The Emotional Unconscious

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One of the earliest marks of the cognitive revolution in psychology was a revival of interest in consciousness, as opposed to behavior. To a large degree, the cognitive psychology which emerged immediately after World War II to replace functional behaviorism was marked by an interest in the span of apprehension, primary memory, attention, and imagery. Now, as we approach the 21st century, cognitive psychology has begun to deal seriously with *unconscious* mental life, and the notion of the *psychological unconscious*: the idea that conscious experience, thought, and action is influenced by percepts, memories, and other mental states which are inaccessible to phenomenal awareness and somehow independent of voluntary control.

The Cognitive Unconscious and Beyond

In the modern history of cognitive psychology, one can discern four early stages in our conceptualization of the psychological unconscious (Kihlstrom, 1995b, 1998a). (1) The first of these might be called the *wastebasket view*:

that the unconscious is comprised of events that are unattended and unrehearsed, and memories that have been lost through decay or displacement. (2) There is also the *file cabinet* view: that the unconscious is comprised of memories that are passively stored, and must be actively retrieved into short-term or working memory in order to play any role in cognitive processing. Note that neither view allows unconscious percepts, thoughts, and memories to be dynamically active. Thus, they do not really satisfy the definition of the psychological unconscious. (3) A more active role for the unconscious appears in the notion of *preattentive processing*, which holds that stimulus events are subject to unconscious processes of feature detection, pattern recognition, and the like before conscious attention is directed to them. (4) An even more active role is suggested by the idea of *automaticity* -- the notion that some cognitive and motoric skills, once executed deliberately, may become automatized through extensive practice -- after which we have no direct introspective access to these procedures or their operations. These ideas allow unconscious processes to play a role in cognition, but they imply that the psychological unconscious is limited to mental processes, and that the contents on which these processes operate are conscious.

Implicit Memory

The idea that mental *contents* might be unconscious, and not just the processes that operate on them, is commonly associated with psychoanalytic theory. But, as Ellenberger (1970) has shown, ideas about unconscious percepts and memories have a history that extends far back beyond Brewer and Freud's (1893-1895/1955) studies of hysteria. And in contemporary psychology it has been revived in the distinction between *explicit and implicit memory* (Schacter, 1987). Explicit memory refers to the conscious recollection of some past event, as in recall and recognition. By contrast, implicit memory refers to any effect of a past event on a person's ongoing experience, thought, and action, regardless of whether that event can be consciously remembered.

Perhaps the most dramatic demonstration of the difference between explicit and implicit memory comes from studies of patients who have suffered bilateral damage to the medial temporal lobes (including the hippocampus) or diencephalon (including the mammillary bodies). These patients show a gross anterograde amnesia, as evidenced by their general inability to recall

or recognize words that have been presented to them for study. But when asked to perform other tasks, they frequently give evidence of the preservation of some sort of memory. The first investigators to document this under controlled conditions were Warrington and Weiskrantz (1968), who found relatively normal retention when the patients were tested with fragments or stems of list items. Thus, after studying a word like ELASTIC, amnesics will be unable to recall or recognize it; but when presented with the stem ELA--, and encouraged to fill in the blanks, they are more likely to produce ELASTIC than ELATED. This phenomenon has now come to be known as a *priming effect*, and it has been demonstrated many times. When amnesic patients, who cannot remember words from a study list, are later given an opportunity to use those same words in another sort of task, they show an advantage for previously studied items as opposed to unstudied neutral items -- an advantage similar in magnitude to that displayed by neurologically intact controls.

Dissociations between explicit and implicit memory can be observed in other forms of amnesia as well, including posthypnotic amnesia (Dorfman & Kihlstrom, 1994; Kihlstrom, 1980),surgical anesthesia (for reviews, see Cork, Couture, & Kihlstrom, 1997; Kihlstrom, 1993b; Kihlstrom & Schacter, 1990; Merikle & Daneman, 1996), and the amnesias associated with electroconvulsive therapy (Dorfman, Kihlstrom, Cork, & Misiaszek, 1995; Squire, Shimamura, & Graf, 1985) and multiple personality disorder (for reviews, see Kihlstrom & Schacter, 1995; Kihlstrom, Tataryn, & Hoyt, 1993), so the effect is quite commonly observed. Implicit memory is also spared in normal aging, which has deleterious effects on explicit memory (e.g., Light & Singh, 1987; Light, Singh, & Capps, 1986; for a review, see Schacter, Kihlstrom, Kaszniak, & Valdiserri, 1993).

Dissociations between explicit and implicit memory can be observed even in normal subjects run under normal laboratory conditions (for a review, see Roediger & McDermott, 1990). Thus, subjects can show savings in relearning items which they can neither recall nor recognize from a previous study trial (Nelson, 1978). Priming effects are unaffected by variables, such as depth of processing during encoding, that profoundly affect conscious recollection (e.g., Jacoby & Dallas, 1981). The study of implicit memory in normal subjects, especially as represented by repetition priming, is now a major enterprise within cognitive psychology (for reviews of this literature, see; Graf & Masson, 1993; Lewandowsky, Dunn & Kirsner, 1989; Roediger & McDermott,

1990). At the same time, the explicit-implicit distinction has also been extended to other domains of cognition (Kihlstrom, 1987, 1990, 1998a).

Implicit Learning

Perhaps the most familiar of these extensions (and one that actually predates the explicit-implicit distinction in memory) is the phenomenon of *implicit learning*, or the acquisition of new patterns of behavior in the absence of awareness of the patterns themselves (for reviews, see Adams, 1957; Berry & Dienes, 1993; Dienes & Berry, 1997; Kihlstrom, 1996a; Neal & Hesketh, 1997; Reber, 1993; Seger, 1994). Implicit learning has been demonstrated by Reber's (1967) work on artificial grammars, in which subjects who have been exposed to letter strings generated according to a complex rule system can classify new instances appropriately, even though they cannot articulate the rules that define the category; Lewicki (1986) has reported conceptually similar experiments involving social categorization and judgment. Similarly, experiments on the control of complex systems show that subjects can learn to manipulate inputs in order to make control outputs, without being able to articulate the relations between them (e.g., Berry & Broadbent, 1984). Finally, it appears that subjects can acquire the ability to predict forthcoming events without being able to specify the underlying sequential structure they have obviously learned (e.g., (Lewicki, Czyzewska, & Hoffman, 1987; Nissen & Bullemer, 1987). Razran (1961) reported that subjects could acquire interoceptive conditioned responses without being aware of either the conditioned or unconditioned stimuli (see also Papka, Ivry, & Woodruff-Pak, 1996). In all these cases, and others, subjects have apparently learned without being aware of what they have learned.

In stark contrast to implicit memory, claims for implicit learning have been highly controversial (Adams, 1957; Dulany, 1997; Shanks & St. John, 1994). Reber (1967, 1993), has defined implicit learning as abstract, automatic, and unconscious, and all three assertions have been seriously questioned by critics. Although questions concerning automaticity and representation are both interesting, in the present context only awareness is relevant, and here it must be admitted that the available evidence is not completely satisfying. For example, while most subjects in artificial grammar learning cannot articulate the entire Markov process by which the grammatical strings have been generated (Reber, 1967), it is also true that above-chance classification performance could result from consciously accessible knowledge of legal

letters, letter positions, or bigrams. Perhaps the best evidence on the positive side is that the subjects experience themselves as behaving randomly. In artificial grammar learning the relationship between accuracy and confidence is very weak (Dienes, Altman, Kwan, and Goode, 1995), while in sequence learning subjects rate their accurate predictions as guesses (Willingham, Greeley, & Bardone, 1993).

Implicit Perception

A somewhat more recent extension of the explicit-implicit distinction is to perception. By analogy to implicit memory, we can define *implicit perception* in terms of the effects of a *current* event (or an event in the very recent past) on performance, in the absence of conscious perception of that event (Kihlstrom, 1996a; Kihlstrom, Barnhardt, & Tataryn, 1992a). Implicit perception includes what has been known as *subliminal perception*, *preconscious processing*, or *detectionless processing*, as illustrated by priming effects involving weak, brief, or masked stimulus presentations (e.g., Greenwald Klinger, & Liu, 1989; Marcel, 1983; Merikle & Reingold, 1990; Pierce & Jastrow, 1885). It also covers priming effects observed in experiments involving parafoveal vision (e.g., Bargh & Petromonaco, 1982; Underwood, 1976) and dichotic listening (Eich, 1984). In each of these cases, the priming is produced by stimuli which can be construed as somehow degraded below some level required for conscious perception. During the recent history of psychology, claims for subliminal perception have been very controversial (e.g., Bruner & Klein, 1960; Dixon, 1971, 1981; Eriksen, 1960; Holender, 1986; Shanks & St. John, 1994), but the effect has now been demonstrated under conditions that should satisfy all but the most incorrigible critics (Greenwald, Klinger, & Liu, 1989; Greenwald, Klinger, & Schuh, 1995; Greenwald, Draine, & Abrams, 1996). It should be noted, however, that truly subliminal processing seems to be analytically limited to very perceptual and very simple semantic analyses (Greenwald, 1992; Kihlstrom, 1993a, 1996a).

However, subliminal perception does not exhaust the category of implicit perception effects. This is because priming and similar effects can be observed under conditions that are not easily classified as subliminal. A neurological case in point is *blindsight* (Weiskrantz, 1986): patient D.B., can make accurate judgments about the visual properties of objects which he cannot see; another is *neglect* resulting from temporoparietal damage (Bisiach,

1993; Rafal, 1998): In at least some cases, the patient's behavior and judgments can be influenced by stimuli presented in the neglected portion of the visual field (Marshall & Halligan, 1988). Similar effects are observed in the functional anesthesias, such as "hysterical" blindness, associated with conversion disorder (e.g., Brady and Lind, 1961; Bryant & McConkey, 1989b), and in some phenomena of hypnosis, such as suggested blindness (Bryant & McConkey, 1989a) and deafness (Spanos, Jones, & Malfara, 1982). in these cases, the stimuli in question are clearly supraliminal: and despite the fact that they are not consciously perceived, they clearly influence the subject's experience, thought, and action. For this reason, Kihlstrom et al. (1992a) preferred the term "implicit" to "subliminal" perception, to underscore the central role of the subject's phenomenal awareness, as opposed to stimulus properties: the subjects are perceiving while unaware of what they are perceiving. Implicit perception is typically revealed by the same sorts of tasks employed in studies of implicit memory, with the difference that in implicit memory, the events in question were consciously perceived at the time they occurred. On these grounds, then, preserved priming following general anesthesia (Cork et al., 1997) might well be classified as a case of implicit perception rather than implicit memory.

Implicit Thought

After memory, learning, and perception, the catalog of cognition comes naturally to thought. Although James (1890) characterized unconscious thought as a contradiction in terms, evidence for *implicit thought* is mounting (Dorfman, Shames, & Kihlstrom, 1994; Kihlstrom, Shames, & Dorfman, 1996). Again by analogy to implicit memory, implicit thought may be said to occur where a thought -- for example, the correct solution to a problem -- influences experience, thought, or action, in the absence of awareness of the thought itself. Implicit thoughts may consist of ideas, beliefs, or images -- any cognitive content, in fact, which is neither a percept (a representation of a current event) or a memory (a representation of a past event); and they appear to be closely associated with the experiences of intuition, incubation, and insight which are hallmarks of creative problem solving.

The notion of implicit thought is exemplified by the research of Bowers and his associates, who showed how the correct solution to a difficult problem can influence choice behavior, even though the subject is not consciously aware of the solution itself (Bowers, 1984; Bowers, Farvolden, & Mermigis,

1995; Bowers, Regehr, Balthazard, & Parker, 1990). Their research involved an adaptation of the Remote Associates Test (Mednick, 1962), in which subjects are presented with two word triplets, one coherent and one incoherent. For the coherent triplet, the items are all associatively related to a single word (e.g., *playing*, *credit*, *report* -- *card*), while for the incoherent triplet, there is no such relation (e.g., *still*,*pages*, *music*). The subject's task is to inspect both triplets, and give the solution to the coherent triplet (the target); if they cannot do so, they are to indicate which triplet is coherent. Bowers et al. (1990, Experiment 1) found that subjects could discriminate between coherent and incoherent triplets at better than chance levels, even when they could not name the target. They further suggested that the subjects' choices reflected information processing outside of phenomenal awareness -- something like the buildup of activation spreading from semantic memory nodes representing the elements of the coherent triplet to a node representing the target. In support of this idea, Shames (1994) found that unsolved but coherent triplets primed lexical decisions concerning their respective targets.

Other experiments also show that, in the absence of awareness of the correct answer, subjects' intuitions about problems, choices, and judgments are not merely random guesses. For example, Bowers et al. (1990, Experiment 2) also showed that subjects could discriminate between picture fragments that could, when properly assembled, represent familiar objects and those that could not -- even though they were unable to tell what the objects were. Durso and his colleagues were able to trace changes in cognitive structure as subjects approached the solution to a problem, even though they had not reached the solution itself (Durso, Rea, and Dayton, 1994). And Bechara and colleagues found that subjects' skin-conductance responses, and choice behaviors, differentiated between advantageous and disadvantageous decks of cards in a gambling game, even though they could not describe the difference between "good" and "bad" decks (Bechara, Damasio, Damasio, & Anderson, 1994; Bechara, Damasio, Tranel, & Damasio, 1997; Bechara, Tranel, Damasio, & Damasio, 1996). These sorts of results converge on the proposition that thoughts, in the form of ideas, images, biases, and the like, can guide behavior even when we are unaware of them.

The Trilogy of Mind

These four categories of phenomena -- memory, learning, perception, and thought -- make up the cognitive unconscious (Kihlstrom, 1987, 1998a; Rozin, 1976). But cognition is not all there is to mental life. At least since the 19th century, many psychologists and philosophers of mind and have classified mental life into three broad faculties, including emotion and motivation as well as cognition (for a review, see Hilgard, 1980). This idea began with Christian Wolfe (1679-1754) who brought the term *psychology* into common use, and who classified the mind into the *facultas cognoscitova* (knowledge) and the *facultas appetiva* (desire). Moses Mendelsohn (1729-1786) added affect (emotion) to the list. The tripartite classification of mental faculties was consolidated by the philosopher Immanuel Kant (1724-1804), who wrote in his *Critique of Judgment* (1790) that "there are three absolutely irreducible faculties of the mind, namely, knowledge, feeling, and desire" (Watson, 1888, p. 311). By this statement, Kant meant that emotion and motivation each have an existence that is in some sense independent of cognition, and of each other. This position which contrasts with the idea, still popular in psychology, that emotional and motivational states are cognitive constructions -- i.e., that they are *beliefs* about what one feels (Schacter & Singer, 1962) or wants (Lepper, Greene, & Nisbett, 1973). Kant's idea of three independent mental faculties is reflected in what Hilgard (1980) has called "the trilogy of mind": cognition, the mental representation of reality through perception, attention, learning, memory, and thought; emotion, the subjective experience of arousal, pleasure, and displeasure, and their expression in behavior; and motivation, the activation of behavior and its direction toward a goal. All three of these mental states enter into the determination of behavior.

We usually think of the cognitive, emotional, and motivational processes that underlie action in terms of conscious mental states. We are aware of what we think, feel, and desire; and we act accordingly. But we have already concluded that cognitive states, such as percepts, memories, and thoughts can affect behavior outside of awareness. If it makes sense to say that cognitive states of perception, memory, and thought can be unconscious, or implicit, it makes sense to ask whether emotional states can be unconscious, or implicit, as well.

The Freudian Model

What might implicit emotion look like? One possibility is that it resembles Sigmund Freud's vision of unconscious mental life (for a detailed analysis of Freud's theory of psychoanalysis, see Macmillan, 1996). Freud (1916-1917/1963, 1933/1964) argued that people are affected by emotional or motivational states of which they are not consciously aware. Later on, when they reflect on their behavior (or perhaps after they have undergone psychoanalysis), they realize what their true feelings and motives are. But when that happens, the insight has the character of an inference, rather than an introspection, and they were never consciously aware of their feelings or desires at the time they acted on them. So, the classic Freudian defense mechanisms (A. Freud, 1936/1966; S. Freud, 1926/1959) all are designed to render the person unaware of his or her true emotions. In reaction formation, we profess love but really feel hate; in displacement, we declare hatred of one person, when we really hate another person entirely; in intellectualization and rationalization, our behavior is stripped of all of its emotional connections entirely. Freud argued that our true emotions were manifest in our behavior, even if they were not represented in consciousness.

Suppes and Warren (1975) have proposed a mathematical model of the kinds of transformations involved in the Freudian defense mechanisms. They begin with a propositional representation of unconscious affect -- of an actor, an action, and an object (*x*) of the action -- as in the prototypical Freudian emotional self-disclosure:

I (actor) *love* (action) *my mother* (object *x*).

They then go on to show that some 44 different defense mechanisms, including all those included in the standard list, can be produced by just eight transformations applied to the actor, the action, or the object, alone or in combination -- e.g., the transformation of self to other, of an action into its opposite, or from object *x* to object *y*.

Thus, displacement retains the original actor and action, but changes the object from *x* to *y*: *I love my father*. In reaction formation, the actor and object remain constant, but the action is changed into its opposite: *I hate my mother*. In projection, the action and the object remain constant, but the actor is changed: *Saddam Hussein loves my mother*. Applying all three trans-

formations, we obtain *Saddam Hussein hates my father* -- a glib and vulgar Freudianism, to be sure, but one which nicely illustrates the essential process by which the defense mechanisms are held to operate so as to render the actual emotional and motivational determinants of our behavior inaccessible to phenomenal awareness.

Of course, one does not have to embrace the whole conceptual panoply of classical (or even neofreudian) psychoanalysis -- the division of the mind into id, ego, and superego, the theory of infantile sexuality, the stages of psychosexual development, repression, and whatnot. And one certainly doesn't have to trace all of one's emotional life to primitive sexual and aggressive instincts. The kinds of emotions whose conscious representations are at issue can be represented by the everyday concepts of folk psychology, as reflected in the affect circumplex (Russell, 1980; Watson & Tellegen, 1985), Murray's (1938) list of needs, and similar ideas. In the present context, what is important in Suppes and Warren's (1975) model is that it suggests two basic ways in which the emotional unconscious can be expressed -- (1) when the original emotion is represented consciously but we are unconscious of the source of that emotion, as in displacement and projection; and (2) where the emotion itself is denied conscious representation, as in reaction formation, intellectualization, and denial.

Emotion as an Expression of Implicit Cognition

One element of the emotional unconscious is that a person may be consciously aware of his or her emotional state, yet unaware of its source in current or past experience. This is the sort of thing the Roman poet and epigrammatist Martial had in mind, when he wrote (*Epigrammata*, Book 1, No. 32, freely translated by the 17th-century English satirical poet Thomas Brown; see Hayward, 1927):

Non amo te, Sabidi,	I do not love you Dr. Fell,
nec possum dicere quare:	but why I cannot tell;
hoc tantum possum dicere,	But this I know full well,
non amo te.	I do not love you, Dr. Fell

It is also what Brewer and Freud (1893-1895/1955) had in mind in their *Studies on Hysteria*:

Hysterics suffer mainly from reminiscences. [But In] the great majority of cases it is not possible to establish the point of origin by a simple interrogation of the patient, however thoroughly it may be carried out... principally because he is genuinely unable to recollect it and often has no suspicion of the causal connection between the precipitating event and the pathological phenomenon.

For Breuer and Freud's unconscious (or repressed) memories, we can substitute implicit ones (for a fuller discussion, see Kihlstrom, 1997b). Viewed in this way, a conscious emotional state may serve as an index of implicit perception or memory. Even though the emotional states themselves are consciously experienced, these phenomena of implicit perception and memory deserve to be counted in the emotional unconscious.

Emotion as an Expression of Implicit Memory

In a classic demonstration of what we have now come to call spared implicit memory in organic amnesia, Claparede (1911/1951) pricked an unsuspecting Korsakoff's syndrome patient with a pin hidden in his hand -- an event that caused her quite a bit of distress. Claparede subsequently left the room, and returned after the patient had regained her composure. Upon questioning, she failed to recognize Claparede, and had no recollection of the unfortunate incident that had just transpired between them. Nevertheless, she refused to shake his hand. When asked why, she replied, "Sometimes people hide pins in their hands". The story illustrates the phenomenon of source amnesia familiar in studies of memory (see Kihlstrom, 1995a). But assuming that the prospect of shaking hands made the patient nervous as well, it suggests a dissociation between conscious awareness of an emotional state, which she probably experienced, and conscious recollection of the origins of that state in experience, which she evidently did not.

In a case of hysterical somnambulism reported by Janet (1893, 1904; see Nemiah, 1979), Madame D. suffered a breakdown after some men jokingly deposited her drunken husband on her doorstep and announced that he was dead. Afterward, the woman had no conscious recollection of the event. But whenever she passed by her front door, she froze with terror. Moreover, she complained of dreams in which her husband was brought home dead. Here again, we have an emotional state -- terror, and distress about the dreams -

- and emotional behavior -- freezing, as well as the nightmares; but no awareness of why they occur.

A third example comes from a case of phobia for running water reported by Bagby (1928). The patient had no memory of the circumstances under which this intense emotional reaction had been acquired. However, the mystery was solved when the patient was visited by an aunt who said, as an aside, "I have never told". It turned out that the patient, as a child, had gone on a picnic with the aunt; and, as children are wont to do, she had disobeyed instructions, strayed into a nearby creek, and become trapped under a waterfall. The child was rescued by the aunt, who promised to keep her transgression a secret. Apparently, memory for the incident was lost -- perhaps due to a process like repression or dissociation, perhaps merely to childhood amnesia or ordinary forgetting -- but the phobia remained solidly entrenched. In this case, the symptom appears to be an implicit memory for an incident lost to explicit memory.

The evidence for emotion as implicit memory is not limited to anecdote (Tobias, Kihlstrom, & Schacter, 1990). There are several formal studies that also demonstrate that emotional responses can persist in the absence of corresponding awareness of the past circumstances in which they were acquired. A study by Johnson, Kim, and Risse (1985) made use of the "mere exposure" effect on preferences (Zajonc, 1968): repeated exposure to an object tends to increase judgments of likability, even if there is no substantive information presented that would support such attitudinal change. Johnson et al. exposed Korsakoff syndrome patients (who are amnesic as a result of damage to diencephalic structures) and controls to unfamiliar Korean melodies. Some melodies were played only once during the study phase, while others were played five or ten times. Later, the subjects were played these melodies, and other Korean melodies that were entirely new, and asked to indicate which they preferred. As expected from the mere exposure effect, both Korsakoff patients and controls preferred old over new melodies, although there was no effect of the number of exposures given to the old tunes. However, the patients showed greatly impaired levels of recognition, compared to the controls. Thus, exposure affected the amnesic patients' preference judgments, and index of emotional response to the melodies, even though the patients showed impaired memory for the exposure trials.

A second study by Johnson et al. (1985) provided subjects with more substantive contact with the stimulus materials. The same amnesic and control patients who served in the melodies study were presented with pictures of two male faces, accompanied by fictional biographical information presented that depicted one individual positively (the "good guy") and the other negatively (the "bad guy"). When asked whom they preferred, control subjects always chose the face that had been paired with the positive information; and they were always able to state that their judgment was made on the basis of the accompanying descriptive information. The amnesic patients also showed a strong (though not unanimous) preference for the "good guy"; however, they were able to recall only a negligible amount of the biographical material presented at the time of study. Again, some aspect of emotional response -- liking of persons instead of melodies -- was altered by information presented during the study phase, in the absence of conscious recollection of this information.

Unfortunately, another group of investigators failed to obtain the mere exposure effect in a mixed group of amnesic patients who were repeatedly exposed to photographs of faces (Redington, Volpe, & Gazzaniga, 1984), suggesting that the exposure effect on preferences is not always dissociable from explicit memory. However, Johnson and Multhaup (1992) essentially confirmed the findings of Johnson et al. (1985) with a new sample of amnesic patients. In the melodies experiment, amnesic patients preferred old melodies new ones but controls did not; controls remembered the melodies well, but amnesics did not. In the impression formation experiment, both amnesics and controls preferred the "good guy" to the "bad" one, even though the amnesics recalled very little of the biographical information presented at the time of study.

The dissociation between acquired emotional preferences and explicit memory was confirmed by an experimental case study with patient Boswell, who had been was rendered densely amnesic following a case of herpes encephalitis (Damasio, Tranel & Damasio, 1989). Despite a profound inability to recognize people, it had been noted that Boswell would go to a particularly generous staff member if he wanted something. In the experiment, Boswell had an extended series of positive, negative and neutral encounters, respectively, with three different confederates. Upon subsequent questioning, Boswell was unable to recall anything about any of the people and never indicated that they were familiar in any way. Nonetheless, when asked on a

forced-choice test whom he liked best, and would approach for rewards and favors, he strongly preferred the "good" confederate over the "bad" one, with the neutral confederate falling in between.

In addition to the disorders of memory produced by lesions to specific brain structures, there are also functional disorders of memory observed in the dissociative syndromes of psychogenic amnesia, psychogenic fugue, and multiple personality disorder. One of the interesting features of the functional amnesias is that patients often display implicit memory for events lost to conscious recollection: sometimes this implicit memory takes the form of an emotional response. For example, in a case reported by Kaszniak and his colleagues, a victim of attempted homosexual rape was amnesic for the incident, but experienced severe distress when shown a TAT card picturing a person attacking another from behind (Kaszniak, Nussbaum, Berren, & Santiago, 1988). Similarly, Christianson and Nilsson (1989) observed that a woman who had suffered severe amnesia following assault and rape became extremely upset when returned to the scene of the crime, even though she had no explicit memory for the event. Finally, in Prince's (1910) case of Miss Beauchamp, a multiple personality, one alter ego, "B IV", experienced strong emotional reactions to people and places that had emotional meaning to personality "B I" and vice versa; however, neither personality had explicit memory for the emotionally arousing objects of the other and each would be puzzled by their inexplicably intense reactions to such stimuli. Similar dissociations of affect from awareness have been reported in "split brain" patients (Gazzaniga, 1985; LeDoux, Wilson, & Gazzaniga; Sperry, Gazzaniga, & Bogen, 1969).

Amnesia for the source of a consciously experienced emotion is also a familiar phenomenon in hypnosis. While hypnotic suggestions are typically intended to alter some aspect of cognitive functioning, they can also have emotional and motivational effects. When these suggestions are accompanied by further suggestions for amnesia, the subject can experience a profound change in mood state, without knowing why this occurs. For example, Luria (1932) suggested to hypnotized subjects that they had committed a terrible crime, and then covered this paramnesia with a further suggestion for posthypnotic amnesia. On a later word-association test, the subjects showed evidence of anxiety in response to cues related to the suggested crime, even though they were amnesic for the suggestion. Luria's findings were essentially replicated by Huston, Shakow, and Erickson (1934).

In a related line of hypnosis research, Levitt (1967; Levitt & Chapman, 1979) administered direct suggestions for anxiety to hypnotic subjects, followed by a suggestion for posthypnotic amnesia. Even though the subjects could not consciously remember the suggestion, they displayed elevated levels of anxiety on various test measures. Similar findings were obtained by Blum (1979) and his colleagues. In their studies, subjects receive suggestions to relive a conflictual, ego-threatening experience from early childhood, and then a suggestion for posthypnotic amnesia covering the experience. The result, according to Blum, was to leave the subject in a state of anxiety which is free-floating, not tied to any hypnotic or childhood experience.

Most recently, Bower and his colleagues (Bower, 1981; Bower, Gilligan, & Monteiro, 1981; Bower, Monteiro, & Gilligan, 1978) used a variant on Luria's technique to study mood-dependent memory. In these experiments, hypnotized subjects were given hypnotic suggestions to relive a particularly happy or sad experience from their past, and further given posthypnotic suggestions to experience those happy and sad emotional states, stripped of cognitive content about the instigating event, in response to particular cues. The suggestion was further covered by one for posthypnotic amnesia. Thus, during the experiment proper the subjects felt happy or sad without being aware that this was something that had been suggested to them previously, or which was more distantly related to some previous experience in their lives.

The studies just described converge on the conclusion that emotional response can serve as an index of implicit memory. That is, subjects can display emotional responses that are attributable to some event in their past history, in the absence of conscious recollection of that event. However, it must be admitted that the evidence in this regard is rather sparse, especially when compared to the vast body of literature on the perceptual and cognitive expressions of implicit memory (e.g., Roediger & McDermott, 1990; Shacter, 1987). More systematic studies are needed, employing both amnesic patients and normal subjects, specifically testing the hypothesis that emotional response, as an expression of implicit memory, can be dissociated from conscious recollection.

Emotion as an Expression of Implicit Perception

There is considerably better evidence for emotion as an index of implicit *perception* -- that is to say, where emotional responses are attributable to some event in the current environment, in the absence of conscious perception of that event. Here again, we begin with anecdote, and proceed to some formal studies.

Levinson (1965) reported on a woman who came out of surgery inexplicably weepy, depressed, and disconsolate. The reasons for this remained obscure until Levinson, on a hunch, hypnotized the patient and regressed her to the time of the surgery -- at which time she blurted out, "the surgeon says it might be malignant!". Further investigation revealed that the doctors had discovered a possible malignancy during the surgery and had discussed it while she was anesthetized (subsequent investigation proved it to be benign). Now adequate anesthesia, by definition, abolishes conscious awareness and thus explicit memory for surgical events. But, as discussed earlier, there is some evidence for the preservation of priming effects. Apparently, implicit perception during anesthesia can appear not just in the form of repetition priming effects, but also in terms of full-blown emotional states.

More recently, Traub-Werner (1989) reported on an unusual case of simultaneous panic attacks in two agoraphobic patients. The first patient's symptoms had been well controlled by clonazepam and amitryptyline; but one day, while she was washing her face, she unexpectedly experienced anxiety, fear of falling, palpitations, and depersonalization. She hid under the bed for some minutes, until she felt better. Later that day, she received a phone call from a friend, also agoraphobic, who reported her worst panic attack in years -- at precisely the same time of day. Further investigation revealed that an earthquake, registering magnitude 6 on the Richter scale, had occurred not far away at exactly the time of the two patients' panic episodes. The interpretation is that an associated earth tremor, too weak to be consciously felt but perhaps picked up by the vestibular system, may have evoked anxiety in the first patient.

More mundane perhaps, but certainly more tightly controlled, evidence of emotion as an index of implicit perception has emerged in a line of research on "subliminal mere exposure effects". Recall Zajonc's (1968) discovery that mere exposure is sufficient to increase judgments of likability, an arguably

affective response; and the evidence from Johnson et al. (1985) and Damasio et al. (1989) that the exposure does not have to be consciously remembered in order to have an emotional effect (see also Moreland & Zajonc, 1977, 1979; but see Birnbaum & Mellers, 1979a, 1979b). Interestingly, it appears that the exposure does not have to be consciously *perceived*, either. For example, Wilson (1979) found that subjects preferred tones that had been presented in the unattended channel during a dichotic listening procedure to tones that had not been previously presented. Similarly, Kunst-Wilson & Zajonc (1980) presented a set of irregular polygons on a tachistoscope, with exposures so brief that the stimuli were not consciously perceived: nevertheless, rated preference was affected by prior exposure history (for an alternative interpretation, see Mandler, Nakamura, & Van Zandt, 1987).

This "subliminal" mere exposure effect has been replicated and extended by a number of investigators (e.g., Bonnano & Stillings, 1986; Murphy & Zajonc, 1993; Seamon, Brody, & Kauff, 1983a, 1983b; for reviews, see Bornstein, 1989, 1992). In perhaps the most dramatic extension of the Kunst-Wilson and Zajonc (1980) study, Bornstein and his colleagues found that subliminal exposures can affect not only subjects' preferences for people's faces, but also their interpersonal behavior towards those very same people when they actually meet them later (Bornstein, Leone, & Galley, 1987). Subjects who were subliminally exposed to a picture of a confederate during the study phase were more likely to express agreement with that confederate on a judgment task. However, testing of a separate group of subjects indicated that recognition of the "old" confederate was at chance levels, indicating that the faces had not been consciously perceived during the study phase. In fact, a meta-analysis by Bornstein (1989) found that the magnitude of the mere exposure effect was significantly greater with subliminal than with supraliminal stimuli. Apparently, affective judgments are influenced by perceptual fluency, which in turn is enhanced by the priming effects of the subject's initial exposure to the material. When subjects consciously remember the prior exposure, they appear to correct their preference ratings accordingly; but when the initial exposure is subliminal, so that subjects do not consciously perceive (much less consciously remember) it, subjects are unable to engage in discounting, resulting in a stronger effect on preference judgments (Bornstein, 1992; Bornstein & D'Agostino, 1992, 1994; see also Klinger & Greenwald, 1994).

Other investigators have found similar sorts of effects, where subliminal or unattended stimuli have effects on judgments and behavior that would be clearly labeled as "emotional". For example, Murphy and Zajonc (1993) found, like Bornstein (1989), that subliminal exposure to emotional faces produced increased liking and preference for Chinese ideographs. In their view, the familiarity produced by subliminal exposure created diffuse positive feelings analogous to (though different in valence from) the clinical concept of free-floating anxiety.

Of course, considerable early evidence for emotion as implicit perception was provided by investigations of perceptual defense, subception, and other aspects of the "New Look" (Bruner & Klein, 1960; see also Erdelyi, 1974; Greenwald, 1992; Kihlstrom et al., 1992a, 1992b). More recently, Bargh and Pietromonaco (1982) found that subjects who had been exposed to hostile words followed by a masking stimulus attributed significantly more negative qualities to a pictured person than subjects who had not received this masked exposure (see also Bargh, Bond, Lombardi, & Tota, 1986). Similarly, Devine (1989) found that unmasked parafoveal presentation of words related to negative stereotypes of African-Americans led to more negative evaluations of a target person whose race was unspecified.

Niedenthal (1990, 1992; Niedenthal, Setterlund, & Jones,1994) and her colleagues have produced yet another emotional adaptation of the basic subliminal priming paradigm. In the study phase of each experiment, briefly presented primes consisting of faces expressing emotions of joy or disgust were rendered subliminal by means of a metacontrasting presentation of clearly supraliminal cartoon figures. In the test phase, the subjects were asked to discriminate between old, previously presented cartoons and new distractors. These were also preceded by a face prime, which again was rendered subliminal by metacontrast. On half the test trials, the affect associated with the prime was the same as it had been on the study trials; for the remainder, the prime was drawn from the opposite emotional category. Congruence between the primes generally facilitated recognition of the targets, especially when the prime was negative. A second study, in which emotionally charged faces or scenes primed emotionally neutral women's faces, obtained essentially the same effect. Moreover, the affective valence of the prime influenced the subjects' interpretations of the target's emotional state. Based on research indicating that the perception of emotionally expressive faces induces a similar emotional state in the perceiver (Niedenthal & Showers,

1991), Niedenthal has proposed that a subliminal emotional prime elicits a corresponding emotional state in the perceiver; this state then serves as a cue for both perceptual identification and recognition memory. It is also, therefore, an expression of implicit perception.

Additional evidence that subliminal emotional primes actually elicit conscious feeling states comes from research on subliminal fear conditioning by Ohman and his colleagues (for reviews, see Ohman, 1998). In one line of research (Ohman, Dimberg, & Esteves, 1989), subjects were conditioned to associate an electric shock with presentation of an angry face (an unreinforced happy face served as a control stimulus). In subsequent unreinforced test trials, the angry face was masked by a neutral face. Despite the fact that subjects could not consciously perceive the angry face, they gave conditioned electrodermal responses when it was presented, compared to masked presentation of the happy face. A subsequent pilot study showed that acquisition of a conditioned fear response is possible, even when the conditioned stimulus is masked and therefore not consciously perceptible. In another line of research, Ohman & Soares (1993, 1994) substituted nonmasked pictures of snakes, spiders, flowers, and mushrooms as conditioned stimuli. On unreinforced test trials, masked pictures of snakes and spiders elicited conditioned electrodermal fear responses, but masked pictures of flowers and mushrooms did not. The fact that only the snake and spider pictures survived masking was interpreted within the framework of Seligman's (1971) preparedness theory of phobias which argues that, by virtue of our evolutionary history, some stimuli (such as snakes and spiders) automatically give rise to rapid and long-lasting conditioned fear responses. In this case, the assumption of automaticity of the association is supported by the fact that the fear response persists even when the fear stimulus is subliminal, and thus unattended.

To date, the most systematic exploration of preconscious emotional processing has been conducted by Greenwald and his colleagues (Greenwald, Draine, & Abrams, 1996; Greenwald, Klinger & Liu, 1989; Greenwald, Klinger, & Schuh, 1995) explored another emotional response: evaluative judgments of words. These studies are especially notable for the amount of care taken to address methodological criticisms of earlier studies purporting to demonstrate subliminal perception (e.g., Eriksen, 1960; Holender, 1986). In all the experiments of the series, subjects are asked to judge an aspect of the connotative meaning of a word: whether it is affectively positive or

negative. In their earliest experiments, presentation of the target word was preceded by a prime word which was either affectively positive or negative. The prime was so effectively masked that subjects were unable to determine whether it appeared on the left or the right side of a fixation point. Nevertheless, evaluative judgments of the target were facilitated by the presentation of primes drawn from the same affective category. More recently, Greenwald et al. (1996) added a further refinement, in which subjects were constrained to make their judgments of the target within a very brief period of time following its presentation -- further insuring that the influence of the prime on the target judgment was not the product of conscious reflection.

On the basis of early studies showing a dissociation between preference judgments and conscious recollection (Moreland & Zajonc, 1977) and conscious perception (Kunst-Wilson and Zajonc, 1980), Zajonc (1980, 1984a, 1984b) argued that emotional processing is independent of, and temporally prior to, cognitive processing (see also Lazarus, 1982, 1984). However, later studies documenting similar dissociations between explicit and implicit expressions of memory (e.g., Schacter, 1987) and perception (e.g., Kihlstrom et al., 1992a) put a different light on the early results. One might just as well conclude, with respect to memory, that dissociations between recall and priming show that memory *itself* is independent of, and temporally prior to, cognitive processing. It is now clear that, in the early studies and those that followed, some aspect of emotional response is serving as an implicit expression of perception and/or memory. But unconscious cognition is still cognition. Furthermore, if there were an emotional system separate from cognition, it would still need the cognitive capacity to analyze stimuli, link them to prior knowledge, and generate emotional feelings and expressions (Leventhal, 1980, 1984). The fact that such cognitive processes can go on outside of awareness, so that changes in evaluative judgment and other aspects of emotional response can be dissociated from explicit perception and memory, yields one aspect of the emotional unconscious. People can be aware of their emotional states, but unaware of the percepts and memories which evoke these states.

"Feeling Memories": A Cautionary Note

Clinical folklore about post-traumatic stress disorder has revived the notion, originated by Brewer and Freud (1893-1895/1955) that unconscious memories of trauma express themselves implicitly as intrusive feelings (see, e.g.,

Bass & Davis, 1988; Blume, 1990; Frederickson, 1993; Herman, 1992; Terr, 1994; van der Kolk, McFarlane, & Weisaeth, 1996; for a detailed analysis of the parallels between Freud's theories and later clinical practices, see Bowers & Farvolden, 1996; Crews, 1995; Kihlstrom, 1996b, 1997b, 1998c). For example Frederickson (1992) has distinguished between a conscious *recall memory* and an unconscious *feeling memory*:

Feeling memory is the memory of an emotional response to a particular situation. If the situation we are being triggered to remember is a repressed memory, we will have the feelings pertaining to the event without any conscious recall of the event itself. Feeling memory is often experienced as a flood of inexplicable emotion, particularly around abuse issues.... A felt sense that something abusive has happened is a common form of a feeling memory. Some survivors will say, "Yes, I think I was sexually abused, but it's just a gut feeling." These clients are experiencing a feeling memory about being abused, even though at that moment they can recall nothing about their abuse (p. 92).

In some respects, the notion of a "feeling memory" finds support in the literature reviewed in this section, which indicates that emotional responses can, indeed, serve as expressions of implicit memory. However, there is an important difference: the experimental literature we have reviewed provides independent corroboration of the emotion-eliciting event. Implicit memory may be inferred only when such evidence is available, and such information is rarely available in clinical practice. Nevertheless, clinical practitioners may infer a history of prior trauma and abuse from the patient's current emotional symptoms, and then engage in therapeutic practices intended to recover the traumatic memories and restore them to conscious accessibility. Of course, in the absence of objective corroboration of the patient's history, such inferences are tautological, and should be avoided -- not least because the techniques used to recover ostensibly lost memories are highly suggestive, and may lead patients to reconstruct distorted or false memories of trauma and abuse (Kihlstrom, 1996b, 1998c; Lindsay & Read, 1994, 1995; Shobe & Kihlstrom, 1998).

Implicit Emotion

But can people be unaware of their emotional states themselves? The proposition seems to contain an internal contradiction, because emotions must be

felt, and feeling is by any ordinary definition a conscious experience (Clore, 1994). But environmental stimuli must be felt, too; yet cognitive psychology and cognitive neuroscience is gradually coming to terms with the possibility that percepts can be unconscious (Kihlstrom et al., 1992a; Greenwald et al., 1996), just as it earlier came to terms with the possibility that memories can be unconscious (Roediger & McDermott, 1990; Schacter, 1987). If there is a cognitive unconscious, in which percepts, memories, and thoughts influence experience, thought, and action outside of phenomenal awareness, then why can't there be an *emotional* unconscious as well? The answer depends on how we define emotion. If we define emotion as a conscious feeling state, a positive answer is foreclosed, by definition. But if we define emotion differently, the question is at least open to empirical evidence.

Desynchrony

In his classic research on experimental neurosis in dogs, Gantt (1937, 1953) observed that separate components of a conditioned fear response could be acquired and extinguished at different rates, and persist for different lengths of time, resulting in an organismic state of *schizokinesis* reflecting the "disharmony or cleavage in behavioral, somatic, and psychophysiological response systems" (Mineka, 1979, p. 987). The clear implication of Gantt's work is that a multifaceted emotional response, and that these facets can be separated, or dissociated, from each other.

Gantt's (1937, 1953) observations have been confirmed in more recent research on fear conditioning. For example, Mineka (1979) distinguished four quite different response systems which have been used in the study of fear conditioning in nonhuman animals: conditioned emotional responses, increased rate of conditioned avoidance response, passive avoidance, and conditioned heart rate. Further, she showed that these indices of fear could be dissociated from learned avoidance behavior. Animals can behave *as if* they are afraid, even if they do not appear to manifest fear according to some standard laboratory measures (see also Mineka, 1985, 1992). One interpretation of such findings is that, contrary to Mowrer's (1947) two-process theory, avoidance learning is not motivated by fear. Another is that the subjective experience of fear is only one component of a broader emotional response to fear stimuli. Similar observations have been made in the case of human fears and phobias. For example, in a study of systematic desensitization of snake phobia, Lang and Lazovik (1963) found that some

subjects would show substantial changes in avoidance behavior, while still expressing fear of the snake; other subjects would deny fear of the snake, but show elevated cardiovascular activity and persisting avoidance behavior.

Based on observations such as these, Lang (1968, 1971, 1978, 1988; Lang, Rice, & Sternbach, 1972) proposed a *multiple-system theory of emotion*. According to this theory, every emotional response consists of several components: verbal-cognitive, corresponding to subjective feeling state (e.g., of fear); overt motor, or behavioral, response (e.g., escape or avoidance); and a covert physiological response mediated by the autonomic and skeletal nervous systems (e.g., skin conductance or heart rate). Lang further proposed that these three systems are partially independent, although they also interact with each other in important ways. When all three systems act together, the person experiences intense emotional arousal. Under circumstances of attenuated emotion, however, the correlations among these systems tend to break apart, at the same time as their individual levels of activity are reduced.

Moreover, Lang proposed that the different components of emotion can have different developmental histories. For example, autonomic responses to emotional stimuli may appear early in development, with the behavioral and cognitive responses emerging only later. Or, alternatively, the cognitive component of an emotional state can be acquired first, as for example through the social learning of fear, with the behavioral and physiological components coming on line later, if at all. Lang further proposed that effective psychotherapy for anxiety states and other emotional disorders should be directed at all three components: it cannot be assumed for example, that flooding directed at reduce compulsive behavior will necessarily reduce subjective anxiety and physiological arousal as well.

Rachman and Hodgson (1974; Hodgson & Rachman, 1974; Rachman, 1978, 1981, 1990) picked up Lang's theme and explored the implications of *desynchrony* among emotional systems, and especially between overt behavior and covert physiology, for the treatment of anxiety disorders. They proposed that different forms of treatment would have different effects on the various components of fear and anxiety: for example, flooding might reduce avoidance behavior but leave autonomic arousal largely intact; on the other hand, spontaneous remission would affect autonomic arousal first, but behavioral avoidance would persist for a longer period of time. Like Lang (1968),

Rachman and Hodgson proposed that fear and anxiety should be assessed in terms of all three components, and that treatment should be directed toward that component which was most "abnormal" (see also Norton, DiNardo, Barlow, 1983). One way or another, however, the remaining components would eventually catch up. So long as one component persisted unchanged, in their view, the likelihood of relapse remained high.

The general idea of desynchrony is that an emotional response can be manifest at one level, but not at another (Hugdahl, 1981; Turpin, 1991). Given that they were writing from a tradition of behavior therapy which emphasizes objective measurement, it is perhaps natural, and certainly understandable, that both Lang (1968) and Rachman (1978) placed most emphasis on desynchrony between the behavioral and physiological components of emotion. In the present context, however, we are most interested in cases that represent the emotional analog of the explicit-implicit distinction in memory: where the subjective component of an emotion (conscious feeling state) is absent, while the behavioral and physiological components persist outside of phenomenal awareness. The snake phobic denies fear, but somehow never quite manages to go near the reptile house at the zoo; the agoraphobic claims to be cured, and even ventures outside the house, but blood pressure and heart rate still go way up. If such observations reflected merely denial, or a flight into health, they would not be too interesting. But suppose that the patients' reports accurately reflect the subjective state of affairs -- that they really do not experience the emotions that used to bother them. If the behavioral and autonomic signs of emotion persist unabated, why can't we say that they are displaying unconscious emotion -- or at least an unconscious emotional response?

Apparently, dissociations between subjective feelings and covert psychophysiological response are found quite commonly in the anxiety disorders (e.g., Barlow, Mavissakalian, & Schofield, 1980; Craske, Sanderson, & Barlow, 1987; Vermilyea, Boice, & Barlow, 1984; for reviews, see Barlow, 1988; Rachman, 1990). Indeed, such findings were a primary motive for Lang's proposal of the multiple-systems theory of emotion in the first place (Lang & Lazovik, 1963). Cardiology clinics frequently encounter patients who complain of behavioral and physiological symptoms associated with panic disorder but who report no subjective fear or distress, aside from concern about the presenting complaints themselves (Kushner & Beitman, 1990; Beitman, Mukerji, Russell, & Grafing, 1993). Similar patients have been seen in neu-

rology clinics (Russell, Kushner, Beitman, & Bartels, 1991). A survey of students with a history of panic attacks found that those who reported "fearless" panic attacks were less likely to engage in avoidance behavior, or to use alcohol or drugs as coping strategies.

Some evidence for desynchrony between subjective experience and covert psychophysiology is also provided in the literature on child-parent attachment. Dozier and Kobak (1992) administered an attachment interview in which subjects were asked to express their feelings about a number of different imagined scenarios involving separation from their parents. Subjects scoring high on a dimension of *deactivation/hyperactivation*, who strategically divert attention from thoughts, memories, and feelings related to attachment, showed greater skin conductance responses to scenarios involving parental separation, rejection, threats of separation, and changes in relationship with the parents.

Unfortunately, dissociations between subjective feelings and overt behavioral response appear to be much less common (e.g., Lang, Lazovik, & Reynolds, 1965). Moreover, evaluations of treatment outcome typically indicate that cognitive subjective fear persists even as behavioral and psychophysiological indices of fear diminish -- precisely the opposite of the pattern of desynchrony implied by the concept of implicit emotion (e.g., Lang & Lazovik, 1963; Gerew, Romney, & LeBoef, 1989; Thomas & Rapp, 1977).

The emotional deficits (e.g., "blunted" or "inappropriate" affect) commonly associated with schizophrenia also have a flavor of desynchrony (Dworkin, 1992). Thus, *anhedonia* refers to a deficit in the conscious experience of emotion, which may leave behavioral or physiological expressions of emotion unimpaired. Similarly, *flat affect* refers to a deficit in the behavioral expression or display of emotion, which may not extend to subjective experience or covert physiology. In fact, Kring and Neale (1993, 1996) found that schizophrenic patients expressed significantly less emotion than normal controls in response to emotional film clips; however, self-reports of emotional experience did not differ between the groups, and the schizophrenics actually showed greater skin conductance reactivity. Again, this is desynchrony, but it is not the desynchrony implied by the concept of implicit emotion.

Individual Differences in Emotional Experience and Expression

A lack of awareness of emotion may be implicated in several different dimensions of individual differences, the most obvious of which is repression. Although conceived by Freud as a general psychological process available to everyone, a tendency to use repression as a defense may be reconstrued as an individual difference variable, as it was by Rosenzweig in his work on the Zeigarnik effect in memory, and his exploration of the personality correlates of hypnotizability (Rosenzweig, 1938; Rosenzweig & Mason, 1934; Rosenzweig & Sarason, 1942; Sarason & Rosenzweig, 1942). Unfortunately, early attempts to measure individual differences in repressive tendency by means of questionnaires, as exemplified by Byrne's (1961, 1964) Repression-Sensitization Scale (RSS; Bell & Byrne, 1978), foundered on the shoals of discriminant validity: somewhat paradoxically, perhaps, repression as measured by the RSS proved to be highly correlated with anxiety and distress. However, other measurement approaches may prove more useful to understanding the differences between explicit and implicit emotion.

Repressive Coping Style. More recently, Weinberger and his associates have attempted to construct a measurement of repressive coping style which is free of such confounds (Weinberger, 1990; Weinberger, Schwartz, & Davidson, 1979). In Weinberger's original procedure (Weinberger et al., 1979), subjects who show extremely low levels of trait anxiety, as shown on Taylor's Manifest Anxiety Scale (MAS; Taylor, 1953), but extremely high levels of defensiveness, as shown by the Marlowe-Crowne Social Desirability Scale (SDS; Crowne & Marlowe, 1960), are labeled as "repressors". Although repressors do report low levels of anxiety, Weinberger et al. (1979) found that they showed elevated levels of physiological response -- EMG, heart rate, and galvanic skin resistance -- to sexual and aggressive phrase stems. In fact, their levels of physiological reactivity were comparable to those shown by high-anxious, nondefensive subjects. The general thrust of these results was later confirmed by Asendorf & Scherer (1983). Given results such as these, we might want to speculate that repressors have a talent for desynchrony: they may not display high levels of stress to others, or even experience it themselves; but at the same time, their physiology is churning away anxiously. This situation may be construed as a dissociation between

explicit (subjective) and implicit (behavioral or physiological) components of emotion.

Unfortunately, however, there has been no followup of this early evidence of implicit emotion. Instead, research has focused on the development of new methods for assessing repression, and on repression as a risk factor for medical complaints. Thus, Weinberger (1990, 1997; Weinberger & Schwartz, 1990) reformulated the concept of repressive tendency, and introduced a new instrument, the Weinberger Adjustment Inventory (WAI), for measuring individual differences in repressive coping style. The WAI follows the same logic as the earlier procedure, but whereas the original formulation involved a fourfold typology (produced by splitting the two dimensions of anxiety and social desirability), the new measure yields six categories. Subjects who are low in distress (anxiety, depression, low self-esteem, and low well-being) and at least moderately high in restraint (impulse control, suppression of aggression, consideration of others, and responsibility) are candidates for identification as repressors. However, a measure of defensiveness (denial of distress, repressive defensiveness) is added to the mix in order to distinguish between genuine repressors and the merely self-assured. As a means of identifying repressors, the WAI is more conservative than the older procedure employing the MAS and SDS (Mulvaney, Kihlstrom, Figueredo, & Schwartz, 1992). Still, to date no research has attempted to replicate the observations of Weinberger et al. (1979) with the new measure, nor -- except for the replication of Asendorf and Scherer (1983), has any published research examined repressive style with respect to implicit emotion.

Alexithymia and Anhedonia. Another potentially relevant personality construct is *alexithymia* (Nemiah, Freyberger, & Sifneos, 1981; Nemiah & Sifneos, 1970; see also Apfel & Sifneos, 1979; Taylor, 1984; Taylor & Bagby, 1988; Taylor, Bagby, & Parker, 1997; Taylor & Taylor, 1997), in which people have difficulty describing their emotional states, or even in discriminating one state from another. Alexithymia, or restricted emotionality, seems at least superficially similar to the repressive coping style (Weinberger, 1990). Again, it may be that alexithymic individuals have "no words for feelings" -- a fairly direct translation from the Greek roots -- because they are not aware of their feelings in the first place (Lane, Ahern, Schwartz, & Kaszniak, 1997). Alexithymia is a prominent feature among neurological patients with hemispheric commissurotomy (e.g., Hoppe & Bogen, 1977; TenHouten, Hoppe, Bogen, & Walter, 1985, 1986; TenHouten, Walter, Hoppe, &

Bogen, 1988), suggesting that the division in awareness affecting such patients includes an inability to communicate, via the language centers of the left hemisphere, emotion arising from centers in the right hemisphere. In other words, the left hemisphere might not be aware of, and thus unable to communicate, emotions of which the right hemisphere is perfectly aware -- awareness which might be revealed if the right hemisphere possessed the same language skills as the left. In any event, the alexithymic patient's inability to discriminate between such feelings as anger and sadness suggests a rather marked deficit in explicit emotion. The question, then, is whether we can find evidence for *implicit* emotion in these people, in terms of behavioral or physiological indices. Clinical lore, as well as an increasing body of empirical data, indicates that alexithymics are at risk for psychophysiological and somatoform disorders. Perhaps alexithymics, like repressors, have a talent for desynchrony, with emotion expressed physiologically even if it is not experienced subjectively.

Alexithymia should be distinguished from *anhedonia*, an inability to experience positive emotions (Chapman, Chapman, & Raulin, 1976). However, the alexithymic inability to communicate emotions to others is correlated with social anhedonia, or a preference for solitary as opposed to social activities (Prince & Berenbaum, 1993). In the present context. however, we may offer the hypothesis that physical anhedonia affects explicit (subjective) components of positive emotion, leaving implicit (behavioral and physiological) components of positive emotion intact.

Levels of Emotional Awareness. Lane and his colleagues (Lane, Quinlan, Schwartz, Walker, & Zeitlin, 1990; Lane & Schwartz, 1987, 1992) have drawn on the developmental theories of Piaget and Werner (for a review, see Flavell, 1963) to propose five levels of emotional awareness determined by the manner in which the individual's emotional states are organized. According to their theory, emotional experience is progressively differentiated and integrated as the individual develops cognitively. At the lowest level, roughly corresponding to the earliest sensorimotor stage of Piagetian theory, the person is aware only of bodily sensations; at the next level, corresponding to later sensorimotor stages, the person is also aware of action tendencies. In neither case, however, is there awareness of emotion as such. Awareness of emotion occurs at a level corresponding to the preoperational stage, where it is confined to awareness of single, pervasive emotions. At a level corresponding to the stage of concrete operations, the person is aware

of emotion blends and simultaneous opposites. And at a level corresponding to formal operations, the person can be aware of subtle nuances of emotion, as well as a difference between one's own emotional reactions and those of others.

It should be understood, however, that shifts in emotional awareness from one level to the next are not coterminous with the progress of cognitive development, which is why it makes sense to distinguish among levels of emotional awareness in adults. Some adults, while firmly ensconced in formal operations with respect to their cognitive abilities, may have only primitive, sensory-motor, emotional reactions -- in other words, no *emotional awareness* at all. Interestingly, some of Lane's levels of emotional awareness correspond nicely to the three components of emotional response postulated by multiple-systems theory: physiological (bodily sensations), behavioral (action tendencies), and subjective (single emotions, blends, and nuances). Thus, one way of conceptualizing a desynchrony between explicit and implicit emotion is in terms of an impairment at higher levels of emotional awareness which leaves lower levels intact.

Hypnotic Analgesia

A further example of desynchrony between the subjective experience of emotion and the behavioral and physiological expressions of it is provided by hypnotic analgesia (Hilgard & Hilgard, 1975). Following appropriate suggestions, many highly hypnotizable subjects report feeling no pain when exposed to normally painful stimulation. Although analgesia may be construed as a special case of sensory anesthesia, in fact pain has two components: *sensory pain*, providing information about the location and severity of irritation or injury, and *suffering*, a psychological reaction of unpleasantness which depends on the meaning of the sensory pain (Hilgard, 1969; Melzack & Torgerson, 1971). Suffering is an explicitly emotional component that is not always present in the other skin senses, such as touch and temperature. Sensory pain and suffering are dissociable in terms of subjects' pain ratings (Gracely & Nabiloff, 1996; Melzack, 1975; Melzack & Torgerson, 1971), and they also appear to be mediated by different brain systems: sensory pain by the somatosensory cortex, suffering by the anterior cingulate cortex (Rainville, Duncan, Price, Carrier, & Bushnell, 1997). Ordinarily, hypnotic suggestions for analgesia diminish awareness of both sensory pain and suffering (Hilgard, 1969; Knox, Morgan, & Hilgard, 1974); however, it is also possible

to alter suffering while leaving sensory pain unaffected (Rainville et al., 1997).

Clinical studies conducted since the mid-19th century indicate that hypnotic analgesia can be highly effective in relieving the pain of major surgery. However, the more common clinical use of analgesia is in the treatment of postoperative pain, episodic pain associated with specific medical and surgical procedures, burns, obstetrics, dentistry, and chronic pain associated with illness (E. Hilgard & J. Hilgard, 1975; J. Hilgard & LeBaron, 1984). These clinical results are confirmed by more tightly controlled laboratory studies. For example, Stern and his colleagues found that hypnosis was more effective than acupuncture, placebo acupuncture, morphine, aspirin, diazepam, and placebo in counteracting both cold-pressor and ischemic pain (Stern, Brown, Ulett, & Sletten, 1977). Other laboratory studies indicated that hypnotizable subjects respond differently to analgesia suggestions than do insusceptible subjects who are instructed to simulate hypnosis (Hilgard, Macdonald, Morgan, & Johnson, 1978). Hypnotic analgesia is not mediated by placebo effects (McGlashan, Evans, & Orne, 1969), or by the tranquilizing effects of relaxation (Greene & Reyher, 1972). Hypnotic analgesia is not reversed by naloxone, an opiate antagonist, so it is not mediated by the release of endogenous opiates (Goldstein & Hilgard, 1975; Spiegel & Albert, 1983).

Most important, hypnotic analgesia does not appear to be mediated by the subject's engagement in *stress inoculation* procedures, such as self-distraction and reinterpretation, which alter the subject's response to, but not his/her awareness of, the pain stimulus. Miller and Bowers (1986) found that subjects administered hypnotic suggestions for analgesia did not report engaging in such strategies. Moreover, response to hypnotic analgesia suggestions was mediated by hypnotizability, while response to stress-inoculation instructions was not. A second paper by Miller and Bowers (1993) showed that stress inoculation strategies interfered with performance on a difficult vocabulary test, while hypnotic analgesia did not. Finally, Hargadon, Bowers, and Woody (1995) showed that the use of counterpain imagery, a common stress inoculation strategy, had no effect on hypnotic analgesia. Taken together, these studies show that while stress inoculation can reduce pain (Meichenbaum, 1977; Spanos, 1986; Chaves, 1989), it does not mediate pain reduction in hypnotic analgesia.

Hilgard (1973, 1977) has proposed that hypnotic analgesia is mediated by an amnesia-like dissociative barrier which partially or fully blocks the subject's conscious perception and awareness of pain. Some evidence for this dissociative process comes from studies using the "hidden observer" technique, in which it is suggested to the analgesic subject that there is a "hidden part" of the person which may have registered, and can report, the true level of pain stimulation. In response to some subjects will report levels of pain which are comparable to those experienced in the absence of analgesia suggestions (Hilgard, Morgan, & Macdonald, 1975; Hilgard, Hilgard, Macdonald, Morgan, & Johnson, 1978). The hidden observer is a metaphor for the continuing cognitive representation of pain outside of conscious awareness, and the means by which it may be accessed. Although hidden observer instructions may be interpreted as altering contextual demands to report pain (Spanos, 1986) or expectations about pain (Kirsch & Lynn, 1998), hypnotic subjects are much less responsive to manipulations of the testing context than are subjects instructed to simulate hypnosis (Kihlstrom, 1998b; Laurence, Perry, & Kihlstrom, 1983). Therefore it seems that the demand characteristics (Orne, 1962, 1979) of the experimental situation are not sufficient to produce the hidden observer in analgesic subjects.

While hypnotic analgesia alters the person's subjective awareness of pain and distress, it has little impact on physiological responses to pain stimulation (Barber & Hann, 1962; Hilgard, Morgan, Lange, Lenox, Macdonald, Marshall, & Sachs, 1974; Sears, 1932; Shor, 1962; Stern et al., 1977; Sutcliffe, 1961). Interpretation of this finding is ambiguous, because psychophysiological parameters to not show the same lawful covariation with intensity of stimulation shown by self-reports of pain (Hilgard, 1969). The preservation of physiological responses to the pain stimulus does not impeach the subjects' self-reports of analgesia, however, because the same dissociation is found with other analgesic agents, including aspirin, diazepam, and morphine (Stern et al., 1977). However, the basic finding of a dissociation between self-reports of analgesia and persisting physiological responses to the pain stimulus is consistent with the notion of desynchrony between the subjective and physiological components of pain as an emotional state. Obviously, however, further research is needed to evaluate the hypothesis of desynchrony as applied to hypnotic analgesia (or, for that matter, any other analgesic). Such research should compare self-reports with psychophysiological indices, but also with overt behavioral indices of pain, such as facial expression.

Implicit Attitudes

Yet another line of evidence bearing on the concept of implicit emotion comes from recent social-psychological work on attitudes, stereotypes, and prejudice. In social psychology, attitudes have a central affective component: they are dispositions to favor or oppose certain objects, such as individuals, groups of people, or social policies, and the dimensions of favorable-unfavorable, support-oppose, pro-anti naturally map onto affective dimensions of pleasure-pain or approach-avoidance. As Thurstone put it, "attitude is the affect for or against a psychological object" (1931, p. 261). Like emotions, attitudes are generally thought of as conscious mental dispositions: people are assumed to be aware that they are opposed to nuclear power plants, or favor a women's right to choose. Similarly, people are generally believed to be aware of the stereotyped beliefs that they hold about social outgroups, and of the prejudiced behavior that they display towards members of such groups. And for that reason, attitudes and stereotypes are generally measured by asking subjects to reflect and report on their beliefs or behavior. However, Greenwald and Banaji (1995) proposed an extension of the explicit-implicit distinction into the domain of attitudes. Briefly, they suggest that people possess positive and negative *implicit attitudes* about themselves and other people, which affect ongoing social behavior outside of conscious awareness.

Following the general form of the explicit-implicit distinction applied to memory, perception, learning, and thought in the cognitive domain, we may define an explicit attitude as the conscious awareness of one's favorable or unfavorable opinion concerning some object or issue. By contrast, an implicit attitude refers to any effect of such an opinion on a person's ongoing experience, thought, and action, regardless of whether that opinion can be consciously reported. From a methodological point of view, explicit attitudes would be assessed by tasks requiring conscious reflection on one's opinions; implicit attitudes would be assessed by tasks which do not require such reflection.

A particularly provocative demonstration of implicit attitudes affecting behavior is provided by Greenwald and Schuh (1994) in an analysis of reference citation practices among social scientists (Study 1) and prejudice researchers (Study 2). In these studies, the authors' names, and the names of the authors cited in their papers, were classified into three ethnic categories:

Jewish, non-Jewish, or other. Authors were approximately 40% more likely to cite colleagues from their own ethnic category, a significant difference that could not be attributed to either differential assortment by ethnicity to research topic, or the tendency for authors to cite their personal acquaintances. Although it seems likely that few of the authors in question would consciously admit to ethnic prejudice (social scientists in general, and prejudice researchers in particular, tending to be a rather liberal bunch), their *behavior* suggests the operation of negative attitudes toward members of a religious outgroup.

A more tightly controlled demonstration of implicit attitudes is provided by a study of the "false fame effect" by Banaji and Greenwald (1995). In the typical false fame procedure (Jacoby, Kelley, Brown, & Jasechko, 1989), subjects are asked to study a list consisting of the names of famous and nonfamous people. Later, they are presented with another list of names, including the names studied earlier and an equal number of new names, and asked to identify the names of famous people. The general finding of their research is that subjects are more likely to identify new rather than old nonfamous names as famous. In their adaptation, Banaji and Greenwald included both male and female names in their lists, and found that subjects were more likely to identify male names as famous. This result suggests that the average subject is more likely to associate achievement with males than with females -- a common gender stereotype.

Similarly, Blair and Banaji (1996) conducted a series of experiments in which subjects were asked to classify first names as male or female. Prior to the presentation of each target, the subjects were primed with a word representing a gender-stereotypical or gender-neutral activity, object, or profession). In general, Blair and Banaji (1996) found a gender-specific priming effect: judgments were faster when the gender connotations of the prime were congruent with the gender category of the name. This means that gender stereotypes influenced their subjects' classification behavior.

In the area of racial stereotypes, Gaertner and McLaughlin (1983) employed a conventional lexical-decision task with positive and negative words related to stereotypes of Blacks and whites, and the words "black" or "white" serving as the primes. There was a priming effect when positive targets were primed by "white" rather than "black", but no priming was found for the negative targets, and this was so regardless of the subjects' scores on a self-

report measure of racial prejudice. thus, the effect of attitudes on lexical decision was independent of conscious prejudice.

Similarly, Dovidio Evans, and Tyler (1986) employed a task in which subjects were presented with positive and negative trait labels, and asked whether the characteristic could ever be true of black or white individuals. While the judgments themselves did not differ according to race (even the most rabid racist will admit that there are some lazy whites and smart blacks), subjects were faster to endorse positive traits for whites, and to endorse negative traits for blacks. Thus, even though conscious attitudes did not discriminate between racial groups, response latencies did.

These studies, and others like them (e.g., Devine, 1989), seem to reveal the implicit influence of sexist or racist attitudes on behavior. However, at present, interpretation of these results is somewhat unclear. In the first place, the logic of the research is that stereotype-specific priming indicates that subjects actually hold the stereotype in question -- that, for example, the subjects in Blair and Banaji's (1996) experiment really (if unconsciously) believe that males are athletic and arrogant while females are caring and dependent). However, it is also possible that these priming effects reflect the subjects' abstract knowledge of stereotypical beliefs held by members of society at large, though they themselves personally reject them -- both consciously and unconsciously. Thus, a subject may know that people*in general* believe that ballet is for females and the gym is for males, without him- or herself sharing that belief. Even so, this knowledge may affect his or her performance on various experimental tasks, leading to the incorrect attribution of the stereotypical beliefs to the subject.

Moreover, most studies of implicit attitudes lack a comparative assessment of explicit attitudes. Although we might like to think that the average Gentile social psychologist is not antisemitic (Greenwald & Schuh, 1994), this may not be so. Implicit measures of attitudes may be useful additions to the methodological armamentarium of the social psychologist, but in the present context their interest value rests on demonstrations of dissociations between explicit and implicit expressions of emotion. Accordingly, it is important for research to show that implicit measures reveal different attitudes than those revealed explicitly. Just as the amnesic patient shows priming while failing to remember, and the repressive subject shows autonomic arousal while deny-

ing distress, we want to see subjects displaying attitudes or prejudices which they deny having, and acting on stereotypes which they deny holding.

Recently, Wittenbrink, Judd, and Park (1997) performed a formal comparison of explicit and implicit racial attitudes. Their subjects, all of whom were white, completed a variety of traditional questionnaire measures of self-reported racial attitudes. They also performed a lexical-decision task in which trait terms drawn from racial stereotypes of whites and blacks were primed with the words *black*, *white*, or *table*. Analysis of response latencies found, as would be anticipated from the studies described above, a race-specific priming effect: *white* speeded lexical judgments of positive traits, while *black* speeded judgments of negative traits. However, the magnitude of race-specific priming was correlated with scores on the questionnaire measures of racial prejudice. In this study, then, implicit attitudes about race were not dissociated from explicit ones. Such a finding does not undermine the use of implicit measures in research on attitudes and prejudice (Dovidio & Fazio, 1992), but a clear demonstration of a dissociation is critical if we are to accept implicit attitudes as evidence of an emotional unconscious whose contents are different from those which are accessible to phenomenal awareness.

Neuroscientific Perspectives

Desynchrony, repression, alexithymia, hypnotic analgesia, and implicit attitudes all seem to represent instances in which the person is subjectively unaware of an emotional state that nevertheless influences behavioral and physiological outcomes. In view of these phenomena, we propose a formal distinction between two expressions of emotion, explicit and implicit. Paralleling the usage of these descriptors in the domain of the cognitive unconscious, explicit emotion refers to the person's conscious awareness of an emotion, feeling, or mood state; implicit emotion, by contrast, refers to changes in experience, thought, or action that are attributable to one's emotional state, independent of his or her conscious awareness of that state. In terms of measurement, explicit emotion tasks require the subject to reflect on, and report, his or her conscious feeling states; implicit emotion tasks do not.

Some of the most convincing evidence for emotion as implicit memory is provided by studies of neurological patients who acquire new emotional res-

ponses but who, by virtue of their brain damage, have no conscious recollection of the experiences by which this learning took place. Similarly, strong support for the concept of implicit emotion would be provided by evidence of brain-damaged patients who do not subjectively experience emotional feeling states, but who nevertheless display overt behavioral and covert physiological responses that would be regarded as emotional. Dissociations among emotion systems would seem a natural topic for study by neuropsychologists, to whom the concept of multiple systems is quite familiar in the domains of memory (e.g., Schacter & Tulving, 1994) and vision (Ungerleider & Haxby, 1994).

Unfortunately, neuropsychological evidence of multiple emotional systems, some supporting conscious feeling states and others supporting unconscious behavioral displays and physiological responses, is hard to come by (for reviews, see Heilman, Bowers, & Valenstein, 1993; Kolb & Wilshaw, 1996). Perhaps this is because the attention of most clinical and experimental neuropsychology has been focused on cognitive, rather than emotional and motivational, functions. The terms *cognitive neuropsychology* and *cognitive neuroscience* will be quite familiar to the readers of this chapter, while the terms *affective neuropsychology* and *emotion neuroscience* are rarely heard.

The idea of dissociable emotion systems is related to the concept of the *emotional brain*, as it has evolved from Cannon (1929) and Bard (1929) through Papez (1937) and MacLean (1949) to LeDoux (1996). Cannon and Bard found that decorticate animals would still show fear responses, so long as the thalamus and hypothalamus remained intact. These observations led them to propose that the diencephalon, which contains these structures, was the seat of the emotions. According to their view, the diencephalon mediated skeletal and autonomic emotional responses; in contrast, the conscious experience of emotion was mediated by the cortex, which was activated by fibers ascending from the hypothalamus. In such a system, a disconnection (Geschwind, 1965) between the diencephalon and the cortex would impair the subjective experience of emotion, while leaving the behavioral and physiological components intact.

Later research and theory broadened the emotional brain to include the entire limbic system (MacLean, 1949, 1952; Papez, 1937) -- a move which, according to one commentary, "had the appeal of combining behavioral phenomena having no known neurological substrates with anatomical structures

having no known function" (Kolb & Wilshaw, 1996, p. 418). For Papez, the afferent messages arriving at the thalamus were transmitted in two separate streams to the sensory cortex (the stream of thought) and to the hypothalamus (the stream of feeling). The hypothalamus, in turn, generated skeletal and autonomic responses to the stimulus, and also transmitted sensory information to the cingulate cortex, which also received inputs from the sensory cortex. When inputs from the hypothalamus were integrated with inputs from the sensory cortex, an emotional feeling state was generated. In such a system, three different disconnections could create a desynchrony between the explicit subjective and implicit emotion: (1) between the thalamus and the sensory cortex; (2) between the hypothalamus and the cingulate cortex; and (3) between the sensory cortex and the cingulate cortex. In any of these cases, the behavioral and physiological responses to an emotional stimulus would run off unimpaired, in the absence of any corresponding subjective feeling state.

MacLean (1949, 1952, 1970, 1990) broadened the limbic system even further, including the amygdala and other structures connecting directly to the hypothalamus, and proposed that a *paleomammalian* brain mediates the visceral and emotional life of the (mammalian) organism, while the *neomammalian* brain mediates consciousness, language, and other complex cognitive functions. Thus, along the lines outlined by Papez (1937), a disconnection between the paleomammalian and neomammalian brains could impair explicit emotion, while sparing implicit emotion.

Most recently, LeDoux (1995, 1996) has proposed a variant on the Papez/MacLean theory which has the virtue of being more specific in terms of both anatomy and psychology. Briefly, LeDoux argues that a particular structure in the limbic system, the amygdala, mediates a particular emotion, fear (for a similar analysis, see Damasio, 1994). Based on his studies of fear conditioning in rats and other nonhuman animals, but supported by studies of human patients who have suffered damage to the amygdala and surrounding brain tissue (e.g., Adolphs, Damasio, Tranel, & Damasio, 1996; LaBar, LeDoux, Spencer, & Phelps, 1995), LeDoux has proposed that fear stimuli are processed by the amygdala, which in turn generates appropriate behavioral, autonomic, and endocrine responses. Cortical arousal, feedback of somatic and visceral information, and information about the fear stimulus are then integrated in working memory to generate the subjective experience of being afraid. As with the simpler systems described by Papez and

MacLean, a disconnection between the amygdala and the cortex can produce a dissociation between explicit and implicit emotion: the person will respond in a fearful manner without feeling fear or anxiety. LeDoux's system is especially appealing because it also offers a mechanism by which fear can serve as an implicit expression of memory: if the eliciting stimulus is not represented in working memory, the person will experience fear without being aware of the fear stimulus.

It should be understood that LeDoux's (1995, 1996) analysis of the amygdala applies only to the fear of emotion. Whereas Papez and MacLean implied that all emotions were mediated by a single system (Papez's circuit or the limbic system), LeDoux postulates a number of different systems, each mediating conscious experience, motor behavior, and somatic changes, corresponding to different emotional domains. It is not clear how many such systems there are, but if Ekman and Friesen (1975) are right that some patterns of emotional expression have deep evolutionary roots, a reasonable hypothesis is that there may be at least seven separate systems, corresponding to the "basic emotions" of surprise, happiness, sadness, fear, anger, and disgust. Thus, the range of possible dissociations is not just between explicit and implicit expressions of emotion *in general*. It is may also be possible, at least in principle, to observe in a single patient, desynchrony between explicit and implicit fear, but synchrony between explicit and implicit anger. This is, of course, a nightmare for any prospective researcher of the emotional unconscious.

The State and the Stimulus

The nightmare is exacerbated by a consideration of the logic of inferring unconscious emotions. Consider the analogy to implicit memory. We know that priming is evidence of implicit memory because we can trace the facilitation in lexical decision, perceptual identification, and the like, to a specific objectively observable event -- the nature of the prime presented to the subject. Furthermore, we can specify objectively the relationship between the prime and the target: same versus different word, same word/same appearance versus same word/different appearance, and so on. Put another way, we can identify an implicit expression of memory because we know what happened to the subject in the past -- what the subject *should* be remembering.

But by the same logic, in order to identify an implicit expression of emotion, we have to know what emotional state the subject *should* be experiencing, or which emotional state is being represented, and expressed, outside of conscious awareness. Applying the logic of explicit and implicit memory to the problem of emotion, then, compelling evidence of a dissociation between explicit and implicit emotion makes a number of methodological demands.

First, we need to possess an adequate stimulus for emotion -- that is, a set of stimuli which, under ordinary circumstances, reliably elicits particular emotions in subjects. Unfortunately, the search for such reliable elicitors has not been particularly fruitful. Apparently, just as the experience of pain depends on the subjective meaning of the pain stimulus, the person's emotional response to a situation depends greatly on his or her cognitive appraisal of that situation (e.g., Ellsworth, 1991; Lazarus, 1991; Lazarus & Smith, 1988; Ortony, Clore, Collins, 1988; Smith & Ellsworth, 1985).

Still, some fairly universal elicitors of emotion have been proposed, and these hold promise for desynchrony research. Ekman and Friesen (1975) found, among other relations, that actual or threatened harm elicits fear, while loss of an object to which one was attached induces sadness. Similarly, Scherer, Wallbott, and their colleagues have found, among other relations, that basic pleasures elicited joy, while separation elicited sadness (Scherer, Wallbott, & Summerfield, 1986; Scherer & Wallbott, 1994). To be sure, the relations in question are moderated to some degree by context-specific appraisals and cultural considerations, but there is enough cross-situational consistency that we can have some hope of measuring subjects' subjective, behavioral, and physiological responses to stimuli that, all things being equal, should elicit certain emotions. If we observe diminished subjective awareness coupled with persisting behavioral and physiological responses, we would have evidence of a dissociation between explicit and implicit emotion.

Of course, documenting such a dissociation also requires that we have reliable measures of the subjective, behavioral, and physiological responses to the emotion stimulus; and these are nontrivial problems. Subjective feeling states can be assessed by the usual sorts of self-report measures, but care must be taken to distinguish between the subjects' failure to consciously feel a particular emotion, and their willingness to report what they feel to an experimenter. Implicit emotion is about awareness, not denial. The behavioral

component of emotion might be indexed by gross patterns of approach/withdrawal, flight/fight, or activation/inhibition (Gray, 1987), and the physiological component by generalized levels of autonomic arousal (Schacter & Singer, 1962), but again ideally we would like to have implicit measures that are more specifically isomorphic to the lexicon of conscious emotions. On the overt behavioral side, one possibility are facial expressions of the sort documented by Ekman and Friesen (1975), as well as cognate postural and gestural expression. On the level of covert physiology, Levenson (1988, 1992) and his colleagues have been able to document specific patterns of autonomic response accompanying particular indices of emotion (Ekman, Levenson, & Friesen, 1983; Levenson, Carstensen, Friesen, & Ekman, 1991; Levenson, Ekman, & Friesen, 1990; Levenson, Ekman, Heider, & Friesen, 1988). Similarly, Davidson (1993) has suggested that particular patterns of cortical activation may also differentiate certain basic emotions.

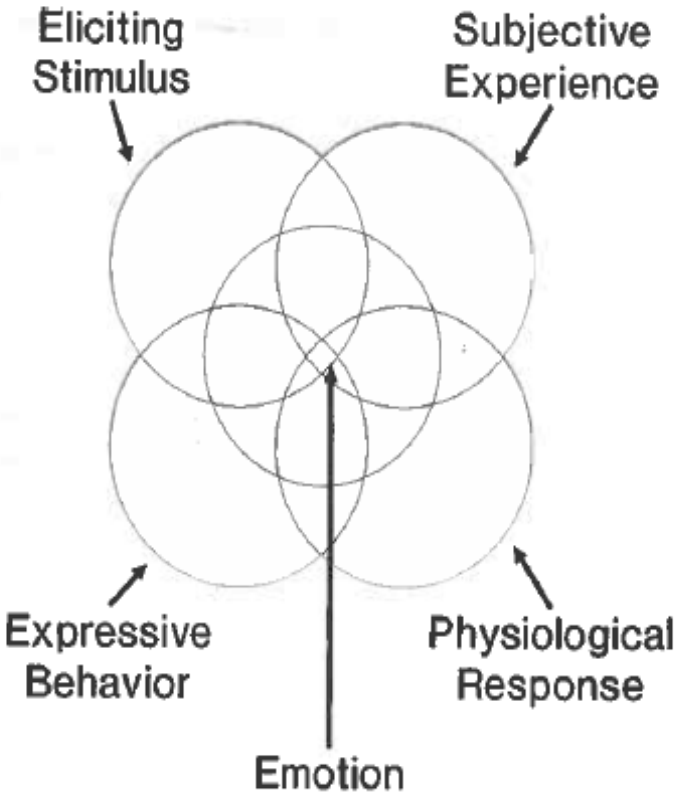

Figure 1. Emotional state defined by the convergence of eliciting stimulus, subjective experience, expressive behavior, and physiological response.

The ideal structure of an experimental demonstration of implicit emotion is now clear. To begin with, we assume that a particular emotional state is a

hypothetical construct defined by the logic of converging operations (Garner, Hake, & Eriksen, 1956; see also Campbell & Fiske, 1956; Kihlstrom, 1984; Stoyva & Kamiya, 1968). These operations include specification of an eliciting stimulus and the measurement of subjecive experience, overt behavior, and physiological response (Figure 1).

When all operations agree, we can be fairly confident that the person is in an emotional state such as fear or happiness. Agreement among the operations is sufficient to establish the presence of an emotional state. However, none of these operations is necessary for this purpose, and under some circumstances some combination of two or three operations would sufficient. For example, a subject might report feeling no fear in response to a real or imagined threat. At the same time, he or she should show continue to manifest facial, postural, and gestural expressions of fear, as well as autonomic and cortical signs of fear. Under these circumstances, the diagnosis of implicit fear might well be irresistible. As we grow more confident with respect to classification of emotional stimuli, and multivariate measurement of emotional responses, we will be in a better position both to evaluate the multiple-systems theory of emotion and to search for evidence of desynchronies between emotional systems -- especially the particular pattern(s) of desynchrony characteristic of a dissociation between explicit and implicit emotion.

Cognition, Emotion, Consciousness, and the Self

So now we have an overview of what the emotional unconscious might look like. The research is not definitive, not by a long shot, but there do seem to be a number of well-documented instances in which current or past events influence our emotional states outside of phenomenal awareness, and another set of plausible instances where emotional responses themselves affect experience, thought, and action outside phenomenal awareness. Accepting such conclusions, even for the sake of argument, leads to the further question of what makes the difference between those cognitions and emotions that are conscious and those that are not.

One possibility, raised by Schacter (1990), is that there is some sort of cognitive module, which he calls the Conscious Awareness System (CAS), corresponding to a brain module or a system of modules, that has connections to other modular systems involved in perception, memory, language, emotion, and other mental functions. Damage to CAS, or more likely to the con-

nections between it and other systems, will produce a loss of conscious awareness; but it will not produce a complete loss of function. Thus, for example, if the connection between CAS and the visual system is broken, the person will not be aware of seeing; but may still respond to visual events -- the sort of thing that occurs in the neuropsychological syndrome of blindsight. If the connection between CAS and the episodic memory system is broken, the person will be unaware of past events; but may still be influenced by the past, in the form of implicit memory, as has been observed in the organic amnesic syndromes. By extension, a disconnection between CAS and an emotion system would prevent the person from being aware of his or her emotional states, at the same time as behavioral and physiological components of emotional response run off outside of conscious awareness. The system proposed by LeDoux (1996), while rather more complicated, has some of the same flavor.

At the psychological level of analysis, staying very close to phenomenal experience, the kinds of dissociations discussed here may be mediated by associations between various mental representations of experience, and the mental representation of the self as the agent or patient of some action, or as the stimulus or experiencer of some state (Kihlstrom, 1993c, 1997a). This proposal, in turn, is stimulated by James's (1890/1980) comment that:

The universal conscious fact is not 'feelings and thoughts exist', but '*I* think' and '*I* feel' (p. 221, italics original).

According to James, consciousness comes when we take possession of our behaviors, thoughts, feelings and desires -- in other words, when we acknowledge them as our own, or inject ourselves into them.

Janet (1907) articulated similar ideas about the role of the self in consciousness, employing an early metaphor for spreading activation:

There are then in the [statement] "I feel", two things in presence of each other: a small, new, psychological fact, a little flame lighting up -- 'feel" -- and an enormous mass of thoughts already constituted into a system -- "I" (pp. 304-305).

So too, consider the great French neurologist Claparede (1911; see Kihlstrom, 1995a), discussing a classic early case of what we now call implicit memory:

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).

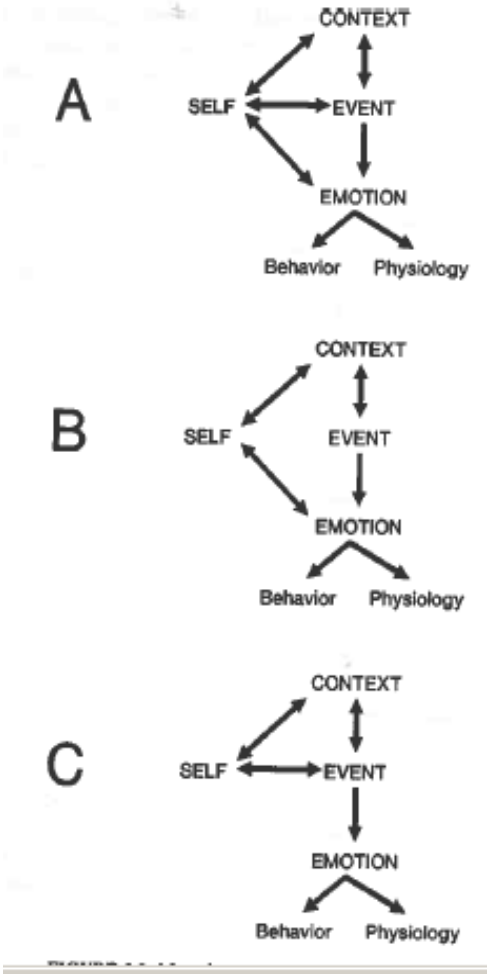

Figure 2. Mental representation of self linked to co-activated mental representations of an event, its episodic context, and emotional state (A). When the link between self and event is disrupted (B), emotional state is an expression of implicit perception or memory. When the link between self and emotion is disrupted (C), expressive behavior and physiological activity serve as implicit expressions of emotion.

This connection to the self is just what appears to be lacking in the phenomena of implicit cognition and emotion. When we perceive an event, assume that we activate fragments of pre-existing knowledge; when we attend to the event, its mental representation becomes part of our working memory,

along with information about our emotional reaction to the event. These activated knowledge structures then have the opportunity to contact other activated knowledge structures. Among these are the person's current processing goals, the current spatiotemporal context, and the self. This self-structure, resident in working memory, routinely comes into contact with other activated pieces of knowledge -- about the environment in which the person exists, current and past events, and other information activated by perceptual processing, memory retrieval, and other acts of thought. This connection, which defines the self as the agent or experiencer of some ongoing event, or the stimulus or experiencer of some state, is the key to consciousness. The cognitive situation is schematically depicted in Figure 2.

Consider what happens when an event is perceived or remembered which generates an emotional response. Under ordinary circumstances, the event, its surrounding context, and the emotional response all make contact with the self in working memory, and all are represented in consciousness (Figure 2a). The person knows what he or she feels, and knows why.

Now consider what happens if the subjective component of the emotional response connects to the self, but the representation of the instigating event does not (Figure 2b). Under these circumstances, the person will be aware of the situational background, his or her emotional state will be experienced consciously, and the behavioral and physiological consequences of that state will run off unimpaired. But the person will not know *why* he feels what he feels, because he is not aware of the instigating event perceived in the present, or retrieved from the past. This is the usual form of a state of dissociation, reflecting an impairment of explicit perception or memory, with the emotional response reflecting spared implicit memory.

Under other circumstances, the representation of the instigating event will connect to the self, but the representation of the emotional state may not -- although the behavioral and physiological components of the emotion will run off activity, but the emotion itself will not be experienced consciously (Figure 2c). The result will be a state of desynchrony, reflecting an impairment of explicit emotion, while implicit emotion, in the form of expressive behavior and physiological changes, will be spared.

Can Emotions Be Nonconscious?

The emotional unconscious, then, has two different aspects. On the one hand, we may be unaware of the percepts, memories, and thoughts which give rise to our emotional feelings. In this case, emotion serves as an implicit expression of perception, memory, learning, or thought. On the other hand, we may be aware of what we are perceiving, remembering, and thinking, but unaware of the emotions instigated by these cognitions. In this case, behavioral and physiological changes serve as implicit expressions of emotion.

But can emotions really be unconscious? A recent symposium answered this question in the negative (Clore, 1994; Davidson & Ekman, 1994; LeDoux, 1994; Zajonc, 1994). There was general agreement that the cognitive and brain processes underlying emotions could operate outside of conscious awareness and conscious control. In this way, we might not be conscious of the source of our emotions; and, in the absence of source awareness, we might not be aware of precisely which emotion we are experiencing. But as Clore put it, the essence of emotion is feeling, and "emotions that are felt cannot be unconscious by definition" (1994, p. 285). And if, as Clore and Schwarz (Clore,1992; Clore, Schwarz, & Conway, 1994; Schwarz & Clore, 1983, 1988) propose, the function of emotion is to provide information concerning the appraisal and evaluation of the (past, current, or anticipated future) situation, it would certainly be dysfunctional if emotions were unconscious.

On the other hand, if it is true, as James (1884; 1890/1980) famously argued, that

(1) emotion is the perception of bodily (muscular and visceral) activity;

and

(2) perception can be unconscious, as seems to be the case from the literature documenting dissociations between explicit and implicit perception (Kihlstrom et al., 1992a);

then

(3) emotions can be unconscious, at least in principle, and can express themselves outside awareness via overt behavioral and covert physiological responses.

While the experimental and clinical evidence for a dissociation between explicit and implicit emotion is not yet convincing, and the methodological requirements for such a demonstration have not yet been met, the hypothesis of unconscious emotional states cannot be rejected out of hand. If we are willing to speak of implicit percepts, memories, and thoughts that are dissociated from their explicit counterparts, then we must be willing to speak of implicit emotions in the same terms as well. It does not matter whether unconscious emotions would be dysfunctional. What matters is whether they can happen, how they can happen, and how we would know.

Notes

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I. The self, as Janet (1907) noted, is a very rich mental structure. In the social intelligence theory of personality (Cantor & Kihlstrom, 1987, 1989; Kihlstrom & Cantor, 1989), the self is an organized knowledge structure that stores what one knows about oneself. This would include semantic knowledge about one's physical and personality attributes, social status, and the like. It is also tightly linked to episodic knowledge forming one's autobiographical history; autobiographical memories must represent the self, by definition (Kihlstrom & Cantor, 1984; Kihlstrom et al., 1988; Kihlstrom & Klein, 1994, 1997; Kihlstrom, Marchese, & Klein, 1997).

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