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Subliminal Perception and Dreaming

Howard Shevrin

University of Michigan Medical Center

Research on the relationship between subliminal perception and dreaming initiated interest in the field of subliminal perception. Nevertheless, over the years only a very small number of studies [11] have investigated this relationship. A review of these studies is presented, divided into three sections: (a) early studies of historical and theoretical interest, (b) quasi-clinical, empirical studies, and (c) experimental studies. Essentially, the early findings reported have been borne out by subsequent empirical and experimental studies: (1) much that remains unreported and presumably unconscious following a briefly flashed stimulus is later recovered in dreams, (2) dreams appear to be necessary to recover at least some kinds of transformed or primary process aspects of the briefly presented stimulus. Implications for our understanding of perception, the nature of consciousness, and various states of consciousness are discussed.

Research on subliminal perception has been marked until recent times by considerable controversy (see Dixon, 1981). Mainly this controversy has been fought out along methodological lines (e.g., better controls, stronger reliabilities, etc.), although lurking in the background has always been the real issue: do unconscious psychological processes exist? For many years psychology has been dominated by a behaviorist point of view which not only denied the existence of unconscious processes, but denied to consciousness itself any valid place in psychology. The tide has recently been turning as cognitive psychology has refocused interest on the nature of consciousness and finally on the contribution that unconscious processes make to consciousness itself. Many of the methodological problems in earlier subliminal research originally pointed out have been successfully overcome. As a result, the subliminal method has found a place as a tool in the investigation of such basic problems as the preconscious phases of attention, social judgment, etc. (see Nisbett and Wilson, 1977; Zajonc, 1980).

Within the large body of subliminal research, the investigation of the rela-

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tionship between subliminal perception and dreaming has a special place. These investigations provided the original impetus for subliminal research as a whole. Nevertheless, these investigations have remained in a relatively small, unnoticed corner of the field. In all, there are eleven studies directly concerned with subliminal stimuli and dreaming. Yet, from a theoretical standpoint, one can defend the position that, few though these studies may be, they are of special importance because, alone among subliminal studies, they permit us to explore the undertow of unconscious processes flowing from waking experience to nighttime dreaming. Was Freud's hypothesis correct about the nature of dream work as drawing upon a different form of thought organization (i.e., the primary process) from the waking state? Or is there a continuity of thought organization for all unconscious processes, whether occurring during the waking state or dreaming sleep? What can we learn about the nature of the perceptual process and its interaction with other nonperceptual processes, such as dreaming and memory? What can we learn about the nature of consciousness from research on subliminal perception and dreaming? These are some, but by no means all, of the questions that can be addressed when considering the findings of research bearing on the relationship between subliminal perception and dreaming.

In this review, brief because the studies are few, the research will be divided as follows: (a) early studies of historical and theoretical interest; (b) quasi-clinical, empirical studies; (c) experimental studies.

Early Studies

Subliminal perception research was largely initiated by a Viennese sensory physiologist who was well acquainted with Freud's psychoanalysis and dream theory. Poetzl (1917/1960)[1] had a remarkable speculative gift and, for his time, an unusual empirical, if not experimental, turn of mind. Experience with brain injured patients in World War I, particularly patients with occipital lesions in the brain, led Poetzl to hypothesize that normally functioning visual perception was based upon an "abstracting process" which inhibited a variety of more primitive processes such as diplopia (double vision). (Recent research on stereoscopic vision would tend to support Poetzl's earlier notion insofar as we know that in stereoscopic vision either a blend of the two images coming from the separate eyes or a suppression of one of the images occurs.) However, injury to the visual cortex impairs this abstracting process and frees primitive processes, such as diplopia, from inhibition. One important consequence is that simultaneously perceived aspects of a stimulus in normal percep-

[1]See Fisher (1960a) for a summary and evaluation of Poetzl's pioneering contributions. Much of what is said in this section is based on Fisher's assessment.

tion are experienced sequentially. For example, a subject blind because of injury to the cortical area responsible for vision, when shown a stalk of asparagus amid a bouquet of roses, could not see the stalk but immediately thereafter when presented with an officer's collar insignia, mistakenly perceived the insignia as green. Poetzl interpreted this to mean that delayed delivery of the asparagus stalk had occurred.

Poetzl further believed that this view of the perceptual process paralleled what Freud was describing as condensation and displacement, in particular, as they occurred in dreaming. He hypothesized that this abstracting process impaired by brain injury could be functionally impaired in normals by brief presentations of visual stimuli. His reasoning was apparently based on some questionable assumptions about the role of eye movements in perception. At 1/100 of a second, the shutter time used in his research (and in much subsequent subliminal research on dreaming), Poetzl reasoned correctly that eye movements were not possible. Only a part of the complex visual scene emerged in consciousness at 1/100 of a second; the rest, argued Poetzl, was registered in the visual apparatus and would appear during the night as the eyes completed their movements (inhibited at the time of the original stimulus exposure) across the remainder of the visual scene. Although Poetzl anticipated the role of eye movements in dreaming, very little credence can be given to the assumption that eye movements released from previous inhibition during dreaming completed their passage across the subliminally registered stimulus. Nevertheless, Poetzl was able to show for the first time that previously unseen parts of the briefly flashed picture appear to emerge in dreams reported the following day. In fact, so clear to him was this inverse relationship between what was consciously perceived and dreamt about that he formulated a *law of exclusion*: according to which the elements of a picture seen consciously on brief exposure do not appear in dreams, while the dream draws upon the pool of previously registered but not consciously perceived pictorial elements. Poetzl saw the relationship between his findings and Freud's concept of the day residue—the "indifferent," or quickly perceived and discounted impression of the dream day which plays a prominent role in the dream. Freud, however, was talking about briefly perceived but conscious stimuli rather than subliminal stimuli as in the case of Poetzl's technique. Thus, with his technique of brief exposure followed by dream report the next day, Poetzl extended the notion of the day residue to include subliminal registrations as well as briefly noted images of the dream day. As we will see later Fisher, in particular, made much of this extension, and on its basis formulated an important revision of Freud's explanation of the dream process.

In a series of empirical studies of individuals subjects, Poetzl identified many instances of apparent symbolic transformation of the unreported pictorial elements, as well as various spatial rotations, fragmentations, reversals of figure-

ground which he likened to Freud's primary process mechanisms. For Poetzl, the visual apparatus was like a photographic darkroom in which the visual perception, like a photographic plate, was developed on the basis of different combinations of "chemicals" and at different times. During waking perception, the flashed picture registered totally on the plate, but only a few elements could be developed and printed (delivered into consciousness) because eye movements were inhibited; the remaining elements were developed and printed later in the dream. Somehow the conditions of sleep attending on dreaming permitted this kind of process to continue. Why dreaming released the previously inhibited eye movements, why the dream process worked on the basis of these primary process transformations, remained unanswered.

In summary, Poetzl thought he had discovered that:

(1) The perceptual process was based upon "abstraction" and a complementary inhibition of primitive part-perceptions.
(2) Briefly flashed pictures could be used to explore the visual process so that it could be demonstrated that primitive forms of perception (rotations, reversal of figure-ground, fragmentations, sequential delivery) appeared when ordinary conscious perception was not possible.
(3) Dreaming revealed the presence of these primitive perceptual products of disinhibition.
(4) Dreams also revealed certain symbolic transformations of the briefly flashed picture which had personal meaning along psychoanalytic lines.

Note that Poetzl also discovered that:

(5) Perception and consciousness were not congruent: more perception goes on than is present in consciousness at any given time.
(6) A subliminal input registers and its effects can be detected in other responses.

Would these findings stand up under closer empirical and experimental scrutiny? Beyond the issue of validity, we arrive at these additional questions: are the visual products of disinhibition as described by Poetzl identifiable with Freud's primary process? If so, it would suggest that unlike Freud's explanation, these products were not the outcome of defensive activity but of inherent characteristics of the visual apparatus. Furthermore, these perceptual changes appear to begin taking place in close conjunction with the initial conscious perception as indicated by Poetzl's report that there were already present in the conscious perception itself evidence of distortions. In other words, does one need to dream in order to have primary process, defensive distortions? In the next section I will describe an interesting and influential series of studies by Fisher, who revived Poetzl's technique of brief exposure followed by dream reports in order to answer these and other questions.

Although these early studies by Fisher fail to meet acceptable standards of experimental rigor, the empirical findings are impressive and pursuasive. This early work of Fisher, and Poetzl before him, constitutes a good argument for the heuristic value of an empirical method which does not do violence to a phenomenon *before* one develops an idea of its solidity. Only then does it make sense to introduce precise measures, reliability, controls, etc. To his credit, Fisher followed this natural evolution in his research and thus preserved the phenomenon for us—rather than destroying it through premature manipulations before we had a clear idea of the nature and stability of the phenomenon discovered by Poetzl.

Empirical Studies

In a series of studies, Fisher (1954, 1956, 1957, 1960b) repeated Poetzl's procedure and discovered similar relationships. As a psychoanalyst, Fisher was especially interested in what light Poetzl's technique would throw on the nature of dreaming and its relationship to the conscious waking sources of the dream. Fisher included not only the briefly flashed picture but other incidental stimuli as well—such as the experimental room, the subject's relationship to the experimenter, etc. In fact, Fisher, unlike Poetzl, was sensitive to transferential aspects of his relationship to the subjects and suggested that the reason why subjects dreamt as often as they did about the stimulus was attributable to the transferential impact of the experimenter-subject relationship, a point ignored in most subsequent subliminal research.

Fisher (1954) followed Poetzl's procedure closely. He used similar complex, natural visual scenes (landscapes, Tower of London, etc.) which were flashed on a screen for 1/100 of a second, occasionally for 1/200 of a second. As did Poetzl, Fisher asked his subjects to note down any dreams they had that night and to bring them to the experimental session the next day. Subjects were then asked to draw the dream scenes and to associate to these, following which they were asked to examine the picture at full exposure, and to comment on any relationships between the picture, now seen in its entirety, and their dreams. Thirty subjects were run. In four instances, Fisher presented a picture other than the one flashed to his subjects after they reported their dreams in order to determine if they could see relationships between their dreams and this control stimulus. He reported that few such relationships were identified. No other control conditions were used.

Fisher reported a series of interesting findings quite similar to those described by Poetzl. In a typical result, a subject reported seeing the top half of a scene depicting four large columnar geological structures with two men standing in front of "The Three Kings," named after the three largest stone mounds. The picture was in color: a bright blue sky, clay-colored stone, two men in

blue shirts, and yellowish bushes in the foreground. The subject, a 28 year old female social worker, described what she saw as "that's Muslim Indian, all I saw was the top half" and she drew a gold dome with a spire and an open rectangle-like window. Her dream was long and complicated but contained references to two men on top of a pile of coal and a third person on another rise. Fisher interpreted these dream elements to be the subliminal recovery of the three stone mounds, and of the two men at the bottom of the picture.

Fisher reported in detail five other conscious descriptions of the picture and associated dream recalls out of 30 subjects run in the research. He drew several conclusions from the findings which in effect constituted hypotheses for his future research:

(1) The perceptual process was richer than was revealed by immediate consciousness.
(2) The specificity and detail of dream recovery pointed to a photographic-like registration of the briefly presented stimulus.
(3) The accurately registered features of the subliminal stimulus undergo a variety of graphic transformations even though the meaning of the objects depicted may still be retained.
(4) Dream work may begin in close conjunction with the subliminal registration and may not depend entirely on the nighttime dream state.
(5) Something akin to repression must affect subliminal registrations insofar as they appear to enter into complex, meaningful, and often conflict-laden dreams drawing upon transferences, in particular with the experimenter.

In a second study Fisher (1956) undertook to answer questions concerning the timing of primary process transformations of preconscious registrations. Do these transformations take place in fairly close conjunction with the initial registration, or do they only occur at a later point during the night in closer conjunction with the actual dream-state? In order to answer this question, Fisher adapted a word association technique developed by Allers and Teler (1924/1960) who were critical of Poetzl's interpretations and hypothesized that much more was conscious than Poetzl realized. They reasoned that what was reported initially depended more on how readily the impressions could be put into words than on unconscious registration. The Allers and Teler study anticipated one of the persistent criticisms of subliminal research—the problem of response bias, or the likelihood that by chance people would "hit upon" subliminal recoveries because they had a tendency to use certain words, or describe certain experiences.

Fisher's adaptation of the Allers and Teler's association technique was intended to serve other purposes than those Allers and Teler had in mind.

He used word associations to obtain associated images within minutes after the picture had been flashed, as well as 72 hours afterward. In several instances he obtained dreams as well, but these were not treated systematically in this study. He also introduced a control condition made up of a blank slide followed by images. According to Fisher, subjects could not see any correspondences between the images obtained following the blank flash and the two experimental pictures (The Three Kings and the Tower of London)—complex visual scenes used in previous experiments—while many such resemblances were seen between the images and the experimental scenes.

The evidence in this experiment strongly suggested to Fisher that many transformations of visual images characterizing dreaming are already present in images obtained minutes after the stimulus presentation at 1/100 of a second. Again, the evidence suggested that it was the initially unreported aspects of the picture which emerged in these images in various changed ways. Perhaps the most striking evidence emerged in connection with a photograph of two Siamese cats with a blue parakeet perched between them. Following the tachistoscopic exposure of this photograph, one subject thought she had seen two black and white animals resembling dogs or pigs. In her drawing, the animals emerged as vaguely bird-like creatures with four legs (Fisher, 1956, p. 23). In one of her images elicited by the word association procedures (to the word "dog" she had associated "house"), this subject drew a watchdog with a remarkably bird-like form which she could not draw otherwise, even though she was critical of her drawing, became confused, and could not understand why she continued to draw a bird, stating that she knew very well how to draw a dog and had done so many times. When the subject saw the bird on full reexposure, she immediately noticed the resemblance between the bird-dog and the parakeet, which she referred to as a "pigeon"—a designation which elicited a series of associations to her father who apparently was cruel to animals and kept a large vicious dog which at one time bit the patient. Fisher made note of the fact that in the initial representation of the picture, already present was a visual condensation of the consciously perceived animals and the bird which was registered but not consciously perceived. Moreover, these condensations appeared very quickly, in just a matter of minutes, already influenced by significant early memories (e.g., father's vicious dog, etc.). Fisher hypothesized that the patient was struggling against revived unconscious anal sadistic wishes, so that despite her conscious "laundering" of the percept, it was heavily tinged with these derivatives. Fisher argued that something like dream work had already begun at the moment the picture was originally flashed. The registration did not simply remain unchanged until nighttime, but the same unconscious forces were already at work in the daytime.

Fisher left open the question as to whether the primary process transfor-

mation, such as the condensation illustrated above, was a product of a primitive perceptual process then put to use by unconscious wishes, or if the unconscious wishes actually produced these transformations for dynamic purposes. He was impressed with the evidence brought forward by Poetzl and others concerning patients suffering from visual agnosia (an inability to interpret visual images) and Korsakoff syndrome (organically based failure of memory accompanied by hallucinations and false reminiscences), according to which changes appear to happen as a function of impaired perception rather than as a function of defenses.

In a third study Fisher (1957) undertook to improve on the previous two studies and to respond to criticisms made of his adaptation of the Poetzl technique and of Allers and Teler's association method. He substituted a "free imagery" condition for the Allers and Teler word association technique for eliciting images, thus removing the biasing tendencies of the stimulus words themselves. Simpler stimuli were also used (e.g., numbers, geometrical figures) in place of the complex landscapes of the earlier studies. With two subjects Fisher obtained dreams as well as images. He made reference again to several control subjects, the use of a blank stimulus, and a no-stimulus condition. However, no systematic data were presented for these conditions.

The free imagery provided more supporting evidence for the immediate emergence of subliminal effects of a transformed nature. In the two subjects from whom both dreams and images were elicited, the dreams appeared to draw upon the image content previously obtained, suggesting to Fisher that dream work began during the daytime and was continued at night. He hypothesized that many of the images appearing in the dream were drawn from daytime subliminal registrations which had already made contact with unconscious wishes. He suggested a revision of Freud's "picket fence" model for dream formation in which Freud hypothesized that because dream thoughts could not follow the usual forward, daytime path from the preconscious to consciousness, they had to follow a regressive course, resulting in the activation of powerful unconscious memories usually drawn from childhood which activated perception, thus resulting in the hallucinations characteristic of dreaming. Fisher pointed out that this formulation could not take into account the role of preconscious registrations since these are present preconsciously. Since Freud had hypothesized that the path through the preconscious was blocked at night, there was no way for these images to be drawn into the dream. For the "picket fence" model, Fisher substituted a model in which preconscious functioning played a major role. According to this model, all perceptions register preconsciously originally, and during this preconscious registration make contact with memory traces, thus resulting in recognition. With most preconscious registrations of a supraliminal nature, once having made contact with relevant memory traces, they are immediately

delivered into consciousness; but some of these registrations may in fact be "withdrawn" and not immediately enter into consciousness, especially if they have made contact with repressed unconscious memories which can also take place preconsciously. Once this happens, these preconscious registrations can only emerge in some delayed and disguised form such as in dreams, images, and hallucinations. The registrations which have been invested with repressed unconscious significance provide the source of day residues drawn upon in dreaming. But these day residues can also be drawn upon by images obtained immediately after the presentation of the stimulus; indeed, the influence of the unconsciously significant registrations may appear in the very conscious description of the stimulus in the form of selections and distortions. The raw material of dreaming, Fisher proposed, is already present during the day and the dream itself arises when there is a second activation of the unconscious wish during sleep. Briefly flashed pictures, like the numerous incidental and peripheral stimuli occurring naturally during the day, provide a reservoir of registrations which are unlikely to be delivered quickly into consciousness because of their low energy. Fisher concluded that Freud's "picket fence" model with its progressive and regressive paths could be simplified into one linear sequence beginning during the day, with the formation of the day residue and ending during the night with the emergence of the day residues in the dream itself. But, in principle, this linear course was no different from the appearance of preconscious registrations and images elicited immediately after the picture was flashed, or for that matter, the appearance of such registrations already influenced by repressed unconscious memories in the initial fragmented description of the picture (i.e., the drawing of the Siamese cat/parakeet picture as a "bird-mammal," giving rise to the associations leading back to charged memories of the father). Fisher was saying that there is in fact a continuity of thought organization for all unconscious processes, whether arising during the waking state or dreaming. Still left equivocal was the role of the various transformations—were they intrinsic to the perceptual process itself, as Poetzl originally hypothesized, or were they the result of defense and disguise? Lastly, was there no unique role for the dream as such?

Fisher's fourth study extended his investigations of subliminal perception and dreaming by comparing the effect of a supraliminal with a subliminal stimulus on dreams (1960b). Two stimuli were used, a snake and a vase with a swastika prominently displayed on its side. The two stimuli were presented side-by-side and the stimulus conditions arranged in such a way that when one of the stimuli was supraliminal, the other was subliminal. Fisher's hypothesis, based on his previous research, was that when the stimulus was subliminal it would enter into more deeply unconscious processes and play a prominent role in the dream; when the stimulus was supraliminal it would more likely enter into conscious, rational processes. The results only partially

supported this hypothesis. He felt that two factors, in addition to the factor of subliminality, had to be taken into account in order to explain his findings: (1) the meaning of the stimulus quite apart from its subliminality, and (2) the subject's personality characteristics, conflicts, and defenses.

In examining his findings, Fisher drew upon the thinking of Rapaport, an ego psychologist and systematizer of psychoanalytic theory. In particular, he drew upon Rapaport's distinction between the conceptual and drive organization of memories (Rapaport, 1960). Roughly, this distinction paralleled the psychoanalytic distinction between secondary and primary process. Fisher concluded that although a subliminal stimulus is more likely than a supraliminal stimulus to be influenced by drive organized memories, it is also possible for a subliminal stimulus to enter into a conceptual organization. The same could be said for a supraliminal stimulus. For example, the swastika, when supraliminal, was often embedded in a conceptual organization even when it appeared in dreams; when subliminal, it could either be affected by conceptual or drive organized memories. The snake, on the other hand, when subliminal, usually interacted with drive organized memories; when supraliminal, it seldom resonated with a conceptual organization of memories. In other words, the meaning of the stimulus appeared to make a difference quite apart from whether it was sub- or supraliminal.

In a number of Fisher's subjects, particular life experience, the nature of their defenses, and personality played key roles in influencing the effect of subliminality and the meaning of the stimulus. In one instance, the swastika, when supraliminal, was strikingly misperceived as a Star of David. This subject had spent three years in a concentration camp. When she finally saw the swastika on a *third* supraliminal exposure, she had trouble naming it! She explained her substitution of the swastika with a Star of David as due to her impression that the "Star of David had to suffer" the swastika. Fisher interpreted her substitution as a wish fulfilling denial. Although Fisher looked upon this fourth study as a pilot investigation only, it appeared to add further details to the understanding of what occurs in subliminal registration and what forces act upon it. The stage was now set for the more rigorous experimental studies which were to follow.

Experimental Studies

The first experimental study based on the Poetzl procedure was undertaken by Shevrin and Luborsky (1958). Although the research design contained flaws criticized by Johnson and Erikson (1961) in an unsuccessful replication attempt, the main thrust of the Shevrin and Luborsky findings has been borne out in subsequent systematic replications (Castaldo and Shevrin, 1970; Fisher and Paul, 1959; Paul and Fisher, 1959; Shevrin and Fisher, 1967; Stross and Shevrin, 1968).

Shevrin and Luborsky modeled their procedure on that of Fisher and Poetzl. A colored slide of a complex scene entitled "Inside Ancient Roman Walls" was flashed at 1/50 of a second for 26 subjects[2]. In a departure from the original procedure, three descriptions and drawings of the picture were obtained: two immediately following the exposure of the picture and a third the following day when subjects were asked to report and draw their dreams. If subjects could not report dreams, they were asked to produce an image and to draw the image. Associations were obtained to the dreams and images. Finally, the picture was re-exposed and subjects were asked to identify similarities between their dreams and images and the picture.

For purposes of more systematic and objective scoring, a list of 34 items belonging to the picture were drawn up and used by two judges to score independently the presence or absence of the items in the subjects' dreams, images, and descriptions of the picture. Acceptable reliability was obtained for three measures: (1) intentional recall, or the number of items consciously perceived in the picture; (2) preconscious recall, or the number of items in dreams and images not consciously perceived; and (3) recalled again, or the number of items present in dreams and images which had been reported consciously. On the average, it was found that out of ten picture-related items appearing in dreams, three had not been reported previously. Interestingly, the images of non-dreamers revealed significantly greater amounts of preconscious recall, supporting Fisher's contention that waking images are also a means for recapturing preconscious registration.

Poetzl had posited a *law of exclusion*, according to which items perceived consciously would not appear in dreams, and conversely, items not consciously perceived would more likely be present in dreams. By taking advantage of the three intentional recalls of the stimulus, Shevrin and Luborsky were able to show that significantly more picture items unreported in the first intentional recall appeared in dreams and images than in two subsequent intentional recalls, while significantly fewer items originally seen in the picture were recovered in dreams and images than in two subsequent intentional recalls. It was as if there were two memory systems, one stablizing as the intentional conscious recall of the picture, and the other stablizing as the preconsciously registered items drawn upon by dreams and images. A related finding emerged in a sleep/dream study to be reported below (Shevrin and Fisher, 1967).

Two other findings were of interest. One result was based on the hypothesis that to the extent recovered elements appeared in the dream, these elements would become part of anxiety arousing, drive organized memories and wishes;

[2]The intent was to have the same 1/100 of a second exposure as Fisher and Poetzl had used, but electronic calibration of the mechanical shutter revealed that the actual time exposure was 1/50 of a second when the setting was at 1/100 of a second.

and the other was based on the hypothesis that a formal pictorial property of the original stimulus (angularity) would characterize pictorial elements recovered from the picture in dreams and images. As hypothesized, it was found that (a) a rating of unpleasantness correlated significantly with the number of previously unreported pictorial elements recovered, and (b) a rating of angularity correlated significantly with the number of elements recovered from the picture, but only in dreams.

In two related studies, Fisher and Paul (1959) and Paul and Fisher (1959), used a stimulus which was both simple and elegant: the classic Rubin's double-profile picture (an ambiguous line drawing that could be seen either as a design or two profiles), for which a checklist of items was compiled, much as was done by Shevrin and Luborsky. In the Paul and Fisher study, 16 subjects were run in a design employing, in addition to Rubin's double-profile, a blank stimulus as a control. The subjects were shown both stimuli in counter-balanced order. Prior to the subliminal presentation of the stimulus at 1/100 of a second, a series of control images were obtained. After the stimulus was presented, a series of post-stimulus images were elicited. In addition, dreams were collected from ten of the 16 subjects, six following the double-profile and four following the blank. Fifteen judges were asked to assign the dream to the correct stimulus. The judges scored a significantly greater number of hits than was expected by chance. Of interest is the finding that one judge (Fisher), who had the greatest experience with the double-profile from previous experimental use, scored the greatest number of hits.

Supporting Poetzl's law of exclusion and the Shevrin and Luborsky findings bearing on this same proposition was the Paul and Fisher result that subjects with higher thresholds for recognizing the stimulus showed a greater amount of preconscious recovery, suggesting that when the stimulus was well below the recognition threshold—and thus little of it reported consciously—proportionally more was available for preconscious recovery.

Several important methodological problems had been identified in the course of research on subliminal perception and dreaming. First, the use of complex visual stimuli, while valuable because of the richness of detail, created difficulties because there was no easy way to control for the degree to which consciously seen items would give rise independently to associations which might be confounded with picture recoveries. Second, the identification of visual transformations posed difficulties because there were no explicit criteria for establishing that these transformations were related to the stimuli and not to other sources. Despite these difficulties, progress has been made as in the Paul and Fisher studies in which a blank stimulus was contrasted with a double-profile picture, the latter a simple visual stimulus with at least one striking formal visual property (the double-profile), which could be traced in dreams and images.

Shevrin and Luborsky (1961), in a later study, introduced a novel stimulus which attempted to remedy these methodological defects. The stimulus was a specially constructed picture made up of two items which were not closely associated with each other, so that seeing one would not easily lead, by association, to the other. Moreover, the two items were subject to predictable primary process transformation based upon the names of the items. For example, one stimulus was made up of a pen and a knee. Pen and knee have a low order associative strength; at the same time, the words pen and knee form a new word, penny. The picture is in fact a commonplace puzzle called a rebus.

Freud had discussed in some detail, in particular in the *Interpretation of Dreams*, the ways in which words are often treated as sounds in dreams and recombined in novel ways unrelated to their original meanings. In effect, words were treated as concrete sound patterns detached from their denotation, much as a contour in a picture can be recombined and rearranged in a new manner (e.g., a contour depicting a hill can be incorporated as a contour depicting a breast). The advantage that the rebus stimulus offered was that there were two predictable transformations that could be identified with some precision and reliability: (1) the rebus combination (i.e., the picture of the pen and knee) comprising a pictorial representation of a word—penny—with its associations such as money, nickel, etc., and (2) clang associates to the words pen and knee (e.g., words such as pennant, containing the clang sound pen, and words such as any, containing the knee sound). Lastly, conceptual associations of the pen and knee could also be identified (i.e., words such as ink, paper, or leg, foot, etc.). Scoring reliability would pose no problem because the judges' task was essentially clerical once adequate normative lists of associations were obtained. Shevrin and Luborsky (1961) indeed found that both rebus and clang effects could be demonstrated by using a priming list of words containing the rebus word and clang associates.

In a series of three studies employing the rebus stimulus, Stross and Shevrin (1968) explored the nature of subliminal transformations in hypnosis, the waking state, and in dreams and images. For the purposes of this review, only findings bearing primarily upon dreams will be reported. Stross and Shevrin found that hypnosis enhanced subliminal *conceptual* effects, but did not enhance the clang and rebus effects. In order for rebus effects to appear, a nighttime dream was necessary. Images recovered aspects of the stimulus but mainly on the conceptual level. Hypnosis could enhance conceptual recovery, although a nighttime dream was apparently necessary for rebus effects to appear. Of further interest was the enhancing effect of hypnosis upon a subsequent waking state in which subjects continued to show the hyperamnesic properties (enhanced recovery of subliminal contents) of the previous hypnotic state, while subjects in the waking state preceding hypnosis did not. On the whole, the findings did not support the earlier Fisher results that

primary process transformations begin to happen almost immediately following the exposure of the picture. A dream did appear to be necessary for recovering primary process transformations. It could still be argued, however, that the primary process transformations investigated with the rebus technique were *verbal*, while those studied by Fisher were *visual*, and that visual primary process transformations are more likely to occur without dreaming. The finding on angularity in the 1958 Shevrin and Luborsky study would appear to argue against this position because these authors found that a formal visual property of the picture, angularity, was recovered more frequently in dreams than in the waking images.

Shevrin and Fisher (1967) conducted a sleep/dream study with ten female subjects wherein a rebus (pen/knee) was compared with a blank stimulus. Responses were obtained following Stage I REM sleep and Stage II NREM sleep. The main hypothesis of the study was that rebus effects would appear following Stage I REM sleep and conceptual effects would appear following Stage II NREM sleep. The findings clearly supported the hypothesis for associations obtained following awakenings from these two different sleep states. It was as if the sleeping state, whether REM or NREM, persisted in its effects in the immediately following waking state, parallel to the previous finding (Stross and Shevrin, 1968) that the hypnotic state influenced the subsequent waking state. Moreover, it appeared that the two sleep stages enhanced their respective subliminal recoveries (rebus level for REM, conceptual level for NREM) when compared to associations obtained in the waking state following the subliminal presentation. Subliminal effects, either primary process or secondary process, were greater in their respective states of consciousness during sleep than in the waking state preceding sleep. When it is borne in mind that during sleep the subject was awakened alternately following REM and NREM states, it would appear that subliminal effects change as a function of state within the same person for the same stimulus.

Partial replication of the Shevrin and Fisher findings was obtained by Castaldo and Shevrin (1970) in a sleep/dream study in which auditory stimuli were presented to subjects during REM and NREM sleep. The auditory stimuli utilized were versions of the pen/knee rebus in which the words "fountain pen" and "knee cap" were presented at four second intervals. No subject reported hearing the stimuli during sleep. Waking reports and images were also obtained. The main finding was that conceptual effects were found in sleep reports following Stage II NREM awakenings as compared to control nights. No rebus effect was obtained following Stage I REM sleep. The failure to replicate the rebus effect may have been due to the marked change in the form of the auditory rebus. The words "fountain pen" and "knee cap" may not lend themselves to the rebus combination as readily as "pen" and "knee," while the conceptual associations to "pen" and "knee" would not have been as grossly affected.

Summary and Conclusion

On the whole, it can be said that Poetzl's original findings have been borne out and amplified: (1) a subliminal stimulus registers and is recovered in dreams, and (2) the recovery is subject to certain transformations, verbal and visual, which appear similar to Freud's distinction between primary and secondary processes.

Was Freud correct in hypothesizing that the dream was a special vehicle for primary process and that such transformations of a subliminal stimulus would occur mainly in dreams? The answer from subliminal research is equivocal. Fisher's early empirical, non-experimental studies appear to suggest that primary process transformations occurred in non-dreaming images obtained in the waking state as well as in dreams, and on the strength of these findings he proposed a revision of Freud's "picket fence" model for the dream process: dreams drew heavily on daytime images already transformed by unconscious wishes. Later experimental studies, in particular the work of Stross and Shevrin using hypnosis, and Shevrin and Fisher with the sleep/dream cycle, suggest that dreams are a better vehicle for recovering primary process transformations of subliminal registrations. However, differences in the nature of the stimuli and responses measured make it difficult to compare these studies. Fisher relied primarily on visual transformations, and the other studies relied on verbal transformations. No definitive study comparing the two types of stimuli and measures has been conducted.

What have we learned about the nature of the perceptual process? Certainly, the evidence in these relatively early studies (the last published in 1970), strengthened the basic proposition now supported by hundreds of studies, as reported by Dixon (1981), attesting that perceptual registration is always greater than immediate consciousness reveals. Moreover, even at very brief durations, there is an amazing amount of the stimulus registered preconsciously which never appears in immediate intentional recalls. The theoretical significance of these findings as they bear on both psychoanalysis and cognitive psychology have been discussed by Shevrin and Dickman (1980). More recent work, with even faster speeds (.001 seconds), and exploring electrophysiological indicators of subliminal registration, has been reported elsewhere (Shevrin, 1978).

What can we learn about the nature of consciousness itself from studies on subliminal perception and dreaming? As already indicated, waking consciousness, at best, reveals only a fraction of what is potentially available to recall. Various changed states of consciousness are necessary to recover a portion of what is available and registered. Stross and Shevrin found that hypnotic consciousness enhances the recovery of conceptual aspects of a subliminal stimulus and will enhance the hyperamnesic properties of a subsequent waking state. Shevrin and Fisher found that dreaming and non-

dreaming consciousness during sleep apparently have different properties as revealed by quite different capacities to recover rebus and conceptual effects. Thus, the evidence strongly suggests that certain states of consciousness are better suited for specific subliminal effects paralleling Freud's distinction between primary and secondary processes. We might interpret this to mean that states of consciousness differ in their cognitive and affective organization.

Finally, the small set of studies dealing with the relationship of subliminal perception and dreaming underscore the important role that unconscious psychological processes play in our mental life. With recent advances in methods, as provided by subliminal techniques, we are now capable of looking into the darkest corners of the "black box."

References

Allers, R., and Teler, J. (1960). On the utilization of unnoticed impressions in associations. *Psychological Issues, 2* (3, Monograph 7), 121–150. (Originally published 1924).

Castaldo, V., and Shevrin, H. (1970). Different effect of an auditory stimulus as a function of rapid eye movement and non-rapid eye movement sleep. *Journal of Nervous and Mental Disease, 150* (3), 195–200.

Dixon, N.F. (1981). *Preconscious processing.* New York: Wiley & Sons.

Fisher, C. (1954). Dreams and perception. The role of preconscious and primary modes of perception in dream formation. *Journal of the American Psychoanalytic Association, 2,* 389–445.

Fisher, C. (1956). Dreams, images, and perception: A study of unconscious-preconscious relationships. *Journal of the American Psychoanalytic Association, 4,* 5–48.

Fisher, C. (1957). A study of the preliminary stages of the construction of dreams and images. *Journal of the American Psychoanalytic Association, 5,* 5–60.

Fisher, C. (1960a). Introduction. *Psychological Issues, 2* (3, Monograph 7), 1–40.

Fisher, C. (1960b). Subliminal and supraliminal influences on dreams. *American Journal of Psychiatry, 116,* 1009–1017.

Fisher, C., and Paul, I.H. (1959). The effect of subliminal visual stimulation on imagery and dreams: A validation study. *Journal of the American Psychoanalytic Association, 7,* 35–83.

Johnson, H., and Erikson, C.W. (1961). Preconscious perception: A re-examination of the Poetzl phenomenon. *Journal of Abnormal and Social Psychology, 62*(3), 497–503.

Nisbett, R.E., and Wilson, D.D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review, 84,* 231–259.

Paul, I.H., and Fisher, C. (1959). Subliminal visual stimulation: A study of its influence on subsequent images and dreams. *Journal of Nervous and Mental Disease, 29* (4), 315–340.

Poetzl, O. (1960). The relationships between experimentally induced dream images and indirect vision. *Psychological Issues, 2* (3, Monograph 7), 46–106. (Originally published 1917).

Rapaport, D. (1960). The structure of psychoanalytic theory. *Psychological Issues, 2* (2, Monograph 6), 479–488.

Shevrin, H. (1978). Evoked potential evidence for unconscious mental processes: A review of the literature. In A.S. Prangishvili, A.S. Sherozia, and F.V. Bassin (Eds.), *The unconscious: Nature, functions, methods of study* (pp. 610–625). Tbilisi, U.S.S.R.: Metsnierba Publishing House.

Shevrin, H., and Dickman, S. (1980). The psychological unconscious: A necessary assumption for all psychological theory? *American Psychologist, 34,* 421–434.

Shevrin, H., and Fisher, C. (1967). Changes in the effects of a waking subliminal stimulus as a function of dreaming and non-dreaming sleep. *Journal of Abnormal Psychology, 72*(4), 362–368.

Shevrin, H., and Luborsky, L. (1958). The measurement of preconscious perception in dreams and images: An investigation of the Poetzl phenomenon. *Journal of Abnormal and Social Psychology, 56*(3), 285–294.

Shevrin, H., and Luborsky, L. (1961). The rebus technique: A method for studying primary-process transformations of briefly exposed pictures. *Journal of Nervous and Mental Disease, 133*(6), 479–488.

Stross, L., and Shevrin, H. (1968). Thought organization in hypnosis and the waking state. *Journal of Nervous and Mental Disease, 147*(3), 272–288.

Zajonc, R.D., (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist, 35*(2), 151–175.