

Anosognosia, Consciousness, and the Self

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Brain damage can lead to profound disruptions of mental function; amnesia, aphasia, agnosia, apraxia, and dementia are just a few of the syndromes produced by insult, injury, or disease of the brain (Heilman and Valenstein, 1985). Perhaps the most disturbing consequence, so far as the patient is concerned, is the sense of cognitive loss: that certain tasks, once routine and effortless, are now difficult or impossible. The actress Patricia Neal wrote in her autobiography (Neal, 1988):

After a stroke, anger grows with awareness of what you have lost. The fog of unconsciousness that held you prisoner from the outside world was, in fact, a blessing in disguise. First you're like a soul with no body, but the soul is drugged. Then the soul awakens into a body you cannot command. You are a prisoner in a private hell.

Goldstein (1948), in his classic account of the psychological consequences of brain damage, made a similar point in his description of the "catastrophic reaction" in aphasic patients. Apparently, the patient's awareness of cognitive loss, of the fact that he or she cannot do things that were possible before, can precipitate episodes of profound dysphoria (for a review, see Heilman, Bowers, and Valenstein, 1985).

On the other hand, some patients suffer precisely the opposite problem: They do not seem to be aware of their cognitive and behavioral impairments. This phenomenon was originally noticed in cases of left-sided hemiplegia and hemianopia and was called *anosognosia* by Babinski (1914, 1918); it was drawn to the attention of modern workers by Weinstein and Kahn (1955) and later Bisiach (e.g., Bisiach, Vallar, Perani, et al., 1986). Anosognosia, the brain-damaged patient's failure to recognize or appreciate his deficits, raises interesting questions concerning subjective awareness of the mechanisms of consciousness.

The purpose of this chapter is to explore some of these concerns, mostly from a *non*neuropsychological point of view. The goal is to integrate the neuropsychological literature on anosognosia with other work in cognitive psychology that also bears on the nature of consciousness and the relations between conscious and nonconscious mental states (for related treatments of these issues, see Kihlstrom, 1984, 1987, 1989, 1990b).

ANOSOGNOSIA, DENIAL, AND INDIFFERENCE

Let us first comment on some definitional issues. As McGlynn and Schacter (1989) have indicated, terminology here is important, and there is good reason to try to draw some distinctions between anosognosia proper and the related symptoms of defensive denial and indifference (e.g., Weinstein and Kahn, 1955). *Anosognosia*, as defined by Babinski, is a deficit in awareness: The patient appears unaware of any problems in memory, language, perception, voluntary movement, or whatever. Evidence bearing on the claim of unawareness may come in various forms: (1) the person may simply not acknowledge that there is anything wrong; (2) the person may acknowledge some difficulty but attribute it to some source other than disease; or (3) the person may actively deny any difficulty at all.

Denial and Indifference

Denial, as an aspect of behavior, is particularly problematic (Weinstein and Kahn, 1955). One may attribute "denial" to a patient under a variety of circumstances. For example, a patient may merely answer the doctor's query in the negative, as in, "Patient denies alcohol abuse." Alternatively, the patient may fail to acknowledge something that the examiner knows to be true. This situation is closer to the phenomenon that concerns us, but it is still ambiguous as behavior. Thus such denial could reflect lack of awareness, but it could also reflect strategic self-presentation on the part of a patient who is fully cognizant of the problem.

Perhaps the term *defensive denial* should be reserved for those cases where the claim of unawareness appears to be motivated by self-presentational concerns, rather like repression. In this context, it is interesting to reflect on some of the manifestations of denial, broadly construed, anticipated by psychodynamic theory (A. Freud, 1936/1966; Sandler and Freud, 1985). As is well known, Sigmund Freud postulated a number of cognitive maneuvers employed by the ego to deflect, suppress, and disguise unacceptable sexual and aggressive impulses arising from the id. Although classical psychoanalytic theory held that these defense mechanisms served to reduce "neurotic" anxiety stemming from conflicts between instinctual demands and social constraints, there is no reason why similar defenses could not be deployed to reduce "reality" anxiety such as might be aroused by the neurological patient's awareness and acknowledgment of loss of function.

If the psychodynamic mechanism of denial operates in neurological patients, its expression might take a number of forms. We have no idea how

often any of these forms of denial are actually observed, but certain possibilities seem intuitively likely. For example, *repression* might yield the characteristics of classic anosognosia: the patient's simple denial that he or she suffers any psychological deficit. Alternatively, the patient might engage in *rationalization*, acknowledging the problem but making reasonable-sounding, plausible excuses for it (e.g., "I'm too tired to move my arm"). On the other hand, a patient might employ a defense mechanism similar to *projection*, in which anxiety is reduced by attributing the deficit to others, instead of oneself. In pure projection, for example, the amnesic patient would attribute memory failure to others while denying it in him- or herself. With shared projection, the patient would acknowledge the deficit but also attribute it to others, as if to say that it is nothing unusual or any cause for concern (e.g., "Everybody forgets things"). With *displacement*, a patient may deny a deficit in one domain but claim a deficit in another, even fabricating a deficit for this purpose. We can even imagine defensive denial taking the form of *reaction formation*, in which the patient, far from acknowledging his or her deficit, claims superior functioning in that domain.

One of Freud's insights was that it is easier to repress something when we can acknowledge something else. For example, he noted that in most individuals autobiographical memory from birth to about 5 to 7 years of age was impoverished (Kihlstrom and Harackiewicz, 1982; Schacter and Kihlstrom, 1989), a phenomenon he attributed to the successful repression of affect-laden memories with the resolution of the Oedipus complex. He also acknowledged, however, that a few early childhood recollections stood out against this background of infantile and childhood amnesia. Freud (1899/1962, 1901/1960) called these surviving recollections "screen memories" and argued that they aided the repression of more threatening material by giving the person something to remember. In an analogous manner, it might occur that patients with multiple deficits acknowledge one—perhaps the least debilitating—while steadfastly denying the other(s).

Indifference is different from denial because it implies a lack of caring on the part of a patient who otherwise acknowledges his or her deficit; this reaction too may be defensive in nature, but at least the defense does not go as far as denial. Perhaps, as with the dementing syndromes, the patient is aware of the deficit but does not fully comprehend it or its significance for functioning. Janet (1901, 1907), of course, remarked on *la belle indifference* in cases of hysteria, now called dissociative or conversion disorder (Kihlstrom, 1984, 1990a): the patient's casual acceptance of, or indifference to, his or her symptom. In neurological cases, this phenomenon is often referred to as anosodiaphoria (Heilman et al., 1985). Although anosodiaphoria may be interesting as an expression of inappropriate or flat affect and may bear importantly on the pathophysiology of emotion, it does not raise the same questions about awareness that are our primary concern in this chapter.

Organic and Functional Anosognosia

The distinctions between unawareness, denial, and indifference are potentially important because they remind us that the term "anosognosia" itself is descrip-

tively neutral. It means, simply, unawareness of deficits and thus carries no etiological connotations. Anosognosia might reflect brain damage, as is plausibly the case in the neurological cases reviewed by McGlynn and Schacter (1989). Thus lesions of the right parietal region have been implicated in anosognosia arising in cases of hemianopia and hemiplegia, whereas frontal lesions seem to be involved when amnesics are unaware of their memory deficits. McGlynn and Schacter suggested a Geschwind-like "disconnection" between a hypothetical cortical center mediating conscious awareness and some other, damaged brain site subserving the lost function.

There might be cases of *functional* anosognosia as well, i.e., cases where there is unawareness of deficits but no sign of the organic brain syndromes commonly associated with the symptom in aphasia (or whatever). One place to look for this problem is in schizophrenia (in making this suggestion there is no implication that schizophrenia is not a genetic-biochemical disorder—just that it does not involve frank insult, injury, or disease in the brain). To what extent are schizophrenics aware of their own symptoms, especially the negative symptoms (Andreason, 1982; Andreason and Olson, 1982), i.e., incoherence of speech, neologisms, loose and clang associations, poverty of speech and content, perseveration, blocking, flat, blunted, or inappropriate affect (for a review, see Chapter 6). Paranoid patients are certainly aware of these symptoms, and in fact there is reason to believe that their delusions stem from their attempts to explain their anomalous experiences (e.g., Kihlstrom and Hoyt, 1988). What about *nonparanoid* patients? Do they commonly acknowledge their cognitive and behavioral deficits, so obvious to others? If not, to what extent does this failure reflect lack of awareness, denial, or indifference?

Another domain in which something similar to anosognosia may be seen is hypnosis. Hypnosis is a social interaction in which one person, designated the subject, responds to suggestions offered by another person, the hypnotist, for imaginative experiences involving alterations in perception, memory, or voluntary action (Kihlstrom, 1985a). In the classic case, these responses are accompanied by feelings of subjective conviction bordering on delusion (Kihlstrom and Hoyt, 1988) and of involuntariness bordering on compulsion (the "classic suggestion effect"; see Weitzenhoffer, 1974; K. S. Bowers, 1981; P. G. Bowers, 1982). Many of these suggestions involve perceptual-cognitive deficits that roughly parallel some of the symptoms of organic brain syndrome. For example, it may be suggested that the subject cannot see objects presented in his or her visual field, hear sounds that would otherwise be clearly audible, or feel even fairly intense tactile stimulation. Alternatively, it may be suggested that the subject does not remember, upon termination of hypnosis, the events and experiences that transpired while he or she was hypnotized (Kihlstrom, 1984).

Although to our knowledge there has never been a systematic study of the matter, we do occasionally observe something like anosognosia when subjects respond to such suggestions. For example, upon inquiry many (if not most) subjects with posthypnotic amnesia acknowledge some degree of memory deficit: they assert (or agree) that they did some things while they were hypnotized but state that they cannot remember the details. Some subjects, however, seem to be blithely unaware that they did anything at all: They may acknowledge the induc-

tion and termination procedures but nothing in between. The latter subjects appear to be unaware of their memory deficits, in much the same manner as patients with Korsakoff syndrome (for a review see Chapter 8). It is not known to what extent this difference simply reflects the degree of response to the amnesia suggestion: Perhaps our "anosognosic" subjects have simply forgotten that they have forgotten. However, the fact that something like anosognosia occurs with hypnosis, where there is no question of frontal or parietal lobe dysfunction, suggests that the syndrome can be functional as well as organic in nature.

Awareness and Disorientation

Setting aside the conceptual distinction between true anosognosia and defensive denial, and the possibility of functional as well as organic deficits in awareness, there are difficulties here as well. It is impressive that anosognosia commonly appears in the acute stage of neurological disorder and remits as the illness becomes chronic (McGlynn and Schacter, 1989). As we detail later, the possibility must be raised that these acute patients may not yet have had the kinds of exchanges with their environments that would allow them to become aware of their deficits. At an internal, cognitive level of analysis, however, the possibility must also be raised that the anosognosia observed in acute neurological syndromes is secondary to the patients' generalized confusion and disorientation. If a person does not know who he is, where he is, or what time it is, it may not be fair to expect him to know he is impaired.

There is apparently at least one counterexample to this generalization: When anosognosia appears in cases of Alzheimer's disease and other forms of dementia, it occurs relatively late, not early, in the course of the disease (see Chapter 6). This fact of natural history merely underscores the point, however, because it is at the late stages of illness that the Alzheimer patient shows the most disorientation and intellectual deterioration. It is not fair to expect such a patient to be aware of his or her deficits. The point, then, is that when diagnosing and studying anosognosia we must be careful to rule out such contaminating factors as insufficient environmental feedback and general clouding of consciousness. Anosognosia is most interesting when it reflects a specific disorder of awareness, rather than a secondary symptom of dementia, i.e., when the person's awareness of self and world is not otherwise impaired.

CONSCIOUSNESS AND THE COGNITIVE UNCONSCIOUS

At this point, we set aside explicitly neuropsychological issues and try to link the literature on anosognosia to a wider body of work on the nature of conscious awareness and the relations between conscious and nonconscious mental life that is emerging from contemporary cognitive psychology (see also Kihlstrom, 1984, 1987, 1989). As everyone knows, scientific psychology began as the study of consciousness. Wundt, Titchener, and others who founded the earliest psychological laboratories generally assumed that the mind is able to observe its own inner workings. Their research relied on the method of introspection by

which trained observers attempted to analyze their own percepts, memories, and thoughts into elementary sensations, images, and feelings. This line of scientific inquiry on conscious mental life was interrupted by the radical behaviorism of Watson and his followers, who argued that consciousness was nonexistent, epiphenomenal, or irrelevant to behavior. One of the most salutary by-products of the "cognitive revolution" and the subsequent development of an interdisciplinary cognitive science has been a revival of interest in consciousness (Hilgard, 1977, 1980, 1987).

Only 20 years ago, a mere decade into the cognitive revolution, the dominant theory was Atkinson and Shiffrin's (1968) multistore model of memory, which was modeled after the modern high-speed computer. True to its name, the multistore model distinguished between three storage structures—sensory memory, primary (or short-term) memory, and secondary (or long-term) memory—and attempted to characterize the properties of these structures and the processes that transferred information between them. In the classic multistore model, consciousness was identified either with attention and rehearsal or with primary memory, the cognitive staging area that holds those percepts, memories, and actions to which attention is being directed.

A somewhat different perspective on conscious mental life is provided by more recent versions of information processing theory, such as Anderson's (1983) ACT*. ACT* assumes a single, unitary memory store, but it classifies the contents of memory into declarative knowledge structures that represent the individual's fund of general and specific factual information, including his or her knowledge of the current environment, and the procedural knowledge repertoire of skills, rules, and strategies that operate on declarative knowledge in the course of perception, memory, thought, and action. Consciousness is identified with working memory, which is similar to the primary memory of the classic model but with a much larger capacity. Working memory contains activated declarative representations of the organism in its current environment, currently active processing goals, and preexisting declarative knowledge structures activated by perceptual inputs or by the operations of various procedures.

This theory is fine as far as it goes, but even the nineteenth century psychologists had recognized that the mental structures and processes that underlie experience, thought, and action were not completely encompassed within the span of conscious awareness; i.e., consciousness is not all there is to the mind. For example, Helmholtz concluded that conscious perception was the product of unconscious inferences based on the individual's knowledge of the world and memories of past experience. Somewhat later, of course, Freud asserted that our conscious mental lives are determined by unconscious ideas, impulses, and emotions, as well as defense mechanisms unconsciously arrayed against them (see Whyte, 1960; Ellenberger, 1970; Bowers and Meichenbaum, 1984).

Perhaps the most forceful advocate of nonconscious mental life was William James (1890; see also Hilgard, 1969; Myers, 1986). This may at first seem paradoxical, because in Chapter 6 of the *Principles* James (1890) listed no fewer than ten refutations of "The Mind-Stuff Theory," which held that conscious experience is composed of elements that were themselves unconscious; he even went so far as to assert that the idea of "unconscious thought" was a contradic-

tion in terms on the grounds of the doctrine of *esse est senti* (to be is to be sensed). However, in his later chapters (specifically those on *The Relations of Minds to Other Things*, *The Stream of Thought*, *The Consciousness of Self*, and *Attention*), James made it clear that mental states could be unconscious in at least two senses. First, a mental event can be excluded from attention or consciousness: "We can neglect to attend to that which we nevertheless feel" (1890, pp. 201 and 455–458). These unattended, unconscious feelings are themselves mental states. Second, and just as important, James drew on the clinical observations of cases of hysteria and multiple personality by Janet, Binet, and Prince, and himself to argue for a division of consciousness into primary and secondary (and, for that matter, tertiary and more) consciousnesses, only one of which is accessible to phenomenal awareness at any point in time. To avoid possible oxymoron in the negation of consciousness, James preferred to speak of "co-conscious" or "subconscious" mental states, rather than "unconscious" ones. Even so, the idea of the "cognitive unconscious" is here to stay (Kihlstrom, 1987, 1989), and we must live with some imprecision of speech.

We have more to say about James' ideas later, but for the present we wish to put him aside and return to our historical account. Of course, the radical behaviorists were no more interested in nonconscious than in conscious mental life, so empirical interest in the kinds of problems that interested Helmholtz and James, not to mention Freud, declined precipitously during the years after World War I. To the extent that the problem was kept alive, it was principally through the efforts of the psychoanalytic ego psychologists such as Klein and Rapaport, who tried to integrate psychoanalysis with clinical psychology, and Jerome Bruner and his kindred souls, who fostered the development of the "New Look" in perception (for a review, see Hilgard, 1987; Kihlstrom, 1990b). Serious theoretical interest in nonconscious mental life, however, again had to await the triumph of the cognitive revolution.

Consider once again the classic multistore model of memory of Atkinson and Shiffrin. By implicitly making consciousness coterminous with attention and primary memory, the multistore model seems to identify nonconscious mental life with early, "preattentive" mental processes, e.g., feature detection and pattern recognition, that occur prior to the formation of a mental representation of an event in primary memory. The implication of this view is that unattended percepts and unretrieved memories make no contact with higher mental processes and thus cannot influence conscious experience, thought, and action. In other words, the classic multistore model of human information processing, by regarding attention and rehearsal as prerequisites for a full-fledged cognitive analysis of an event and implicitly identifying consciousness with higher mental processes, leaves little or no room for the *psychological unconscious*—mental structures and processes that influence experience, thought, and action but that are nevertheless inaccessible to phenomenal awareness.

A rather different perspective on nonconscious mental life is provided by Anderson's (1983) ACT* model of the architecture of cognition. ACT* holds that people can become aware of declarative knowledge (about themselves, their environments and processing goals, and other relevant information), and that this awareness depends on the amount of activation possessed by the represen-

tations in question. However, it also holds that procedural knowledge is not available to introspection under any circumstances. Thus procedural knowledge appears to be unconscious in the strict sense of the term. Because unconscious procedural knowledge is the cognitive basis for all higher thought processes, ACT* and similar revisionist models afford a much wider scope for the cognitive unconscious than did the classic statements.

An even larger place for nonconscious mental structures and processes has been created by a variant on information-processing theory known as connectionism or parallel distributed processing (PDP) (McClelland, Rummelhart, and PDP Research Group, 1986; Rummelhart, McClelland, and PDP Research Group, 1986). Whereas ACT* and similar models assume the existence of a single central processing unit (e.g., primary or working memory), PDP models postulate the existence of a large number of processing units, or modules, each devoted to a specific task. PDP models assume that information about an object or event is distributed widely across the processing system, rather than localized in any particular unit. Moreover, the activation of individual processing units can vary continuously rather than discretely. For these reasons it is not necessary for an object to be fully represented in consciousness before information about it can influence experience, thought, and action. In addition, traditional information-processing theories tend to assume that various perceptual-cognitive functions are bound together in a unitary processing system operating under a single set of rules and under the control of a central executive. By contrast, PDP models assume that various systems (e.g., those supporting perception and language) operate independently and under different rules. Only some modules are assumed to be accessible to awareness and subject to voluntary control.

Finally, PDP models abandon the traditional assumption that information is processed in a sequence of stages. Parallel processing permits a large number of activated units to influence each other at any particular moment in time, so that information can be analyzed rapidly. The number of simultaneously active processing units and the speed at which they pass information among themselves may exceed the span of conscious awareness. In contrast to multistore information processing theories that restrict the cognitive unconscious to elementary sensory-perceptual operations, PDP models seem to consider almost all information processing, including the higher mental functions involved in language, memory, and thought, to be unconscious.

Automatic Processing

Theories aside, there is no doubt that a good deal of mental activity is unconscious in the strict sense of being inaccessible to phenomenal awareness under any circumstances. In conversational speech, for example, the listener is aware of the meanings of the words uttered by the speaker but not of the phonological and linguistic principles by which the meaning of the speaker's utterance is decoded. Similarly, during perception the viewer may be aware of two objects in the external environment but not of the mental calculations performed to determine that one is closer or larger than the other. Unconscious procedural knowledge of this sort appears to be innate. However, other cognitive procedures

appear to be acquired through experience. A great deal of evidence now indicates that cognitive and motoric skills that are not innate may become routinized through practice and their operations thereby rendered unconscious. Employing a metaphor derived from computer science, this process is described as knowledge compilation, suggesting that the format in which the knowledge is represented has been changed (Anderson, 1982). In this way, both innate and acquired cognitive procedures may be unconscious in the strict sense of the term.

Unconscious procedural knowledge has also been described as automatic rather than controlled or effortful (for reviews, see Kahneman and Triesman, 1984; Shiffrin and Schneider, 1984). Automatic processes are so named because they are inevitably engaged by the presentation of specific stimulus inputs, regardless of any intention on the part of the subject. In addition, automatic processes consume little or no attentional resource. It is a fundamental premise of cognitive psychology that the amount of attention that can be allocated to various activities is limited, producing a bottleneck in information processing. Thus our ability to perform two or more tasks simultaneously is limited by the demands they make on available attentional resources. If attentional demands exceed attentional resources, the tasks interfere with each other. Nevertheless, routinized processes consume little or no attentional capacity. For this reason, it is possible for expert typists to carry on a conversation while transcribing even complicated material or for skilled drivers to negotiate the road while listening to the radio news.

Automaticity is important because it permits a great deal of complex cognitive activity to go on outside of conscious awareness. However, automatization can have negative consequences for conscious awareness (Spelke, Hirst, and Neisser, 1976). In the first place, automaticity may render us unable to describe our skills to others. Just try to get an old salt to teach you how to tie a sailor's knot or an accomplished pianist how to play an arpeggio. Moreover, as golfers and tennis players know, too much attention paid to an automatized skill can actually interfere with its execution. Finally, automatic processes may not leave accessible traces of themselves in memory. Skilled typists often have difficulty describing texts they have transcribed, and skilled drivers may have poor memory for details of their journeys over familiar stretches of road.

Implicit Perception, Memory, and Thought

Although the procedural knowledge structures that guide thought and action are unconscious, the declarative knowledge structures on which they operate are ordinarily thought to be accessible to conscious awareness. Thus we generally assume that people notice and can describe the salient features of an object or event, even if they cannot articulate the way in which those features have been integrated to form certain judgments made about it. However, another implication of automatization is that the processes in question may operate on declarative knowledge structures that are not themselves fully conscious. This point raises the question of subliminal perception: the possibility that stimuli that are not consciously detected nonetheless have an impact on perceptual and cognitive functioning.

Ever since the first demonstration of subliminal perception by Peirce and Jastrow (1884), a variety of methodological critiques have sought to demonstrate that stimuli cannot be analyzed for meaning unless they have been consciously identified and attended to (for a review, see Holender, 1986). However, a number of compelling demonstrations of preconscious processing have now appeared in the literature. For example, Marcel (1983a,b) employed a lexical decision task in which one stimulus word (the prime) is followed by another word (the target), and the subject has to decide if the target is a meaningful word. It is well known that such judgments are facilitated when the prime is also a word and especially when the prime and target are from the same taxonomic category; but most of these demonstrations have involved primes that were consciously detectable by the subject. Marcel arranged to present the prime followed by a second stimulus (called the mask) consisting of randomly arranged letters, before the target appeared. The interval between prime and mask was short, with the result that subjects were unable to reliably detect masked primes. Nevertheless, such primes facilitated performance on the lexical decision task. Because lexical decisions obviously require some degree of semantic processing, it appears that meaning analyses are performed on stimuli that are themselves outside of conscious awareness.

Because preconscious processing appears to be mediated by the activation of relevant mental representations already stored in memory, the question is raised whether analogous effects may be observed in memory itself. That is, just as there are palpable effects on experience, thought, and action of events that cannot be consciously perceived, there may be similar effects of events that cannot be consciously remembered. An early demonstration of the effects of consciously inaccessible memories was provided by Nelson (1978), whose subjects showed significant savings in relearning paired-associates that they were unable to recall or even recognize from a previous learning experience. Other demonstrations have made use of repetition priming effects in which the processing of an item is facilitated by the fact that it had been encountered previously. Similarly, studies of priming in tests involving lexical decision or word identification (e.g., Jacoby and Dallas, 1981) or word-fragment completion (e.g., Tulving, Schacter, and Stark, 1982) have shown that the magnitude of the priming effect is independent of the subject's ability to recognize the item as having been presented in a previous study session (see Schacter, 1987, for a review).

Relearning and priming effects such as the ones just described show that task performance may be affected by available memories of prior experiences, even though those experiences are not accessible to conscious recall. On the basis of such results, Schacter (1987) has drawn a distinction between explicit and implicit memory. Explicit memory involves the conscious reexperiencing of some aspect of the past, whereas implicit memory is revealed by a change in task performance that is attributable to information acquired during a prior episode. An increasing amount of literature derived from reports on both patient and nonpatient populations indicates that people can display implicit memory without having any conscious recollection of the experiential basis of the effect.

Implicit memory effects are conceptually similar to subliminal perception effects, in that both reveal the impact on experience, thought, and action of

events that are not accessible to conscious awareness. The term "implicit" perception might be offered as an alternative to "subliminal" perception in an attempt to get away from the unfortunate psychophysical implications of the concept of the *limen*. However, in contrast to implicit perception, the events contributing to implicit memory effects were clearly detectable by the subject at the time they occurred, attention was devoted to them, and they were represented in phenomenal awareness at the time. Arguably, implicit memory should be reserved for those situations where a consciously perceived event is subsequently lost to conscious recollection, leaving implicit perception for instances where stimulus information in the current (or immediately past) environment affects ongoing experience, thought, and action. Because memory is the residual trace of perceptual activity, it stands to reason that implicit percepts can reveal themselves in memory, even if it should turn out that implicit percepts produce only implicit memories. Still, both sets of phenomena illustrate the cognitive unconscious by showing perception and memory outside of phenomenal awareness.

Implicit perception and memory do not exhaust the domain of the psychological unconscious because it appears we can also have implicit *thought*. Consider one of the more interesting and controversial phenomena of problem-solving: "incubation." Subjects are asked to work on a difficult problem: If they fail to achieve the correct solution within a specified period of time, they are given something else to do. Later, when they are confronted again with the original, as-yet unsolved problem, they arrive at the solution fairly readily. Sometimes the solution appears spontaneously, even after the person has consciously abandoned the problem. Sometimes the solution appears in the person's dreams, although the most famous example of problem-solving in dreams, Kekule's discovery of the structure of the benzene molecule, may have been a fabrication (Browne, 1988). One interpretation of incubation is that the person continues to work on the problem subconsciously, after consciously setting the problem aside, and then finds the problem solved or at least considerable progress made when attention is subsequently returned to it.

Although this interpretation of incubation is as controversial as the phenomenon itself, some experiments by Bowers (1984, 1987) and his associates are important. In these experiments, subjects are presented with word triads patterned after those of the Remote Associates Test and are instructed to think of a concept they have in common. A classic example is as follows.¹

Democrat
Girl
Favor

Two others² are shown below, the first semantically convergent (where the meaning of the target word does not change from element to element within the triad)

¹The uniting concept is *party*.

²The uniting concepts are *mountain* and *match*, respectively.

and the second semantically divergent (where different senses of the target word must be employed to solve the problem).

Goat	Strike
Pass	Same
Green	Tennis

The trick in Bowers' experiments is that some of the triads are soluble, meaning that there really is some concept, however remote, that unites the individual words. Other triads are insoluble, however, meaning that there is no such uniting concept, except in the minds of subjects with psychotically loose associations. Bowers presented subjects with both kinds of triads simultaneously and asked his subjects to indicate which is which. An example is provided below.³

<i>Triad A</i>	<i>Triad B</i>
Playing	Still
Credit	Pages
Report	Music

Bowers found that subjects can do this task with some degree of accuracy, even though they have not achieved the solution to the soluble triad. They seem to be responding to some vague "feeling of knowing" analogous to that observed with episodic and semantic memory. The point is that the correct solution influences the subjects' behavior, even though they are not consciously aware of it, in much the same manner as does implicit perception and memory.

So these three reference experiments provide evidence for three aspects of the cognitive unconscious. In Schacter's (1987) work, there is implicit memory: a change in task performance attributable to some past event but in the absence of conscious recollection of that event. In Bowers' (1984, 1987) studies, there is implicit thought: reflections in behavior of problem-solving activity outside phenomenal awareness. In Marcel's (1983a,b) work, there is implicit perception: a change in task performance attributable to some *current* event but in the absence of conscious perception of that event. Note that these sorts of implicit cognition effects are produced under conditions that might be described as *degraded*: stimulus presentations that are too brief to be consciously perceived; encoding conditions, or retention intervals, that produce memories too weak (in some sense) to be retrieved; problems that are too difficult to be solved except by crossword mavens.

Implicit Cognition in Clinical Syndromes and Special States

In other cases, the problem is not in the task environment imposed on the subjects but, rather, with the subjects themselves. For example, some of the most dramatic demonstrations of implicit memory effects come from studies by Schacter (1987) and his associates, among others, on cases of the amnesic syndrome resulting from bilateral damage to the medial temporal lobe (including

³Triad A is soluble, and the uniting concept is *card*.

the hippocampus) and diencephalon (including the mamillary bodies). These patients display a gross anterograde amnesia, meaning that they cannot remember events that occurred since the onset of the brain damage; other intellectual functions remain relatively intact. When such patients are asked to study a list of familiar words and to recall them shortly thereafter, they show gross impairments in memory compared to controls. Different results are obtained, however, when the subjects are asked to identify briefly presented words or to complete a word stem or other fragment with a meaningful word. Not surprisingly, intact subjects show superior performance on trials where the correct response is a word that had appeared on the previously studied list compared to those where the correct response is an entirely new word. This advantage of old over new items reflects a sort of priming effect of the previous learning experience. However, amnesic subjects also show normal levels of priming, despite the fact that they cannot remember the words they studied.

Although the available evidence is somewhat controversial, some phenomena analogous to implicit cognition appear to be observed in a variety of other neuropsychological syndromes as well. For example, Weiskrantz (1980) and his colleagues (Weiskrantz, Warrington, Sanders, and Marshall, 1974) have reported a patient, D.B., who had extensive damage to the striate cortex of the occipital lobes. Although the patient reported an inability to see, he was nonetheless able to respond appropriately to some visual stimuli, a phenomenon called *blindsight* (for a review, see Campion, Latto, and Smith, 1983). Similar phenomena have been obtained in other patients. Thus blindsight involves a behavioral response to objects and events of which the person is apparently unaware—a dissociation of visually guided behavior from visual awareness analogous to the implicit perception that occurs with briefly presented stimuli. Similarly, patients with bilateral lesions to the mesial portions of the occipital and temporal cortex are unable to recognize previously encountered faces as familiar, a condition known as *prosopagnosia*. Nevertheless, there are now several reports indicating that prosopagnosic patients show differential behavioral responses to old and new faces (e.g., Tranel and Damasio, 1985; deHaan, Young, and Newcombe, 1987), a dissociation similar to the implicit memory seen in the amnesic syndrome.

Even in the absence of demonstrable brain insult, injury, or disease, conceptually similar effects have been reported with conversion hysteria, functional amnesia and fugue, and multiple personality (for review, see Hilgard, 1977; Kihlstrom, 1984, 1985b). For example, Hilgard (cited in Hilgard and Marquis, 1940) found that a patient with functional anesthesia and paralysis could acquire a conditional finger-withdrawal response in the affected arm, and Brady and Lind (1961) showed that a functionally blind patient nonetheless displayed discriminative responses to visual stimulation. In the domain of learning and memory, experiments by Ludwig and his colleagues (Ludwig, Brandsma, Wilbur, et al., 1972) on a case of multiple personality found some transfer of learning among alter egos, despite the patient's apparent lack of awareness of their experiences.

Setting aside the neurological and psychiatric syndromes, even normal sub-

jects who are asleep (Evans, 1979b), anesthetized for surgery (Kihlstrom and Schacter, 1989), or hypnotized (Kihlstrom, 1984, 1985) can give evidence of perception, memory, and thought outside of awareness. Consider an experiment by Kihlstrom (1980) that was originally construed as bearing on the episodic-semantic distinction in memory. The subjects memorized a list of 15 unrelated words to a strict criterion of learning and then received a suggestion that they would not be able to remember the words they had learned. On an initial test of recall, the hypnotic virtuosos displayed dense posthypnotic amnesia, remembering virtually none of the words they had previously memorized. At this point the subjects were asked to give word associations to various probes: half of them, called critical stimuli, were selected because they had a high a priori probability of eliciting the items from the previously memorized word list; the remaining, neutral stimuli targeted items the subjects had not learned. The most important finding was that the subjects were more likely to give the targeted response to critical than to neutral stimuli. This response represents a kind of priming effect of the earlier learning experience on the word-association task. However, equal amounts of priming were observed in the densely amnesic virtuoso subjects and their nonsusceptible, nonamnesic counterparts.

What we see in these priming results is an effect of episodic memory for a prior experience on subjects' performance on a semantic memory task, despite the fact that the subjects cannot remember the experience that is the source of the priming effect. In other words, the hypnotic subjects displayed implicit memory for their earlier experience, just as amnesic patients do. There is a big difference, however: Amnesic patients have not encoded these memories particularly well, as evidenced by the fact that there are no known circumstances under which they can display explicit memory for them. By contrast, posthypnotically amnesic subjects are able to recall their experiences perfectly after administration of prearranged reversibility cues. Thus for hypnotic subjects the episodic memories remain available for conscious retrieval by virtue of having been adequately encoded at the outset, even if they are temporarily inaccessible.

TOWARD A TAXONOMY OF CONSCIOUSNESS

The clinical and experimental studies described above, conducted in a wide variety of domains and with many types of subject, seem to lead to two general conclusions. First, consciousness is not to be identified with any particular perceptual-cognitive functions such as discriminative response to stimulation, perception, memory, or the higher mental processes involved in judgment or problem-solving. All of these functions can proceed outside of phenomenal awareness. Rather, consciousness is an experiential quality that may accompany any of these functions. The fact of conscious awareness may have particular consequences for psychological function: It seems necessary for voluntary control, for example, as well as for communicating one's mental states to others and for sponsored teaching. It is not necessary, however, for many forms of complex psychological functioning. Second, they lead to a provisional taxonomy of non-

conscious mental structures and processes constituting the domain of the cognitive unconscious:

Unconscious (Proper)
Preconscious
Subconscious

There are, within the domain of procedural knowledge, a number of complex processes that are inaccessible to introspection, in principle, under any circumstances. By virtue of routinization (or perhaps because they are innate), such procedures operate on declarative knowledge without conscious intent or conscious awareness in order to construct the person's ongoing experience, thought, and action. Execution of these mental processes, which can be known only indirectly, through inference, is inevitable and consumes no attentional capacity. They may be described as unconscious in the strict sense of that term; in short, they comprise the *unconscious proper*.

In principle, declarative knowledge is available to phenomenal awareness and can be known directly through introspection or retrospection. Traditional information-processing analyses seem to imply that conscious access to declarative knowledge is a matter of activation. If a knowledge structure is activated above some threshold, it is conscious; if not, it is not. There is the further implication that declarative knowledge structures activated at subthreshold levels are essentially latent. However, it is now clear that procedural knowledge can interact with and utilize declarative knowledge that is not itself accessible to conscious awareness. The phenomena of implicit perception and memory, then, suggest a category of *preconscious* declarative knowledge structures. Unlike automatized procedural knowledge, these percepts and memories would be available to awareness under ordinary circumstances. Although activated to some degree by current or prior perceptual inputs and thus able to influence ongoing experience, thought, and action, they do not cross the threshold required for representation in working memory and thus for conscious awareness. These representations, which underlie the phenomena of implicit perception and memory, may be classified as preconscious, implying that, in contrast to unconscious procedural knowledge, these mental representations reside on the fringes of consciousness, and changed circumstances could render them consciously accessible, at least in principle.

In addition to unconscious cognitive procedures operating on declarative representations and preconscious declarative representations that serve as sources of spreading activation, the phenomena of hypnosis and related states seem to exemplify a category of *subconscious* declarative knowledge. These mental representations—fully activated by perceptual inputs or acts of thought above the threshold ordinarily required for representation in working memory and available to introspection and retrospection under some circumstances—seem nevertheless inaccessible to phenomenal awareness.

During the nineteenth century, Janet described such structures as dissociated from conscious awareness, and more recently Hilgard (1977) revived these ideas in the form of his neodissociation theory of divided consciousness. Dissociative phenomena are of theoretical interest because they do not comfortably

classify as either unconscious or preconscious. They are not limited to innate or routinized procedural knowledge, their execution is not automatic, and it consumes cognitive capacity. The stimulus input has not been degraded in any way, and the resulting memory traces are fully encoded and available for explicit retrieval. From the point of view of activation notions of consciousness, these phenomena are theoretically interesting because they indicate that high levels of activation, supported by the active deployment of attention and complex mental processing, although presumably necessary for residence in working memory, are not sufficient for conscious awareness.

ANOSOGNOSIA, CONSCIOUSNESS, AND THE SELF

So what exactly *is* required for conscious awareness? Kihlstrom (1984, 1987) holds that conscious awareness requires that a mental representation of an event be connected with some mental representation of the self as agent or experiencer—an idea derived from William James. In his discussion of the stream of consciousness, James wrote that “the first fact for . . . psychologists is that thinking of some sort goes on.” He also wrote, immediately thereafter, that “thought tends to personal form,” i.e., that every thought (by which James meant every conscious mental state) is part of a personal consciousness: The universal conscious fact is not “feelings exist” or “thoughts exist” but “I think” and “I feel.”

In other words, an episode of ongoing experience, thought, and action becomes conscious if, and only if, a link is made between the mental representation of the event itself and some mental representation of the self as the agent or experiencer of that event. This mental representation of self resides in working memory, as a memory structure, along with coexisting representations of the current external environment (Anderson, 1983; Kihlstrom and Cantor, 1984; Kihlstrom, Cantor, Albright, et al., 1988). Both self and context representations are necessary for construction of a full-fledged conscious perception, which according to James always takes the following form: “*I see* (or hear, smell, taste, etc.) *this, now*. Because memory is the residual trace of perceptual activity, these elements are necessary for reconstruction of a full-fledged conscious recollection as well.

Consider the following variations on Anderson’s (1983) famous sentence, *The hippie touched the debutante*.

1. I saw the hippie touch the debutante in the park on Thursday.
2. I was the hippie who touched the debutante in the park on Thursday.
3. I was the debutante whom the hippie touched in the park on Thursday.

In each case we have a proposition representing the raw description of a particular event, a hippie touching a debutante; it is linked to a proposition representing the self as the agent or experiencer of this event and a further proposition (or two, depending on how you count) representing the context in which the event took place.

In a generic associative theory of knowledge representation, this entire episodic memory would be represented by one node connecting three others: the

event node, the context node, and the self node. Conscious recollection of such an event occurs only when the representation of the self is retrieved along with some other information about the event. The inability to retrieve the links among all three types of propositions accounts for some of the peculiarities in conscious memory (Reed, 1988).

Two personal anecdotes from the life of one of us (J.F.K.) may help make the point.

1. *A simple memory failure.* I remember that I once saw a new Woody Allen movie in the company of my former student Judith Harackiewicz and her husband Cliff Thurber. It was opening night, the midnight show, at the Beeckman Theatre in Manhattan; we sat in the balcony, and afterward we took the bus up Broadway back to their apartment. This event is a vivid personal recollection, confirmed by Judy and Cliff, but I do not remember the title of the movie, nor can I recollect any particular scene that I viewed that night. With Judy's aid (she keeps a diary of all the movies she has ever seen, at least since graduate school) I have been able to narrow it down to either *A Midsummer Night's Sex Comedy* (1982) or *Zelig* (1983). Maybe I fell asleep, which I have been known to do at movies, but I do not think so because I remember individual scenes from both films clearly, without benefit of subsequent videotape replays. I simply cannot say which film I saw that night.

2. *A case of déjà vu.* In July 1976, while attending a hypnotists' convention, I visited the Philadelphia Museum of Art with Kenneth and Patricia Bowers to view an exhibit of American painting and sculpture on the occasion of the Bicentennial of the American Revolution. While standing in one of the basement galleries I had the strong impression that I had been there before. Of course, I *had* been in that room many times before, during the 5 years I had lived in Philadelphia as a graduate student. But my feeling was that this *particular* room, with this particular exhibit in place, was familiar. It was not until more than a year later, sitting in the Stanford medical library (in fact, preparing a lecture on déjà vu), that I remembered that in fact I *had* seen the Bicentennial exhibit the previous May, when I had attended a wedding out on the Main Line. I was aware of this fact even in July because I had encouraged Ken and Pat to see the exhibit on the basis of my previous visit. The recollection was not false at all but, rather, one whose source I failed to remember.

In both cases there is an explicit, conscious, episodic memory based on the retrieval of only partial information: in the first instance about self and context, and in the second about self and event. The point is that a conscious recollection is possible without the information represented by the context or event nodes, one or the other; but it is inconceivable without the information represented by the self node.

Thus in consciousness a connection is made between the mental representation of an event and the mental representation of the self as agent or experiencer of that event. In conscious experience, thought, and action the mental representation of self is explicitly connected to whatever is being experienced, thought, or done. This procedure makes the person a part of the event that he or she is perceiving, remembering, or thinking about. In consciousness, everything rises or falls on the link to the self.

What unites the various phenomena of the cognitive unconscious—automatic processing and the various forms of implicit perception, memory, and

thought—is that the link to self either does not become forged in the first place or it is subsequently lost. With some disorders of consciousness the link between the fact node and the context node(s) also fails, but that is of secondary importance. Thus automatized procedural knowledge is executed without being represented in working memory at all, although its goals and the conditions of action presumably are (or may be). Hence, so far as the procedure itself is concerned, there is not even the possibility of a link to the self. Procedural knowledge is unconscious, in the proper sense of the word, because it is impossible to make the link to the self under any circumstances.

Preconscious processing concerns declarative rather than procedural knowledge, and thus the link to the self is possible at least in principle. In the usual case of implicit perception, however, in which stimuli are presented for brief periods of time, it may be that the event is never represented in working memory at all—perhaps because attention is focused elsewhere, not enough time is afforded to focus attention on the item, or not enough activation has been built up before the stimulus disappears. In the amnesic syndrome the stimuli are represented in working memory all right, but a permanent link to the self nevertheless fails to be encoded in a manner that supports its later retrieval, perhaps because of damage to certain brain structures. With subconscious processing, the stimulus information is not degraded in any way and is subject to substantial cognitive processing, but it nonetheless fails to make a proper link to the self. Preconscious and subconscious percepts, memories, and thoughts can have effects on ongoing experience, thought, and action, depending on the amount of processing they have received at the time of encoding, but these effects are not accompanied by the phenomenal experience of conscious thought, in James's (1890) sense, because that experience requires links to the mental representation of the self.

A Mechanism for Awareness of Deficits

How can we conceptualize unawareness of deficits in terms of the information-processing models described earlier? It is relatively easy to talk about perception or memory without awareness. The blindsight patient is unaware of visual forms, the prosopagnosic patient is unaware that certain faces are familiar, and the amnesic patient is unaware that certain events have occurred, even though at some level he or she processes the relevant percepts and memories. To account for this state of affairs, all one has to do is assume that complex mental processing can occur in the absence of a link in working memory between the mental representation of some object or event and a mental representation of the self. Thus Claparede (1911/1951) wrote of the amnesic syndrome:

If one examines the behavior of such a patient, one finds that everything happens as though the various events of life, however well associated with each *other* in the mind, were incapable of integration with the *me* itself. [p. 71, emphasis in original]

It is somewhat more difficult to conceptualize *unawareness of deficits*, in contrast to deficits of awareness. Hemianopic patients with anosognosia are not unaware of seeing; rather, they are unaware of *not* seeing. Similarly, patients who

are anosognosic for their amnesia are unaware of *not* remembering; those who are anosognosic for their aphasia are unaware of *not* communicating (see Chapter 3); and those who are anosognosic for their hemiplegia are unaware of *not* moving. What seems to escape the awareness of anosognosic patients is the discrepancy between their expectations and intentions on the one hand and their actual cognitive-behavioral performance on the other. The anosognosic patient does not consciously appreciate the discrepancy between what *should be*, in terms of cognition and behavior, and what *is*.

How do we then become aware of our deficits when we have them? It seems that there are two sources of information available to us. First, there is feedback from the environment: the dismayed expressions on the faces of observers when we make an error, the tone of voice in the examiner who repeats a request we have failed to carry out satisfactorily. Second, there is feedback from ourselves, a mismatch between what we intend and what actually happens; alternatively, there is a mismatch between what we can do or experience now and what we could do or experience in the past.

We assume that anosognosia is not merely a matter of poor interpersonal communication. Nevertheless, from a social-psychological point of view, aspects of the interpersonal context may contaminate some diagnoses. Consider, first, the frequent failure of physicians and other medical personnel to give patients adequate feedback about their examinations. When we conduct a mental status examination, an aphasia battery, or an IQ test, we are trained to behave in an impersonal, nonjudgmental, objective fashion, which effectively forbids us from telling the patient that he or she has made an error in performance. If we do not tell them, how are they ever going to find out? Maybe from other people, but that is not likely in fact. Common courtesy prevents us from pointing out others' errors to them: Consider the anguish we go through before we tell someone that his nose is running, or he has egg on his beard, or that her lipstick is smeared. Such a dilemma poses a test of true friendship. Rather than say a word, we usually try to behave as if nothing at all is wrong and passively allow the person to humiliate himself.

Therefore if even our best friends do not tell us, how are we to find out?

The answer, of course, is by monitoring ourselves. In anosognosia the problem is really one of self-perception or, as Johnson (Johnson and Raye, 1981; see also Chapter 10) would put it, of reality monitoring and metacognition. How would you know you were blind? If you had never been able to see, it would be only after someone else pointed out your deficiency to you. However, if you had been able to see once, you would immediately notice the discrepancy between what happens now when you open your eyes and look around and what used to happen. You know you are amnesic when you recognize a gap between what you do remember and what you know you ought to be able to remember. You know you are aphasic when you recognize the difference between what you intend to say and what actually is articulated. Awareness of such discrepancies is the cognitive, in contrast to the environmental, basis of anosognosia.

The situation is somewhat reminiscent of the Test-Operate-Test-Exit (TOTE) mechanism of Miller, Galanter, and Pribram (1960) or, in more contemporary terms, the production system apparatus of Newell and Simon (1972;

see also Anderson, 1983). In the TOTE system, "action is initiated by an 'incongruity' between the state of the organism and the state that is being tested for" (Miller et al., 1960, pp. 25–26). In a production system architecture, a procedure is executed when there is a discrepancy between a representation of the present conditions and some goal state. It is the conscious recognition of such incongruities and discrepancies that is the basis of awareness of deficits. When we open our eyes, we expect to see something, unless we know it is pitch dark; when we do not see something, even though there is adequate light to support vision, we may begin to think that something has happened to our eyes. When we intend to move our limbs, we expect to see (or feel) them move; and when they do not, we know something is wrong. [In *Kings Row* (1942), the character played by Ronald Reagan discovers that his legs have been amputated and cries, "Where's the rest of me?"] When we try to remember, it is usually because metamemory processes have already indicated that the attempt might be successful—that we ought to be able to recollect the fact or event; and when we recognize failure, in the face of our knowledge (or belief) that we ought to succeed, we begin to suspect we are losing our minds.

Implicit Cognition of Deficits

If anosognosics fail to show conscious awareness of their deficits, do they show *implicit* appreciation of them? Anosognosia, as described, is a phenomenon of explicit cognition: The patient's cognitive-behavioral deficits are not represented in his or her phenomenal awareness. However, as we have seen in cases of implicit perception, memory, and thought, just because something is not registered in awareness does not mean that it is not registered at all or that it cannot influence ongoing experience, thought, and action outside awareness. Therefore the question is whether anosognosic patients might not show changes in task performance that are attributable to the registration of their deficits at some non-conscious level. As McGlynn and Schacter (1989; see also Weinstein, Cole, Mitchell, and Lyerly, 1964) have noted, certain aspects of the routine behavior of anosognosic patients indicate that they do appreciate their deficits at some level of awareness. Thus a patient who denies any psychological deficit may nonetheless remain in bed or otherwise enact the patient role.

For example, Bandura (1977, 1986) has argued that a person's behavior is, in part, determined by his or her belief that he or she can successfully meet the requirements of some situation. In a number of experiments, Bandura and his colleagues have shown that people's confidence that they can execute some behavior is a highly accurate predictor of their actual performance. Decisions involving the choice of situations and the activities to take place within them, the amount of effort and persistence to be devoted to a task, and one's emotional reaction to success and failure are determined, at least in part, by the person's beliefs about his or her operative capabilities. Self-efficacy is not the same as self-esteem, which depends largely on how the culture values the person's self-perceived attributes. However, it is closely linked to concepts of effectance motivation (White, 1959) or competence motivation (Harackiewicz, Abrahams, and Wageman, 1987). Individuals derive information about self-efficacy from var-

ious sources, including vicarious experience and persuasion by others. By far the most important source of self-efficacy information, however, is the person's history of mastery experiences—of repeated success in meeting task demands.

Viewed from this perspective, brain damage should have profound effects on perceived self-efficacy, at least in situations that are relevant to the lesion in question. It is what the catastrophic reaction is all about. We know of no empirical literature on brain damage, and there is little literature from other domains that might be relevant. There are reasons to believe that the elderly may show declines in perceived self-efficacy by virtue of persuasion by a culture that believes in age-related performance declines, vicarious learning from age peers, and comparison with their own levels of performance at an earlier point in life. Anosognosic patients, who are unaware of their deficits, are denied much of this information. No matter how much they may be told by others about their deficits, apparently they lack the personal experience of incapacity that Bandura (1986) suggested is the most important source of self-efficacy judgment. The prediction, then, is that anosognosic patients' self-efficacy judgments are more positive and less accurate than those of patients with comparable brain damage who are aware of their deficits. However, are their judgments as positive as those of intact controls? Perhaps not. Are their self-efficacy judgments totally orthogonal to actual performance? Again, probably not. Pessimism about performance coupled with any degree of accuracy in performance-related predictions might count as evidence of implicit cognition of deficits.

We might obtain additional evidence of implicit acknowledgment of deficits if we examined anosognosics' self-ratings of anxiety, depression, and other personality characteristics. For example, if anosognosics were in no sense cognizant of their deficits, we might expect them to score less on indices of the catastrophic reaction—*anxiety, depression, and the like*—than patients with comparable brain lesions who are aware of their deficits. Such evidence would be especially compelling if anosognosics proved to score normally, with respect to appropriate controls, in terms of dimensions that are unrelated to their deficits, e.g., agreeableness and friendliness.

TOWARD A NEUROPSYCHOLOGY OF CONSCIOUSNESS

These speculations aside, one achievement of contemporary cognitive psychology is a clear theoretical framework for studying the nonconscious mental structures and processes that so interested our nineteenth century forebears. With the development of a new class of psychological theories and a corresponding set of new experimental paradigms, we have revealed a topography of nonconscious mental life that is different from the seething unconscious of Freud and more extensive than the unconscious inference of Helmholtz. Work must now begin to clarify the nature of the processes by which cognitive and motoric procedures are automatized, the scope of preconscious processing of implicit percepts and memories, and the mechanisms underlying dissociation.

Historically, cognitive and clinical neuropsychology have played an important role in this work by revealing relations between conscious and unconscious

mental processes that might well have gone unrecognized in more conventional laboratory work involving subjects who were not brain-damaged. This area is clearly one of the contributions to work on the amnesic syndrome, blindsight, and prosopagnosia, all of which classify in some sense as deficits of awareness rather than merely as deficits of perception or memory. Anosognosia counts even more clearly as a deficit of awareness, a pure deficit that can be attached, as it were, to a wide variety of other cognitive-behavioral deficits. With the beginning of serious experimental work on anosognosia, we can say that we are one step closer to uncovering the biological basis of consciousness and the experience of selfhood that is the essence of human nature.

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Awareness of Deficit After Brain Injury

Clinical and Theoretical Issues

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