

image was available then seems unreasonable, and was explained by suggesting a bias against switching tenses. The mixed use of tenses by the eidetic subjects after the image was reported to have faded doesn't lend itself to a simple explanation either. Even granted that some subjects actively retain some presented information in attention after the picture has been taken away, there are other consistent models (e.g. Gray and Gummerman 1975) that do not require a distinct eidetic memory.

In conclusion, we find that we can agree with Haber's call for more research analyzing verbal reports, yet the particular evidence cited by Haber does not present convincing evidence for eidetic imagery. Ericsson and Simon (1978) found in their review that studies collecting verbal reports have done so without much concern for control and methodological rigor, or alternative explanations, because the researchers felt these reports could not be considered anything more than suggestive evidence anyway. We agree with Haber's concluding remark that for verbal reports to achieve their appropriate status as an informative and significant data source for cognitive psychology, it is necessary to apply the same methodological rigor and theoretical precision as for other, already accepted sources of data.

by Charles J. Furst

Neuropsychiatric Institute, University of California, Los Angeles, Los Angeles, Calif. 90024

The inside and outside of eidetic imagery

Whether eidetic imagery (EI) turns out to be a scientifically interesting phenomenon or a red herring depends on whether an objective criterion can be found. During 1972-1974 I tested over 250 children for eidetic imagery and found 25 who satisfied criteria modeled after Haber and Haber (1964). My frustration in being unable to find strong correlates of eideticism together with an inability to arrive at an objective test for identifying eidetikers led me to become skeptical about EI.

One approach to finding an objective criterion is to examine the accuracy of subjects' verbal descriptions of their EI. Contrary to Haber's data, which gave no evidence for better pictorial recall for eidetikers than others, our results using a scoring procedure for open-ended responses (and thereby allowing for idiosyncratic coding for each S), showed that eidetikers tended to have better visual recall than most, but not all, other children. Eidetikers tended to be near the top of the distribution of recall scores, but still they were not off the distribution (Furst, Fuld, and Pancoe 1974).

Haber believes that accuracy of report should not be used as an objective indicator, but if the EI is not dense in information, as visual perception is, then how is it "visual" or different in kind from other forms of memory? Haber says that EI may be fragmentary, but if so, shouldn't eideticism imply something about the grain of the fragments?

One implication might be Haber's eighth criterion - a test of the ability to fuse two separate pictures by superimposing one (eidetically remembered) onto another (visible) to form a third or target image not present in either image alone. A strict fusion test, most people would agree, would form an objective demonstration of the reality of EI, since it would be beyond ordinary abilities. Despite Haber's report that four of twenty-three eidetikers could fuse his Figure 6, this stimulus does not quite satisfy the fusion criterion, since the target pattern is visible in the first component alone. The fact that his eidetikers could identify it may represent no more than that they are talented at visuospatial or pictorial cognition. This talent is suggested by the data on recall accuracy and also by other unpublished data I have collected showing that eidetikers are superior to other children in the Kohs Block-Design, a putative test of right-hemisphere cognition (Furst and Fuld, 1975).

My own efforts to devise an objective test for EI using the image-fusion principle were unfruitful, eidetikers and other children alike proving unable to fuse any of a variety of component images to find a figure revealed in their superposition. Gummerman, Gray, and Wilson (1972) were also unsuccessful in having eidetic children demonstrate their abilities with a fusion test.

Another approach I took was to devise a pictorial recognition task that might favor accurate visualization of picture fragments and that would not require verbalization of response (verbalization is said to inhibit the persistence of an EI). In this test, subjects were required to point to the spatial location of a sample piece from a large complex scene, following a standard procedure for inducing an eidetic image of the scene. We found that eidetic subjects were no better at this than other children. As a final stab, I tried to see if EI is related to an unusually persistent visual "icon" - it wasn't.

In the absence of an objective criterion, it is difficult to see the utility of the notion of eidetic imagery. If EI does not *make* a difference, then it is reasonable to view it as not different in kind from ordinary visual memory, but merely a difference in the way some people construe some mnemonic experiences. When Haber says that the critical distinction is the visual-nonvisual one, he blurs the issue of whether EI differs from run-of-the-mill visual images, the kind most people have. That these ordinary "pictures in the head" are visual is clear, not only on phenomenological grounds but also from Shepard's demonstrations of structural isomorphism between this coding system and visual perception (e.g., Shepard and Chipman 1970).

The localization of an ordinary visual image inside one's head may be as arbitrary as placing it anywhere else - being based on metaphor related to prevailing theories of the locus of mind in the brain. It could be argued that it makes about as much sense to say that mental events occurred in one's head as to say it occurred in Cleveland. Mental events, as Descartes was fond of saying, are "unextended substance" which don't occur, strictly speaking, in any place at all.

It is true that the phenomenology of EI, as described by Haber, is intriguing - that's what got us all interested in the first place - but these phenomenological reports may only represent the fanciful elaboration of suggestible subjects in a domain for which there are few rules of discourse. Wittgenstein (1953) and others (e.g., Sarbin 1968) have convincingly argued the socially determined nature of constructions of mental experience.

Some of Haber's "converging evidence" that an eidetic child actually *sees* EI externally located could be viewed merely as logical extensions of the situational demands. If a child has reported seeing an image on the easel in front of him, then it is reasonable for the child when questioned, to elaborate by saying that the image falls off the edge when he tries to move it. Other bits of "evidence" can be viewed as properties equally applicable to ordinary visual memories - for example, reversals of Necker cubes (try imagining a Necker cube fading of parts, quality related to recency of scanning, and so on).

Particularly troublesome for those who try to make sense of EI is the failure to find support for the developmental hypothesis. My own data contradict the assertion that EI declines with age. In fact, over second through fourth grades in our sample, we found an increasing age trend, adding to the puzzle presented by Haber's finding in a longitudinal study that only one of twelve eidetikers lost that classification with age. These findings are contrary to the hypothesis that EI is a primitive cognitive ability displaced by more analytic strategies, but they are consistent with the view that the behaviors of an eidetiker represent compliance with the considerable demand characteristics of the testing situation - compliance that would be expected to increase with socialization. Also, having in the past acceded to the experimenter's suggestion, a child would on retesting be motivated to make EI reports that were consistent with earlier ones. By this view, EI is not found among adults because there is something unconvincing about the testing situation for them, and they have more firmly acquired the prevailing metaphor for visual images, which is "in the head," rather than "out there." This would also explain the reported prevalence of adult eidetikers among certain African societies (Doob 1964, 1965) - cultures that may be isolated from the "in the head" metaphor.

The assertion that EI is phenomenologically distinct from other images, but not distinct by any objective criterion, is unsatisfying from a scientific point of view, as Haber is good to point out. If there are no objective, operational means of distinguishing a true eidetiker from a subject who is merely compliant, then eidetic imagery has questionable utility for a science of mind, much like hypnotic age-regression.

the mediating circumstances.

I turn now to the promising leads that are suggested by cross-cultural research and that might be useful to explain the reactions of American children. Both within and between societies individuals differ with respect to whether they have previously been aware of their own eidetic propensity: if the images have served some compellingly useful function, why were some persons surprised when they were induced to "see" them and why among the Bororo of Brazil was witchcraft suspected? Among the Kamba a significant relation existed between replies in an interview about images and actual responses three months later in the testing situation. The greater confidence displayed when eidetic or pictorial rather than memory images are reported might be a reflection of the fact that in these traditional societies information could not be stored in the form of writing. The less or the no more accurate recall days or weeks later of the Kamba who allegedly had "seen" images of the exposed stimuli, in comparison with those claiming to lack such images, on the other hand, suggests that images may not provide more efficient storage and is perhaps of greater psychological significance than the relatively high and low reliabilities reported, respectively, in the United States or Australia, and in Ghana. The sharp distinction subjects made between details they did and did not perceive during the original exposure points to the probability that whatever is "seen" in the images depends as much upon attention as almost any other act of perception and hence may lead to omissions and errors ("I wanted to put them in my mind, but then you took the picture away so quickly," a Kamba complained). Since the superimposition of an image upon a stimulus was too difficult for the Kamba, Hutu, and the aborigines, it may not be a valid test.

On the whole, I repeat, I think Haber is right: we must keep searching for the correlates of these perplexing images. Whether we are more likely to find them in the phenomenology he somewhat vaguely proposes for himself and his laboratory colleagues or in irritating, real-life field situations I do not know. Let us keep all doors open.

by K. Anders Ericsson, William G. Chase, and Herbert A. Simon

Department of Psychology, Carnegie-Mellon University, Pittsburgh, Penna. 15213

Phenomenological reports as data

Haber claims that eidetic imagery is supported by phenomenological reports and proposes that phenomenological evidence should be more widely accepted as legitimate scientific evidence. In this commentary we will first address the general issues of using verbal reports as data; then, in light of this discussion, we will turn to an analysis of the particular phenomenological evidence cited by Haber in support of eidetic imagery.

In their review of general issues associated with using verbal reports of cognitive processes, Ericsson and Simon (1978, 1979) proposed that verbal reports be viewed like any other kind of data; any model that can reproduce them (or their content) is legitimate. A subject who reports using a subgoal for a problem or computed partial results in a mental multiplication need *not* be trusted. The veracity of reports can be assessed by an independent analysis of the task; a model is sought that both regenerates the reported intermediate steps and generates the same solution as the subject does.

In analyzing the broad range of instructions and circumstances under which verbal reports have been solicited, Ericsson and Simon (1978, 1979) found that valid reports are obtained when subjects are asked to verbalize the information they are currently attending to, that is, "to think aloud." Within an information-processing model, we can assume that attended information is directly available for further processing, and thus also for recoding into the verbal form to be reported. Cases of invalid verbal reporting are invariably associated with asking subjects for reports of information not otherwise directly attended; these reports require inferences. There is explicit evidence (Nisbett and Wilson 1977) that, in response to questions about the reasons for their behavior, subjects resort to inferences based on general knowledge — their answers no longer reflect any direct memory

trace of the cognitive process.

If we want to use verbal reports as data in support of some proposed cognitive mechanism, we need to propose an explicit model for how the verbalized information is generated by accessing this mechanism. Second, we need to show that alternative hypotheses for how the subjects generate their verbal reports without this mechanism are not plausible given the recorded verbal reports. In short, in evaluating verbal reports, we need to apply the same criteria as for any other type of data.

In reviewing the phenomenological evidence cited by Haber, we raise the issue of whether subjects are making direct reports of attended information or whether they are making inferences. For example, in the composite picture test (Figure 6), do eidetic subjects actually "see" a composite image of a face directly, or do they "figure it out"? Are people classified as eidetic on the basis of their visual imagery processes, or on the basis of their ability to make the appropriate inferences? One unfortunate problem with identifying eidetic subjects is that they cannot be discriminated on the basis of superior memory performance, nor are the subjects in general spontaneously aware of their eidetic ability. Hence, a rather elaborate procedure of instruction and direct questioning of subjects is necessary to identify an eidetiker and to produce the phenomena and verbal reports associated with eidetic imagery (Leask, Haber, and Haber 1969). The specific questions asked by the experimenter leave rather little information for the subjects to report, for example, "Yes, I see X." The small amount of information generated makes it reasonable to consider other hypotheses than Haber's assertion that a distinct eidetic memory is accessed. Furthermore, many of the studies Haber cites were designed to explore characteristics of eidetic memory (such as the location of the image), and used questions and probes that may well have biased the content of the verbal reports. Leask, et al. (1969) were explicitly aware of the demand characteristics of their assessment procedure and the presuppositions in their questions. In fact, they even uncovered at least one subject faking his report of "seeing" the images. Under such conditions we cannot rule out the possibility that reports were generated without access to a phenomenological experience. Instead of resorting to disputes over whether subjects can be trusted, one should devise an experimental procedure so as to clearly eliminate such a hypothesis. For example, Comstock and Kiltredge (1922) were able to elicit verbal reports of afterimages from children while explicitly avoiding any suggestion with a general instruction (e.g., "Tell me what you see; tell me all about it.") The verbal reports accurately reflected the existence of complementary colors, intensity of afterimage as a function of the stimulus, and so on, as predicted by a physiologically based theory of afterimages. Any model of the process that generates these verbal reports without accessible afterimages appears implausible.

How, exactly, are the verbal reports used to define eidetic imagery? From the verbal reports of attended and remembered information, Haber has analyzed the reported content of a picture, as well as information suggesting whether the reported content was directly attended or required retrieval from memory. Eidetic subjects could not be discriminated from noneidetic subjects on the basis of *what* or *how much* information was reported. However, eidetic subjects appeared to have some pictorial content directly available, as shown by their use of present tenses of verbs and the greater fluency of their reports. (Differentiation of recall and verbalization of attended information by verb tense has also been used by Benjafield (1969) in comparing retrospective reports to "think aloud") in response to requests for specific information about the picture, Haber found the tense criterion to be a "powerful" one in discriminating between eidetic and noneidetic subjects. Let us look more closely at the model, which is proposed to account for the differences between eidetic and noneidetic subjects in explaining why one eidetic subject used past and present tense intermittently while her eidetic image was supposedly available. Leask et al. (1969) suggested that, because of the incompleteness of the eidetic image, some requested information was not available, thus requiring retrieval and the use of the past tense. The other eleven subjects' consistent use of present tense while the eidetic