



Unconscious, The

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GLOSSARY

automatic processes Perceptual–cognitive operations that are initiated involuntarily, executed outside phenomenal awareness, and consume no attentional resources.

dichotic listening A technique in which different auditory messages are presented over separate earphones; the subject is instructed to repeat (shadow) one message but ignore the other.

dissociation A statistical outcome in which one variable, either a subject characteristic (such as the presence of brain damage) or an experimental manipulation (such as the direction of attention), has different effects on two dependent measures (such as free recall or priming). In psychiatry, the “dissociative disorders” include psychogenic amnesia, psychogenic fugue, and multiple personality disorder: All three disorders involve disruptions in consciousness involving memory and identity.

explicit memory Conscious recollection, as manifested in a person’s ability to recall or recognize some past event. Explicit memory is the model for the definition of explicit perception, learning, thought, emotion, and motivation.

functional magnetic resonance imaging A brain-imaging technique using magnets to measure blood oxygenation due to brain activity.

Implicit memory Any effect on task performance that is attributable to a past event, independent of conscious recollection of that event. Implicit memory is the model for the definition of implicit perception, learning, thought, emotion, and motivation.

limen From the German, “threshold.” In classical psychophysics, the threshold referred to the minimum amount of energy required for

an observer to detect the presence of a stimulus (the absolute threshold) or a change in a stimulus (the relative threshold). Processing of stimuli, which are undetected, is referred to as subliminal. In modern signal-detection theory, the concept of the threshold has been replaced by that of zero detectability ($d' = 0$).

preattentive processing Perceptual–cognitive operations occurring before attention has been paid to a stimulus.

priming The facilitation of perceptual–cognitive processing of a target stimulus by prior presentation of a priming stimulus. “Negative” priming refers to the inhibition of processing occurring under the same conditions.

Consciousness has two aspects: (i) monitoring ourselves and the world around us so that percepts, memories, thoughts, and other mental states are represented in phenomenal awareness and (ii) controlling ourselves and the environment so that we are able to voluntarily initiate and terminate behavioral and cognitive activities. In psychology, the unconscious refers to the idea that cognitive, emotional, and motivational states and processes can influence ongoing experience, thought, and action outside of phenomenal awareness and voluntary control.

I. CONSCIOUSNESS IN PSYCHOLOGY

In the last twenty-five years of the 19th century, as the new science of psychology began to emerge from its roots in philosophy and physiology, consciousness was at the center of the enterprise. Beginning with Wilhelm Wundt and E. B. Titchener, the whole structuralist school of psychology attempted to analyze conscious mental states in terms of their constituent sensations, images, and feelings. Its preferred method of introspection assumed that people had accurate

introspective awareness of their own mental states. In 1927, E. G. Boring summarized the achievements of structuralism with a monograph titled *The Physical Dimensions of Consciousness*.

Even William James, opposed as he was to the doctrines of structuralism, embraced a version of introspection as his preferred research method (he had a collection of brass instruments, but he hated using them). James began his *Principles of Psychology* with the assertion that “psychology is the science of mental life.” By this he meant *conscious* mental life, as he made abundantly clear in the *Briefer Course*, in which he adopted G.T. Ladd’s definition of psychology as “the description and explanation of states of consciousness as such.”

II. THE INITIAL DISCOVERY OF THE UNCONSCIOUS

At the same time, both James and the structuralists understood that there was more to mental life than was accessible to introspection. The notion that unconscious processes are important elements of mental life is commonly ascribed to Sigmund Freud, the founder of psychoanalysis, but in fact it was an old idea, originating before Freud was born.

A. The Unconscious in Prepsychological Philosophy and Physiology

At the beginning of the 18th century, long before psychology split from philosophy and physiology, the German philosopher Leibniz wrote that our conscious thoughts are influenced by sensory stimuli of which we are not aware. At the close of that century, Immanuel Kant’s *Anthropology from a Pragmatic Point of View*, the philosopher’s last work and arguably the first comprehensive textbook of psychology, devoted a major section to a discussion of “the ideas which we have without being conscious of them.”

In the 19th century, Johann Friedrich Herbart, drawing on the views of Gottfried Wilhelm von Leibniz, defined the “*limen*,” or sensory threshold, as a mental battleground where various perceptions, themselves mostly unconscious, competed for representation in consciousness. In the *Treatise on Physiological Optics*, Hermann von Helmholtz argued that our conscious perceptions are determined by unconscious inferences.

The pre-Freudian analysis of unconscious mental life reached its apex with Eduard von Hartmann and

his *Philosophy of the Unconscious* (1868), an extremely popular work whose three volumes, comprising more than a 1000 pages, went through a total of 12 editions. For Hartmann, the universe was ruled by the unconscious, a highly intelligent dynamic force composed of three layers: the absolute unconscious, accounting for the mechanics of the physical universe; the physiological unconscious, underlying the origin, evolution, development, and mechanisms of life; and the relative unconscious, which Hartmann considered to be the origin of conscious mental life. Hartmann’s relative unconscious is what we nowadays call the psychological unconscious—a term referring to those mental states and processes that influence our experience, thought, and action outside phenomenal awareness and independent of voluntary control.

We owe to Hartmann the Romantic notion, still with us in some quarters today, that the unconscious possesses capacities and powers that are superior to those available to consciousness. As Hartmann stated, “the Unconscious can really outdo all the performances of conscious reason.” In the end, however, Hartmann’s ideas proved to be too speculative for the first generation of scientific psychologists. Hermann von Ebbinghaus, in discussing Hartmann’s book, concluded that “what is true is not new, and what is new is not true.” William James also offered a warning that would reverberate throughout the 20th century exploration of the unconscious: “The distinction ... between the unconscious and the conscious being of the mental state ... is the sovereign means for believing what one likes in psychology, and of turning what might become a science into a tumbling-ground for whimsies.”

B. The Psychoanalytic Unconscious

Nevertheless, all of this activity, from Leibniz and Kant to Helmholtz and Hartmann, laid the foundation for what Henri Ellenberger, the great historian of psychiatry, called the discovery of the unconscious. This discovery was consolidated with what Ellenberger called a new dynamic psychiatry—the psychiatry of Sigmund Freud and his sometime compatriots, C. G. Jung and Alfred Adler.

Based on their clinical observations, for example, Freud and collaborator Josef Breuer concluded that the symptoms of hysteria were produced by unconscious memories of traumatic events. They stated, “Hysterics suffer mainly from reminiscences,” with the proviso that these memories are unconscious,

emerging only after skilled intervention by a therapist. In *The Interpretation of Dreams* (1900), Freud proposed a topographical division of the mind into conscious, preconscious, and unconscious compartments. Later, he proposed that our conscious experiences, thoughts, and actions are determined by the interaction between unconscious sexual and aggressive impulses, on the one hand, and defense mechanisms such as repression arrayed against them in order to ward off anxiety caused by the conflict between these primitive motives and sociocultural demands and strictures, on the other hand.

C. The Impact of Behaviorism and the Revival of Consciousness

Unfortunately, just when the concept of the psychological unconscious was gaining support, the behaviorist revolution occurred. Interest in consciousness disappeared virtually overnight, and interest in the psychological unconscious went with it. For John B. Watson and comrades in arms, the only way to make psychology truly scientific was to abandon the mental. It was bad enough to try to explain behavior in terms of mental states that could not be publicly observed; it was even worse to try to explain behavior in terms of mental states that could not be privately observed. Of course, psychological interest in consciousness did not die completely with the triumph of behaviorism. So, too, some psychologists maintained an interest in the psychological unconscious. Still, a full-scale revival of academic interest in consciousness had to wait until behaviorism was overthrown by the cognitive revolution.

Ironically, the early cognitive psychologists rarely used the term consciousness. This is a reflection of two tendencies described by the philosopher Owen Flanagan: On the one hand, there is a positivistic reserve reflecting our persisting reluctance to use mentalistic language, and on the other hand, there is a piecemeal approach that assumes that major problems such as consciousness can be solved by working up from the bottom. However, consciousness was there anyway, in the guise of such topics as selective attention, primary or short-term memory, and mental imagery.

III. THE REDISCOVERY OF THE UNCONSCIOUS

A revival of interest in unconscious mental life followed shortly thereafter. The seeds for this revival had been planted at the very beginnings of the

cognitive revolution, when the linguist Noam Chomsky argued that human language was mediated by “deep” grammatical structures that are inaccessible to conscious introspection and can be known only by inference. Along the same lines, the philosopher Jerry Fodor argued that many mental functions, such as visual perception, were mediated by dedicated structures that were impenetrable by conscious awareness and voluntary control. Cognitive approaches to perception, as exemplified by the work of Irvin Rock on visual illusions, entailed a version of Helmholtz’s notion of unconscious inference. Finally, the classic multistore model of memory invoked a concept of preattentive, or preconscious, information processing.

We are now at a point, however, where interest in the psychological unconscious runs wide and deep within psychology. This happy state of affairs is the end-product of at least four independent strands of investigation, which together converge on our modern conception of the psychological unconscious: automaticity, cognitive neuropsychology, subliminal perception, and hypnosis.

A. Automatic and Controlled Processes

One research tradition contributing to the modern interest in the psychological unconscious is the distinction commonly drawn between “automatic” and “strategic” cognitive processes. Skilled reading provides one example of automaticity: We recognize certain patterns of marks on the printed page as letters and certain patterns of letters as words, and we decode the meanings of words in light of the words near them, but we rarely have any conscious awareness of the rules by which we do so. It just happens, as an automatic consequence of having learned to read.

The power of these processes is illustrated by the color–word effect discovered by J. R. Stroop. In the basic “Stroop” experiment, subjects are presented with a list of color names printed in different colors and are asked to name the color in which each word is printed. This task is easy if the ink color matches the color name (e.g., the word yellow printed in yellow ink), but if the word and its color do not match (e.g., yellow printed in green ink) it is very difficult. Despite the subjects’ conscious intention to name ink colors and to ignore the words, they cannot help reading the color names, and this interferes with naming of the colors. It just happens automatically.

According to traditional formulations, automatic processes are inevitably engaged by the appearance of

specific environmental stimuli, regardless of the person's conscious intentions. Once invoked, they proceed inevitably to their conclusion, and (in theory at least) their execution consumes no attentional resources. Because they consume no attentional resources, automatic processes leave no traces in conscious memory. Some automatic processes are innate, or nearly so, whereas others are automatized only after extensive practice of a task. Recently, some of these properties have been called into question by revisionist, memory-based views of automaticity. It is no longer clear that ostensibly automatic processes are really executed involuntarily and really consume no attentional resources. However, even these revisionist views concur that some mental processes, represented in procedural memory, are unconscious in the strict sense of the term: They are inaccessible to phenomenal awareness in any circumstances and can be known only by inference from task performance.

B. The Rise of Neuropsychology

Both traditional and revisionist approaches to automaticity assume, at least tacitly, that the mental contents on which these processes operate are accessible to conscious awareness. However, it is now clear that our experiences, thoughts, and actions can be influenced by mental contents—percepts, memories, thoughts, feelings, and desires, of which we are unaware. Compelling evidence for this proposition began to accumulate about 30 years ago, as cognitive psychology turned into cognitive neuropsychology and researchers began to obtain evidence of the psychological unconscious in the behavior of brain-damaged patients.

Pride of place in this history goes to studies of the amnesic syndrome resulting from bilateral damage to the hippocampus and related structures in the medial temporal lobe or, alternatively, to the diencephalon and mammillary bodies. On clinical observation, such patients show a dense anterograde amnesia: After only a few moments of distraction, they cannot consciously remember events that occurred recently. However, as the study of these patients shifted from clinical description to controlled laboratory investigation, it became apparent that the events apparently covered by the amnesia nonetheless influenced the patients' ongoing experience, thought, and action.

For example, Elizabeth Warrington and Lawrence Weiskrantz showed that amnesic patients who could not remember having studied a list of words were

nonetheless biased to complete ambiguous word stems or fragments with items from the previously studied list. Past experience influenced their subsequent task performance, even though they had no conscious recollection of the experience. Based on "priming" effects such as these, Daniel Schacter and others drew a distinction between two expressions of memory, explicit and implicit. Explicit memory refers to one's conscious recollection of the past, as manifested on tasks such as recall and recognition. In contrast, implicit memory refers to any change in experience, thought, or action that is attributable to a past event, regardless of whether that event is consciously remembered.

Priming effects in which prior exposure to a word such as "assassin" makes it easier to complete a fragment such as "a_a_i_" than one such as "t_p_r_" are good examples of implicit memory because the priming effect obviously depends on memory, but the task does not, logically, require conscious recollection of any past event. The subject must only generate an acceptable word that fits in the spaces provided. The sparing of implicit memory in amnesia shows that some representation of a prior event has been encoded and stored in memory and influences ongoing experience, thought, and action, even though that event cannot be consciously remembered. Implicit memories are unconscious memories.

Neuropsychological research has also revealed unconscious influences in the perceptual domain. Perhaps the most dramatic example is the phenomenon of blindsight documented in some patients with damage to the striate cortex of the occipital lobe. Such patients experience a scotoma—a portion of the visual field where they have no visual experience. When a stimulus is presented to their scotoma, they see nothing at all. However, when encouraged to make guesses about the properties of the stimulus, their conjectures about the presence, location, form, movement, velocity, orientation, and size prove to be more accurate than would be expected by chance.

Something similar occurs in at least some cases of visual neglect arising from lesions in the temporoparietal region of one hemisphere (usually the right) that do not affect primary sensory or motor cortices. These patients appear to neglect the corresponding portion of the contralateral sensory field (usually the left). Thus, a patient asked to bisect a set of horizontal lines may ignore the ones on the left side of the page; and for the remainder, the pencil strokes tend to be located about one-fourth of the way in from the right. It is as if the left half of the page, and the left half of each line, is

not seen at all. However, in some cases, it can be shown that these patients respond to information available only in the neglected field. For example, pictures presented in the neglected portion of the visual field prime lexical decisions concerning semantically related words presented in the intact portion. Preserved visual functioning in blindsight and in neglect is unconscious perception.

C. The Subliminal

Perception without awareness can also be observed in neurologically intact subjects in the form of “subliminal” perception. Before World War II, the question of subliminal perception was raised mostly in regard to psychoanalysis; after the war, the notion was revived as part of Jerome Bruner’s “New Look” in perception, only to be shot down by the withering critiques of Israel Goldiamond and C. W. Eriksen. However, in the early 1980s Anthony Marcel presented solid evidence of subliminal semantic priming effects on lexical decision: Presentation of a word such as “doctor” primed lexical decisions of a semantically related word such as “nurse,” even though an intervening mask prevented subjects from consciously perceiving the prime.

Other investigators soon confirmed and extended Marcel’s findings, but his studies raised a firestorm anyway, with a number of critics essentially repeating the criticisms that Goldiamond and Eriksen had made of Bruner and colleagues. A major reason for this response may have been the association of subliminal perception with psychoanalytic theory. However, another reason was the simple fact that the cognitive theories of the time tended to describe cognition in terms of a series of ever more complicated processes and had no room for the possibility that the meanings of words could be analyzed unless conscious attention was paid to them. The criticisms had the character of the apocryphal entomologist who found a bug he could not classify so he stepped on it.

In any event, things are vastly different now. Signal detection theory has replaced the notion of an absolute limen, or threshold, with the statistical concept of zero sensitivity (where $d' = 0$). A wealth of evidence now supports the validity of subliminal perception, defined broadly as the influence of stimuli that are too degraded by their conditions of presentation to be accessible to conscious perception. The debate now is not so much over whether subliminal perception (so defined) occurs as over the extent of subliminal processing.

D. The Role of Hypnosis

The fourth line of research contributing to the rediscovery of the unconscious was hypnosis, a social interaction in which the subject acts on suggestions for experiences involving alterations in perception, memory, and the voluntary control of action. As William James recognized more than a century ago, many of these phenomena involve a division in consciousness such that memories, percepts, and the like influence experience, thought, and action outside of phenomenal awareness.

Consider posthypnotic amnesia, the phenomenon that gave hypnosis its very name. After receiving appropriate suggestions, many highly hypnotizable subjects come out of hypnosis unable to remember the events and experiences that transpired while they were hypnotized. For example, subjects who studied a list of animal names while hypnotized will be unable to remember them afterward. However, these unremembered items will also give rise to priming effects: If asked to generate names of animals, subjects will be more likely to give the names they studied while under hypnosis. Moreover, after the amnesia suggestion has been canceled by a prearranged reversibility cue, the subject will regain perfect conscious memory for the studied list. The reversibility of amnesia indicates that, in contrast to the organic amnesias associated with hippocampal damage, posthypnotic amnesia reflects a deficit in retrieval rather than encoding. However, the preserved priming effects show that the retrieval deficit affects explicit, but spares implicit, expressions of memory.

Hypnotic suggestion can also affect perceptual functions. When given hypnotic suggestions for blindness, many hypnotizable subjects have the subjectively compelling experience that they no longer can see. However, Richard Bryant and Kevin McConkey presented subjects with cards on which were printed homophones (i.e., words that have the same sound but two different spellings, such as “pain” and “pane”) together with disambiguating words (e.g., “body” or “window”). The hypnotically blind subjects did not see the cards, but on a subsequent test they spelled the homophones in accordance with the disambiguating associates with which the words had been paired. This is another kind of priming effect, and it clearly indicates that the words in question were perceptually processed outside of awareness.

A third example of unconscious processing in hypnosis is provided by posthypnotic suggestion—the phenomenon that, our mythology tells us, gave Freud

his first good insight into the psychological unconscious. In some sense, posthypnotic suggestion is a special case of implicit memory because subjects act on a suggestion given during hypnosis, despite the fact that they cannot remember the suggestion. Posthypnotic behavior is typically experienced as an involuntary, quasi-automatic response to the cue, but it has had no opportunity to be automatized by extensive practice, and detailed experimental analysis shows that it does not fit the conventional criteria of automaticity. Despite consuming considerable attentional resources, posthypnotic suggestions are executed, outside of awareness, thus extending the boundaries of the psychological unconscious beyond the automatic.

IV. IMPLICIT COGNITION

The rediscovery of the unconscious may have gotten a late start, but it is now well along.

A. The Automaticity Juggernaut

The concept of automaticity has proved to be particularly popular across a wide variety of fields within psychology. For example, a set of articles in the July 1999 issue of *American Psychologist*, published under the title of “Behavior—It’s Involuntary,” illustrated the increasingly powerful role played by the concept of automaticity in personality, social, and clinical psychology. The general argument is that some attitudes, impressions, and other social judgments, as well as aggression, compliance, prejudice, and other social behaviors, are typically mediated by automatic processes, which operate outside phenomenal awareness and voluntary control. To some extent, what might be called an automaticity juggernaut seems to represent a reaction to a cognitive view of social interaction, which some consider inappropriately emphasizes conscious, rational, and cognitive processes at the expense of the unconscious, irrational, emotive, and conative. In addition, the popularity of automaticity seems to represent a reversion to earlier, precognitive, situationist views within social psychology.

After all, the concept of automaticity is at least tacitly modeled on innate stimulus–response connections, such as reflexes, taxes, and instincts, as well as those acquired through classical and instrumental conditioning. The automaticity juggernaut is not exactly a reversion to Skinnerian behaviorism because it entails internal mental representations and processes intervening between stimulus and response, but it is

close: If the cognitive processes underlying social cognition and social behavior are indeed largely automatic, then not too much thought has gone into them.

B. Implicit Memory

Like automaticity, the concept of implicit memory has received a huge amount of attention in the field. A whole industry has developed around implicit memory, involving amnesic and demented neurological patients; dissociative disorders such as psychogenic amnesia, fugue, and multiple personality; children and the healthy aged; depressed patients receiving electroconvulsive therapy; surgical patients receiving general anesthesia or conscious sedation; hypnotized subjects (but apparently not sleepers); and even college students who have all their wits about them.

However, there are some important issues that have to be addressed by further research. For example, almost all the evidence on implicit memory has been collected within a single narrow paradigm, repetition priming, leading to theories of implicit memory that emphasize relatively low-level perceptual processes. However, semantic priming also occurs, not just in posthypnotic amnesia but also in organic amnesia, suggesting that these perception-based theories are not adequate for the phenomenon. Similarly, although explicit and implicit memory are dissociable, they also interact, requiring revisions in theories that hold that these two expressions of memory are mediated by separate memory systems in the brain.

Despite these and other persisting questions, the general acceptance of the distinction between explicit, conscious and implicit, unconscious expressions of memory opens the door to extensions of the explicit–implicit distinction to other domains of mental life.

C. Implicit Perception

By analogy to implicit memory, implicit perception may be defined as the influence of a current event, or an event in the very recent past (what William James called the specious present), on experience, thought, or action, in the absence of conscious perception of that event. Implicit perception subsumes so-called “subliminal” perception, involving the processing of stimuli that are degraded beyond conscious perception by low intensities, brief durations, or masking stimuli. However, it goes beyond the subliminal to include neurological syndromes such as blindsight and neglect,

where the stimuli are in no sense subliminal: They are perfectly visible to everyone but the brain-damaged subject. This is also the case for the conversion syndromes of “hysterical” deafness, blindness, and anesthesia. Similarly, in hypnotic blindness, deafness, anesthesia, and analgesia, the subjects would be clearly aware of the stimuli in question were it not for the hypnotist’s suggestion. On the fringes of consciousness are cases of so-called preattentive processing, in which the stimulus in question is nominally supraliminal but escapes focal awareness by virtue of parafoveal presentation or presentation over the unattended channel in the dichotic listening or shadowing paradigm. Thus, the term implicit perception captures a broader range of phenomena than is covered by the term subliminal perception because it covers the processing, outside of conscious awareness, of stimulus events that are clearly perceptible in terms of intensity, duration, and other characteristics. It also has the advantage of skirting the difficult psychophysical concept of the limen.

What all these phenomena have in common is a dissociation between explicit and implicit perception, analogous to the dissociation between explicit and implicit memory: The subject’s experience, thought, and action are affected by some event in the current stimulus environment, in the absence of conscious perception. The distinction between implicit perception and implicit memory is not always easy to make because both phenomena are revealed by postexposure priming effects (i.e., by performance on a nominal test of implicit memory). Arguably, however, the term implicit memory should be reserved for cases in which the stimulus event was consciously perceived at the time of encoding; where there is no conscious awareness at the time of encoding, we can consider priming effects as evidence of implicit perception. Thus, on the assumption that adequately anesthetized patients are really unaware, during their procedures, of what our medical colleagues disarmingly call “surgical stimuli,” evidence collected in the recovery room of priming effects attributable to events presented during surgery constitutes evidence of implicit perception, not just implicit memory. In contrast, priming effects observed in conscious sedation, in which subjects are fully aware of the study trials, are pure implicit memory effects.

Adopting the implicit–explicit distinction may help resolve a persisting controversy over the scope of unconscious perception. For example, Anthony Greenwald and colleagues asserted that subliminal perception is analytically limited: Some semantic processing of a subliminal stimulus is possible, but

not too much. On the other hand, advocates of subliminal symbiotic stimulation—the “mommy and I are one” experiments—assume more processing than Greenwald’s arguments would predict; so do those who employ subliminal techniques in advertising and psychotherapy. Most arguments for the analytic power of subliminal processing appear to be based on Romantic or psychoanalytic notions of the unconscious. On the other hand, there are many ways to render percepts implicit, and how this is done may make a major difference in regard to what one can do with them. Philip Merikle and colleagues distinguished between the objective threshold, where all responses to the stimulus decrease to chance levels, and the subjective threshold, where the subject simply does not experience the stimulus consciously. Greenwald’s experiments take subjects as close to the objective threshold as possible, and with such degraded presentations it is not surprising that perception, and memory encoding, is analytically limited. When subjects get closer to the subjective threshold, more extensive analyses, still outside awareness, might be possible. In hypnosis, in which the stimulus is in no sense degraded, the possibilities for analysis might be unlimited.

D. Implicit Learning

Continuing the elaboration of the explicit–implicit distinction to other domains, implicit learning can be defined as the acquisition of new knowledge and patterns of behavior through experience, in the absence of awareness of the knowledge or behavior so acquired. As it happens, the term implicit learning antedates implicit memory, having been coined by Arthur Reber in 1967. Reber demonstrated that subjects who studied a set of letter strings generated by a Markov process artificial grammar could distinguish between new grammatical and ungrammatical strings without being able to articulate the grammar in question.

In some respects, the learning of artificial grammars appears similar to the acquisition of syntax in natural language. After all, we are perfectly fluent speakers and interpreters of our native language long before we learn the rules of grammar in elementary school. However, implicit learning has also been observed in a wide variety of other paradigms, including classical and instrumental conditioning, control of complex systems, and the learning of categories and sequential relationships. In each of these cases, the claim is that people’s behavior is shaped by prior experience (the

classical definition of learning), even though they are unaware of what they have learned.

As with implicit perception, however, the border between implicit learning and implicit memory is vague. Of course, this is as it should be: Memory provides the cognitive basis for learning in the first place, and whatever is learned has to be stored in memory. However, the problem goes deeper than that. When normal subjects learn an artificial grammar, they certainly remember being asked to study the sample strings, and they may even remember the strings themselves, even if they are unaware of what they have evidently learned about the structure of the grammar. In contrast, when brain-damaged amnesic patients acquire new patterns of behavior from experience, as exemplified by mirror tracing and pursuit-rotor learning in patient H.M., they are amnesic for the whole learning experience. In amnesia, the occurrence of implicit learning also provides evidence of preserved implicit memory, but as in the case of implicit perception the term implicit memory is best reserved for effects that occur in the absence of conscious memory for the original experience. By the same token, implicit learning refers to abilities and patterns of response that are acquired through learning experiences, in the absence of conscious awareness of what has been learned.

A small industry has developed around implicit learning, culminating in the 1998 publication of an entire handbook devoted to the topic. However, the claim of implicit learning remains controversial even after more than 30 years of work. There is continuing debate over whether implicit learning is really unconscious in any meaningful sense of the term. It may be too much to expect subjects to be able to articulate an entire Markov process artificial grammar, but subjects might be consciously aware of enough of the rule to permit them to discriminate at above chance levels between grammatical and ungrammatical strings. Perhaps this debate will be resolved if we pay more attention to the format in which the newly acquired knowledge is represented. Perhaps, as implied by the original artificial grammar studies, the subject acquires a whole system of “if-then” productions and this procedural knowledge, like all procedural knowledge, is inaccessible to conscious introspection.

On the other hand, perhaps the knowledge acquired during implicit learning is not procedural at all, but declarative in nature. For example, subjects might abstract from the learning trials a prototype of a grammatical string; alternatively, they may simply memorize the instances on the study list. In either case,

they may make relatively accurate grammaticality judgments by consciously comparing test items to the summary prototype or to the specific exemplars they have memorized. In any event, amnesic patients can learn from their experience without remembering the learning experience, and in this sense, at least, implicit learning provides evidence of unconscious influence.

E. Implicit Thought

If the concept of implicit learning is more controversial than those of implicit memory or implicit perception, the concept of implicit thought is even more so. However, the literature contains some favorable evidence. For example, Kenneth Bowers and associates found that subjects can choose which of two problems is soluble without knowing the answer to the soluble one. In a variant on Sarnoff Mednick’s Remote Associates Test (RAT), called “Dyads of Triads,” subjects were presented with two RAT-like items. The task in the traditional RAT is to generate a fourth word that is associatively linked to the other three. In Bowers’s modification, one triad coheres on a common (if remote) associate, and the other does not (at least barring psychotically loose associations). Bowers *et al.* found that subjects could choose the coherent triad at better than chance levels, even when they could not say what the solution was.

Subsequent research has found that soluble RAT items primed their solution words for lexical decision, even when the subject failed to produce the solution. This priming effect, and the effect on choice observed by Bowers, seem to reflect the preconscious activation of a mental representation of the solution to the problem. However, this mental representation is not a percept, and it is not a memory. The mental representation in question is an idea or an image or, more broadly, a thought.

Accordingly, implicit thought may be defined as the influence of some cognitive representation, itself neither a percept nor an episodic memory, on experience, thought, or action in the absence of conscious awareness of that representation.

Implicit thought may well underlie some of the most interesting facets of creative thought. In this view, intuition reflects a priming-based “feeling of knowing” similar to what we commonly see in studies of memory, incubation reflects the gradual accumulation of strength of this primed idea, and insight reflects the emergence of the preconscious idea into the full daylight of consciousness.

V. IMPLICIT MOTIVATION AND EMOTION

Along with automaticity, implicit memory, implicit perception, implicit learning, and implicit thought comprise the cognitive unconscious. However, cognition is not all there is to mental life, and so we are led to ask whether there is an affective unconscious and a conative unconscious as well. Of course, emotional and motivational states may arise automatically and in this sense result from unconscious processes. However, can motives and emotions be unconscious in the same way that implicit memories can?

In fact, the late David McClelland and associates articulated a concept of implicit motives—interestingly, without overt reference to the concept of implicit memory. Explicit motivation might be defined as the conscious representation of a conative state or the desire to engage in some particular activity, as represented by a craving for food, yearning for love, and the like. In contrast, implicit motivation refers to any change in experience, thought, or action that is attributable to one's motivational state in the absence of conscious awareness of that state. We are admittedly on the verge of Freudian territory here, but the motives in question are not seething sexual and aggressive impulses arising from the id; they are motives for achievement, power, affiliation, and intimacy.

Moreover, McClelland and colleagues keep us on a firm empirical base. For them, explicit motives are self-attributed: The person is aware of the motive, can reflect on it, and can report its presence in interviews or on personality questionnaires. Implicit motives, in contrast, are inferred from the person's performance on such tasks as the Thematic Apperception Test. On the basis of an extensive program of empirical research, McClelland and associates concluded that explicit and implicit motives influence different classes of behavior and respond to different types of social influence. More work needs to be done, but the evidence indicates that explicit and implicit motives are indeed dissociable, in much the same way that explicit and implicit memories are dissociable.

Regarding the affective domain, it is possible that dissociations occur between explicit and implicit expressions of emotion, just as they occur between explicit and implicit expressions of memory. Again paralleling the vocabulary of the cognitive unconscious, we define explicit emotion as the person's conscious awareness of an emotion, feeling, or mood state; implicit emotion refers to changes in experience, thought, or action that are attributable to one's

emotional state in the absence of conscious awareness of that state.

Note that conscious emotional responses can serve as expressions of implicit memory and perception. Most of the relevant studies make use of the mere exposure effect documented by Robert Zajonc, in which exposure to an object increases one's preference for that object on a subsequent choice task. According to one theory, the mere exposure effect is a variant on the priming effect familiar from studies of implicit memory and implicit perception. On the memory side, it seems that brain-damaged, amnesic patients show the mere exposure effect, even though they cannot recognize the objects to which they had previously been exposed. With respect to perception, normal subjects show mere exposure effects even when the exposures in question were subliminal and thus not consciously perceived. In both cases, the subjects preferred previously exposed objects to new ones, even though they had no conscious perception, much less conscious recollection, of the visual stimuli.

With respect to the proposition that people can be unaware of emotional states, which nonetheless influence their ongoing experience, thought, and action, the empirical evidence is regrettably sparse. However, there remain good theoretical reasons for thinking that it might be true. For example, Peter Lang's multiple-systems theory of emotion postulates that every emotional response consists of three components: verbal-cognitive, corresponding to a subjective feeling state such as fear; overt motor, corresponding to a behavioral response such as escape or avoidance; and covert physiological, corresponding to a change in some autonomic index such as skin conductance or heart rate. These three components or systems usually covary, but in some circumstances they can move in different directions—a state that Stanley Rachman and colleagues labeled desynchrony.

Of special interest in the current context is a particular form of desynchrony in which explicit emotion, as represented by the conscious, subjective feeling state, is absent, but behavioral and somatic signs of emotion persist. Currently, most evidence for this desynchrony comes in the form of clinical anecdote rather than controlled experiment, but it is comforting that just such a desynchrony is predicted by a neuropsychological model of fear recently presented by Joseph LeDoux. LeDoux proposes that environmental stimuli are first processed by sensory centers in the thalamus that then pass information about emotional events to the amygdala, which in turn generates appropriate behavioral, autonomic, and

endocrine responses. Information about these responses is also passed to cortical centers supporting working memory, where it is integrated with information provided by thalamic centers about the fear stimulus, thus generating the full-blown subjective experience of being afraid of something. However, if a disconnection between thalamus and cortex prevents the fear-eliciting stimulus from being represented in working memory, the person will experience fear without being aware of the fear stimulus. In this case, emotion will serve as an implicit expression of perception or memory, as described earlier. Alternatively, if there is a disconnection between the amygdala and the cerebral cortex, the person will behave in a fearful manner without feeling fear or anxiety. In this case, there will be a dissociation between explicit and implicit emotion.

Neuroscientific theory aside, a potentially interesting approach to implicit emotion has been offered by Anthony Greenwald and Mahzarin Banaji in their application of the explicit–implicit distinction to the social–psychological concept of attitude. Attitudes are affective dispositions to like or dislike certain things; like motives, they are usually measured explicitly by self-report scales. However, Greenwald and Banaji suggested that people may possess positive and negative implicit attitudes about themselves and other people, which can affect ongoing social behavior outside of conscious awareness. Like McClelland's implicit motives, implicit attitudes are assessed in terms of task performance rather than self-report. When implicit attitudes diverge greatly from their explicitly expressed counterparts, this indicates a dissociation between explicit and implicit emotion. Unfortunately, the experimental literature on implicit attitudes rarely offers a direct contrast between explicit attitudes, so it is unknown whether such dissociations actually occur, in what kinds of people, and in what circumstances. However, this experimental approach to implicit emotion is very promising.

VI. THE UNCONSCIOUS AND THE BRAIN

In the 19th century, Hartmann distinguished between the relative (psychological) unconscious and the physiological and physical unconscious, and we can make a similar distinction between unconscious mental life and unconscious physiological and biochemical processes. Most of our bodily functions proceed unconsciously, without any direct introspective awareness of them or direct voluntary control over them, and

this is as true of the nervous system as it is of the other systems in the body. At the molecular and cellular levels of analysis, we have no awareness of the depolarization of cell membranes, the transmission of action potentials down the axon, or the processes of synaptic transmission. We are not aware of the transmission of neural impulses up and down the spinal cord or of the patterns of neural activity that constitute the cortical representation of experience, thought, and action afferent.

We are not aware of the saccades by which we refresh our retinal images or of the opponent processes that allow us to see various combinations of red, yellow, green, and blue. Spinal reflexes are spared in neurological patients who have been rendered paraplegic or quadriplegic by virtue of a complete break in the spinal cord. However, the patients have no direct awareness of these responses, no ability to voluntarily inhibit them, and no ability to initiate similar actions, at will, in the absence of effective stimuli. In the absence of biofeedback technology, we have no awareness of our blood pressure or whether our brains are generating alpha, beta, delta, or theta activity. These physiological and electrochemical processes in the body are as unconscious as photosynthesis and cell division, the tides, and plate tectonics. However, these things are not what “the unconscious” is all about. To refer to them as unconscious, as Hartmann did, is to make what the philosopher Gilbert Ryle called a category mistake—the error of ascribing to one domain a feature attributable only to another. Consciousness belongs to the domain of the mental, and so does the psychological unconscious. It makes no sense to apply the distinction to anything other than mental life.

The revival of interest in consciousness among psychologists and other cognitive scientists has led to a revival of interest in its physiological substrates. A number of neural correlates of consciousness (NCCs) have been proposed, such as activity in the reticular formation or the left hemisphere. However, the reticular formation appears to be responsible for maintaining cortical arousal, which is not the same as consciousness, and careful studies of split-brain patients make it clear that the right hemisphere has a consciousness of its own, even if lacks the ability to communicate its experiences verbally. Recent proposals have similar problems. For example, Francis Crick and Christof Koch proposed that the NCC consists of synchronized firings (e.g., at 40 Hz) of different various cortical neurons representing features of an object; however, it may also be that such firings serve merely to

bind various features of an object together to form a unified mental representation, and that other neural processes determine whether that representation will be consciously accessible. Giulio Tononi and Gerald Edelman proposed that consciousness results from the firings of neurons distributed widely over the thalamocortical system; however, this may be true of any mental representation, conscious or not.

The 19th-century phrenologists did not assign the “faculty” of consciousness to any portion of the brain, perhaps because they viewed consciousness as an intrinsic property of mental life. However, documented dissociations between explicit and implicit cognition, emotion, and motivation offer the possibility of finding portions of the brain that are involved in conscious but not unconscious, or unconscious but not conscious, mental life. For example, Schacter hypothesized the existence of a conscious awareness system (CAS), a brain module that supports conscious awareness in various domains, such as perception and memory. Connection between a module supporting memory and the CAS would render memories accessible to conscious awareness; a disconnection (to use a term coined by Norman Geschwind) between these modules would impair conscious recollection but spare implicit expressions of memory.

Schacter’s proposal is congruent with a general principle of the modularity of the mind and brain, but some considerations suggest that there might be multiple CASs, each supporting conscious awareness in different mental domains. Thus, although it appears that the hippocampus plays a special role in explicit memory, it plays essentially no role in conscious vision. The striate cortex (area V1) mediates conscious visual experience but plays no special role in conscious recollection. As noted earlier, LeDoux proposed that conscious emotional experiences (or at least the experience of fear) are mediated by connections between the amygdala and cortical structures supporting working memory, whereas unconscious behavioral and physiological expressions of emotion are mediated by connections between the amygdala and subcortical structures. Perhaps newly emerging brain imaging techniques applied to patients or subjects who display a dissociation between explicit and implicit memory, or the like, will be able to reveal cortical structures that are differentially involved in conscious and unconscious mental life.

On the other hand, it may be that brain imaging approaches will not reveal the neurophysiological differences between conscious and unconscious mental life. For example, it has been proposed that all

conscious mental states refer to the self as the agent or patient of some action or the stimulus or experiencer of some state; unconscious mental states lack this kind of self-reference. If so, then conscious awareness is not a matter of the activity of one or more brain modules but rather of a connection of some sort between the mental representation of the action or state in question and a mental representation of the self. It is now believed that such knowledge representations are generated by ensembles of neurons distributed widely across the cortex rather than by specific cortical loci (e.g., “grandmother” cells). If this notion is correct, then brain imaging techniques such as functional magnetic resonance imaging, which are designed to identify specific neural loci involved in one kind of mental activity or another but cannot discriminate between neural representations of specific mental contents, cannot reveal the NCC.

VII. WHITHER THE UNCONSCIOUS?

The initial discovery of the unconscious, which was consolidated at the turn of the 20th century, has been revived, and the process of rediscovery is well along at the beginning of the 21st century. There is incontrovertible evidence for automatic mental processes and for implicit memories. Implicit perception is perhaps less convincingly established, and implicit learning remains controversial as well. However, the evidence favoring both concepts cannot be dismissed out of hand. Research on implicit thought is admittedly immature, but the evidence in hand is quite provocative. Based on the evidence for the cognitive unconscious, implicit motivation and implicit emotion cannot be dismissed out of hand, but we still require convincing evidence that they can be dissociated from their explicit counterparts. However, it is clear that the paradigms developed in the study of implicit memory provide a vehicle for exploring all aspects of the psychological unconscious. In response to Immanuel Kant, we can say that priming and other methodologies do in fact enable us to infer that that we have ideas, even though we are not conscious of them. Also, in response to William James, we can say that these same methodologies, rigorously applied, will prevent us from believing whatever we like about the unconscious mind.

In that respect, it must be emphasized that the scope of the psychological unconscious, broad as it is, does not appear to be so broad as to encompass the unconscious of psychoanalytic theory. There is no

evidence favoring Freud's view that the unconscious is the repository of primitive, infantile, irrational, sexual, and aggressive impulses, repressed in a defensive maneuver to avoid conflict and anxiety. Nor is there any evidence to support the more extreme clinical lore concerning unconscious representations of trauma or the excesses of the recovered memory movement in psychotherapy. In this case, as James warned, the unconscious does indeed seem to be a tumbling ground for whimsies.

See Also the Following Articles

COGNITIVE PSYCHOLOGY, OVERVIEW • CONSCIOUSNESS • CREATIVITY • DREAMING • INHIBITION • MEMORY, EXPLICIT AND IMPLICIT • NEUROPSYCHOLOGICAL ASSESSMENT • PRIMING • PSYCHOPHYSIOLOGY • RECOVERED MEMORIES

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