

The Psychological Unconscious

A Necessary Assumption for All Psychological Theory?

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ABSTRACT: *The notion of complex psychological processes operating outside of awareness has traditionally been associated with the concept of the unconscious used by psychodynamically oriented clinicians; it has never found an equivalent place in the mainstream of American experimental psychology. However, mounting evidence from several rather diverse fields of empirical research (e.g., selective attention, cortical evoked potentials, subliminal perception) provides support for such a concept, and, in fact, explanatory constructs of a similar nature have been embodied in several current models of perceptual processing. While there clearly remains an enormous gap between the clinically based conception and the experimentally based conception of the nature of these unconscious processes, they nevertheless seem to provide an interface between two seemingly disparate approaches to the understanding of personality.*

In a section entitled "Can States of Mind Be Unconscious?" William James (1890), in his classic *Principles of Psychology*, presented 10 arguments in favor of unconscious processes and 10 refutations of these arguments. The arguments in favor of unconscious states of mind ranged from unconscious inference, as in perceptual constancy, to unconscious motivation, which has since become so closely identified with psychoanalysis and Freud. To most of the arguments in favor of unconscious processes, James replied that a more parsimonious approach could be based on the assumption of neurophysiological processes unassociated with any psychological counterparts (e.g., "activated brain-tracts") or on the assumption that a psychological state could be briefly conscious and quickly forgotten, a fate suffered by many dreams. He also advanced the argument of a "split-off" cortical consciousness, as in multiple personalities, which sounds very much like a position recently taken by Hilgard (1977). James (1890) warned that "the unconscious is the sovereign means for believing whatever one likes in psychology and of turning

what might become a science into a tumbling ground for whimsies" (p. 163).

Historically, American psychology since James has taken extreme positions on the issue of unconscious mental processes. Behaviorism, reacting against the methodological deficiencies of introspection, not only rejected the unconscious but also rid itself of consciousness, a direction hardly agreeable to James, for whom consciousness was the very subject matter of psychology. Psychoanalysis, as reflected in much clinical practice, has continued to base itself on unconscious mental processes, no matter what its particular school—classical Freudian, neo-Freudian, Jungian, Sullivanian, and so forth. Recent popular variants, such as transactional analysis, primal-scream therapy, and gestalt therapy, also share the assumption of unconscious mental processes. In more recent years, the "black box," into which no Skinnerian would peer, has tempted the voyeuristic impulses of not a few behaviorists. A growing number of behaviorists have begun thinking about thinking, finding it necessary to hypothesize about cognitive factors mediating between stimulus and response. Shallice (1972) has argued against the behaviorists' rejection of consciousness as a pseudoconcept, contending that "concepts such as strategy and rehearsal are . . . used as explanatory concepts. Such concepts depend on the theorist reflecting on conscious experience" (p. 383). Others, such as London (1972), Bandura (1974), and Lazarus (1977), have described their own evolution from radical behaviorism, in which cognitive mediating factors play no role, to a view of psychology in which subjective and conscious events are important. As cognition and consciousness have returned to psy-

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chology, the concept of unconscious mental processes has received increasing attention (Erdelyi, 1974; Neisser, 1976; Nisbett & Wilson, 1977; Posner, 1973).

It is the purpose of this article to show that in a number of different research areas, investigators have developed explanations that incorporate concepts akin to psychological unconscious processes. In fact, the variety and extent of such explanations, touching on several significant areas of investigation, suggest strongly to us the likelihood that no psychological theory can do without the assumption of a psychological unconscious.

Before presenting the models referred to, it will be necessary to offer a definition of unconscious psychological processes.

The Psychological Unconscious: Description and Definition

The clinical phenomena that led to the assumption of unconscious processes often take the form of a patient describing a bothersome condition that the patient can neither account for nor control (e.g., a phobia, a self-destructive pattern of behavior, a depressive mood) (Rapaport, 1944/1967; Sherwood, 1969). The patient's report in effect conveys a discontinuity in his or her ability to make sense out of some important aspect of experience.¹ Thus, a discontinuity is inferred when the apparent (i.e., consciously accessible) causal factors for a particular thought, feeling, or act are not, in and of themselves, sufficient to explain its occurrence. The psychodynamically oriented clinician then assumes that the disturbance can be accounted for by the existence of certain psychological processes unknown and unavailable to the patient. Underlying the concept of a psychological unconscious is the axiomatic belief that psychological factors are not epiphenomenal but can be causative agents. The psychological unconscious is simply that class of psychological events that are at the time unknown to the patient but that actively affect the patient's behavior. Furthermore, this impact on behavior reveals itself as a discontinuity, in which illogical or irrational relationships are often involved. Thus, the psychodynamic concept of the unconscious can be defined in terms of three characteristics: It is *psychological*, it is *active*, and it can be *different* in character from conscious psychological processes.

By *psychological* we mean simply that all cate-

gories of descriptive terminology applicable to conscious experience can also be applied to unconscious processes: perception, judgment, thought, affect, motivation, and so forth.² Thus, personally significant, cognitively abstract, and highly idiosyncratic experiences can be unconscious. Moreover, inasmuch as conscious processes are correlated with brain events, the same may be assumed for unconscious processes.

By *active* we mean that unconscious processes affect ongoing behavior and experience, even though the experiencer may be unaware of this influence. From this point of view, a memory trace, indicating some structural modification of the nervous system, would not be considered to belong to the psychological unconscious until such time as it actively influenced psychological events.

By *different* we mean that unconscious processes may follow different principles of organization than those that characterize psychological processes occurring during the normal, waking state of consciousness.

On the basis of this definition, we arrive at two postulates—a weak form and a strong form—for which we shall venture to adduce a range of relevant theory in psychology at large. In the *weak* form of this postulate, we shall assume that psychological unconscious processes exist and actively affect conscious psychological processes. In the *strong* form of the postulate, we shall add only that these psychological unconscious processes follow different laws of organization. It is worth noting that the view of unconscious processes held by psychodynamically oriented clinicians includes an important feature that we have not incorporated into either of the above postulates: We make no reference at this point to the special role of mo-

¹The reader is referred to Rapaport (1944/1967) for an extended discussion of the concept of discontinuity and its relationship to psychodynamic concepts.

²We are defining the term *psychological* on the basis of an ostensive definition, comparable to defining the color red by pointing to a series of red objects. In this way we are essentially using a common sense approach, drawing on readily available experience shared by most people. We chose this type of definition rather than an analytic type (e.g., red is defined as that color experience associated with a physical stimulus having the property of so many angstrom units) to avoid getting into a "mind-body" quagmire. For our present purposes, we propose to leave open the question whether by such terms as judgment, thought, affect, and the like we are talking about "mind" or "body." We are simply talking about identifiable and reportable phenomena.

tivational factors (e.g., drives, impulses), which are so important to the psychodynamically oriented clinician. However, in the course of our discussion, we shall attempt to point out the ways in which motivational factors fit within our conceptual framework.

Evidence and Theory in Support of the Psychological Unconscious

We shall now consider a number of different sources of evidence and a variety of theories, all of which appear to involve an implicit assumption of psychological unconscious processes. These areas of research and theory are (a) selective attention, (b) subliminal perception, and (c) certain visual phenomena involving perceptual processing, namely, retinal image stabilization, binocular rivalry, and backward masking. We do not consider these areas to be exhaustive of the areas in psychology that would provide support for our thesis; rather, we consider these particular areas to be of special importance because of the diversity of the methods on which they are based and because of their theoretical significance.

SELECTIVE ATTENTION

An individual, at any given time, is confronted with more stimulation from within and from without than can be managed adaptively. Some degree and kind of selection must occur. What is the nature of this selection process? In recent years some interesting answers have emerged, based on a body of highly ingenious experimentation. We shall focus on the general theories that have been advanced to account for the findings emerging from this area of research, rather than reviewing the specific studies themselves. For detailed reviews of selective-attention research, see Moray (1969) and Kahneman (1973).

Inherent in all the major models of attention is the assumption that at least part of the cognition related to attention takes place outside of awareness. Six such models will be described briefly. These models are based on extensive experimental research that has given rise to a literature marked by sharp controversy. For our purposes, however, we need rely only on the noncontroversial and broadly accepted findings, while identifying the controversial issues wherever they are relevant.

The earliest of these models was proposed by

Broadbent (1958). In Broadbent's original "filter theory" of attention, signals enter the perceptual system through a number of parallel sensory channels. These parallel sensory inputs feed into a memory store, where they are retained for a few seconds. Beyond this memory store is a single channel that has a much smaller capacity than the combined capacity of all the input channels. A filter, lying between the memory store and the limited-capacity channel, selects one of the input lines and allows the signals that enter through it to gain access to the limited-capacity channel. Signals feeding in from the other channels are held briefly in memory and then lost. Thus, an initial sensory analysis of the stimulus input does occur prior to awareness of the nature of that input. Broadbent indicates that the determination of which signals are allowed access to the limited-capacity channel is based not only on the properties of the stimuli but also on the state of the organism (e.g., its drive state).

While a filtering mechanism of the sort described does involve perceptual processing outside of awareness, it should be noted that the analysis that occurs prior to awareness is a very rudimentary one inasmuch as only sensory information is involved—*meaning* is not a factor. Moreover, there is no provision for those stimuli that do not achieve awareness to be stored in any form. However, because Broadbent uses terms like *memory* to describe processes occurring prior to awareness, it appears that he considers them to be psychological; because they precede awareness, they are unconscious; lastly, because the filtering that occurs outside of awareness affects what will become conscious and because it interacts with the state of the organism at the time, these unconscious psychological processes are not simply latent but are active in our sense. There is also a hint that these unconscious processes work on a different principle from that of conscious processes—input is organized along multiple channels, as contrasted with the single channel for conscious processes. On the whole, however, Broadbent's (1958) model is more consistent with the weak postulate for unconscious processes than with the strong postulate.

Treisman's (1964) theory of perception is similar to Broadbent's in that information enters the system through multiple parallel channels. Treisman's model incorporates two stages of perceptual processing. The initial filter analyzes the incoming signals only on the basis of simple physical

properties, such as intensity or frequency. All signals pass through this filter and are processed further; however, this first filter attenuates the signal strength of the nonattended channels to a level below that of the attended channel. The signals then proceed through a second screening process based on more complex characteristics. In this higher order screening process, thresholds differ for different types of signals, so that even though a signal may have been attenuated by the earlier filter, it can still pass through this later screening process if it is of a type for which the threshold is low. In this second-level screening, the mechanisms that respond to biologically (or emotionally) important signals have permanently lowered thresholds; the thresholds for other types of signals may vary, depending on circumstances. In this model, the full import of a signal reaches awareness only after it has passed through the higher order second-stage screening process.

For Treisman, the processing that occurs prior to awareness involves far more complex attributes of the stimulus than is the case in Broadbent's (1958) model. Furthermore, these complex unconscious processes are concurrent (going on in parallel channels), whereas conscious processes are serial (single-channel in nature). Thus, Treisman's (1964) model is strongly consistent with the weak postulate and moderately consistent with the strong postulate.

Deutsch and Deutsch (1963) have propounded a theory of attention similar to Treisman's except that it does not posit an initial analysis on the basis of simple physical characteristics. Instead, all signals reach the higher order analyzers and then undergo complex perceptual analysis. Each signal increases the output of some mechanism for perceptual discrimination to a certain level; only the highest level output enters awareness. Conscious perception, in this scheme, is a response to the output of the higher order analyzing mechanisms; thus complex processing must occur outside of awareness. This model is, for our purposes, essentially similar to the Treisman (1964) model, and the same considerations apply to it as to the latter model.

The fourth model of attention to be discussed is that of Neisser (1967). Neisser's model is similar to the others described in that it posits parallel input processes that feed into a single mechanism of awareness. Neisser differs from the other theorists, however, in his conception of the nature of

the processing that occurs without awareness and also in the degree to which he concerns himself with the explication of these perceptual processes in cognitive terms.

According to Neisser (1967), attentive mechanisms come into play only after preliminary processes have already ordered the stimulus field into coherent figural units, because these attentive mechanisms cannot operate on the whole field simultaneously. The preliminary, or preattentive, processes must of necessity be global and holistic in nature, since their function is to separate each figure or object as a whole from the rest of the stimulus field. Attentive processes, in contrast to the preattentive ones just described, are sequential, proceeding in a logical fashion on the basis of what is appropriate in terms of past experience.

Neisser's model allows for the possibility that a crude percept resulting from the preattentive processing may receive no further elaboration within consciousness. He raises the possibility that such elaboration may be deliberately avoided in certain areas and suggests a similarity between this notion and the clinician's concept of repression.

Neisser's (1967) model is clearly consistent with the weak postulate of a psychological unconscious: Complex psychological processes are carried on unconsciously, and there is an active commerce between these unconscious processes and conscious ones. But unconscious psychological processes are also qualitatively different from conscious ones in this scheme. Neisser's model is thus consistent with the strong postulate for unconscious processes as well.

In the fifth model to be described, offered by Posner (1973), a single-channel central-processing capacity is the aspect of attention most closely associated with consciousness. Consciousness, in this view, involves such mental operations as rehearsal and choosing a response. At least two stages of perceptual processing, encoding and comparison with long-term memory, occur outside of consciousness; that is, they occur before the subject becomes aware of the stimulus.

It would appear that the first stage of processing in Posner's scheme consists in the encoding of the stimulus. There is, in Posner's (1973) view, "simultaneous registration and retention of multiple codes of the same event" (p. 41). The different ways in which a given stimulus can be encoded (e.g., visually, symbolically) represent "isolable subsystems," which develop independently of each

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other. The later, rehearsal phase (associated with consciousness) is code specific and tends to select one of the codes for dominance. However, even when attention is directed (because of the nature of the task) to only one of the ways in which a stimulus can be coded, the stimulus may nonetheless be coded other ways as well. Posner (1973) gives an example of this phenomenon, drawn from the visual-search literature:

When the subject is presented visually with a list of letters, the names are also activated although they may not be conscious. Similarly, when the subject hears a list of letter names, the visual code is increased in availability. (p. 59)

The next stage of analysis after encoding involves comparison of the stimulus with the contents of long-term memory. According to Posner, the processes involved here also take place outside of awareness. In the studies Posner draws on most, the subject is first presented with a "target" stimulus (e.g., a digit) and is then told to search through a stimulus array to locate that particular stimulus. This stage of processing, in Posner's view, involves a comparison of each stimulus in the array through which the subject is searching with the previously presented stimulus (now stored in long-term memory). This comparison takes place outside of awareness. Posner (1973), reviewing research bearing on this point, concludes,

The data suggest that both the target and non-target items are subject to a memory search process but only the target item gives rise to the phenomenological experience of jumping out at the subject. Thus, the phenomenal experience occurs rather late in the sequence of processing. (p. 41)

Posner believes that in the course of perceptual processing the stimulus makes contact with long-term memory prior to the point at which awareness occurs. He also argues that the fact that a limited-capacity channel exists in the sequence of perceptual processing does not restrict the range of associations that can be activated by a given stimulus outside of awareness. "Indeed," suggests Posner (1973), "it might require more effort to inhibit such associations than to produce them" (p. 41). This notion fits in well with the strong postulate because it suggests that processing outside of awareness is qualitatively different from processing within awareness.

For Posner and his colleagues, then, consciousness is bound up with those processes that involve

the limited-capacity system. "This mechanism," they state, "serves to impose a serial order upon what are essentially widespread parallel processes initiated by a stimulus" (Posner, Klein, Summers, & Buggie, 1973, p. 11). They even go so far as to suggest a physiological correlate (an event-related brain potential) for this central processing mechanism: "The mechanism whose activity we have been detecting by interference [i.e., the mechanism of consciousness] is also the one which releases the late positive wave (P_{300})" (Posner et al., 1973, p. 11). Posner's model is consistent with the strong postulate for unconscious psychological processes.

Although not primarily dealing with attention, Sternberg's (1975) research on memory in visual processing is of some relevance. The basic paradigm in Sternberg's studies involves two steps. First, the subject commits to memory a set of stimuli (e.g., letters, digits, figures), which are called the *positive set*. He is then presented with a single test stimulus and must indicate by pressing one of two switches whether or not the test stimulus is a member of the positive set.

The results of Sternberg's reaction-time studies led him to hypothesize that the subject goes through the positive set, comparing each member with the test stimulus, at a rate of about 30 comparisons per second. Sternberg (1975) states specifically that "judging from what subjects report, the search is not accessible to introspection" (p. 5). Furthermore, Sternberg cites evidence that this rate is substantially faster than the rate of covert speech (which might be taken as one index of the rate of conscious processing). And he also states that "even when introspections include a search, it is reported to be slow and self-terminating" (p. 10), by which Sternberg means that the subject stops the search as soon as he or she finds the counterpart of the test stimulus among the comparison stimuli. In other words, there is a qualitative difference between conscious and unconscious processing. Sternberg's model is consistent with the assumption that unconscious psychological processes exist and do, in fact, obey different laws from those governing conscious processes, and thus his model is consistent with the strong postulate.

Summary. All six theorists assume that an initial phase of cognitive activity occurs outside of awareness, and each uses psychological terms to describe the processes involved. Second, these processes outside of awareness interact with and influ-

ence ongoing and subsequent conscious psychological processes, at the very least insofar as they determine what enters consciousness. For these reasons, these models are consistent with the weak postulate for unconscious psychological processes. But there is more. All six models posit that cognitive processes outside of awareness are based on a different mode of cognition from that of conscious processes. For five of these models, unconscious processes are multichanneled, whereas conscious processes are single channeled. In the sixth model (Sternberg, 1975), at least one kind of unconscious process is considered to be exhaustive in nature and much more rapid in execution, as compared with conscious processes. For some theoreticians there are even greater differences. For Neisser (1967), preattentive cognition is global and gestalt in character, though lacking in symbolic significance; for Posner (1973; Posner et al., 1973), multiple codes can be activated outside of awareness even though only a single code may enter consciousness. Posner raises the possibility of the inhibition of associations existing prior to consciousness as well as of a physiological index for consciousness itself. All of these models are based, not on clinical data, but largely on experimental investigations. There is still a considerable gap between the conception of unconscious psychological processes offered by these theorists and the view of the same processes held by psychodynamically oriented clinicians. For instance, none of these theoreticians discusses the possibility that percepts can be stored in long-term memory and can exert an active influence on simultaneous conscious processes, even though they may never enter into awareness or may not do so until long after they were originally perceived. The conception of unconscious motivation and memory held by most psychodynamic theorists, however, does in fact encompass such a possibility.

We shall now turn our attention to the literature on subliminal perception, in which some of these possibilities are considered.

SUBLIMINAL PERCEPTION

In selective-attention research, the stimuli are either fully conscious or can become conscious once attention is directed to them. In dichotic-listening experiments, for example, on which a considerable amount of attention research is based, stimuli are usually presented separately to each

ear. Subjects are instructed to attend to the stimuli in one ear and to repeat them out loud to insure continued attention. Of interest is the finding that, generally, subjects are unaware of the stimuli in the unattended ear, although these stimuli exercise an influence on various response parameters of the attended stimuli. The unattended stimuli remain outside awareness only as long as a subject is attending to the other ear.

There is also an extensive literature on the investigation of stimuli that cannot be consciously perceived, even when attention is directed to them. These are stimuli that are presented so quickly that no matter how alert and focused a subject's attention, the stimuli remain unreportable. Nevertheless, effects of the subliminal stimuli are detectable. Dixon (1971), who has written an extensive evaluation of the subliminal-perception literature and has offered an interesting neurophysiological model, has suggested that selective attention and subliminal perception represent "end points on a single continuum of information processing" (p. 306). At any given time, an individual is presented with a broad array of stimuli of varying intensities and of varying relevance to adaptive tasks. Selection on some basis must occur. Subliminal stimuli are those stimuli that do not become conscious simply because they are too weak in intensity, even though they may be highly relevant.

Subliminal-perception research is relevant to our thesis because this research suggests that complex effects of stimuli that do not enter awareness can persist well beyond a few seconds or minutes, which is the span that the effects of stimuli in selective-attention experiments have thus far been determined to persist. At the same time, subliminal-perception research has been a source of controversy in psychology. In fact, Dixon's (1971) book is subtitled *The Nature of a Controversy*. The same book presents a strong case in favor of subliminal perception as a valid phenomenon, based on converging evidence from eight bodies of supporting research. More recently, Nisbett and Wilson (1977) have argued,

The basic question of whether people can respond to a stimulus in the absence of the ability to report verbally on its existence would today be answered in the affirmative by many more investigators than would have been the case a decade ago . . . largely because of better experimental methods and the convincing theoretical argument that subliminal perception phenomena can be derived . . . from the notion of selective attention and filtering. (p. 239)

These comments are of special relevance because much of the controversy has centered on methodological difficulties.³ Our emphasis in this article, however, is not primarily on the actual research investigations but on the explanations developed to account for a variety of findings. As with the selective-attention literature, controversies within the field may challenge one or another experimental hypothesis, but it can be shown that there is an underlying commonality in the explanations offered that does not depend on any one particular finding. Unlike selective-attention researchers, who did not set out to study unconscious psychological processes but were increasingly compelled to take such processes into account, researchers in the area of subliminal perception have often been interested in such processes from the start and have purposefully studied them experimentally.

Before briefly describing a number of models for explaining subliminal-perception findings, some of which parallel the models just presented for selective attention, we think it may be helpful to formulate what we consider to be the key issues bearing on our thesis for which subliminal-perception studies provide support:

1. Subliminal-perception research is concerned with stimuli too weak to become conscious immediately, no matter how much attention is directed to the stimulus field. No amount of shifting attention, as in dichotic-listening experiments, can bring the stimulus into consciousness.

2. Nevertheless, these stimuli have detectable effects on conscious processes, both immediately and, in some cases, after an interval of time.

3. These effects emerge in changed states of consciousness, as in dreams. By contrast, selective-attention research thus far has been concerned exclusively with one state of consciousness: the usual waking, alert state that most psychological subjects are paid to maintain.

4. Subliminal stimuli can be used to explore differences between unconscious and conscious processes.

The subliminal-perception literature provides an additional line of converging evidence for the necessity of assuming the existence of unconscious psychological processes.

We shall now describe five models developed to explain the various findings in the subliminal-perception literature.

Klein and Holt (1960) postulated that the effects of subliminal stimuli persist only briefly and

have to be incorporated quickly into some ongoing cognitive activity or else they will disappear and leave no trace of their presence. They argued that inasmuch as the subliminal stimulus is never cognized as such but is only detected by its indirect effects on conscious processes, it will remain ineffective unless it can be assimilated into some ongoing cognitive activity. This model was based largely on an experimental paradigm in which subliminal stimuli were interspersed among conscious stimuli. The subliminal stimulus was either the word *angry* or the word *happy*, while the conscious stimulus was an ambiguous face that could be judged either way. The investigators determined that the face was seen as happy or angry depending on the particular subliminal word presented (Bach & Klein, 1957; Sackeim, Packer, & Gur, 1977; Smith, Spence, & Klein, 1959). Klein and Holt's model follows closely the findings derived from their particular method. Interestingly, this model is comparable to Broadbent's (1958) view: Stimuli enter a short-term memory system, and unless they become conscious immediately, they have no further effect. The main difference from Broadbent's model is the fact that this interaction between short-term memory and attention concerns subliminal stimuli exclusively. Klein and Holt's model is consistent with the weak postulate for unconscious psychological processes.

On the basis of an interesting series of experiments, Spence arrived at a model that is at variance with the model proposed by Klein and Holt: In his research Spence determined that a subliminally presented word can evoke a series of associations based on its meaning (Spence, 1961, 1966; Spence & Holland, 1962; Spence & Smith, 1977). He found that associations could be elicited at some point after the subliminal stimulus had been presented. On the basis of his findings, Spence posited what he called the "restricting effects of awareness." According to Spence, when a stimulus is presented subliminally, as compared to when it is presented supraliminally, a greater

³ One important controversial issue has centered around the use of threshold measures in subliminal research, which, according to signal-detection theorists, confounds sensory sensitivity with response parameters. Dixon (1971) has taken up this issue, discussing the theoretical implications as well as citing subliminal-perception research based on signal-detection techniques that have yielded positive results. Nisbett and Wilson (1977) also discuss signal-detection theory and subliminal perception.

variety of associations are elicited. Awareness of the stimulus appears to limit or restrict the range of associations elicited by the stimulus word. This concept appears to be quite similar to the one offered by Posner (1973) when he proposed that stimuli are multicoded (i.e., elicit multiple associations) even though we may be consciously aware of only one of these codes or associations. Again, the significant difference is that Spence is concerned solely with subliminal stimuli, which in themselves never become conscious. Spence's model is consistent with the strong postulate for unconscious psychological processes.

Perhaps the most comprehensive model for subliminal perception has been offered by Fisher (1956). A pioneer in subliminal-perception research, he suggested that it would be useful to assume that all cognitive processes of whatever kind have to start in an unconscious phase; some become conscious almost immediately, while others remain unconscious for longer periods of time and may then appear in various altered states of consciousness such as dreams. Moreover, Fisher interpreted his findings to support the view that unconscious cognition is qualitatively different from conscious cognition. His model is consistent with the strong postulate for unconscious psychological processes.

Dixon (1971) proposed one of the first neurophysiological models attempting to account for subliminal perception. He argued that although certain instances of subliminal perception may involve temporal or spatial summation at the level of peripheral receptor neurons, for complex stimulus arrays the processes involved must lie at higher levels of the nervous system. As evidence for this hypothesis, Dixon cited a study done by Libet, Alberts, Wright, and Feinstein (1967) demonstrating that cortical responses can be evoked by stimuli below the awareness threshold. He also described an experiment by Shevrin and Rennick (1967) which indicated that subliminal stimuli influence both cortical evoked potentials and the subject's free associations. And he discussed a study by Begleiter, Gross, and Kissin (1969) which suggests that it may be the meaning rather than the structure of the subliminal stimulus that determines both the cortical response and subsequent behavior.

Dixon's (1971) proposed physiological model is consistent with these findings and also with results of studies of perceptual defense which suggest

that the threshold (in terms of intensity) for emotionally significant stimuli, such as words or pictures, tends to be either higher or lower than the threshold for emotionally neutral stimuli. Dixon argued that the most important mechanism underlying these phenomena probably involves corticofugal influences on the reticular activating system. According to this view, the classical afferent fibers transmit the information that forms the specific content of consciousness, but these fibers do not per se mediate awareness. For awareness to occur, there must be not only sensory input through these afferent fibers but a simultaneous activation of the nonspecific reticular system.

In subliminal perception, then, the intensity of the stimulus is great enough to elicit activity in the sensory fibers but lacks sufficient energy to activate the nonspecific reticular system. Thus information reaches the cortex without awareness of the stimulus itself.

Subliminal perception, according to Dixon, is made possible by the fact that the primary, classical afferent lemniscal system (which conveys sensory information to the cortex) conducts faster than the secondary, nonspecific extralemniscal system (which is involved in reticular activation). As a consequence of this disparity in conduction speeds, it is possible for information to reach the cortex and for the cortex to exert inhibitory control over the reticular system prior to the arrival of the neural impulse that would normally have activated that system and thereby produced awareness of the stimulus.

Inasmuch as this suggests that the underlying neural processes are different for subliminal and supraliminal processes, Dixon's (1971) model is consistent with the strong postulate for unconscious psychological processes. And, whether this particular model is correct or not, the most important contribution Dixon has made with regard to the physiological basis of subliminal perception (as he himself has pointed out) is simply to demonstrate that such a phenomenon is plausible in terms of current neurophysiological knowledge. Such a demonstration, in turn, can serve as a spur to further investigation of the neurophysiological underpinnings of unconscious psychological processes. To the extent that such future research can firmly establish that such neurophysiological measures as cortical evoked potentials index unconscious psychological processes in the same way that evoked potentials have been shown to index conscious per-

ceptual processing, it will provide investigators with an additional tool with which to study these unconscious processes.

On the basis of findings from a series of evoked-potential studies employing a pair of visual stimuli presented sub- and supraliminally, Shevrin (1973) proposed that the evidence strongly suggests that (a) complex unconscious psychological processes have identifiable neurophysiological correlates, (b) these neurophysiological processes are associated with attention to the meaning of the stimulus, (c) different parameters of the evoked potential are associated with different thought processes related to the subliminal stimulus, and (d) subjects characterized as repressive, on the basis of psychological tests, show reduced evoked potentials to the subliminal stimuli but show augmented potentials to the same stimuli when they are supraliminal. Moreover, Shevrin (1978) has suggested that there may, in fact, exist an evoked-potential correlate of consciousness. This correlate may take the form of a critical duration of a late positive evoked-potential component occurring sometime between 150 and 250 msec poststimulus. This model is based in part on Libet's findings demonstrating that a certain critical duration of cortical excitation ($\frac{1}{2}$ sec in actual time) is necessary before consciousness of a stimulus is activated (Libet et al., 1967). Thus, the "weakness" in subliminal stimulation may not be the failure to activate the reticular activating system but may be a failure to activate it for a critical duration. Shevrin's explanation, in particular the point noted in (d) above, is consistent with the strong postulate for unconscious psychological processes.

In partial confirmation of Shevrin's work, Kostandov and Arzumanov (1977) have reported that the average evoked potential associated with emotionally significant verbal stimuli showed systematic changes in latency and amplitude as a function of consciousness.⁴ When neutral and emotionally meaningful words were present in consciousness, a positive wave at 300 msec poststimulus (P_{300}) tended to be greater in amplitude for the emotional words at the occipital region and also shorter in latency; no differences were found at the vertex. When neutral and emotionally meaningful words remained unrecognized, latency differences disappeared, but significant amplitude differences were present in favor of the emotional words at both the occipital site and the vertex site for P_{300} . Kostandov and Arzumanov

(1977) concluded that "the difference in the amplitude of the evoked potential for neutral and emotional words suggests . . . that even if the verbal stimulus is not recognized, the analysis of its semantic content occurs at the cerebral cortex" (p. 321). They have hypothesized that "unspecific impulses" from the limbic system must undergo a different fate depending on whether the emotional stimulus is conscious or not. When it is conscious, the effect of these impulses is restricted to the occipital region; when the stimulus is unconscious, their effect appears to spread to the vertex as well. The possible psychological effects of this spread are not specified, although one can speculate that they may be related to Spence's "restricting effects of awareness" and the "single-channel" conception of consciousness embodied in a number of cognitive models of selective attention. It is also important to note that, as in previous perceptual-defense studies, the recognition threshold for the emotionally meaningful words is higher than the threshold for the neutral words for most subjects but lower for some subjects. Nevertheless, the evoked-potential difference is found regardless of threshold. Thus we can see that there is indeed a prior cognition of semantic properties, as evidenced by the evoked potential, to which the individual responds with either a raising or a lowering of recognition thresholds. The defense or vigilance is subsequent to actual cognition. Insofar as there are differences for unconscious stimuli, we can consider this study to support the strong postulate for unconscious processes. It is also of interest, in view of Posner's (1973) hypothesis concerning the P_{300} amplitude as a possible correlate of consciousness, that the Russian investigators found that the P_{300} amplitude was the critical correlate. For the Russian investigators, however, P_{300} appears to be associated with unconscious processes, whereas Posner has hypothesized that P_{300} might be a correlate of consciousness. Further research will be needed to reconcile this difference.

⁴ It is of considerable interest that a growing number of Russian investigators have been conducting investigations on subliminal and other unconscious processes. The Russians have sponsored an international conference on unconscious processes; three volumes of the proceedings of this conference have been published, containing articles by Russian, American, French, German, and other investigators (Prangishvili, Sherozia, & Bassin, 1978).

Summary. In general, the findings and models emerging from subliminal-perception research converge strikingly on the same conclusion that the findings and models emerging from attention research have reached: A great deal of complex cognitive activity can go on without benefit of consciousness. Moreover, this complex activity is characterized by different properties from those present in conscious cognitive activity. Thus, subliminal research supports both the weak and the strong postulates for unconscious psychological processes.

VISUAL PHENOMENA INVOLVING PERCEPTUAL PROCESSING

Subliminal-perception research generally deals with complex stimuli whose effects are studied over relatively long periods of time. We have cited experiments that show how cortical evoked potentials accompany subliminal cognition. In addition to these experiments, there is a growing body of research which has found that cortical evoked potentials are present when a stabilized retinal image disappears from consciousness, when an image is suppressed in one eye through binocular rivalry with the other, and when a stimulus is masked by a second, succeeding stimulus. For more extensive reviews of the research pertaining to the central mediations of these phenomena, see Turvey (1973), Coren and Porac (1974), and Walker (1978).

For our purposes, a major limitation of these studies lies in the fact that they make no attempt to document any contemporaneous effects on conscious cognition, leaving unanswered the question of whether the psychological processes indexed here can be said to be active (in the sense used in our definition of the weak postulate). Hence, these studies can only be considered to lend indirect support to the weak postulate; they are noted here largely because they represent, potentially at least, a converging line of evidence based on quite different methods from those described heretofore.

Retinal image stabilization. When an image is stabilized on the retina in such a way that as the eye moves, the stimulus continues to act on precisely the same area of the retina, the image disappears (although part or all of it may briefly reappear from time to time). Riggs and Whittle (1967) and Lehman, Beeler, and Fender (1967) have reported that there were no changes in the cortical evoked potential when their subjects stated

that the image had faded from consciousness. At the same time, the retinal evoked potential indicated that retinal cells were firing, and so the visual stimulus was being propagated along the optic nerve. Riggs and Whittle used an occipital electrode, and Lehman et al. used an occipital-parietal display. In the latter study, the investigators also found that bursts of EEG alpha appeared to precede the reported fading of the image, strongly suggesting that a central "turn-off" of consciousness was at work. The authors of these two studies concluded that the loss of awareness was a cortical and not a peripheral phenomenon. Studies that have used other approaches than examination of cortical evoked potentials to investigate the effect of stabilization of the retinal image have also offered evidence that this phenomenon is central rather than peripheral in origin (e.g., Bennett-Clark & Evans, 1963; Blakemore, Muncey, & Ridley, 1971). In the one study with less striking results (Keeseey, 1969), it was still found that an evoked potential was present for the faded image, but it was smaller in size than when associated with a conscious stimulus. Thus, retinal image stabilization seems to represent another experimental paradigm in which the evoked potential serves to index the existence of perceptual processing at a cortical level in the absence of subjective awareness of the stimulus.

Binocular rivalry. Binocular-rivalry studies offer still another experimental paradigm in which the presence of cortical evoked potentials may be detected in the absence of subjective perception of the eliciting stimulus. The general procedure in these studies is to present different images simultaneously to the two eyes, making certain that the visual fields of the eyes do not overlap. In such a situation, at different times one or the other eye will be dominant; that is, the subject will be aware of the image presented to the visual field of that eye while being unaware of the image presented to the visual field of the other (suppressed) eye. A visual evoked response (VER) will be found for the suppressed image even though this VER may be smaller than the VER associated with the image for the dominant eye (Cobb, Morton, & Ettlinger, 1967; Harter, Seiple, & Musso, 1974; Harter, Towle, & Musso, 1976; Lehman et al., 1967; Lehman & Fender, 1968; Riggs & Whittle, 1967; Spekreijse, Van Der Tweel, & Regan, 1972).

It might also be noted that a number of studies of binocular rivalry using other approaches than

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evoked-potential recording have also found evidence to suggest that binocular suppression occurs at a central (i.e., cortical) rather than at a peripheral level (Walker, 1978). In one particularly interesting study, for instance, Walker (1975) found that a moving visual stimulus that was presented at a subliminal intensity to the suppressed eye (the subject reported no awareness of it whatsoever) reduced the proportion of time the other eye maintained its dominance. In his discussion of his results, Walker argued that this phenomenon can be accounted for only by assuming that information about the moving stimulus reaches the cortex even though it never enters awareness. It would appear, then, that binocular rivalry represents another condition under which perceptual information is processed at a cortical level despite the fact that it is not subjectively perceived.

Backward masking. Two basic types of backward masking have been demonstrated. In one type, a stimulus is presented, followed by a second stimulus of greater intensity. When the interstimulus interval is around 25 msec and the second stimulus is more intense than the first, the subject will perceive only the second stimulus. This phenomenon is sometimes called the *Crawford effect*. The other type of backward masking is termed *metaccontrast*. Here, the stimuli used are generally shapes or patterns. They are presented one after the other at equal light intensities. The location of the two stimuli in the subject's visual field is such that if the two stimuli were presented simultaneously, their contours would be adjacent. In this situation, the presentation of the second stimulus "masks" the subject's perception of the first, so that he or she is not aware of it. The Crawford effect appears to be mediated peripherally and will not be pursued further (see Donchin & Lindsley, 1965; Donchin, Wicker, & Lindsley, 1963; Fehmi, Adkins, & Lindsley, 1969). However, there is reason to believe that in metaccontrast the masked stimulus—although the subject is not aware of it—elicits a cortical evoked potential.

Andreassi and his co-workers have investigated this metaccontrast phenomenon (Andreassi, DeSimone, & Mellers, 1976; Andreassi, Mayzner, Beyda, & Davidovics, 1971; Andreassi, Stern, & Okamura, 1974). The general procedure was to present five X's (or patterns) in a horizontal spatial array: XXXXX. The second and fourth figures were presented simultaneously, followed

after a brief interval by the first, third, and fifth figures (presented at the same time). In this way, the first two figures presented were surrounded on either side by the second set of three figures, providing the basis for the metaccontrast effect to occur. When the stimulus sets were presented with an interstimulus interval of 40 msec, the subjects perceived the second set of stimuli but not the first. When masking was thus obtained, the amplitude of the visual evoked potential to the first, or masked, stimulus decreased as the disparity in intensity between the two stimuli was increased; however, the evoked potential never entirely disappeared, even in the conditions in which stimulus intensities were most discrepant.

The presence of an evoked potential in the absence of any awareness of the masked stimulus provides another example of perceptual processing outside of awareness.

Discussion and Conclusions

The different avenues of research and theorizing reviewed in this article converge on three fundamental propositions, which can be stated as follows:

1. The initial cognitive stage for all stimuli occurs outside of consciousness.
2. This initial cognitive stage outside of consciousness is psychological in nature, is active in its effect on consciousness, and can be different from conscious cognition in its principles of operation.
3. Consciousness of a stimulus is a later and optional stage in cognition.

These three propositions bring us to an interesting further question: If the initial stage of cognition is unconscious, what factors determine the emergence into consciousness of a particular stimulus? We should like to suggest that there are at least three groups of factors that, working singly or together, determine this final step in cognition:

1. Stimulus factors (e.g., loudness, brightness, figural coherence, etc.);
2. State factors (e.g., level of arousal, sleep stage, fatigue, distractibility, etc.);
3. Motivational factors (e.g., avoidance of anxiety, guilt, conflict, etc.).

Some cognitive theorists, such as Neisser (1967, 1976), have made reference to all three factors. Broadbent's (1958) model allowed for the state

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of the organism to affect the selection of stimuli that become conscious. Treisman (1964) posited built-in low thresholds for biologically and emotionally important stimuli, which would permit these stimuli to pass through higher filter systems into consciousness. Of special interest to the clinician is the last group of factors, consisting of motivational factors. Several experiments we have cited (Kostandov & Arzumanov, 1977; Shevrin, 1973) suggest that the specific emotional content of a stimulus may raise the threshold for the perception of that stimulus, with the clear implication that the stimulus is analyzed prior to the individual's awareness of it. As Posner (1973) noted in regard to his research on attentional processes, although an individual may be aware of the fact that a particular stimulus has "popped" into awareness, he may be quite unaware of the preceding complex selection process. Evidence of this kind provides the bridge to the psychoanalytic concept of repression. Repression may be conceptualized as a motivated inhibition of awareness of a particular stimulus. This motivated inhibition may work independently of stimulus strength and state of arousal. It is conceivable that at least some of the forces affecting the preattentive processes are motivational in nature.

In most cognitive research, and, in particular, in research on selective attention, generally only one state of consciousness is considered—the normal waking state. In fact, in many of these studies, consciousness is often tacitly equated with this particular state of normal waking consciousness. The single-channel cognition model of consciousness may be a special case limited to waking consciousness. Dream consciousness, states of intoxication, and psychotic states may not share this single-channel characteristic. These other states of consciousness remain an important area for experimental investigation because they might provide an additional bridge between laboratory research on cognitive processes and the consulting room.

Another important qualification to be borne in mind is that all the research cited in the present article is based on external stimuli. Much clinical thinking, on the other hand, is based on the fate of internal stimuli—for example, wishes and needs. While the evidence presented here does not demonstrate that the processing of internal stimuli is identical to the processing of external stimuli, it does suggest that these two processes are not neces-

sarily dissimilar. Although Freud (1915/1958a) argued, and many clinicians have assumed, that the mechanisms used by the individual to fend off external stimuli differ from those used for internal stimuli (e.g., motor acts for external stimuli vs. repression for internal stimuli), the evidence presented in this article suggests that a much greater similarity exists between the two modes of processing than Freud supposed. In fact, elsewhere in his writings Freud described how attentional processes are involved in symptom formation (Breuer & Freud, 1893-95/1958) and in repression itself (Freud, 1915/1958b), thus providing a bridge, through the concept of attention, to the models proposed by attention theorists that we have described in this article.

If the thesis we have elaborated here is correct, then James (1890) was mistaken in his rejection of unconscious psychological processes. Rather than being the "sovereign means for believing what one likes in psychology," the assumption of unconscious psychological processes appears to be a conceptual necessity in a variety of models dealing with selective attention, subliminal perception, retinal image stabilization, binocular rivalry, and metacontrast. Ironically, these areas of investigation are entirely experimental, not clinical, in nature and are thus not as likely to be subject to James's concern that the notion of unconscious psychological processes would turn "what might become a science into a tumbling ground for whimsies." Behaviorism, for its part, must accommodate itself to accepting the importance of what goes on inside the "black box," especially since we now have methods for investigating its contents. The clear message from much recent thinking in psychology appears to be that behavior cannot be understood without taking conscious experience into account and that conscious experience cannot be fully understood without taking unconscious psychological processes into account. The laboratory and the consulting room do seem to be sharing at least a common wall, which may in fact turn out to have a door in it.

Finally, if the thesis elaborated in this article is correct, then no psychological model that seeks to explain how human beings know, learn, or behave can ignore the concept of unconscious psychological processes. Moreover, we dare to hope that the present article may provide a basis for a shared task and useful communication between clinician and experimenter.

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