CHAPTER 1

Implicit Perception

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Such faint sensations ought to be fully studied by the psychologist and assiduously cultivated by every man.

—C. S. Pierce & Joseph Jastrow (1884, p. 83).

Perception is often a conscious act. We are aware of what we see, and hear, taste, smell, and feel; this awareness allows us to describe our experiences to others, and to plan deliberate actions in response to events in the world. But for at least the last century, psychologists and philosophers have been concerned with the possibility of *non*conscious perception, or perception without awareness—that is, with the possibility that events in the environment might influence our experience, thought, and action even though they themselves have not been consciously perceived.

"SUBLIMINAL" PERCEPTION

Perhaps the first laboratory evidence for something like perception without awareness was collected by the philosopher C. S. Pierce and his graduate student Joseph Jastrow, working at Johns Hopkins University, and was reported by them in 1884 (Pierce & Jastrow, 1884). Pierce was interested in the problem of the just-noticeable difference (JND) in psychophysics, and he wanted to know what would happen if the differences between stimuli were reduced below what Weber and Fechner had characterized as a physiological threshold. The observers (Pierce and Jastrow themselves) were forced to choose which of two pressures was the heavier (a later experiment concerned which of two surfaces was brighter), and to assign a confidence level (on a 0–3 scale) to their judgments. The task was very difficult, as the preponderance of confidence levels of zero, denoting "absence of any preference for one answer over its opposite, so that it seemed nonsensical to answer at all" (p. 77), attests. Figure 1.1 shows some data from this experiment: Note that correct responses vary in proportion to the actual stimulus differences

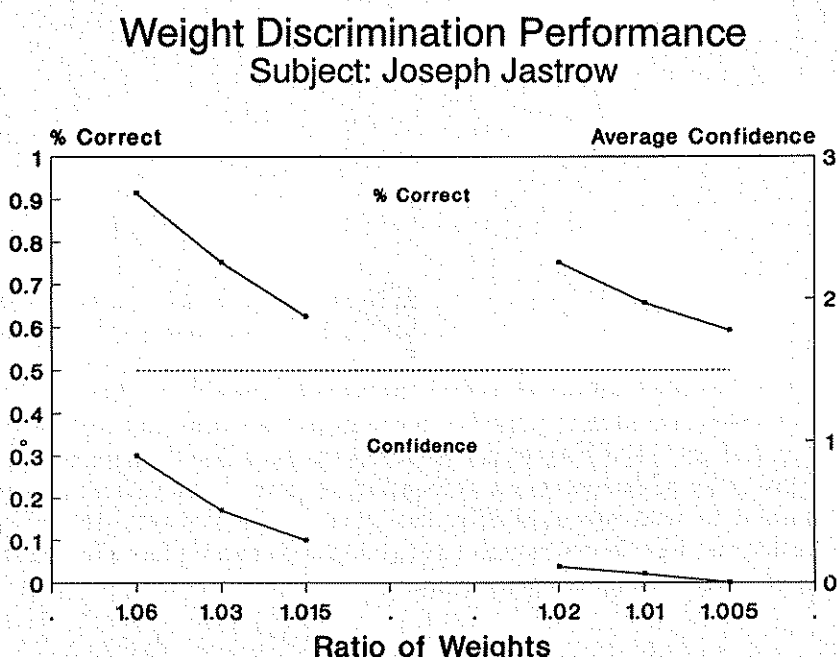


FIGURE 1.1. Results of the Jastrow–Pierce (1884) experiment. The left-hand portion shows the results of the "second series" of experiments, the right-hand portion the "third and fourth series," involving different series of ratios of weights. Adapted from Pierce and Jastrow (1884).

even when these differences are subliminal and the subjects are guessing. Overall, Pierce completed 706 out of 1,125 trials at a confidence level of zero, indicating guessing, and was correct on 436 of these (61.8%); Jastrow, in Series 1 and 2, using the same weight differences as Pierce, guessed on 1,123 out of 1,975 trials and was correct on 783 (69.7%); in the more difficult Series 3 and 4, Jastrow guessed on 1,560 of 1,675 trials and was correct on 1,038 (66.5%). All three values are significantly different from the expected value of 50%. Thus, Pierce and Jastrow were both accurate more often than chance would allow, even though they were not conscious of any difference between the stimuli.

Pierce and Jastrow were mostly interested in attacking the psychophysical concept of threshold, defined as "a physiological limit beyond which there would be no registry whatever" (Jastrow, 1930, p. 136). On the basis of their results, which were subsequently confirmed by other investigators (e.g., Fullerton & Cattell, 1892; for a review of these early studies, see Adams, 1957), Pierce and Jastrow argued for subconscious registration of stimulus differences, a sensation that vanishes only when the proximal stimulus vanishes. But they also seem to have realized the connection between their findings and other issues:

> The general fact has highly important practical bearings, since it gives new reason for believing that we gather what is passing in one another's minds in large measure from sensations so faint that we are not fairly aware of having them, and can give no account of how we reach our conclusions about such matters. The insight of females as well as certain "telepathic" phenomena may be explained in this way. Such faint sensations ought to be fully studied by the psychologist and assiduously cultivated by every man. (p. 83)

The Pierce and Jastrow experiment is particularly interesting, not just as "a pioneer contribution to American psychology" (Jastrow, 1930, p. 136), which indeed it was,[1] but also because it presaged the debate, engaged around *1984*, about subjective versus objective thresholds (e.g., Cheesman & Merikle, 1984, 1985, 1986; Dixon, 1971, 1981; Holender, 1986; see also Merikle & Reingold, this volume). If the threshold is the point at which the observer cannot detect the presence of a stimulus (or, in this case, the difference between stimuli) at better than chance levels, then we have two candidate thresholds—one represented by observers' phenomenal reports, the other represented by their guesses. If we accept the phenomenal reports as the standard for threshold setting, as suggested by advocates like Dixon (1971, 1981), then the guessing behavior gives evidence of "subliminal" perception. But if we accept any discriminative behavior as the standard for threshold setting, as Eriksen (1960) and Holender (1986) insisted we must, then evidence for "subliminal" perception perforce disappears. It is as if the discriminative behavior is used to impeach the observer's subjective report of sensory or discriminative failure: to insist, to an observer who claims he or she cannot see, "Oh yes you can!"—a point to which we shall return later.

Our view is that the quest for subliminal perception has no meaning unless the limen is defined in terms of what Cheesman and Merikle (1985) have called the *subjective threshold*: "the detection level where subjects claim not to be able to discriminate perceptual information at better than chance level" (p. 333). Reliance on the *objective threshold*, "the level of detectability where perceptual information is actually discriminated at chance level" (p. 333), effectively rules the phenomenon of subliminal perception out of existence. This is because subliminal perception is reflected in discriminative behavior, and the persistence of any discriminative behavior is taken as evidence that the threshold of detectability has not yet been reached. Partly for this reason, we advocate abandoning the notion of "subliminal" perception entirely, and with it all of the unfortunate psychophysical implications of the concept of the *limen* (Kihlstrom, 1987, 1990). In its place we proffer the concept of *implicit* perception, based on an analogy with the phenomenon of implicit memory (Schacter, 1987).[2]

IMPLICIT MEMORY AND IMPLICIT PERCEPTION

At this point the concept of implicit memory (Graf & Schacter, 1985; Schacter, 1987), also known as indirect memory (Johnson & Hasher, 1987; Richardson-Klavehn & Bjork, 1988) or memory without awareness (Eich, 1984; Jacoby, 1984; Jacoby & Witherspoon, 1982), is quite familiar and widely accepted. But perhaps it is useful to review some of this literature as a kind of backdrop to our discussion of perception.

The story begins with the amnesic syndrome observed in patients suffering bilateral damage to the medial temporal lobe (including the hippocampus) and diencephalon (including the mammillary bodies). These patients display a gross anterograde amnesia, meaning that they cannot remember events that occurred subsequent to the brain damage. Thus, after a brief period of distraction, they are unable to recall or recognize the items of a word list that they have studied. However, if they are presented with a word stem or other fragment and asked to complete it with an English word, they do better with problems that can be solved with items from the previously studied word list than with those that cannot (Warrington & Weiskrantz, 1974). This phenomenon, now known as a priming effect, shows clearly that some information has been retained from the study episode, despite the patient's failure of conscious recollection. Priming would not occur if the event had not made some sort of lasting impression in memory.

Such priming effects have been well documented in the amnesic syndrome, and in other domains of forgetting as well. For example, in an experiment on paired-associate learning by Nelson (1978), normal subjects showed appreciable savings in relearning items that they could neither recall nor recognize. Similarly, Kihlstrom (1980) found that subjects with a dense posthypnotic amnesia for a word list memorized during hypnosis nevertheless showed priming effects in generating free associations and category instances. Butters and his associates (Butters, Heindel, & Salmon, 1990) have shown intact priming in demented patients suffering the early stages of Alzheimer's disease and Huntington's disease. The healthy aged often show normal priming effects, even though they can prove extremely forgetful on tests of recall and recognition (Light, 1991; Schacter, Kaszniak, & Kihlstrom, 1991). And, finally, Kihlstrom and his colleagues have shown priming effects in surgical patients who were presented with a list of paired associates while under an adequate plane of general anesthesia (Kihlstrom, Schacter, Cork, Hurt, & Behr, 1990; for a review, see Kihlstrom & Schacter, 1990).

But one does not have to be amnesic or demented to show a dissociation between priming and conscious remembering. For example, in another early experiment, Jacoby and Dallas (1981) found that prior study of an item increased the likelihood that it would be identified on a subsequent perceptual task involving brief tachistoscopic presentations—another priming effect. Interestingly, however, priming in perceptual identification occurred regardless of whether the word was recognized as a list item; and while the degree of elaborative processing received by an item at encoding affected the likelihood that it would be recognized, elaboration had no effect on perceptual identification. Thus, one expression of memory (recognition) was essentially independent of another (priming).

On the basis of these sorts of findings, Schacter (1987; Graf & Schacter, 1985) has drawn a distinction between two expressions of memory, explicit and implicit. Explicit memory refers to the person's conscious recollection of some previous episode. It is most commonly reflected in free recall, cued recall, or recognition tasks that make a clear reference to some prior episode and ask the subject to deliberately remember some aspect of the experience. By contrast, implicit memory is demonstrated by any change in experience, thought, or action that is attributable to some past experience, even in the absence of conscious recollection of that event. Implicit memory tasks do not necessarily refer to prior episodes in the subject's life, and do not require him or her to remember any experiences, *qua* experiences, at all. A wide variety of clinical and experimental studies indicate that explicit and implicit memory are dissociable in at least two senses: (1) Implicit memory can be spared while explicit memory is impaired, and (2) certain variables pertaining to encoding, storage, or retrieval conditions have different effects on explicit and implicit memory performance.

Some theorists (e.g., Schacter, 1987, 1991; Tulving & Schacter, 1990) have suggested that explicit and implicit memory reflect the operations of two independent memory systems in the brain while others (e.g., Roediger, 1990; Roediger, Srinivas, & Weldon, 1989; Roediger, Weldon, & Challis, 1989) have their doubts. We do not seek to resolve (or even address) this issue here. Rather, what interests us is the apparent parallel between implicit memory and subliminal perception. In implicit memory, we have evidence of memory despite the subject's claim that he or she cannot remember some event. In so-called "subliminal" perception we have evidence of registration despite the subject's report that he or she cannot perceive some event.

Accordingly, we propose to make a distinction between two expressions of perception, explicit and implicit. Explicit perception refers to the person's conscious perception of some object or event in the current stimulus environment. Explicit perception tasks involve sensory detection, or require the subjects to describe the form, color, distance, behavior, or identity of some object. By contrast, implicit perception is demonstrated by any change in experience, thought, or action that is attributable to some event in the current stimulus field, even in the absence of conscious perception of that event. Implicit perception tasks do not necessarily refer to objects or events in the current stimulus environment and do not require the subject to perceive any object, *qua* object, at all.

The task in the Pierce and Jastrow (1884) study required the observer to say "yes" when he consciously detected a difference between two stimuli, and "no" when he did not. This was an explicit perception task, and the subject could only perform it meaningfully so long as he was consciously aware of the differences in question. But at some point Pierce and Jastrow could no longer make this discrimination with any confidence, and the task requirements shifted; now they were required merely to "guess" whether the stimuli differed. This is an implicit perception task, because the question is still meaningful even in the absence of the phenomenal experience of perception. If you hold your hand behind your back and ask an observer how many fingers you are extending it's an unfair question because it requires the observer to see something that he or she can't see. But if you ask the same observer to *guess* how many fingers, the task is reasonable because it requires the observer simply to speculate about an unobserved state of the world. Note that all of the classic demonstrations of "subliminal" perception have this character to them.

For example, in a lexical decision study by Marcel (1983a, Experiment 5; see also Marcel, 1983b), subjects saw a string of letters presented for 1000 ms; on some trials this target was preceded by a masked prime consisting of another word, either semantically associated to the target or not. In one task the subjects were asked to detect the presence of the prime; in another they were asked whether the target was a word. The former task involves explicit perception in that the subjects were asked whether they noticed a particular event in their visual field, but the latter task does not because subjects weren't asked about the prime at all, but, rather, about the target. Marcel found that the masked primes weren't detected by subjects, which counts as a failure of explicit perception; but he also found that associated primes facilitated lexical decisions concerning targets, an effect on behavior that counts as evidence of implicit perception. In this case implicit and explicit perception are dissociable in that the former occurs even in the absence of the latter. Let us list a few other examples, just to reinforce the point.

Forster and his colleagues (1987; Forster, Booker, Schacter, & Davis, 1990; Forster & Davis, 1984) have documented repetition and form priming effects in lexical decision and a variety of other tasks, even when the prime is completely masked. For example, masked presentation of the word *plastic* facilitates lexical decision of the word *plastic*; so does masked presentation of the word *elastic*. And masked priming by *plastic* leads subjects to complete the stem ELA—with *elastic* rather than *elated*. In none of these cases are the subjects aware of the prime, yet the effects clearly indicate that the prime registered somehow.

Shevrin and his colleagues (e.g., Shevrin & Fisher, 1967; Shevrin & Luborsky, 1961; Stross & Shevrin, 1968; see also Shevrin, Chapter 4, this volume) presented subjects with an extremely brief flash (6 ms, unmasked) of a rebus picture consisting of a pen pointing to a knee. The subjects saw nothing. Yet, on subsequent free-association, imagery, or dream-report tasks, they were extremely likely to produce clang associations such as "penny" or semantic associations such as "ink" or "leg"—a phenomenon similar to Silberer's (1909/1951) "autosymbolic" effect in hypnagogic imagery.

Kunst-Wilson and Zajonc (1980) presented subjects with several repetitions of nonsense polygons, exposed for an extremely brief time (1 ms, also unmasked). Again, the subjects saw nothing. Yet, when subsequently asked to evaluate the figures on a dimension of likability, the subjects showed a significant preference for those that had been shown earlier, a variant on Zajonc's (1968) mere exposure effect.

Finally, Greenwald, Klinger, and Liu (1989) asked subjects to decide whether words had positive or negative connotations. These targets were primed by other words, strongly positive or negative in evaluative meaning. Presentation of these primes was masked to such an extent that the subjects were not only unable to identify the word but were also unable to indicate where it appeared on the screen. Nevertheless, positive primes speeded judgments of positive targets and slowed judgments of negative ones while negative primes speeded judgments of negative targets and slowed judgments of positive ones.

POTENTIAL PROBLEMS FORESHADOWED

Now, we want to acknowledge at the outset that our concept of implicit perception has the qualities of a working definition, subject to refinement. We've already noticed at least two difficulties. First, implicit memory tasks *never* ask about the target episode, but implicit perception tasks sometimes do. For example, Pierce and Jastrow asked themselves to guess whether two stimuli were different, clearly referring to stimuli in the environment. But the fact remains that in performing the guessing task subjects were not required to be aware of the difference in question.

In the final analysis, it seems best to agree that every perceptual or memory task has an explicit and an implicit component, the importance of which can be increased or decreased by task demands. Consider, for example, the analogous problem of recognition memory, usually considered to be an explicit memory task. If subjects are asked to adopt a very strict criterion, they are unlikely to say "yes" in the absence of a specific, detailed, conscious recollection of the event in question; but if they are allowed to guess, they may say "yes" based on nothing more than a feeling of familiarity (Mandler, 1980). In the latter case recognition has been transformed into something closer to an implicit memory task. Still, the fact remains that ostensible dissociations between explicit and implicit perception, like those between explicit and implicit memory, will be clearest if one task refers to an event and the other does not.

A somewhat thornier problem is that most demonstrations of implicit perception rely on memory. Thus, for example, in Shevrin's experiments the free-association, imagery, or dream tasks occur some appreciable time after the stimulus has been presented. Similarly, in Zajonc's demonstration of subliminal mere exposure, the preference ratings are made sometime after the stimuli have been presented. Even in the work of Marcel, Forster, and Greenwald the prime occurs sometime before the target and thus has to be preserved in memory. For these reasons it would be easy to classify the experiments described earlier as instances of implicit memory rather than implicit perception. It would be easy, perhaps, but it would be wrong. As William James noted, all introspection is retrospection; enforcing such a standard would inevitably collapse perception into memory, much to the discomfort of many perceptionists. Moreover, in all of the classic cases of implicit memory the subjects were consciously aware of the event at the time it occurred, although it was subsequently lost to conscious recollection. We wish to reserve the term *implicit memory* for cases where an event was consciously perceived at the time of encoding, and we prefer that a decent interval of time (ideally, one filled with a distractor task) spans between presentation and test. In the cases of implicit perception described here, the event in question is not consciously perceived and, in most instances, its effects on behavior are tested almost immediately. Still, it should be admitted that the distinction between implicit perception and implicit memory is a little fuzzy at the edges. After all, if memory is the residual trace of perceptual activity, then even implicit percepts should be recorded in memory—although, perhaps, these memories may be expressed only implicitly.

With respect to the distinction between subliminal perception and implicit perception, however, we feel we are on firmer ground. The analogy between implicit memory and implicit perception strikes us as heuristically useful. Moreover, as we shall begin to see in a moment, there are many instances of implicit perception, as we have defined it here, where the stimuli in question are in no sense subliminal. They are presented at intensities and for durations clearly sufficient for conscious perception; yet they are not consciously perceived. To classify these phenomena as instances of subliminal perception is, in our view, a category mistake that obscures their true nature. Rather, subliminal perception is a subcategory of implicit perception in which stimulus events are so degraded as to be denied conscious representation.

PERCEPTUAL DEFENSE

One familiar example of implicit perception is *perceptual defense*, the hallmark of the "New Look" in perception that gathered momentum in the late 1940s and early 1950s (Bruner & Klein, 1960; for recent reviews, see Erdelyi, 1974; Greenwald, 1992). In a classic experiment Bruner and Postman (1947a, 1947b, 1949; see also McGinnies, 1949) found higher thresholds for tachistoscopic recognition of vulgar or disturbing words than for neutral ones. Later research showed that some subjects showed lowered recognition thresholds, a phenomenon called perceptual vigilance. Bruner wanted to conclude that even something as elementary as sensory detection and perceptual identification was influenced by higher-order cognitive processes such as attention, expectation, and set, and by noncognitive processes such as emotional and motivational state.

This was an interesting idea, and one that formed the basis for an appealing alliance between academic psychology and psychoanalytic ego psychology, as promoted by such figures as David Rapaport (1960), George Klein (1970), and, most recently, Mardi Horowitz (1988) and Matt Erdelyi (1974, 1985; Erdelyi & Goldberg, 1979; see also Ionescu & Erdelyi, Chapter 5, this volume); it can now be seen as a precursor of contemporary arguments within cognitive psychology and cognitive science about modularity and cognitive penetrability.

This perceptual defense research was severely criticized on both methodological and conceptual grounds by Eriksen (1958) and Goldiamond (1958). It's true that the early experiments were confounded by such factors as word frequency, expectancy, and response bias. But, as Erdelyi (1974) has intimated, they would have drawn fire even if they had been methodologically above reproach. The problem, of course, is that perceptual defense requires that the emotional connotations of an object be known so that the perceptual threshold can be raised to defend against it. But how can something be analyzed before it is seen? Bruner (1983) referred to this as the paradox of the "Judas eye," the peephole used by bouncers at speakeasies to distinguish between members, for whom the door opens, and police and other undesirables, who are shut out. Obviously, perceptual defense poses serious problems for a model of information processing in which meaning analysis occurs relatively late in the sequence, after focal attention has been devoted to the stimulus.

We do not appear to be living in that theoretical universe anymore, but perceptual defense still requires fairly complex analyses of events that are not consciously perceived—otherwise, what good is the defense? These analyses, of course, require something like subliminal perception, but to use the term in this context only underscores its difficulties. In psychophysics, the limen is supposed to be a physiological fact, a property of the sensorium, something that is invariant across types of stimuli and differences in meaning. It doesn't matter to the rods and cones whether light radiates from angels or monsters. In perceptual defense, what makes a stimulus subliminal is not the fact that it is weak, masked, or tachistoscopically brief; what matters is something about the observer—and it is not a flaw in the sensory system, either. To call it subliminal locates the action in the wrong place.

But perceptual defense illustrates nicely some of the virtues of the concept of implicit perception. In perceptual defense, the observer's inability to detect or recognize the stimulus counts as a failure of explicit perception. But the selectivity of the effect, the fact that the threshold for identification varies as a function of the personal significance of the stimulus, is a behavioral change that reveals clearly that implicit perception has occurred. More important, locating perceptual defense within the domain of implicit perception leads us to ask more interesting questions than might otherwise be asked. For example, if perceptual defense is considered a failure of explicit perception, what, to paraphrase Marcia Johnson, is perceived nonetheless? In addition to the raised thresholds themselves, are there other ways in which we can show that subjects' experience, thought, and action are affected by events of which they are unaware? Early on, McGinnies (1949) found elevated galvanic skin responses (GSRs) to unidentified, taboo, and conflictual words, a phenomenon he termed "subception." Can we show priming effects and other forms of influence as well? Perhaps.

In fact, there is some evidence in this regard, but we want to note that in perceptual defense, as in "subliminal" perception, the evidence of collateral influence is sometimes used to impeach the subjects' verbal reports of perceptual failure, to say, as it were, that the subjects saw the stimulus after all but merely neglected to say so. This may be a reasonable conclusion in forensic applications of lie detection, but it is far from certain. Consider, for example, the finding of Bentin and Moscovitch (1990) that subjects showed elevated GSRs and P300 components of the event-related potential to previously presented stimuli, even though these stimuli were not recognized as familiar; the words in question were not emotionally threatening in any way, so subjects had no motivation to withhold responses. Furthermore, consider the finding, reported by Bauer (1984) and others (deHaan, Young, & Newcombe, 1987; Tranel & Damasio, 1985) that prosopagnosic patients show elevated GSRs to previously encountered faces that they do not recognize as familiar. Because prosopagnosics have bilateral lesions in the mesial portions of the occipital and temporal cortex, it never occurs to anyone to imagine that they are withholding recognition responses. What's good for the goose is good for the gander: If GSRs count as evidence of implicit memory, they should also count as evidence of implicit perception.

NEUROPSYCHOLOGICAL SYNDROMES

Turning to another area of research, it is well known that brain insult, injury, or disease can have profound effects on perceptual functioning (for reviews, see Heilman & Valenstein, 1985; Kolb & Wilshaw, 1985). Damage to the primary sensory projection areas, such as the occipital or temporal lobes, can produce an apparently complete loss of function in one modality or another. These syndromes are particularly interesting because there are some instances in which the patients are clearly responsive to visual events, even though they claim to be unable to see. In a now-classic study Weiskrantz (1980, 1983, 1986; Sanders, Warrington, Marshall, & Weiskrantz, 1974; Weiskrantz, Warrington, Sanders, & Marshall, 1974) presented a dramatic report of a patient, D. B., who suffered a left hemianopia following surgical excision of his right striate cortex in order to remove an arteriovenous malformation. This patient had hardly any vision in his left visual field. Nevertheless, he was able to reach accurately for objects and accurately judge the presence or absence of visual stimuli; his detection of sine-wave gratings varied as a function of their spatial frequency; he was able to detect the presence of a moving object and could differentiate between horizontal, vertical, and diagonal lines; he could distinguish between Xs and Os, and between Ts and 4s, and discriminate the direction of contrast between black, white, and grey—all the while claiming to be unable to see the objects to which he responded. When the object was salient (e.g., large, moving, contrasting), D. B. reported that he knew that something was in his field but he did not describe his experience as seeing (not even the type of seeing experienced in peripheral vision). When the object was salient, he reported no awareness of any sort, although his "guesses" about location, form, and orientation were 95% accurate. Similar observations have been made in other patients with striate lesions (e.g., Poppel, Held, & Frost, 1973), and analogous effects have been studied in dogs and monkeys. Marquis and Hilgard (1936, 1937), for example, demonstrated that destriate monkeys could acquire conditioned responses to light, as well as turn their heads and reach toward light and shadow (for comprehensive reviews, see Campion, Latto, & Smith, 1983). Weiskrantz dubbed this phenomenon "blindsight."

In Weiskrantz's terms, blindsight entails a horizontal disconnection between visual perception on the one hand and subjective awareness of visual perception on the other. That this phenomenon entails something more than degraded vision is shown by a variety of "double dissociations" affecting the visual performance of D. B. and other patients. For example, while form discrimination is better in the intact field, stimulus detection is actually better in the scotoma. Blindsight has often been taken as evidence of the existence of two visual systems: One, projecting via the lateral geniculate nucleus to the striate cortex, appears to be involved in form and color analysis; the other, projecting to the superior colliculus and other subcortical structures, is involved in detection, localization, and pursuit. The general idea is that patients with striate lesions lose access to the first system but retain access to the second. Thus, they can perform some visually guided behaviors even though they have no awareness of seeing the objects to which they respond. The idea of two visual systems is an old one, but it remains controversial. In the present context the point is merely to suggest that there may be rather specific brain mechanisms mediating some forms of perception without awareness.

FUNCTIONAL SYNDROMES

Dramatic disorders of perception can be observed even in the absence of demonstrable brain insult, injury, or disease. We have in mind the so-called "functional" or "psychogenic" disorders traditionally associated with hysteria and labeled as "conversion disorders" in the current nosology of psychiatric diagnosis (Kihlstrom, Tataryn, & Hoyt, 1991; Kihlstrom, in press). By analogy with the description of functional amnesia offered by Schacter and Kihlstrom (1989; see also Kihlstrom & Schacter, 1990), the functional disorders of perception may be defined as entailing a loss of sensory-perceptual function attributable to an instigating event or process that does not result in damage or injury to the brain, but produces more loss of function than would normally occur in the absence of the instigating event or process. Mostly, these disorders are suggestive of neurological disease: blindness, deafness, anosmia, analgesia, and anesthesia. In addition, the conversion disorders include functional disorders of motor functioning, such as paralysis, aphonia, and akinesia, but in this chapter we are concerned only with the disorders of sensation and perception.

What is interesting about these patients, in the current context, is that they complain of a loss of sensory-perceptual functioning but typically display behavior that is inconsistent with these claims. For example, the functionally blind individual may be able to navigate around an unfamiliar room and the functionally deaf patient may orient to ambient sounds—or, better yet, says "no" when asked if he can hear anything.

No better description of these paradoxes can be found than in Janet's (1907) classic lectures on *The Major Symptoms of Hysteria.* Janet noted that patients with hysterical anesthesia retain reflexes elicited by stimulation of the anesthetic area. And he observed that their fingers do not show the scars and blisters characteristic of organic patients, who are constantly cutting and burning themselves. He also offered the following clever demonstration:

> We propose to Is. a little contrivance to verify her anesthesia quickly. She is to answer "Yes" when she feels and "No" when she does not feel anything. . . . Although she has her eyes carefully concealed behind a screen, although we avoid any kind of rhythm and pinch her several times irregularly on the same side before we pass over to the other, she is never mistaken, and always says "Yes" when we pinch her on the left and "No" when we pinch her on the right. (pp. 169–170)

Janet observed that patients with functional deafness retained the ability to hear a watch or tuning fork applied to their teeth or skull, in contrast to patients with true (peripheral) deafness. Finally, Janet noted that in hysterical unilateral blindness, pressure on one eye or the use of a prism produced a doubling of the image, showing clearly that vision in both eyes was intact. In a more sophisticated demonstration the patients put on spectacles with lenses that passed only red or blue light, and were then asked to read words composed of red and blue alternating letters. Patients with true monocular blindness would see only one set of letters or the other, but the hysterical patients saw the whole word. Patients with hysterical tunnel blindness moved about their environment without effort, played ball games, and so forth (try doing the same while peeking through a pinprick in an index card). In hysterical hemianopsia, as might be expected, Janet found that the patient responded to events in the scotoma.

In summarizing his clinical studies, Janet remarked that the hysterical disturbances of vision affected "attentive and voluntary perceptions" (p. 207), and spared elementary sensations and reflexes. Moreover, he noted that functional blindness typically separated the different functions of vision—that is, detection from form, form from color, monocular from binocular, and so forth. In an interesting passage foreshadowing the position of Weiskrantz and others, Janet speculated that there were two physiologically distinct visual systems, one binocular and the other monocular, and that "hysterics" lose the former but retain the latter.

Other investigators, such as Binet (before he turned to the measurement of intelligence) and William James (see Taylor, 1983), made similar kinds of observations; the contradictions and paradoxes in hysteria are today enshrined in clinical lore that hysterics can be distinguished from malingerers by the mistakes they make. Put another way, nobody would be so stupid as to claim blindness and then catch a ball tossed in his or her direction: such a person is a hysteric, not a faker. A similar notion underlies Orne's (1959) concept of trance logic in hypnosis, a subject to which we shall turn presently. But at this point we want to show how the clinical observations of Janet, James, and others were transformed into rigorous experimental techniques for the study of hysteria.

The pioneers in this area, as in the study of blindsight, were Hilgard and Marquis (1940), who described the application of conditioning to the analysis and subsequent treatment of a case of hysterical anesthesia and paralysis. The patient, who had been involved in an automobile accident 6 years previously, complained of a "glove" anesthesia of the left arm with a boundary at the shoulder (a neurologically impossible condition); this limb was also paralyzed. In Hilgard and Marquis's procedure, an electric shock delivered to the patient's anesthetized hand served as a CS for a shock US to the normal hand. Although the patient gave little evidence for conditioning, sensitivity gradually returned to the left arm.

Then the electrodes were reversed, leading to the development of a conditioned withdrawal response. This study inspired later work by Malmo, Davis, and Barza (1952–1953) in which a tone CS was paired with shock in a case of hysterical deafness. Although there were no signs of overt finger withdrawal, the occurrence of conditioned electromyographic responses clearly indicated that the tones registered, despite the patient's report that she heard nothing.

In the interests of historical accuracy, it should be noted that Hilgard and Marquis were not the first to employ such techniques. They were introduced by the Russian Bekhterev, an associate of Pavlov, in 1912, and had been previously used by Sears and Cohen (1933) and by Cohen, Hilgard, and Wendt (1933). Together these studies stand as early contributions to behavior therapy (Yates, 1970), but what interests us here is that they presage the distinction we have been drawing between explicit and implicit perception. Of their work Hilgard and Marquis (1940) wrote the following: "The detection of sensory function . . . is a natural application of conditioning techniques, because sensory thresholds are measured without dependence on the verbal report of the subject" (p. 296). In other words, as demonstrated in their experiments on destriate dogs, conditioning and learning procedures, which do not depend on subjects' ability to report on their conscious experiences, are a route to implicit perception.

The best-known use of a learning paradigm in the behavioral analysis of hysteria, of course, is the classic report by Brady and Lind (1961) of a patient who complained of total blindness. These researchers devised a situation in which the patient was taught to press a button every 18 to 21 seconds—what is known in the parlance of operant conditioning as the differential reinforcement of low rates. Initially, a correct response was reinforced only by a buzzer; later, social approval and trips to the hospital canteen were added to the menu. The patient was tested for two half-hour sessions daily. Phase 1 comprised six sessions of baseline trials, at the end of which most responses were occurring within the specified interval. In Phase 2 (sessions 7 to 16) an incandescent bulb was turned on, slightly changing the illumination of the room during the critical interval; the frequency of correct responses went down dramatically, and the patient became markedly agitated. Although the patient denied awareness of the light, this change in behavior was clearly a response to visual stimulation. By the end of this phase the response rate had returned to baseline levels. In Phase 3 (sessions 17 to 23) the bulb was brightly illuminated right before the patient's eyes; again, response rate initially diminished and then gradually returned to baseline. All the way through these first 23 sessions the patient maintained that he could not see; he attributed his performance to his ability to feel heat radiated by the bulb. In Phase 4 (sessions 24 to 45) the intensity of the bulb was reduced, but the patient's hit rate increased—while he continued to deny seeing anything. Near the end of this phase the patient claimed he could now see the light, and in Phase 5 (sessions 46 to 63) he was switched to a more difficult discriminative stimulus (a change in the pattern of illumination of a panel of lights), on which he performed well. Brady and Lind's procedure clearly had the effect of restoring the patient's vision, but the entire course of events shows clearly that, in some sense, he was seeing all along.

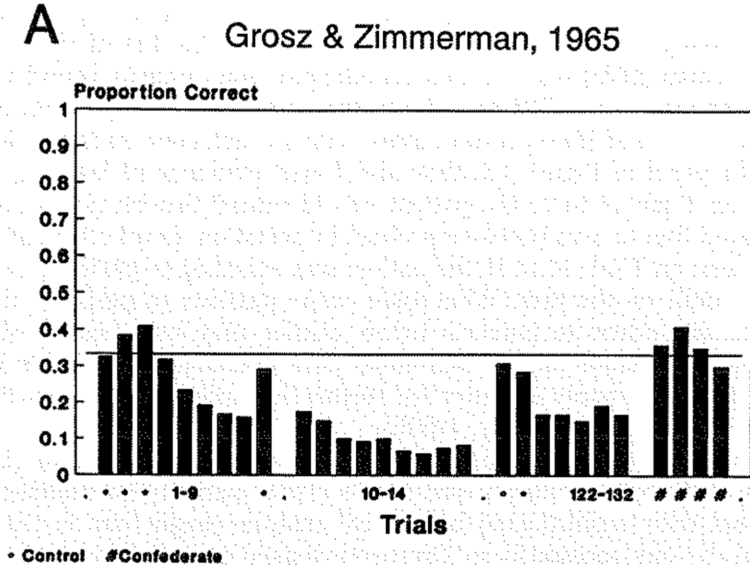
As it happened, Brady and Lind's patient subsequently suffered a relapse, and he was studied later by Grosz and Zimmerman (1965; see also Grosz & Zimmerman, 1970; Zimmerman & Grosz, 1966). In their procedure, which unconfounded visual discrimination learning from temporal conditioning, the patient was instructed to select one of three switches to turn off a tone. The effective switch was varied randomly from trial to trial, but the correct choice was indicated by the illumination of lights below the switchboard. The top panel of Figure 1.2 shows that this patient's performance on this task was significantly *below* chance, compared to baseline trials, and returned to baseline levels only on control trials when the lights were also turned off. On the final set of trials, after a confederate informed him how a truly blind person would behave, the patient's performance returned to chance levels.

While Grosz and Zimmerman (1965; Zimmerman & Grosz, 1966) strongly suggested that the patient was malingering, Brady (1966) replied that the patient's complaints were genuine when he was first seen but that in response to subsequent life events he had fallen back on old ways and become a malingerer. We'll never know what the truth of the matter was, and it really doesn't matter. The point of this case study is, as Grosz and Zimmerman put it, that "the patient's behavior was strongly under the control of visual stimuli" and that he "was denying visual functioning while functioning visually" (1965, p. 260).

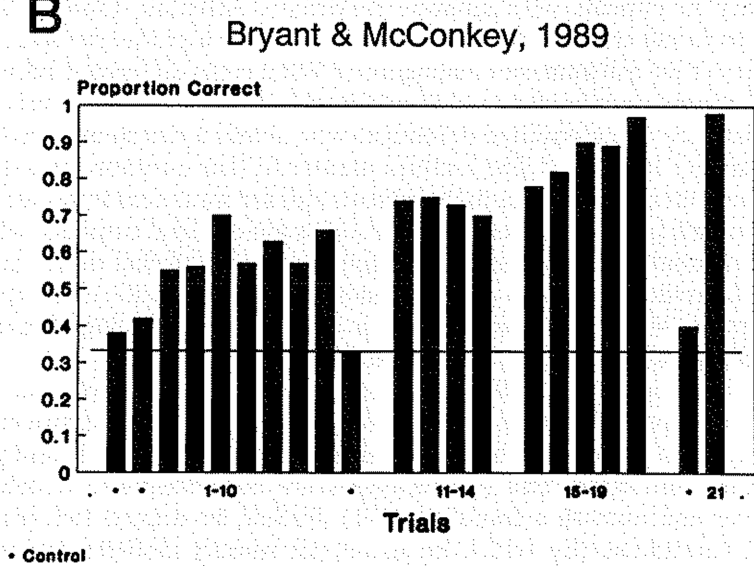
The logic behind these experiments has been used in a number of other studies of functional blindness (Bryant & McConkey, 1989b; Grosz & Zimmerman, 1970; Keehn, Keuchler, & Wilkenson, 1973; Miller, 1968, 1986; Ohno, Sugita, Takeya, Akagi, Tanaka, & Ikemi, 1974; Theodor & Mandelcorn, 1973) and it has been adapted to the study of functional

FIGURE 1.2. Results of the experiments by Grosz and Zimmerman (1965) and by Bryant and McConkey (1989b) on the influence of visual cues on judgment by functionally blind patients. Bars marked with an * represent control trials, where no visual cue was available. In Panel A, bars marked with # represent trials after the patient was told that a genuinely blind person would perform at chance levels. Notice that the patient tested by Grosz and Zimmerman (Panel A, top) performed consistently below chance, while the one tested by Bryant and McConkey (Panel B, bottom) performed consistently above chance. Adapted from Grosz and Zimmerman (1965) and Bryant and McConkey (1989b).

A


Grosz & Zimmerman, 1965
Proportion Correct
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1-9
10-14
122-132
# # # #
Trials
• Control #Confederate

B


Bryant & McConkey, 1989
Proportion Correct
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1-10
11-14
15-19
21
Trials
• Control

deafness as well (Barraclough, 1966). For example, Bryant and McConkey (1989b), using a three-choice decision task like that of Grosz and Zimmerman (1965) with another functionally blind patient, found a correct response rate of 79% on experimental trials, with visual cues, compared to a rate of 39% on control trials, without such cues. As shown in the bottom panel of Figure 1.2, they also found evidence of learning over time: on Trials 11 to 14 the patient was informed that his performance indicated that he was processing visual information, despite his claim of blindness; on Trials 15 to 19 the patient was exhorted to perform as well as he could on the task. What leads some patients to perform above chance and others to perform below chance may be a matter of the motivational details of the individual case (Sackeim, Nordlie, & Gur, 1979) and is certainly a matter for further research as such cases come along (Bryant & McConkey, 1989b).

What are we to make of all this? Grosz and Zimmerman (1965) clearly believed that Brady and Lind's (1961) patient was malingering and that their sophisticated behavioral analysis caught him in the act. Maybe, but not necessarily so. On strictly logical grounds, the persistence of visually guided behavior in the face of self-reports of blindness has the same logical status as the dissociations between explicit and implicit memory in patients with amnesic syndrome. After all, these patients claim to forget at the same time that their behavior is guided by memory. Why don't we call amnesics malingerers? What is the difference between a prosopagnosic who shows a discriminative GSR to a subjectively unfamiliar face and a criminal defendant who shows a discriminative GSR to details of his crime? The truthful answer to that question, frankly, is that the patients have holes in their heads and for some reason we tend to believe such people, whereas the defendants are criminal suspects, whom we think tend to lie. But on strictly logical grounds, all that these experiments provide is evidence of a dissociation between explicit and implicit perception. Whether the dissociation is attributable to malingering or to something else is another matter entirely.

For his part, Janet (1907) rejected the "crude explanation" (p. 171) that "These patients pretend not to feel, and by very simple artifices we can prove to them that they feel perfectly well. Their insensibility is, therefore, simulated, and our processes are only means to deceive a deceiver and unmask a fraud" (p. 171). Rather, he argued that his patients' anesthesias (by which he meant all sensory deficits, including deafness and blindness) reflect sensations that are disconnected, or dissociated, from the totality of consciousness. Nevertheless, these sensations retain the power to elicit reflexes and guide movements. Janet referred to them as subconscious sensations and perceptions, which continue to be represented in the mind outside the subject's awareness. These days, we would call them implicit percepts.

HYPNOTIC ALTERATIONS OF PERCEPTION

Genuine conversion disorders are rare (Ziegler, Imboden, & Meyer, 1960), perhaps almost as rare as blindsight, and they have been subjected to rigorous study under controlled conditions even less frequently. Fortunately, somewhat analogous alterations of perception are routinely observed in hypnosis, and these phenomena have received a great deal of experimental study. Hypnosis is a social interaction in which one person, designated the subject, responds to suggestions offered by another person, designated the hypnotist, for various kinds of imaginative experiences, some of which involve alterations in perception of the sort we are considering here. In the classic instance, these subjective experiences and consequent behaviors are accompanied by a degree of personal conviction bordering on delusion and an experience of involuntariness bordering on compulsion.

Many different types of perceptual change occur during hypnosis, including positive hallucinations (e.g., seeing something that is not actually present in the visual field) and distortions of perception (e.g., tasting an apple while eating a lemon). For present purposes, however, we wish to focus on negative hallucinations, which resemble most closely the sensory and perceptual deficits observed in the "hysterical" conversion disorders (Kihlstrom, 1979, 1984; Kihlstrom & Hoyt, 1988). In these phenomena it is suggested that the subject cannot perceive some object that is present in the stimulus field. From an investigational point of view, these hypnotic phenomena may have an advantage over conversion symptoms in that they can be studied from beginning to end in a fairly large group of subjects (that 10%–15% of the population who score high on standard measures of hypnotizability; Hilgard, 1965) under rigorously controlled laboratory conditions that do not confound evaluation and treatment goals.

The paradigmatic alteration of sensation and perception is hypnotic analgesia, which involves a reduction in awareness of a normally painful stimulus (Hilgard & Hilgard, 1983; Hilgard & LeBaron, 1984). Psychophysical studies show clearly that such suggestions are effective in reducing both sensory pain and suffering (Hilgard, Hilgard, Macdonald, Morgan, & Johnson, 1978; Knox, Morgan, & Hilgard, 1974) and that the extent of the effect is correlated with hypnotic susceptibility (Hilgard, 1967, 1969). Some indication of the magnitude of the effect is provided by a study reported by Stern and his associates (Stern, Brown, Ulett, & Sletten, 1977), in which hypnosis compared favorably with five other challenging agents, including aspirin, diazepam, and morphine, while subjects received both cold-pressor and ischemic pain stimulation. In hypnotizable subjects hypnosis proved more effective than any other technique, but only the effect of hypnosis was correlated with hypnotizability. A review of the clinical literature by Hilgard and Hilgard (1983) indicates that hypnotic suggestions alone may produce clinically significant pain relief in as much as 50% of an unselected sample of patients.

Hypnotic analgesia is also paradigmatic in that it reveals in two different ways the kinds of paradoxes that we also observed in hysteria. First, despite the subjectively compelling reduction in pain experienced by hypnotic subjects, analgesia suggestions do not necessarily modify psychophysiological responses to stimulation. For example, Sutcliffe (1960, 1961) observed skin conductance responses to electric shock in subjects who had received analgesia suggestions; similar findings had been reported earlier by Sears (1932), and subsequently by many others (for a review, see Hilgard & Hilgard, 1983). This dissociation between subjective experience and physiological response to stimulation is interesting and has suggested to some (e.g., Wagstaff, 1982) that the subject continues to experience pain but denies doing so. But by analogy with psychophysiological studies of memory in the amnesic syndrome (e.g., Bentin & Moscovitch, 1990), it provides *prima facie* evidence of implicit perception, or perceptual processing outside of awareness.

Second, the impression that pain stimuli register outside phenomenal awareness is supported by the "hidden observer" technique introduced by Hilgard (1973, 1986). After analgesia has been established, it is suggested to the subject that he possesses a "hidden part" that has registered, and can report, the true level of pain stimulation. Under these circumstances, some (but not all) hypnotic subjects give pain reports that are comparable to those collected under normal waking conditions. The "hidden observer" is not a homunculus but is both a metaphor for the subconscious mental representation of pain, as indicated by the continuing physiological responses and a label for the method by which this registration may be accessed. If the psychophysiological responses reflect implicit perception, then the hidden observer gains access to residual memory traces of this perceptual activity.

In addition to studies of hypnotic analgesia, a substantial literature has developed on the effects of hypnotic suggestions on visual perception—a body of work mostly inspired by studies of the clinical syndromes of functional blindness. The suggestions may be for total blindness or for blindness in just one eye. Bryant and McConkey (1989a, 1989c, 1990) employed a variant of the Gross/Zimmerman paradigm to study hypnotic rather than hysterical blindness. In their first study (1989a, Experiment 1) a group of highly hypnotizable subjects received a suggestion for total blindness; then they were given a box with three switches and three lights and instructed to find the switch that turned off a tone. The subjects were more accurate on trials where the light indicated the correct response than on those without this visual cue, even though they denied seeing the light. Interestingly, however, a follow-up study (1989a, Experiment 2) showed a further increase in accuracy in the presence of cues after the suggestion for blindness was canceled.

A second study by Bryant and McConkey (1989c) used a more conventional priming paradigm developed by Jacoby and Witherspoon (1982) for the study of implicit memory. The subjects saw cards on which were printed pairs of words, in the form of WINDOW-PANE. Note that the second word is a homophone (PANE, PAIN) and that the first word, supplies a disambiguating context for the spelling of the second. After eight such items the experimenter suggested that the words were fading into invisibility and then presented eight more items like the first. Later on, the subjects were asked to recall the items that had been presented to them. Not surprisingly, perhaps, they recalled fewer of the words presented while they were hypnotically blind. Nevertheless, on a subsequent spelling test the subjects spelled the homophones according to the disambiguating context in which these words had been presented originally. The subjects' failure of explicit memory is consistent with their failure of implicit perception. But the fact that the subjects showed a priming effect for both "seen" and "unseen" items indicates that the "unseen" items were registered nonetheless, and affected performance on the subsequent spelling task. Here, then, is an example of how performance on an implicit memory task can give evidence of implicit perception.

Similar findings have been obtained in the auditory modality. Suggestions for partial deafness lead to clear changes in auditory sensitivity as assessed by the magnitude-estimation procedures of classical psychophysics (Crawford, Macdonald, & Hilgard, 1979). That the auditory stimulus is registered and processed, however, is shown by the occurrence of speech dysfluencies in delayed auditory feedback (DAF; Sutcliffe, 1961), and intrusions from the affected ear in a dichotic listening task (Spanos, Jones, & Malfara, 1982). Moreover, the actual intensity of auditory stimuli, reduced by suggestions of partial deafness, may be recovered using the "hidden observer" technique (Crawford et al., 1979). Again, the contradiction between the subject's denial of perceptual experience and the behavioral evidence of stimulus impact may be taken either as evidence that subjects are reporting incorrectly (Spanos et al., 1982) or as evidence of a dissociation between explicit and implicit perception.

Other examples of this dissociation may be found when paradigms used in the study of normal perception are applied to the hypnotic case. For example, Miller, Hennessy, and Leibowitz (1973) found that ablation of the background did not affect perception of the Ponzo illusion (see Figure 1.3, Panel A). That is, the subjects denied seeing the converging lines; yet these same lines affected their perception of the horizontal bars. Similarly, Jansen, Blum, and Loomis (1982) found that suggested ablation of slanted lines surrounding a slanted target line did not reliably alter the perception of slant in the target (Figure 1.3, Panel B). Of course, such a selective effect on perception—being blind for converging but not horizontal bars, being blind for some slanted lines but not others—raises the paradox of the Judas eye that we encountered in studies of perceptual defense. In order to selectively ablate the background of the Ponzo illusion, one must first see it, and the perceptual registration of the background must have some consequences for perception of the figure. For this reason, it should not be surprising to find a dissociation between explicit perception, as reflected in the failure to consciously perceive the converging lines, and implicit perception, as reflected in errors in estimating the comparative length of the horizontal bars.

The Ponzo illusion is a case of a more general phenomenon of *perceptual couplings*, apparently inviolable links between one perceptual organization and another (e.g., Epstein, 1982; Gogel & Teitz, 1974; Hochberg, 1974; Hochberg & Peterson, 1987; Peterson, 1986; Peterson & Hochberg, 1983). Seeing one thing, such as lines converging in the distance, forces the observer to see something else, such as a difference in length between two horizontal bars. Ordinarily, the two percepts in question are both conscious. But the Miller et al. (1973) findings suggest that perceptual couplings may provide fertile ground for studying dissociations between explicit and implicit perception. Put simply: when one perceptual organization is abolished, in terms of explicit, conscious perception, what happens to the other to which it is ordinarily coupled?

As of yet, this question has not been addressed directly, but there are a number of findings in the literature indicating that perceptual couplings may remain intact even though one percept is processed outside of awareness. Thus, Leibowitz, Lundy, and Guez (1980), studying hypnotic suggestions for tubular blindness, found that estimates of stimulus size varied with viewing distance. In other words, despite their inability to see objects outside of a narrow field, subjects still compensated for distance cues available in the periphery: Janet (1907) made similar observations in cases of hysterical tunnel blindness. In another study Leibowitz, Post, Rodemer, Wadlington, and Lundy (1981) observed tubular vision by means of conventional perimetry measures; nonetheless, when a stimulus

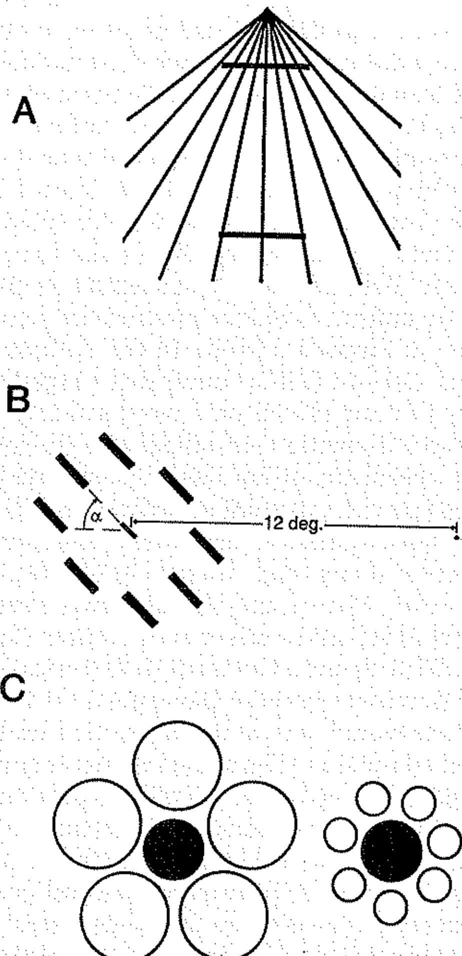


FIGURE 1.3. Sample figures used in experiments on hypnotic blindness. In the Ponzo illusion (Panel A) the two horizontal lines are equal in length, but the one nearer the point of convergence appears longer (adapted from Miller, Hennessy, & Leibowitz, 1973). In Panel B, the surrounding lines, with a constant orientation of 45°, affect perception of the test line in the middle, whose orientation varies (adapted from Jansen, Blum, & Loomis, 1982). In the Titchener-Ebbinghaus circles illusion (Panel C), the black circle on the right appears larger than the one on the left (adapted from Blum, Nash, Jansen, & Barbour, 1981).

was rotated in the ablated periphery, around the line of sight, the subjects experienced roll vection, or illusory feelings of egomotion.

There are many other examples of such dissociations in the literature, although it should be noted that the available research is not unanimous. Thus, for example, Blum, Nash, Jansen, and Barbour (1981) found that ablation of the surround affected the perceived magnitude of the center in the Titchener-Ebbinghaus circles illusion (Figure 1.3, Panel C). And while subjects who receive suggestions for color blindness do not perform in the same manner as the congenitally color blind on the standard Farnsworth-Munsell "100 hues" test (Cunningham & Blum, 1982), these same suggestions do appear to reduce interference on the Stroop color-word test (Harvey & Sipprelle, 1978). In the auditory domain, Nash, Lynn, Stanley, and Carlson (1987) found that suggestions for deafness abolished auditory priming effects on a word-selection task.

Perhaps the most dramatic contradiction in the hypnosis literature concerns hypnotic anesthesia, or the loss of tactile and kinesthetic sensitivity. In an interesting series of studies, Wallace and his colleagues have claimed that anesthesia reduces or eliminates perceptual adaptation, as measured by pointing errors (e.g., Wallace & Garrett, 1973; Wallace & Fisher, 1982). However, Spanos and his colleagues have reported a failure to replicate the adaptation effect on pointing (Spanos, Dubreuil, Saad, & Gorassini, 1983; Spanos, Gorassini, & Petrusic, 1981). This issue is an important one to resolve because the concept of implicit perception being developed here would suggest that hypnotic anesthesia would have no effect on visual adaptation. The reason is that hypnotic anesthesia is not the same thing as a nerve block, which prevents the transmission of afferent impulses to the somatosensory projection area of the brain. There can be little question that in hypnotic anesthesia the proprioceptive information is registered in the appropriate cortical centers even if it is dissociated from conscious awareness. Thus, we should not be surprised if this registration has collateral effects on experience, thought, and action, just as the functionally blind patient sees double when his eye is deformed by external pressure. Nevertheless, unanimity of results among different experiments comparing measures of explicit and implicit perception is by no means fatal to the concept of implicit perception. For example, Roediger and his colleagues have found dissociations between measures of implicit memory, as well as dissociations between explicit and implicit memory (Roediger, 1990; Roediger, Srinivas, & Weldon, 1989; Roediger, Weldon, & Challis, 1989).

As in the case of the conversion disorders, discrepancies between self-reports of phenomenal experience and overt behavior on experimental tasks have often been construed as impeaching the claims of hypnotic subjects that they are, in fact, unable to perceive certain events (e.g., Jones

& Flynn, 1989). For example, Spanos et al. (1982), discussing the results of their dichotic listening study, concluded: "Our findings, like those of the DAF studies, indicate that hypnotically deaf subjects hear adequately" (p. 76). That there are other possibilities, however, was suggested by Sutcliffe (1961), who was the first to use the DAF paradigm. Remarking on the typical discrepancy between hypnotic subjects' reports of their experience and their performance on experimental tasks, Sutcliffe argued that these individuals are essentially deluded; their self-reports indicate that they are unaware that objective reality is other than the state of affairs suggested by the hypnotist. Nevertheless, their performance on experimental tasks indicates that the actual state of affairs continues to be processed outside of awareness (Kihlstrom & Hoyt, 1988). This dissociation between the subject's belief that he or she is blind or deaf and the evidence that visual and auditory information is processed nonetheless is a dissociation between explicit and implicit perception.

THE DIFFERENCE THAT MAKES FOR CONSCIOUSNESS

Whatever limits there may be on the phenomenon, this chapter has provided an overview of the full panoply of implicit perception, instances in which current events influence our experience, thought, and action outside of phenomenal awareness. Accepting the concept leads to the question, What makes the difference between those percepts that are conscious and those that are not? In the past, psychologists have offered a number of different answers. Some of these emphasize stimulus factors: For example, subliminal perception is said to occur under circumstances where the stimulus is too brief or too weak to be consciously noticed. Others emphasize subject factors: For example, the person may be anesthetized and thus unable to form conscious percepts.

Another idea, which does not necessarily contradict these, has to do with the role of the self in conscious experience (Claparede, 1911/1951; James, 1890; Janet, 1907). The self may be viewed as a mental representation of one's own person and personality (Cantor & Kihlstrom, 1987; Kihlstrom & Cantor, 1984; Kihlstrom, Cantor, Albright, Chew, Klein, & Niedenthal, 1988). This organized knowledge structure resides in working memory, where it routinely comes into contact with information about the environment in which the person exists and additional knowledge structures that are activated by perceptual processing and other acts of thought. This connection, which defines the self as the agent or experiencer of some ongoing event, may be the key to consciousness because it represents that sense of possession that is crucial for the experience of conscious awareness.

This connection to the self is just what appears to be lacking in the phenomena of implicit perception. When we perceive an event, we activate fragments of pre-existing knowledge stored in memory; when we attend to the event, the corresponding mental representation becomes part of our working memory. As such, this activated knowledge structure then has the opportunity to contact other knowledge structures, including those representing the spatiotemporal context in which the event took place and the self as the agent or experiencer of the event. When contact occurs between the representation of the event—what might be called the "fact node," and the representation of oneself—what might be called the "self node," the event comes into consciousness. But contact between the event and the self is by no means automatic. A number of circumstances may prevent such contact.

In cases of "subliminal" perception and perceptual defense, it may be that stimulus information never enters working memory in the first place and thus never has the opportunity to link up with the self-node. Nevertheless, stimulus information may contact other memory structures and thereby influence experience, thought, and action over the short or long term, yielding the phenomena of implicit perception or memory. This influence will be outside conscious awareness, because the link to the self was never established in the first place.

In blindsight, damage to the striate cortex may effectively disrupt the normal connection between visual experience and the self. But while some visual function is mediated by subcortical structures, these percepts lack a connection to the self entirely. Thus, some visual functioning persists but outside conscious awareness.

In the dissociative disorders that constitute classic "conversion" hysteria, something else seems to be involved. Here the necessary links to self are set aside, not through a more or less deliberate act but as a consequence of psychological stress. Still, the bonds are preserved at some level because we can recover them later. In hypnosis the same sort of thing happens, although here the process is under something like voluntary control. Conversion hysteria happens against the person's will while the hypnotic subject enters hypnosis willingly.

In any event, these sorts of phenomena seem to indicate that perception is not to be identified with consciousness and that quite a bit of perception can take place outside of awareness. The phenomena of implicit perception are not restricted to degraded or unnoticed stimuli but can include representations of objects and events that are activated well above whatever threshold might be necessary for consciousness. These events are available, in principle, to introspection but they are not accessible to consciousness. In the final analysis, consciousness is a phenomenal quality that may accompany perception and other mental functions, but it is not necessary for many kinds of complex psychological functioning. Perception can be explicit or implicit, but the domain of implicit perception ranges far beyond the merely subliminal and raises important questions about both the nature and function of consciousness and the role of the self in mental functioning.

POTENTIALS AND LIMITS

Although the study of subliminal perception is very old, the concept of implicit perception, as analogous to implicit memory, is very new. Some concept of implicit perception is necessary because there appear to be numerous examples of perceptual influences on experience, thought, and action where the stimulus in question is in no sense subliminal but the percept is nevertheless outside of awareness. To conclude this chapter, we wish to provide a framework for the future exploration of these phenomena and some of the theoretical issues raised by them.

Perhaps the most contentious of these concerns the magnitude of implicit perception effects, or, put another way, the sorts of effects that implicit perception can have on the person and his or her behavior. There is, of course, the persisting debate about the efficacy of subliminal advertising (Moore, 1982, 1988) and, more recently, about the effects of subliminal self-help audiotapes (Greenwald, Spangenberg, Pratkanis, & Eskenazi, 1991). Aside from the very interesting issue of whether a subliminal signal even exists on many commercial products (Merikle, 1988), it does appear that subliminal advertising is not a particularly powerful inducement for consumer spending. Subliminal stimuli may affect attitudes and preferences (Bornstein, 1989, Chapter 7, this volume; Kunst-Wilson & Zajonc, 1980; but see Mandler, Nakamura, & Van Zandt, 1987), but attitudes do not always translate into behavior. On the other hand, it has been claimed that subliminal presentations of symbiotic messages, such as MOMMY AND I ARE ONE, produce salutary effects on both mental patients and normal subjects (e.g., Hardaway, 1990; Silverman, 1976; Silverman & Weinberger, 1985; but see Balay & Shevrin, 1988; Weinberger & Hardaway, 1990; Weinberger & Silverman, 1990; see also Weinberger, Chapter 6, this volume).

Another interesting issue is whether explicit and implicit perception represent the operations of two different perceptual systems. A claim for separate underlying systems has been made in the case of dissociations between explicit and implicit memory (e.g., Schacter, 1991; Tulving & Schacter, 1990; but see Roediger, 1990; Roediger, Srinivas, & Weldon, 1989; Roediger, Weldon, & Challis, 1989). And, of course, a claim for two visual systems has been made on the basis of observations of "blindsight" in patients and laboratory animals (e.g., Weiskrantz, 1986).

There may very well be two different systems, corresponding to explicit and implicit perception, and this question is an important one. But we are concerned primarily with explicit and implicit *expressions* of perceptual activity, rather than with any theoretical claim about separate neuropsychological systems. One expression is tapped by tasks that require conscious perception of some stimulus event; in these situations, perception is experienced and acknowledged by the perceiver. The other is tapped by assessments of the influence of some event on ongoing experience, thought and action: In these situations, perception is inferred by others. Dissociations between explicit and implicit perception are interesting, even if the phenomena in question prove to have the same underlying basis in the brain.

Acknowledgments

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NOTES

1. In his essay in the *History of Psychology in Autobiography*, Jastrow (1930) writes that the Pierce and Jastrow study was the first psychological investigation undertaken at Hopkins (from December 1883 to March 1884); and since Hopkins was the first psychological laboratory in America, having just been founded in 1883, it is likely that this study was the first psychological experiment performed in America—a pretty interesting heritage for investigators of unconscious processes to contemplate. Jastrow himself is a seminal figure in American psychology (Blumenthal, in press). After four years at Hopkins he became the recipient of the first American PhD in psychology, conferred in 1886. He was the founding Professor of Psychology at Wisconsin, in 1888, retiring in 1927—an unbroken tenure of 41 years, at that time unique in psychology. He and William James, with whom he shared an interest in subconscious processes, were the only Americans to attend the First International Congress of Psychology, in Paris in 1889. (In the *Principles*, James cited Jastrow more than any other American save Cattell; and James and Jastrow were treated by the same physician for depression.) Jastrow was first secretary of the American Psychological Association, its president in 1900, and a founder of the American Association of University Professors, an organization he hoped would serve as an opposing force to despotic administra-

tors. He administered the psychology pavilion at the Columbian Exhibition in Chicago in 1893, and he invented what is now known as "APA style." Jastrow's most famous graduate student was Clark Hull, whom he introduced to hypnosis research (an area in which Hull made perhaps his most lasting contribution to psychology). After retirement Jastrow moved to New York, where he continued to teach at the New School for Social Research, gave a series of public lectures, and wrote a syndicated column and many other articles in the popular press on the topic of mental hygiene.

2. As is the case with implicit memory, a variety of terms can be used to capture our intended distinction between two forms or expressions of perception (Roediger, 1990; Schacter, 1990). As noted, the term *subliminal* must be rejected because in some of the phenomena discussed here, the events in question are clearly supraliminal in the psychophysical sense. *Perception without awareness* raises the question, Awareness *of what*? Similarly, *unconscious perception* implies that the subjects are not conscious. Finally, a distinction between direct and indirect perception must be avoided, because the term *direct perception* already has a technical meaning in the work of Gibson and his followers. *Implicit perception* has its own problems, but it seems the best choice, because it refers to instances in which perception is implicit in the subject's task performance, even though it is not explicitly referenced by that task.

We prefer *implicit perception* because of the heuristic value of the link to the implicit memory literature and because it ultimately avoids the controversy over subliminality. Note that current studies of implicit memory do not necessarily rely on the subjects' failure to consciously remember events, as occurs in the amnesic syndrome. Rather, they tend to rely on experimental dissociations, single or double, in which some variable affects performance on one memory task but not another. In the same way, dissociations between explicit and implicit expressions of perception can be studied even when the events in question were consciously perceived at the outset.

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Perception Without Awareness

Cognitive, Clinical, and Social Perspectives

EDITED BY

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To our parents,
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