

THE MONIST

An International Quarterly Journal of General Philosophical Inquiry
FOUNDED 1888 BY EDWARD C. HEGELER

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EXPERIENCE, MEMORY AND INTELLIGENCE¹

Many traditional accounts of experience suggest that memory plays a crucial role. But what, precisely, is the nature of memory? What *is* its role in experience?

As a non-technical, non-theoretical notion, "memory" can signify not only the ability to relate now to things that have happened in the past, but more fundamentally, it is involved to some extent even in the ability to perceive. My ability to perceive that this is a hand I see before me requires that I have had experiences of hands before, perhaps also that I have learned the concept "hand" before, and that I be able to apply this information, previously acquired, in the present situation. So even intelligent *perception* requires memory.² Thus we are led one step deeper. If perception is fundamental to experience, then so is memory.

I emphasize, though, that memory is *correctly* to be understood as central to intelligent experience, if at all, only in a non-technical or non-theoretical sense of the notion. I emphasize this because the technical or theoretical accounts of memory that have been given are spurious. They do not explain memory in a plausible way, and therefore they do not help in understanding either intelligence or experience in general.

What characterizes most technical or theoretical accounts of memory is their reliance upon an *internal storage* model. Psychologists and neurophysiologists have suggested neural traces (either dynamic or static) as the mechanism for this storage, and designers of artificial intelligence have relied upon the same general model, instantiated magnetically or electronically instead of neurally, to do the same job. Both psychology and artificial intelligence design have heretofore relied, without much question, upon the idea that memory is to be understood as a matter of internal storage.

In what follows, I shall first sketch the most important reasons for skepticism about this model, and I shall then propose an outline of an alternative way of talking about memory. This will provide an appropriate framework for suggesting a few implications for future work in artificial intelligence.

THE MONIST, Vol. 68, No. 4

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Problems with the Storage Model

As a beginning, let me justify the project I am undertaking, in response to an argument that has been pervasive in the recent philosophical literature regarding memory. The argument I have in mind is ultimately to be attributed to Ludwig Wittgenstein, but its application to the memory issue has been carried out in detail by some of Wittgenstein's followers, notably Norman Malcolm.³ The argument goes like this: memory refers not to one single kind of phenomenon, but to a wide array of phenomena which have no particular "structure" in common. What they have—all together, rather than in common—is nothing more specific than a "family resemblance". This being the case, there can be no account of memory in general. There is no single unifying phenomenon to give an account of. So, anyway, goes the argument.

Now, I have no doubt that the word "memory" refers to an *array* of perhaps loosely related phenomena. I am not quite so sure that Wittgenstein and Malcolm are right in imagining that there can be no one successful analysis of memory in general, but I shall not quarrel, for the moment, with this contention. Even if they are right about this, however, one can notice that among the phenomena that are examples of memory, some may appear puzzling while others do not. One can examine these puzzling examples, and try to clear up the puzzles one by one, even if no overall account is available to clear them up all at once. To the extent that one is successful in clearing up the puzzles involved with memory, regardless of whether this success is the fruit of several different discussions or of one overall discussion, it seems apt to describe this as accounting for memory, or even as giving *an account* of memory. If Wittgenstein and Malcolm are correct about the variety of phenomena that may be examples of memory, the account will be complex, not simple. But it will be no less an account for all that.

On to the puzzles and problems, then.

Most fundamentally, the problem with a storage account of memory is that either it leads to an infinite regress of necessary storage capacity or it is circular. Both are unacceptable.⁴

The infinite regress argument is easiest to outline, and perhaps easiest to respond to. It goes like this: try to understand the reasoning that motivates the offering of an internal storage theory of memory. The problem seems to be this: here we are in the present, and somehow we are able to think about things (or act on the basis of things) that have happened in the past, and in other places. How is this possible? How can far away past events influence us here and now? We must take them with us, somehow, since action at a distance is not a congenial explanation. It would be magical.⁵

Thus, philosophers have, for centuries, favored accounts of memory that envision, first, an account of perception that includes some sort of imprinting or recording of what is experienced; second, a postulated storage facility that allows us to take this record away with us in time and space as we "move" through our lives; and, third, a recall mechanism for digging this data up upon appropriate stimulation at a later time and (perhaps) a different place.

It is important, incidentally, to realize that this is a *philosophical* theory that dates back at least to the fourth century B.C., and not a recent psychological or neurophysiological "discovery." Much as it has been sought, the mechanism responsible for all this has so far successfully eluded its pursuers.

Now, why is there a need for such an elaborate explanation? Well, it seems obvious, doesn't it? Let's say you and I run into an old friend of mine. You have never seen her before. I remember her. Yet the visual stimuli for you and me are the same. The difference between us in the significance attached to this visual experience must be due to different things *in us*. In particular, I carry around a memory of her and you don't. The visual experience evoked or called forth that memory in me, while in you nothing happened, unless it was some other evocation that involved the baggage that *you* carry around.

Alternatively, imagine a more private example. You can think up a new program for your home computer, or you can remember a program you wrote yesterday. What's the difference? It must involve the matter of whether what you are now thinking of is an original creation, or whether it is something you dug up out of the recesses of your mind. Memories, whether they are evoked by environmental stimuli or by mental stimuli, and whether they are deliberately dug up or simply occur to us, seem obviously distinct from present and future oriented thought, imaginings, and experiences. The traditional philosophical literature suggests that our immediate experiences are more "vivid," but whatever the difference is, they certainly *are* different from memories.⁶ The storage and retrieval model is an attempt to explain all this.

But in order to explain retrieval itself, the following problem arises. When we recognize something or someone, when a present experience evokes a memory, or when we, in thought, evoke a memory, how is it done? Theorists have typically argued that some sort of key is required in order to "unlock" the stored memory. Memory is like a library, we are told, but we need a card catalog to find the right book. So: a present visual stimulus—say of an old friend—must incorporate some "cue," as it is called, to unlock the memory of times well spent in the past. Perhaps it's the

funny smile and the hooked nose. But how do I know that "funny-smile-and-hooked-nose" goes with *that* set of memories, in particular? Well, I guess I must remember this. But how do I unlock *that* memory? There must be some cue in the perception of funny-smile-and-hooked-nose that links it with the storage bin in question. But how do I know that *that* cue goes with *that* bin? Do I remember it? The account might go on forever. In addition, there seems to be a funny sort of circularity going on, with memory being used as part of the account of memory.

I said, above, that this argument may appear to be easy to respond to. Indeed, computer designers and programmers solve this problem by *fixing* some of the linkages between stimulus and storage in a permanent, rigid way. At some level, there is no question of needing memory to relate cue to storage. The relation is simply *given*, either in hardware or software. Thus the significance of a cue at some level requires no interpretation by the computer. The significance is simply *given* to it.

Perhaps people work in the same way. Perhaps at some level the account of human memory may be stopped short of infinite regress by postulating the existence of genetic or other instructions which simply *tell* the perceiver that *certain* stimuli, or certain *features* of a stimulus, are invariably to be interpreted as having a certain kind of significance. Certain stimuli or features of a stimulus have their capacity to unlock certain memories, or certain memory *bins*, simply *given* to people. They require no interpretation, and thus do not require memory as part of the account of how they work. They have their significance as cues written on their face, as it were.⁷

A Different Proposal

This response, however, is not satisfactory. Memory storage was first postulated, remember, to show how some *present* stimulus could be linked to some past experience. But we have found it necessary, in order to block an infinite regress, to postulate that at *some* level, significance is simply given. If this is possible at *any* level, why isn't it possible at the *first* level? Why cannot my friend's face simply *give* me the information that this is my friend in the first place? Since I have to resort to this kind of move anyway, why not resort to it right away? Why should I, in order to explain the significance that this face has for *me*, resort to all kinds of explanatory detail only to be forced to say, at a deeper level, that significance is simply *given*? *Something* in what is given in this experience has its significance written on its face in either case. Why not my friend?

Now, this is an unusual suggestion. It is an objection to over 2,000 years of psychological theorizing. It *should* seem odd. If followed to its logical conclusion, the proposal amounts to this: since all theories of

memory require that significant information be available in the *present* environment of the rememberer, why not suppose that *all* such information is available in the present, and in this way, to him?⁸ Odd though it may seem, this is, indeed, what I propose. For it simply will not do to suggest, as a theory of how present stimuli take on the significances that they have, that there must be an elaborate mechanism which itself relies on significance being simply given. The mechanism is excess baggage that we are better off without.

But how can a proposal like this account for the fact that you *didn't* see that this person was an old friend of mine in my earlier example? If the information relevant to memory is simply given in the experience, how come only I picked it up? How come you don't get it too? The answer, I think, has to be that you and I do not experience the same thing when my friend walks up. I see my old friend, and you see a stranger. Let us stick with memory for another few lines, though, before we take on perception.

Here is a story that may offer some illustration of how my proposal may be applied. And since it is a familiar sort of tale, it may offer some support to the view that some such proposal as mine should be entertained.

You and a friend are about to leave on a long-planned excursion to a wonderful restaurant that you have been lavishing praise upon. It's quite a way out of town, so it is not easily accessible. You were there one other time, several years ago. Your friend is eager, and he will be the driver.

As you start your trip, he asks "Where do I go?"

You say, "Just drive out highway 31 for twenty miles or so."

"Then what?"

"I'm not sure," you answer, "but I'll know the place to turn when we get there."

For the twenty minutes or so that it takes you to drive out highway 31, you and your friend puzzle over this phenomenon. He asks various questions, such as whether there are buildings or not near the turnoff, whether there is a sign or a landmark.

Your answers are vague. You *do* know that there are buildings there, but you can't remember anything about them. There are no landmarks that you can remember. As you approach the twenty-mile mark, you drive through a few places where there are buildings, and where there are turnoffs. None of these is right, you are sure.

Finally, you reach a place where you say "This is it!"

Your friend makes the turn, and tells you he knows how you remembered. There was a big gaudy billboard at the corner.

But you are sure that he is wrong. You aren't even sure that the billboard was *there* the last time. You say "No, I think it was that fire station."

Your friend, surprised, asks "What fire station?"

"The fire station on the corner."

As it happens, there *was* no fire station on the corner. Your friend points this out, suggesting perhaps that it was the barn.

"What barn?" you ask.

It appears that there was a big red barn on one corner.

You are not sure about any of this, and the conversation ends. You have a nice meal (although not as nice as the one you had last time), and on your way home you spot the big red barn; you are sure that you had never noticed it before. What you thought was a fire station turned out to be a combination food store and gas station, but you further notice that on two other similar corners on the way back there are virtually identical such stores, so that couldn't have been the clue. You are still uncertain about how you did it, but you know that the corner "looked familiar."

Just in case, though, you resolve to remember the conversation with your friend, so as to be able to recall the billboard, the big red barn, and the fire station for next time (or *was* it a fire station?).

I contend that such examples are typical of memory. Things look familiar, but not in virtue of the detail; not, in fact, in virtue of "cues" of any kind.

But the details of the *story* are interesting. There is a grocery store in it that you thought was a fire station. There are no red rectangular patches that might or might not be the side of a fire station. There is a billboard and a big red barn, both of which seem (to you, anyway) to be irrelevant to the memory of where to turn. *You* thought it was the fire station (which turned out to be a store, the likes of which were on other corners that you passed).

You seem to be clear about *none* of the details. Therefore you are clear about no *composite* of details (unless, of course, you somehow know the composite *without* knowing the details, which is one way of putting what I am proposing). Yet you found the place to turn. And since this can only be due to the fact that you had been there before, it is clearly a case of your *remembering* where to turn.

It seems to me that there are good grounds for saying that the *only* thing particularly significant about the scene was that it was the place to turn. No secondary clues were needed. The information was *in* the scene, and no other information was needed to cue it. You saw a fire station this time, although it turned out to be a store. What *is* a fire station? It's a place to go or call if you need help in putting out a fire (among other things, I suppose). What's a store? It's a place to go to buy food and sundries. Can these serve as cues to tell you where to turn? If *they* can—if a place to go for help or a place to buy food can serve as cues to knowing where to turn, why

can't you simply see the place to turn? (Surely, if you can simply *see* a landmark, you might also know *that* it's your landmark because it sits there, right at the place to turn. Either seems to me to be equally possible, and if one seems plausible so should the other.)

Problems like this have long been discussed under the rubric "the theory-ladenness of observation" (or "perceptual readiness" in psychology). This has been an influential theme in the philosophy of science. If a trained physicist and a native of the Trobriand Islands were to enter a laboratory, they would *see* different things. One would see a microscope, for example, where the other would see (perhaps) an odd shaped weapon. Or imagine the child who lives near the forest, but doesn't enter it for some years. He sees the forest, and later comes to climb in a particularly neat big tree when he first visits the forest. In the future, the forest will be seen as the site of his favorite tree. As he grows older, his interest and experience may lead him to see, instead of a tree, an oak; instead of an oak, the home of a particular bird. He may take home pieces of the tree, examine them under his father's microscope (his father is the physicist in the other example), learn to see molecules, see atoms, and even see quarks.

Not *one* of these things *is given* to him in the data available to the retinae alone. *All* of them reflect significances of various kinds, and in *this* story, anyway, the significances vary over time and as a function of the interests and needs and desires of the observer. The significances are certainly not mutually exclusive. Instead, they are *nested* in the overall environment and are dependent upon the particular characteristics of the observer. What might be called the stimuli in these examples vary *not* just as a function of changes in the environment itself, but *also* as a function of changes in the observer. The environment becomes "parsed" differently, as regards significance, on different occasions. The same variability will, of course, be evident among different observers.

One more example: I have been told that eskimo languages lack a generic word for snow. Instead, they have something like eleven different words for the stuff, ranging from "nice for making igloos" to "watch out the ice is weak there." Perhaps these translations are a bit too florid. But the point is this: what we see, the way we parse our experience of the environment, has to do with us and our needs as much as it has to do with the environment. Stimulus definition is relative to the observer (as well as being dependent upon what is offered for definition by the environment).

If stimulus definition is relative to the observer in the way indicated by these examples, then stimulus itself is laden with significance or meaning.

If stimulus is laden with meaning, then meaning does not have to be attached, not remembered or stored in *order* that it may be attached, to a sup-

posedly neutral stimulus. If stimulus is laden with meaning, then it is the fundamental feature of such and such a stimulus that it has such and such a meaning, or significance, or relation to the individual observer. The details (color or shape or whatever) need not be noticed. This is true (by virtue of the same argument) whether what is attended to is a feature of the environment or a mental image. We see the place to turn, and we may not even know or notice the details—that it involves a red barn, for example. We can dream or imagine a familiar face without dreaming or imaging any details at all. We may not even know whose face it is—it is just a familiar face.

Perception, or imaging, or thinking, *may* evoke or be instances of remembering. But *when* such things are instances of remembering, this is due to the fact that *what* is perceived, imaged, or thought has as one of its defining features the fact that it has been related to us in some way in the past. Just as the defining feature of what we see at the street corner is that it is the place to turn, just as the defining feature of a cave may be that it is a place to hide, the defining feature of a presently perceived face may be that we have seen it before. We may have to *work* to establish conclusions about where or when we have seen it before, and we may or may not be successful in this. But this is a function of the degree to which stimulus definition has been specified in detail, or refined.

Thus, what we see is something whose significance is determined by its relation to us or to other things which themselves bear some relation to us. It is these relationships that are primary in perception. They are (or may be) *objective* in so far as they really do hold. But they are *subjective* in that they involve us in a fundamental way. Dualism between subject and object loses its explanatory value at this juncture, since perception is (at least sometimes) *both* objective and subjective, not one or the other exclusively.¹⁰

One of the more important stimulus-defining relationships is that of having been experienced before. It is primary—that is to say, it is not a function of any strictly present or momentary features of the stimulus that may be defined independently of the observer. This is why we can see a face and feel strongly that we have seen it before, without having any idea *why* we feel this way. Similarly for images. There is no need to postulate an internal storage mechanism, no need to postulate “subconscious” memory. These, after all, are required only if the stimuli with which we are confronted are somehow neutral, lacking significance. Since stimuli are not like this—or better, since the things we experience are not like this (the environment, as such, just sits there; it doesn’t use up what energy it has trying to *stimulate* us)—we do not need neurophysiological or subconscious storage mechanisms to account for their *gaining* significance. They do not gain significance, they simply have it. They simply have it because having significance is a *sine qua non* of perception.¹¹

There is a sense, then, in which it is at least partially true to say that human beings store their memories in their environments, not in their heads. People interact (perceptually *or* behaviorally, physically or mentally) with *things* or with more or less defined *concepts*, rather than with indifferent arrays of neutral stimuli, or with mental color patches which may be assembled to create images which still need to be interpreted. And the things in question, or the concepts in question, receive definition *through* their significance to the perceiver. Their significance, their relation to the perceiver, determines what they *are* to the perceiver. That *is* what they are. What is seen, then, is their significance or meaning. One crucial such significance is this: having been experienced before.

Machine Intelligence

The significance of this for machine intelligence may be sketched as follows.

Machines have been designed on a model of *human* intelligence that may be erroneous. Present-day machines, in fact, behave “intelligently” as a direct function of an elaborate internal storage system and an increasingly sophisticated array of access mechanisms.

If it is human intelligence that is to be imitated, and if human intelligence does not work in the way the traditional models have indicated, then machines designed on these models may be unable to replicate or imitate human intelligence. The model which requires storage of memory may lead us to a dead end.

Indeed, the more plausible arguments of the critics of artificial intelligence may be interpreted in this way: *this* model of intelligence is inadequate.

Now, either machines *must* be designed in this way, or there are better alternatives.

If the former, and if my thesis is right, then artificial intelligence would always be disappointing. There would always be room for improvement in storage capacity and in access, and there is probably no particular human behavior that could not be imitated, but the imitations would always be inelegant and inadequate. They would be inelegant because they would rely on what is, after all, a rather brutal strategy for replicating intelligent behavior: increasingly large storage capacity, increasingly fast processing time, increasingly complex access mechanisms. This is mimicry by brute force. The imitations would be inadequate because they would be, by hypothesis, unable to exploit the most fundamental feature of human intelligence, which I will call “constrained creativity” (I’ll come back to this in a moment). This would be impossible, of course, only if the condition alluded to a moment ago were to hold: namely, that the only strategy

available to practitioners within the artificial intelligence field was to use a model of memory—and of intelligence, therefore—which is not accurate as a model of human intelligence.

I do not see why this should be the case, however. I cannot see why a more accurate model of human intelligence should not also be available for use in the design of machine intelligence. Here, therefore, are a few of the things that seem to me to be required.

The crucial area for future work seems to me to be what I shall call “stimulus definition.” There is a world of complex trouble to be found in stimulus/response theories of human behavior, so I use the expression reluctantly. But what I have in mind is this: what humans notice, react to, inquire into, experiment with, etc., is a function of the importance or significance of certain parts of their environments. Indeed, the otherwise undifferentiated environment is parsed by the perceiver as a function of such importance or significance.¹² Since importance or significance is a function not only of characteristics of the environment, but also of characteristics of the observer (his needs, interests, desires, or whatever), the way the environment gets parsed depends in large part on these latter, observer-specific, characteristics.

It is, of course true that some of the relevant characteristics among human beings are shared by all organisms, some are species-specific, some are culture-specific, and some are specific to the individual. But these complications are not problems for artificial intelligence.

What is a problem is this: how can we get machines to make and refine their own stimulus tables as a function of their experience? If they are to mimic human beings, they must *create* their own arrays of significance-bearing stimuli out of a stimulus environment that first confronts them as undifferentiated. Machines can of course “create” such arrays, either randomly or at the command of the programmer. But what must be done to mimic human intelligence is to program a specific *kind* of creativity: a creativity which

1. defines and refines over time the resolution and differentiation of the otherwise undifferentiated stimulus environment.
2. does this as a function of its own (probably programmed) “drives.”
3. does this also as a function of the (learned) opportunities available in the environment for satisfaction of the drives mentioned in #2.

Since this creation of a parsed or differentiated stimulus environment is constrained by facts about the environment and facts about the perceiver, I call this capacity “constrained creativity.”

What is crucial in this approach, and what is new, is that the machine is *not* to be given simply a capacity for ever-more complex responses (through

a growing array of stored data) to a fixed and concrete array of pre-ordained stimuli; instead, most of the machine’s work will be devoted to creating and refining the array of stimuli to which it will respond. *It* must parse the stimulus environment into a dynamic nested array of things, features and events, and it must do this, not randomly, but as a function of both its programmed drives and the opportunities that it learns about for the satisfaction of those drives.

Thus it requires a capacity for constrained creativity in the construction of an increasingly refined stimulus array out of a previously undifferentiated stimulus environment. It also requires “drives,” of course, and it requires an ability to shape its stimulus-refinement in the light of the satisfaction of desires. It may require, in addition, a mechanism for acquiring secondary desires, which experience suggests to it may be instrumental in satisfying primary desires. This last, however, is a complexity that may best be avoided in early attempts at designing such machines.

Such a machine, if it can be designed, would *not* be storing information about the significance of indifferent stimuli. As is the case with humans, it would *leave* the information where it was found: in the environment. Instead of having to link stored significances with a virtually infinite array of indifferent stimuli, it would have parsed the stimulus environment into a handleable array of things, features, and events whose significance is intrinsic to the parsing. It would not do this once and for all, but would continue to refine its definition and resolution of the environment in the light of further activity *in* the environment.

Ideally, such a machine could be set to work, initially, with *no* instructions about the appropriate stimuli to react to. It would only have instructions to parse on an exploratory and experimental basis. It would try some scheme of differentiating the environment, test for success in drive satisfaction, try other schemes, and where a scheme leads to such success, try more refined schemes. What will be altered as a result of success will *not* be a stored array of data, but, instead, the array of stimuli that the machine is prepared to respond to. The stimuli, then, having been *defined* as significance-bearers, will bear significance on their face. Meaning and significance will be seen and responded to directly, not as a function of association between neutral stimuli and internally stored information.

Whether the design of such a machine is possible, I leave to those who are more expert in such matters than I. But one further question needs to be mentioned, at least. Can *any* machine at all ever be regarded as genuinely intelligent? Will we ever regard any machine as the appropriate bearer of rights, for example, or as the appropriate object of compassion or concern?

This is a question that plagues a large body of the philosophical literature regarding machine intelligence. The inconclusive character of the

debate to be found in that literature suggests that the answer to this question cannot be based simply on a suitably precise specification of the details of machine design. Just as in the abortion controversy, added biological data does not seem to imply any particular conclusion about whether a fetus (or unborn child) has or should be afforded rights, the same is true here: the genuine intelligence of a machine does not seem simply to follow from its being able to do complex things or from its having a suitably complex design.

In line with the argument of this paper, I submit that the resolution of this problem depends upon how we parse our stimulus environment. And if I am right, this has as much to do with our *decisions* or unreflective choices about what is significant as it does with what the environment offers.

Indeed, intelligence in general is fundamentally creative. Like all works of art, the products of intelligence—the definition and refinement of the environment as a function of its multiple relations to us—depend in large part upon the material with which we have to work. But the environment is passive. Intelligence must *establish* significance within the environment as a result of a trial and error process. This, I claim, is true of *any* intelligence, whether artificial or natural.

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NOTES

1. Thanks go to Aaron Ben-Zeev, Marjorie Grene, Martin Noval, Christine Suits, David Suits, Victoria Varga, and David White. All helped to nurture these thoughts. An early version of this paper was presented to a Symposium on Artificial Intelligence at the Rochester Institute of Technology.

2. This is the case, anyway, for perceiving *that* this is a hand before me. What about perceiving the hand before me? Here we may become confused. Can an infant, for example, perceive her hand without perceiving (or realizing) *that* it's a hand? It seems so (why not?). But is memory, then, *not* involved in such a perception? I'm not sure. If the infant is aware of a *thing* before her (a thing we know to be a hand), is it necessary that she have previous encounters with *things*? The general question is, how does the infant ever get this show on the road in the first place, if all genuine perceiving (or experiencing) requires memory? My guess is that she could not, and therefore that the role of memory differs importantly from what is suggested in the introductory paragraphs of this paper. In particular, the problem may be solved by avoiding the temptation to distinguish sharply between perception and memory. This, indeed, is what is contended below. See James J. Gibson, "The Problem of Temporal Order in Stimulation and Perception," *Journal of*

Psychology, 1966; Gibson, "Events Are Perceivable but Time Is Not," in J. T. Fraser and N. Lawrence, eds., *The Study of Time II: Proceedings of the Second Conference of the International Society for the Study of Time, Lake Yamamaka, Japan* (New York: Springer-Verlag, 1975); Gibson, *The Ecological Approach to Visual Perception* (Boston: Houghton-Mifflin, 1979); M. T. Turvey and Robert Shaw, "The Primacy of Perceiving: An Ecological Reformulation of Perception for Understanding Memory," in Lars-Goran Nilsson, ed., *Perspectives on Memory Research: Essays in Honor of Uppsala University's 500th Anniversary* (Hillsdale, NJ: Lawrence Erlbaum Associates, 1979); Stephen Wilcox and Stuart Katz, "A Direct Realist Alternative to the Traditional Conception of Memory," *Behaviorism*, 1981; and Robert Shaw, M. T. Turvey and William Mace, "Ecological Psychology: The Consequence of a Commitment to Realism," in Walter B. Weimer and David S. Palermo, eds., *Cognition and the Symbolic Processes*, vol. 2 (Hillsdale, NJ: Lawrence Erlbaum Associates, 1982).

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

4. What follows is largely inspired by Malcolm, *Memory and Mind*, H. A. Bursen, *Dismantling the Memory Machine* (Dordrecht, Holland: D. Reidel, 1978), and Gibson, *The Ecological Approach*. Wilcox and Katz, "A Direct Realist Alternative," have been similarly influenced, and they catalogue a similar list of problems. For a different, more general argument to the same effect, see Arthur W. Collins, "Could Our Beliefs Be Representations in Our Brains?," *Journal of Philosophy*, 1979, reprinted in David L. Boyer, Patrick Grim and John T. Sanders, eds., *The Philosopher's Annual*, vol. 3 (Atascadero, CA: Ridgeview, 1980).

5. The view that there must be an uninterrupted causal chain, through time, between the initial remembered event and the memory itself has come to be called the "causal theory of memory." See C. B. Martin and Max Deutscher, "Remembering," *The Philosophical Review*, 1966, for the most widely discussed modern version of the theory. Roger Squires criticized the causal theory in "Memory Unchained," *The Philosophical Review*, 1969, and Sydney Shoemaker came to its defense in "Persons and Their Pasts," *American Philosophical Quarterly*, 1971. John Schumacher joined the fray with "Memory Unchained Again," *Analysis*, 1976, and Norman Malcolm mounted a sustained attack on the causal theory (among others) in *Memory and Mind*. See also Delmas Lewis, "Dualism and the Causal Theory of Memory," *Philosophy and Phenomenological Research*, 1983.

6. As a phenomenological description, "vividness" seems inapt as a characterization of the difference between present experience and memory. Some memories are very vivid indeed, some present experiences quite pale. It is best to say that the two phenomena simply differ.

7. This is the strategy adopted by Sam S. Rakover, "In Defense of Memory Viewed as Stored Mental Representations," *Behaviorism*, 1983. Its inadequacy was identified in both Wilcox and Katz ("A Direct Realist Alternative," p. 230) and Ulric Neisser, *Cognitive Psychology* (New York: Appleton-Century-Crofts, 1967), p. 79. Criticism of such a strategy may also be found in Shaw, Turvey and Mace, "Ecological Psychology."

8. I would like to avoid, for present purposes, one issue that is, admittedly, quite fundamental. It is the question about what the present actually is, and what distinguishes present perception from memory. We do *not* perceive or experience only an instantaneous present. We perceive events that have duration. Thus we must be

careful in drawing sharp lines between "present" experience and memory. For a provocative and illuminating treatment of this issue, see Turvey and Shaw, "The Primacy of Perceiving." See also Gibson, "Events Are Perceivable But Time Is Not." On the less abstract question regarding the role of presently available information in memory, see Endel Tulving, *Elements of Episodic Memory* (Oxford: Clarendon Press, 1983) for a different approach. Tulving argues for an explanation of "episodic" memory (the memory of a personal, dated experience or episode, as opposed to "semantic" memory, which is the recalling of some impersonal, timeless fact) based on "synergistic ephory." This is contrasted with other theories of memory by emphasizing the large contribution that *presently* available information makes to what is remembered. It is a *step* toward the proposal being advanced here. But for Tulving, the engram or trace plays an equally important role. There is "synergy" between the contributions of trace, on the one hand, and presently available information, on the other. The present proposal urges that the contributions of "trace" are spurious in such a view. For an interesting discussion of memory as an ability or "dispositional capacity," rather than a storage facility, see Aaron Ben-Zeev, "Two Approaches to Memory," forthcoming in *Philosophical Investigations*.

9. See, for example, J. Bruner, "On Perceptual Readiness," *Psychological Review*, 1957.

10. In Gibson's terms, what we perceive is "affordances." Simple examples are "hideable in" or "sit upon." To perceive things of this kind is to perceive relational properties. The properties might hold objectively (I really *can* hide there or sit on that), yet still be relative to the perceiver (you *can't* hide there because it's too small for you; thus you do *not* perceive "hideable in" when looking over there, while I do). See Gibson, *The Ecological Approach*. For criticism of Gibson's approach, see especially J. A. Fodor and Z. W. Pylyshyn, "How Direct is Visual Perception?: Some Reflections on Gibson's 'Ecological Approach'," *Cognition*, 1981. Although a complete response to Fodor and Phlyshyn would require more space than is available here, the following general remarks are appropriate. Gibson's most important claim is that it is *affordances* which are directly perceived, not neutral stimuli. This takes seriously the traditional distinction between perception and sensation, and requires a similar distinction between perceptual system and sense organ. But if it's true that affordances are directly perceived, then two routes of discussion are possible. One route involves trying to analyze this "direct" perception into sub-routines which, together, show how *such* direct perception is made possible in the physical organism. The other route regards such efforts as less fruitful and less important than an examination of the consequences *to* an organism of having such a perceptual system. The first approach (represented by Fodor and Pylyshyn) urges reduction of perception to sub-systems (whether neurophysiologically instantiated or not). The second approach (Gibson's) is fundamentally anti-reductionist. The argument, then, is a near-classical case of conflict over the most fruitful unit of analysis for research. As is usual in such cases, the arguments seem to find their most vivid focus in conflicts over issues which appear, at least to the outsider, to be more taxonomic or verbal than substantive. They are in fact crucial conflicts, but their importance is at the level of research strategy, and not at the level of empirically testable claims. The main claim of the Gibsonians, it seems to me, should be that their direct approach to perception dispenses with constructs which are neither helpful in explanation nor observable empirically, confronts important issues that are dodged by the reduc-

tionists, and ties in with evolutionary biology in ways unavailable to the reductionist approach. For further discussion of the conflict between Gibsonians and everyone else, see S. Ullman, "Against Direct Perception," *Behavioral and Brain Sciences*, 1980; M. T. Turvey, R. E. Shaw, E. S. Reed and W. M. Mace, "Ecological Laws of Perceiving and Acting: In Reply to Fodor and Pylyshyn (1981)," *Cognition*, 1981; Ge Calis, "Concerning Gibson's 'On the Face of It': Immediate Perception and Single-Glance Face Recognition," *Acta Psychologica*, 1984; and Ge Calis, Jan Sterenborg and Frans Maarse, "Initial Microgenetic Steps in Single-glance Face Recognition," *Acta Psychologica*, 1984. Finally, I would like to limit my present endorsement of the Gibsonian approach to the things I say in the text. My main topic in the present paper is memory, not perception as a whole. I am trying to offer a plausible way of looking at memory that is an alternative to the storage view. A full assessment of the reductionist/anti-reductionist debate concerning perception will have to wait for another paper.

11. For discussion of issues of this kind, see Aaron Ben-Zeev and Michael Strauss, "The Dualistic Approach to Perception," *Man and World*, 1984.

12. The notion of an "undifferentiated environment" is a difficult one, since environments are always environments of someone or some thing. This fact implies certain broad significances which we anticipate within the environment, and already starts the process of differentiation within the environment. Apart from all of this, no one of us can think of an environment without differentiating it—"parsing" it—in some way. But the notion of a previously undifferentiated environment is implied by the idea that it is we who differentiate it. If it is *affordances* that get perceived—that is, certain *relationships* between perceiver and environment—then it is apt to say that these simply do not *exist* independently of the perceiver (or prior to the onset of perception). See Turvey and Shaw, "The Primacy of Perceiving," for some thoughts on this matter; see also Ben-Zeev and Strauss, "The Dualistic Approach."