something (to take a perceptual example). These are not representations to us, since we don't even know about them, apart from what neurophysiologists tell us. And they are not representations to some internal signal-monitoring center, since (as Dennett heroically argues) there is no such thing. So they are representations in some sense that does not require anyone *to whom* they are made, and this is what Dennett finds himself constrained to remind the reader.

[25] What is that sense? Well, the general idea seems to be this. I am presently typing on a keyboard with lots of letters on it. I push on the "k" key, and the letter "k" appears on my screen. That is a representation of what is going on inside the computer as a result of my pushing that key. But I could shut the monitor off, push the "k" key, and while I would no longer see a "k," the same thing that happened before inside my computer would happen again. Thus, the characteristic computery thing that happens within my machine when I hit the "k" key "represents" a stroke of the "k" key, just as much as does the appearance of a "k" on my monitor. To whom? Well, we could loosely say it was for the machine (perhaps), but we could just as easily say it was for no one. It is just a representation.

[26] Now there might still be some chance of confusion on this issue. If I were to say that the machine now has its own representation of a "k," that might mislead. "k" has significance to me, not to the machine. The machine's having this "representation" of "k" has significance to me, too, but not to the machine. The thing in the machine "represents" "k" only because it stands in relations to other things in the machine in much the same way that "k" stands to other letters of the alphabet. And while the relations among the several things in the computer that "represent" the letters of the alphabet are quite spare, they are good enough for my word-processing purposes.

[27] Now, how do we tell a similar story about the way the brain carries "representations" of information that has been passed to it in one way or another? We must be careful. These "representations" are not seen or used by anyone (unless we care to go back to the Cartesian Theater). There is no doubt that something happens to my brain when I walk my dog past the Polish Academy of Music early in the morning (especially during the weeks of the Chopin festival). If a neurophysiologist (or, for that matter, a neurophilosopher) had me wired up in the

right way, this could be monitored. And on the spare sense of "representation" that we are considering, all of the things that got recorded on the little tapes coming out of their machines would be representations of representations in my brain. But if you are thinking about this by now in the way I hope you are thinking - absent a Cartesian Theater - the sense in which these little tapes may be called "representations" is vastly more robust than the sense in which mere things that happen in the brain, just by virtue of the fact that they are the effects of the passage of information to the brain, may reasonably be called representations.

[28] But that is really all there is to this sense of "representation." While the term "representation" normally indicates something like "being held before some viewer," this one must carefully not be understood in this way (we don't view them, and there is no Cartesian Theater). Perhaps a neurophysiologist could look at my brain - via those little tapes, of course - or via some other instrument that transcribes data from my brain into a clear-cut representation - and say "he's hearing them practice their performances," and thus argue that what was witnessed by his instruments (the things going on in my brain) must themselves be representations of the practice sessions. But in this attenuated sense, all effects represent their causes. A footprint represents, in the ground, the passage of someone. The solar system represents whatever processes led to its being formed.

[29] Don't get me wrong. I'm not presently arguing that this is an impossible or even "incorrect" way of using the term "representation" (although I admit that I am trying to make it seem sort of silly). I do argue, though, that it is unwise to talk in this way, since it invites confusion with the other, more normal sense of "representation" which presumes that representations are *for* or *to* some subject, and thus reinvigorate the illusion of the Cartesian Theater. I also contend that it is basically the quest for the Cartesian Theater, and for the mechanical arrangements inside the brain that provide for the theatrics witnessed there, which continually lead people - even people like Dennett - to look for their understanding of cognition exclusively inside the head.

The Brain as Controlling the Body

[30] Does the brain control the body? Why of course. But the body controls the brain, too. Where do I "store" my knowledge? And if not knowledge, then where do I keep my beliefs and desires and so forth? It has by now become a commonplace that this "storage" is not very tidy. For one thing, it is no longer at all likely that there are discreet areas where beliefs go, where desires go, and so forth. There are no centers for these things; particular mental events of the kind we are likely to enumerate implicate different parts of the brain. This is not to say that the parts of the brain are not particular about what they do. They are. But the centers that may be found in the brain combine responsibilities that may, at first glance at least, seem disparate. [\(7\)](#)

[31] The ecological approach to cognitive science certainly does not deny that the parts of the brain do what they have been empirically shown to do. But what this is may not be as clear as is sometimes assumed. Are memories stored, for example, in even a very sophisticated way, in the brain? There is reason to think that they are not (See Malcolm 1977; Bursen 1978; Collins 1979). To what extent is *anything* stored there? The ecological approach suggests that, while there are certainly fascinating things to be learned by investigating structure and internal mechanism, this route is not as vital, at least in the present state of the discipline, as is understanding ways in

which we - not something inside us - behave, learn, and act. Talk about the "brain and its body" - or about the brain as controlling agent over the body - simply moderates old "Cartesian" themes. We've still got something inside that is in control, although now it is a material something.

[32] Most of the data that leads others to focus on brain sites as loci for both reception and control of the organism involves unarguable facts concerning the results of lesions and stimulations of various parts of the brain. But these facts do not lead inexorably to the conclusion that it is the brain that is in a privileged "controlling" position *vis a vis* the rest of the body (cut off the blood supply and see what happens to that "controller"), that it is the site of storage for anything at all, or that it represents anything at all. There can be no doubt about the absolutely vital role played by the brain as we go about learning, searching, and acting. But the unit of analysis should be the organism, not the brain.

Conclusion: Organisms in Their Environments

[33] Whatever one might wish to say about the extent to which the way organisms see their environments is shaped by their needs, dispositions, interests, and the like (see Sanders unpub. ms. and Sanders forthcoming), it is not at all plausible to say that their environments are in their heads. If any sense at all is to be made of spatial words like "in" and "out" (even, at the extreme, if one understands them in the way Berkeley did), this makes no sense at all.

[34] But what people see - in particular, the way in which they parse their environments - is plainly in part a function of interest, desire, need, etc. It is just as plain that this is not all that is going on. But people do not do the exploring or reacting they do amidst an environment of neutral stimuli. The environment is available to any organism (not just people) in terms that are the result of natural selection. In the case of people, the influences on how environments will be cast are not just biological. There is ideology to take into consideration, there is a much more elaborated sense of personal desire. Things are generally much more complicated in the environment of organisms like ourselves. But the main story is the same. The frog's vision picks up only moving objects, because that's all that really matters to the frog. We (some of us, anyway) catch glimpses of 1955 Corvettes. There is no reason in the world to doubt that this more complicated facility requires, among other things, different eyes and different brains from the frog's. But there is also no reason in the world to think that, at least in the human case, all the work is done inside.

[35] For one thing, especially because opportunity for using different parts of the environment are so much richer for us than for frogs, what there is in the world presents itself differently. This is no longer just a matter of being able to see stationary flies (whereas the frog can't). It is a matter of extraordinary richness and complexity, wherein what I am prepared to encounter in my environment (which is itself largely a function of my own previous encounters together with my biology, which is itself the outcome of a process involving encounters between my ancestors and their environments) not only affects brain tissue, but hormones, muscle tissue, etc. Much of current discussion in cognitive science, having abandoned "knowledge" as something that might be stored long ago, is now on track to the abandonment of beliefs, desires, emotions and a whole train of substantives that do not seem to capture anything that can sensibly be fit with the data that is coming in from neuroscience, or to cohere well with reasonable theory. Instead, it seems

better to focus on dispositions of several kinds and types. This is the right way to move, it seems to me, but the lesson has frequently been learned incompletely. Nerve tissue is described as being disposed this way or that way, rather than the organism as a whole.

[36] This is a simple enough extension of a perfectly usable term (glasses may be disposed to break, for example), but it is the wrong move in cognitive science. It is not brains which think, it is people. Things that go on in brains are necessary for cognition, but cognition could not go on in the absence of interaction with an environment, and environments could not be negotiated in the absence of bodies. These may be simulated (as they would have to be for "brains in vats"), but cognition makes no sense in their absence. Organisms - and especially people - find their dispositions in their muscle-tone and in the balance of hormones coursing through their blood streams, not just in their brains. They fix their beliefs not only in their heads but in their worlds, as they attune themselves differently to different parts of the world as a result of their experience. And they pull the same trick with their memories, not only by rearranging their parsing of the world (their understanding of what they see), but by marking it. They place traces *out there* which changes what they will be confronted with the next time it comes around. Thus they don't have to carry their memories with them.

[37] It is exciting to see that, more and more, discussions of cognitive science are focussing greater attention on the importance for day-to-day cognitive activity of interaction with the changing environment, both at the level of individual cognition and, ultimately, at the level of understanding cognition more generally. It remains to be seen, though, how long it will take finally to shake the bonds of the Cartesian Theater and fully to embrace the ecological approach.

Received 11/19/95.

References

[1]

Boring, Edwin G. and Gardner Lindzey (eds.) (1967). *A History of Psychology in Autobiography, Vol. V*. New York: Appleton-Century-Crofts.

[2]

Bursen, H. A. (1978). *Dismantling the Memory Machine*. Dordrecht: D. Reidel.

[3]

Calis, Gé (1984). "Concerning Gibson's 'On the Face of It': Immediate Perception and Single-Glance Face Recognition." *Acta Psychologica*.

- [4] Calis, Gé, Jan Sterenborg, and Frans Maarse (1984). "Initial Microgenetic Steps in Single-Glance Face Recognition." *Acta Psychologica*.
- [5] Collins, Arthur W. (1979). "Could Our Beliefs Be Representations in Our Brains?" *Journal of Philosophy*.
- [6] Damasio, Antonio (1994). *Descartes' Error: Emotion, Reason, and the Human Brain*. New York: G.P. Putnam's Sons.
- [7] Dennett, Daniel (1991). *Consciousness Explained*. Boston: Little, Brown and Company.
- [8] Fodor, J. A. and Z.W. Pylyshyn (1981). "How Direct is Visual Perception?: Some Reflections on Gibson's 'Ecological Approach.'" *Cognition*.
- [9] Gibson, J. J. (1950). *The Perception of the Visual World*. Boston: Houghton Mifflin.
- [10] --- (1966). *The Senses Considered as Perceptual Systems*. Boston: Houghton Mifflin.
- [11] --- (1979). *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin.
- [12]

Lombardo, Thomas J. (1987). *The Reciprocity of Perceiver and Environment: The Evolution of James J. Gibson's Ecological Psychology*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

[13]

Malcolm, Norman (1977). *Memory and Mind*. Ithaca: Cornell University Press.

[14]

Merleau-Ponty, Maurice (1963). *The Structure of Behavior*. Alden L. Fisher, translator. Boston: Beacon Press.

[15]

Reed, Edward S. (1988). *James J. Gibson and the Psychology of Perception*. New Haven: Yale University Press.

[16]

Sanders, John T. (1985). "Experience, Memory and Intelligence." *The Monist*, October.

[17]

--- (1993). "Merleau-Ponty, Gibson, and the Materiality of Meaning." *Man and World*, July.

[18]

--- (forthcoming). "Merleau-Ponty, Reality, and Berkeley's God." In Lawrence Hass and Dorothea Olkowski (eds.), *Rereading Merleau-Ponty: Essays Beyond the Continental-Analytic Divide*. Atlantic Highlands, N.J.: Humanities Press.

[19]

--- (unpub. ms.). "Affordances: An Ecological Approach to First Philosophy."

[20]

Turvey, M. T., R. E. Shaw, E. S. Reed and W. M. Mace (1981). "Ecological Laws of Perceiving and Acting: In Reply to Fodor and Pylyshyn." *Cognition*.

[21]

Ullman, S. (1980). "Against Direct Perception." *Behavioral and Brain Sciences*.

Footnotes

(1)

The first draft of this paper, almost unrecognizable in the present version, was presented and discussed at the Eighth International Conference on Event Perception and Action, Marseille, July 1995. I owe thanks to the participants at that conference, and to Victoria Varga, for comments and suggestions that have greatly improved the piece. In addition, I am grateful for the support of Fulbright Scholar Award #95-65079, of a Rotary International Grant, of the Rochester Institute of Technology, and of the Graduate School for Social Research at the Polish Academy of Sciences during the preparation of the final draft.

(2)

It may, of course, also testify to the *necessity* of the straightjacket. Some of the reasons for being confident that this is not the right explanation may be found in what follows, and many more of these reasons may be found in authors who have paved the way. These authors comprise an otherwise oddly mixed crew, and include the likes of Maurice Merleau-Ponty, J. J. Gibson, Hubert Dreyfus, John Haugeland, and Daniel Dennett.

(3)

That the hold of this picture runs deep is shown in the fact that one of the most brilliant recent attacks on the "Cartesian" picture (which is really as old as Plato, after all) - namely, Daniel Dennett's *Consciousness Explained* - is still pervaded with remnants of Cartesianism. Aspects of the world are still "represented" internally, brains are still in control of machine-like bodies, and so forth.

(4)

For relatively early Gibson, see (1950). Gibson began to develop his "ecological optics" in about 1954, and this work eventually led to *The Senses Considered as Perceptual*

Systems (1966). For the full blown argument in behalf of the ecological approach, see (1979). Finally, for a bit more detail about this development, see Gibson's own account in (Boring and Lindzey 1967: 125-43). Further valuable sources are (Reed 1988) and (Lombardo 1987). For a comparison of the interesting similarities between the development of (the empiricist) Gibson's ideas and those of (the phenomenologist) Maurice Merleau-Ponty, see (Sanders 1993).

(5)

See especially (Fodor and Pylyshyn 1981). For further commentary, see (Ullman 1980), (Turvey et al. 1981), (Calis 1984), (Calis et al 1984). See also (Sanders 1985) for what I took then to be a moderately Gibsonian approach to memory.

(6)

I set aside, with some sense of incompleteness, the fact that nervous tissue - in particular, the central nervous system, behaves quite differently from the tissue that makes up the rest of me. This opens the well-known possibility that I am the matter-energy of which my central nervous system is composed, rather than the matter-energy of which my entire body is made up. While this possibility is not touched by the argument sketch in the text, there are good reasons for rejecting it. The reader should get a clear enough inkling of some of those reasons as the paper progresses.

(7)

For interesting discussion of these issues from the point of view of a neurologist who has been very much involved in this work, see (Damasio 1994).

©1996 John T. Sanders

EJAP is a non-profit entity produced at Indiana University. EJAP may not be printed, forwarded, or otherwise distributed for any reasons other than personal use. Do not post EJAP on public bulletin boards of any kind; use pointers and links instead. EJAP retains the right to continuously print all the articles it accepts, but all other rights return to the author upon publication. EJAP, Philosophy Department, Sycamore Hall 026, Indiana University, Bloomington, IN 47405.