The Journal of Mind and Behavior
Autumn 1992, Volume 13, Number 4
Pages 397–412
ISSN 0271–0137

Freud on Dreams and Kosslyn on Mental Imagery

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The author attempts to show the relevance of Kosslyn's research on mental imagery to some aspects of Freud's theory of dreams. Some of the findings of this research, such as the properties of visual images, the processes involved in image generation, etc., are discussed and it is shown how they contribute to the various Freudian hypotheses concerning the properties of dream images, the processes constituting the dream work, and the activity of dream interpretation.

The task of this paper is to show how Kosslyn's (1980, 1981, 1984) research on mental imagery is relevant to Freud's theory of dreams, one of the most crucial areas of psychoanalytic theorizing and clinical practice (Freud, 1912, p. 265). I would like to begin by looking at Freud's earlier writings where he first demonstrated an interest in mental images.

Freud on Mental Images: Some Preliminary Remarks

Freud's interest in the subject of mental imagery precedes his work on dreams, since mental imagery became an important issue in the explanation of hysteria. According to the theory of hysteria, symptoms develop because the subject is unable to find verbal expressions to communicate thoughts that emerge as a result of a traumatic experience. Once these thoughts and the affect associated with them are put into words by the hysteric, the symptoms disappear (Freud and Breuer, 1893, p. 280). What is of interest to us is that such thoughts or memories are considered as being of an iconic nature:

I would like to thank the reviewers of an earlier draft of this article for useful comments and suggestions. Requests for reprints should be sent to D.D. Nikolinakos, Philosophy Department, Anderson Hall—7th Floor, Temple University, Philadelphia, Pennsylvania 19122.

> [O]nce a *picture* has emerged from the patient's memory, we may hear him say that it becomes fragmentary and obscure in proportion as he proceeds with his description of it. *The patient is, as it were, getting rid of it by turning it into words.* (Freud and Breuer, 1983, p. 280, first emphasis is mine)

Similarly, the emerging memory of the hysteric is described as being comprised of things that the subject "sees . . . before him with all their original actuality" (Freud and Breuer, 1893, p. 35). Once such memory is retrieved and translated into words, the affect attached to it is dissipated which enables the subject to be liberated from its influence. It is this failure to shift from the pictorial mode of childhood memories to a linguistic mode that remained the essential feature of Freud's understanding of neurosis (Forrester, 1980, p. 34).

The above concerns are also supported by Freud's (1915) more general formulations on the nature of conscious mental representations which are said to have two components, the word-presentation and the thing-presentation. With repression a split occurs between the two with the word-presentation remaining in the conscious-preconscious system and the thing-presentation, which is of a visual nature, being drawn into the unconscious. If thing-presentations rise to consciousness by means other than words, one forms mental images which are mistaken for reality. It is these iconic representations that constitute the center around which elements of the dream and neurosis are shaped (Freud, 1900, pp. 546; 659; 1915).

Freud on Dreams

Manifest Dream Content

A dream's formation can be described as developing along the following path: initially there is the production of dream-thoughts (latent dream thoughts) which have a propositional form and get transformed, via the operations constituting the dream-work, into the manifest content of the dream, having primarily a pictorial form (Forrester, 1980, p. 71; Freud, 1900, p. 8; 14; 19; 21; 506; 534; Laplanche and Pontalis, 1980, p. 235). It is the claim that the manifest content of dreams is composed primarily of mental images which underlies Freud's contention of dream images being more like percepts and dreaming being "visual thinking" (1900, pp. 49–50; 1923, p. 21).

The affinity between dream images and percepts is repeatedly emphasized by Freud. The generation of dreams is described as a regressive process by which the perceptual system, coinciding with consciousness, is activated (Cs–Pcpt). Hence, the claim that both dream images and percepts make use of the Cs–Pcpt system. They are only distinguishable in terms of their relation to muscular action. Where perceptions of external objects disappear by an action,

e.g., the movement of the head, mental images such as hallucinations persist in the wake of actions (Freud, 1917, p. 233). The Cs–Pcpt system, having at its disposal motor innervation, enables the agent to decide whether a visual experience is resistant and internal, or not resistant and external, i.e., involving a percept. It is partly the use of the same mechanisms of the visual system that accounts for the confusion between visual percepts and visual images.

It is appropriate at this point to make some preliminary remarks of the relevance of Kosslyn's pictorialist views on mental imagery to Freud's theory of dreams. One important reason why the pictorialist research seems to be pertinent to Freud's account is that it views mental images as picture-like,[1] in contrast to the descriptionalist account of mental imagery which adheres to the view that "all mental representations are descriptions" (Block, 1981, p. 3). Since pictorialism is a view that comes close to Freud's and since there seems to be sufficient support for the hypothesis that mental images are more like pictures than verbal descriptions, I will attempt to examine Freud's theory of dreams in relation to such research.[2]

It could be objected that the application of research on voluntarily produced iconic mental images to the treatment of dream images is inappropriate since even if we agree that dream images and waking images are both picture-like, there is still a fundamental difference between the two: the former, as opposed to the latter, are voluntary. However, this objection is only partly correct, as a variety of reasons indicate the gap separating dream images and images produced during visualization is not that significant.

One such reason is given by Kosslyn (1984, p. 1), who is willing to accept daydreaming, involving the involuntary production of images as a species of imaging. He also observes that there are images which due to unconscious influences cannot be shaken-off (1984, pp. 227–228, ft. 1). I take these com-

[1]A picture represents an object because it is capable of representing parts of that object and because relations between parts of the picture represent relations between parts of the object. A mental image is like a picture, i.e., a quasi-picture because it functions the way pictures do. Although it does not share all the properties with a picture it is nonetheless capable of depicting information, such as objects or scenes, in a spatial medium (Kosslyn, 1981, p. 213). When an object is represented in an image then every part of the representation corresponds to a part of the object represented so that the distances among parts of the representation preserve the distances among parts of the object represented. The distance between parts of the representation is not physical but functional. It is in this respect that image parts are capable of representing object parts. Finally, to say that mental images are like having pictures in ones head is to say that one is having mental representations as the ones obtained when seeing. The difference between the two types of representations it that in the case of mental images representations are retrieved from memory and are not formed directly from sensory experience.

[2]Because the purpose of this paper is to show where the pictorialists' views are relevant to the Freudian theory of dreams, I will refrain from considering Foulkes (1985), who attempts to assimilate Freud's theory to the descriptionalist account.

ments to suggest that his account can accommodate other than voluntary produced mental images.

Another reason is provided by experiments which suggest that dreams are not that far off from waking experience since the failures that characterize cognitive activity during dreaming are very similar to the failures that appear in waking life (e.g., confusional states, deficiencies in memory, etc.), while features that characterize waking thought are also very dominant during dreaming (e.g., adaptive thought, narrative coherence, etc). Dreams are less bizarre than normally assumed since the majority of dreams seem to exemplify content much closer to mundane situations (Hunt, 1989).

Furthermore, evidence suggests there are waking reveries which may be aptly described as waking dreams since they share some of the characteristics of dreams experienced during sleep, i.e., they may at times be hallucinatory; the subjects may believe the reality of the content of such experiences; mental content may be unusual and involuntary, etc. (Foulkes, 1985, pp. 71–77)—these features also characterize dreams brought about by hypnotic suggestion and guided fantasies (Hunt, 1989, p. 3). All these findings indicate, as Foulkes suggests (1985, p. 76), that dreams are not confined to sleep and that the dichotomy between waking versus sleeping is unacceptable. Consequently, the study of dreams may be approached using the concepts developed for the examination of the processes characterizing waking consciousness (see Hunt, 1989, pp. 71–73; 98; Foulkes, 1985, p. 4). If this is the case, even if we characterize dreams as involuntary iconic mental images, an investigation along these lines is justified.

Contemporary neurophysiological research is also important in this context. Traditionally, the neuroanatomical locus of mental imagery was taken to be the right hemisphere. However, this hypothesis has come under attack by a variety of studies which have shown that the right hemisphere cannot be such a specialized unit for mental imagery since the left hemisphere seems to contribute to the process of imaging (Richardson, 1990, p. 367). Other studies have shown that the left hemisphere is superior to the right one in the generation of images which have greater and more accurate visual detail (Finke, 1989, p. 149). Kosslyn, Van Kleek, and Kirby (1990) have also rejected the hypothesis that mental imaging is solely located within one cerebral hemisphere since the generation of mental images requires the use of both pictorial and propositional representations necessitating the use of both hemispheres.

In addition, Greenberg and Farah's (1986) research suggests that the left hemisphere has a crucial role to play in dream generation, undermining the notion that dreaming is an exclusively right hemisphere function. But more importantly the inability to generate imagery due to damages on the left hemisphere is often accompanied by the loss of the ability to dream. This is taken to indicate that the generation of both dream and waking images utilizes

the same neuroanatomic areas (1986, p. 316). Furthermore, other findings indicate that dreaming is the result of the interaction of two cognitive processes, one being the processing of propositional knowledge which is left hemispheric, the other being pictorial knowledge which is right hemispheric (Hunt, 1989, p. 174).

The affinity between imaging and dreaming is also supported by the role Kosslyn's research ascribes to perception in relation to mental images. He has shown that both images and percepts are represented in the same way and processed by the same mechanisms and physiology (Finke, 1989, p. 41; Kosslyn, 1984, chapter 5). Other experiments are taken to show that the same interpretive mechanisms and the visual buffer, i.e., the mental medium on which images are projected upon generation, are used in both types of activities (Kosslyn, 1980, p. 272; 1984, p. 87). I take these findings to support and elaborate upon Freud's thesis that the same system is used in the production of dream images and percepts.

It is important to add at this point that according to Kosslyn's account, the confusion between images and percepts is to be explained by the fact that the same mechanisms are used in both imaging and perceiving. However, his account differs from Freud's in that he offers a different criterion for distinguishing percepts from mental images.[3] Kosslyn's (1984, p. 91–92) criterion is that mental images can be manipulated with ease while percepts are fixed and stable. According to Freud, dream images and percepts are distinguishable in terms of their relation to muscular action; while a percept disappears by an action, such as the movement of the head, hallucinations are persistent. It seems that Kosslyn's criterion is problematic because dream images as a species of mental images, and daydreaming, which Kosslyn wants to include in his account, involve compulsive images as resilient to manipulation as percepts. This suggests that Kosslyn's criterion is not satisfactory while Freud's seems to be more appreciative of the varieties of iconic mental imagery and their distinguishing features.

There are other indications to encourage the correlation between imaging, dreaming and perception. Hunt offers a variety of objections to Foulkes, who refrains from assimilating dreaming, imaging and perception and construes dreaming more as a psycholinguistic skill typified as the manipulation of propositions through abstract linguistic processes (1989, pp. 37–38). One objection is that children and animals would not be considered as having the capacity to dream since they would lack the linguistic capacities required in dream formation. As Hunt (1989, p. 43) has indicated, there is strong evi-

[3]Although Freud's explanation that the confusion between dream images and percepts arises from the presence of a wish, his account does not conflict with Kosslyn's. On the contrary, the fact that there are mechanisms shared by the activities of dreaming and perceiving adds to the plausibility of the dynamic explanation.

dence to suggest that young children do have the capacity to dream and that their dreaming is based on perceptually acquired cognition rather than on linguistic–propositional cognition.

These concerns bring us to another area of affinity between dream and imagery research. Freud claims that our capacity for vivid visual imagery goes back to our early childhood which is primarily visual. This is inferred from the observation that during adult life recollections of early childhood are of a visual type. The visual character of early memories is also considered to be responsible for the predominantly visual character of dreams, i.e., dream thoughts attract visual scenes from early childhood and bring them to consciousness as the manifest content of the dream (1900, pp. 546; 548). These are some of the reasons why Freud characterizes dreaming as a regressive phenomenon (Laplanche and Pontalis, 1980, pp. 386–388).

These claims are defended by Kosslyn's representational–development hypothesis (1980, p. 408). According to this hypothesis, children rely upon imagery more predominantly than adults when accessing and using information stored in memory; adults rely primarily on verbal abilities and therefore on abstract representations. More specifically, the main point of the hypothesis suggests a change from a predominantly imagistic representational mode used during childhood to a propositional/verbal mode used in adult life. If this is the case, imaging can safely be categorized as a regressive phenomenon since, even in Kosslyn's terms, the use of imagery is an activity that dominates an earlier phase of ontogenetic development.[4]

Lewin (1973) has proposed a hypothesis pertinent to this discussion in maintaining that every dream is projected on a dream screen. This screen is described as "the blank background" on which "the visually perceived action in ordinary manifest dream contents takes place" (p. 88). It is taken to be analogous to the cinematic screen and to occupy the dreamer's visual field (p. 101; 250). It only becomes manifest in certain dreams, called blank dreams, which are devoid of any visual content.

Kosslyn's research provides partial support for the concept of the dream screen. He claims that mental images are projected on a mental medium or screen that functions like a space resembling a television screen. This screen or visual buffer is analogous to the visual field used in perception. Although Kosslyn (1984, p. 62) denies that one is aware of the visual buffer when imaging, he advances a variety of hypotheses about the properties of the mental medium. These include the capacity of depicting three-dimensional relations

[4]However, it is important to remember that Kosslyn's hypothesis is not concerned with the notion of earlier stages of psychosexual development, i.e., the temporal notion of regression. This seems to be an exclusively psychoanalytic notion whose justification requires other avenues of evidential support. It is the formal and the topographical conceptions of regression that obtain support from Kosslyn's research.

among objects of the scene being imaged, a limited spatial extent, an elliptical shape, a fixed grain, and a limited resolution—the mental medium is used for the projection of both images and percepts which are interpreted by the same mental processes (Kosslyn, 1984, chapter 4; p. 85). This contention is supported by the various studies on patients with right parietal lesions where brain damage in the right parietal region causes unilateral visual neglect in perception and also in imagery (Kosslyn, 1984, p. 70).

Kosslyn's findings concerning the visual buffer do not only support the affinity between imaging, dreaming and perception, but also substantiate, at least to some extent, Lewin's neglected thesis that dreams are projected on a dream screen. It would of course be important to know whether patients with right parietal lesions also exemplify similar visual neglect in their dreams. Such data would greatly enhance the status of the hypothesis suggested by all these considerations, namely that dreams, percepts and waking images are projected on the visual buffer. Greenberg and Farah's (1986) claim that dream and waking images use the same neural processes adds to the plausibility of this hypothesis.

Dream and Waking Image Generation

According to Freud's (1900) account, once dream thoughts are produced they obtain a propositional form. They are cognitive states with propositional content and full syntactic structure, e.g., "I am not responsible for the persistence of Irma's pains"; "because I am of such low descent, the course of my life has been so and so" (pp. 315–316; 434; see also p. 430; 435; 664). These propositional representations are stored in memory and are usually inaccessible to the dreamer's waking life.

Subsequently, dream thoughts become manipulated by a variety of unconscious mental operations, i.e., condensation, displacement and considerations of perceptual representability, and get transformed into the manifest content of the dream (Freud, 1900, pp. 281; 506; 507; ft. 2; Laplanche and Pontalis, 1980, p. 125). These operations will represent dream thoughts as manifest dream content by selecting the appropriate representations already stored in memory. These representations are visual memories from the dreamer's childhood and recent experience (Freud, 1900, p. 546; 659).

The dream generating processes do not generally reproduce the memory images but manipulate them in a variety of ways. First of all, only "fragments" of these iconic representations are used (Freud, 1900, p. 21). These fragments may be altered in a variety of ways, e.g., parts of an image may be deleted, parts may be replaced by other parts, and parts may lose their original form (Edelson, 1990, pp. 28–29). This suggests that dream formation involves the activation of memory from different "files" which are subsequently mixed and fused.

Due to the efforts of dream work operations, the manifest dream is often absurd, ambiguous and distorted. However, since the manifest content represents the dream thoughts, psychoanalysis ventures to interpret it. The act of interpretation involves a shift of translation from one symbolic system of representations, which in this particular case is pictorial, to another which is propositional.

On the other hand, mental images (surface representations) are formed from information represented and stored in long term memory, that is, deep representations which are of two types, literal and propositional. The content of a literal representation is the same as that of the surface image produced by it. This representation is a skeletal encoding, a rough representation of the subject. There are also encodings of parts of the object and these are related to one another and the skeletal image by propositions which specify the exact nature of the relationship. Propositional representations have a propositional format; they are "language-like discursive representations, corresponding roughly to simple active declarative statements" (Kosslyn, 1981, p. 218). These representations are ordered in lists and these lists are identified by a name. The lists contain information about the parts of an object, the position of these parts on the object, the size of such parts, etc.

The process of image generation, the IMAGE process, is described as resembling the assembling of bicycle parts by following a certain set of instructions (Kosslyn, 1984, p. 98). Images are formed once certain mental instructions in the form of descriptions come to operate on separately stored image parts. These descriptions are used to assemble various memories into a single image which is later displayed on the visual buffer. The use of both verbal/descriptive and depictive information is the reason why subjects have no trouble envisaging any situation that they are instructed to image even if they have never perceived the scene before.

Once an image is generated the inspection process may be activated in order to identify a feature of the object whose image has been generated in the visual buffer. Other processes may alter parts of the visual image. Images are transformed bit by bit and the time taken for such transformations increases proportionally to the complexity of the transformation task. There is also a fourth kind of processing which determines when images are to be used spontaneously, e.g., when the information required concerns the appearance of objects (1981, p. 223).[5]

Kosslyn's account of image generation is relevant to Freud's theory of dreams in the following ways. First, Freud's emphasis on the dream work as the "essence" of dream formation is also shared by Kosslyn's approach to imagery that emphasizes the need to examine an image not in isolation but

[5]For a detailed description of these processes refer to Kosslyn (1980, 1984).

in relation to the processes that manipulate it (Kosslyn, 1980, p. 5). Moreover, both theorists consider the processes involved to be unconscious.

The transformation process is important for the Freudian account since at times Freud maintained that once dream images are selected from one's memory they can become subjected to distortion; this also applies to hallucinations (1937, p. 267). These claims can be read as supporting the view that dream images undergo transformations which are not, strictly speaking, the effects of the three main processes constituting the dream work but rather the result of operations acting on dream images which have already been formed and projected on the visual buffer. If this is correct, it suggests that these processes identified by Kosslyn may operate non-deliberately on dream images contributing further to their distortions.

Kosslyn's suggestion that one uses imagery with information that is predominantly visual and encoded in an imagistic mode gives some support to Freud's view that dreams deal with childhood experiences which are characterized by the limited use of language skills. If the experiences of childhood are predominantly encoded in images and linguistic skills are relatively absent, then it makes sense that one would try and retrieve such information by forming images. The extensive use of childhood memories during dreams is also partly supported by research which has shown that mental images are better recalled over time while words tend to be easily forgotten (Finke, 1989, p. 9).

An important aspect of Kosslyn's account is that images are stored in separate chunks which are later retrieved and synthesized in order to form an image. As I indicated earlier, this claim was also supported by Freud. But besides the empirical support it provides for Freud's claims, Kosslyn's account has the advantage of creating a clear break with the view that the images stored in long term memory are stored in whole units. This point needs to be emphasized because Freud on occasion conceived such images as photographs projected on a surface (1900, p. 293). The pictorialist's contribution is in providing reasons why an account of mental imagery needs to distance itself from such a view.[6]

We can also use Kosslyn's views on the generation of mental imagery to resolve some of the disputes that have arisen over the capacity of Freud's theory to account for the creative nature of dream images. According to

[6]For a defense of the view concerning the inappropriateness of the photographic conception of mental images and visual perceptions see Kosslyn (1981, p. 13), Finke (1989, p. 15), and Block (1983). However, the case against the view is often overstated especially when photography is viewed as a mechanical process. Photography can hardly be seen in that manner since a variety of decisions need to be made during the process of producing the photograph such as choice of film, camera, lens, chemical treatments involved in the development and printing of the film, type of paper used, filters rendering the photograph indeterminate by eliminating and diffusing parts of the object, etc.

Freud, dreams are composed of memory traces which are combined during dream formation to form dream images (1900, pp. 538; 543; 546; 565). Hence Freud's claim that dreams are a conglomeration of composite structures (1900, pp. 324–325). It is partly this composite structure of dream images that makes possible the creativity and the novel information discovered in dreams.

However, it is often objected that Freud's account cannot explain the creativity of dreams. According to Globus (1987, pp. 16–17), the synthetic function performed by the dream work must exemplify great editing capacity. This is rather implausible, especially when the composition of more complex images are concerned. The objection here seems to be that the description of the process of image composition as a projection of photograph-like memory images and their synthesis in a unitary image is too simple for dealing with the complexity, novelty and idiosyncratic nature of dream imagery, e.g., Freud's dream experience of riding a horse or the dream image of "flying through the cool evening air and swooping down on a group of people . . ." (Globus, 1987, p. 25; 32; 60). We cannot conceive how this synthetic function or process is accomplished "nor can we think of machines that might accomplish such feat" (1987, p. 17; 21). Consequently, the hypothesis that memory traces used in dreams are derived from unremembered lived or imagined experiences seems to be ad hoc (1987, p. 22).

In a somewhat similar fashion Hunt (1989, pp. 64–65) argues that there are dreams such as nightmares, lucid dreams, problem solving dreams, archetypal dreams, dreams expressing somatic disorders, etc., which go beyond waking life and therefore cannot be explained in terms of the operations of the dream work. What we need, Hunt claims, is the concept of creative constructive imagination which may account for such features of dream life that memory cannot. Imagination and creative thinking cannot be explained by memory since the visual structure of the dream contains knowledge which "goes beyond previous understanding" (1989, pp. 108; 109).

I would like to defend Freud's account against these charges by taking into consideration some of the points raised about dream and image generation. According to Kosslyn's account images are constructed by retrieving images piece by piece which are then synthesized into a unity projected on to the visual buffer. It is the fact that images are stored and retrieved in parts that accounts for our capacity to form them even if we have no perceptual experiences of the scene represented. It suffices that information stored in memory can be synthesized to form complex images. Once we give up the notion that waking mental images and dream images are like photographs and replace it with the notion that mental images are quasi-pictures, then the synthetic capacity of image generation is not such an impossibility. We have enough experimental material to counteract such skepticism.

If some of the same processes are involved in dream generation then we do not really have problems accounting for the kind of dream imagery suggested by Globus. What is required is that the dreamer has available the appropriate depictive information stored in memory which can be used for creating novel and complex images. For example, we can postulate that Freud had actually perceived others horse-riding and as a result he had a memory trace of such an event which was later retrieved and combined with Freud's own body image to produce the dream image of Freud horse-riding. Similarly, the image of swooping over a group of people does not have to be experienced or imagined beforehand since this can be constructed from the synthesis of a variety of stored percepts such as those of birds swooping over an animal, the kinesthetic images produced in childhood from being thrown in the air by an adult, those produced by a rapidly approaching object, the wind blowing against one's face, etc. Kosslyn's description of image generation along with Freud's hypothesis that dreams use memories from one's distant and recent past provide a good theory to account for the idiosyncratic nature of dream images.

Furthermore, it is possible to make a case for the novelty discovered in dreams by taking into consideration the various explanations advanced by the pictorialists concerning the creativity of images. First, the novelty of images can be partly explained by the implicit encoding principle, according to which (Finke, 1989, p. 7), mental images are capable of "retrieving information about the physical properties of objects, or about physical relations among objects, that was not explicitly encoded at any previous time." For a piece of information to be implicit means that the "information was not intentionally committed to memory prior to its being retrieved." In other words, the knowledge that one has at one's disposal may be tacit thereby enabling the subject to make new judgments based on information extracted from old sensory experience. In addition, the objection is wrong because it falsely assumes that we hold true the consequences and conjunctions of everything that we believe.

Further, the capacity of images to function as bearers of information also rests on their capacity to simulate and anticipate real objects and objects' performances in the real world. Similarly, because images may be fused to form new ones, a variety of structural relationships between the parts of represented objects may be revealed (Finke, 1989, pp. 61; 93; 132–136; 1990, p. 18; Kosslyn, 1984, p. 104). It is due to such capacities that mental images are considered to be useful for solving a variety of problems and performing a variety of functions (Block, 1983, p. 537; Finke, 1989, pp. 150–154; Kosslyn, 1984, chapters 10; 12).

We have enough reasons in addition to the ones provided by Freud to account for the composite and creative nature of dreams. Perhaps we cannot account for all of the aspects of creativity and new information to be found

in dreams, especially those characterized by bizarre imagery,[7] but it seems that the pictorialist claims can go a long way in accounting for them.[8]

Finally, I would like to consider some of the implications of the research on imagery for the interpretation of dreams. An important requirement for mental images, if they are to be taken to represent the objects that they are supposed to represent, is that they must be situated in a certain context by being brought under a description (Wittgenstein, 1958, pp. 197; 199; 217; 572–573; 663; 1974, p. 102). The provision of such story/description/interpretation seems to be the main criterion for determining the referent of a picture or image and for eliminating the ambiguity inherent in icons.

Images, according to Kosslyn (1980, pp. 217–224; 450; 452; 1984, pp. 119–120), meet the above condition because the process of image generation requires that propositional information is accessed. This information serves as the description under which images fall, determining the objects represented by an image, even if such an image could potentially be read in a variety of ways. Dream images also meet this requirement since the analysand has to provide an interpretation of content of dream images before she puts forward the various associations that spring to mind when recounting dream events. It is only when this condition has been satisfied that the task of interpretation along psychoanalytic lines may take place.

However, Freud's (1900, pp. 277; 341) optimism concerning the possibility of discovering the "language of dreams"—which was on occasion compared to a hieroglyphic script that would greatly facilitate the recovery of the rele-

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[7]I owe this suggestion to Professor Hunt.

[8]I have not said much about the way in which one could accommodate Kosslyn's account of image generation to the understanding of the dream work. What needs to be considered are the various paths that the dream mechanisms follow in order to reach the point at which the instructions, the starting point of image formation, are determined. Since Kosslyn does not provide an account of how such instructions are produced when mental images are produced spontaneously, I suggest that the various instructions that set the IMAGE process into action are produced by the processes of condensation and displacement. These manipulate the dream thoughts to the extent that once their end product is crystallized, it hardly bears any resemblance to its origins. Once this has taken place the IMAGE process is set into motion giving rise to dream images. This hypothesis is in accordance with Freud's claim that condensation "must probably be pictured as a process stretching over the whole course of events *till the perceptual region is reached*" (Freud, 1905, p. 164, my emphasis). If this is the case, then, we cannot accept Freud's claim following the quoted passage above, that all the operations involved in dream formation function simultaneously. What seems to be the case, according to the scenario proposed here, is that condensation and displacement manipulate the dream thoughts, and the end result of this process is subsequently transformed into images via the IMAGE process, incorporating Freud's third operation which is responsible for selecting the images that represent dream thoughts. But it is important to mention that it is not clear at all that a computational approach will be able to account for condensation and displacement since these do not appear to be rule-following. The connectionist approach, based on an associationist analysis, would be much more appropriate.

vant dream thoughts—needs to be examined. Although Kosslyn (1980, pp. 453–454) shares Freud's (1900, pp. 314–338) interest in the representation of logical relations in dream images and makes some suggestions about the way logical relations are represented in them, he maintains that we are still far from discovering such logic.

But despite these difficulties the task of dream interpretation is not undermined. The reason is that images can both simulate and symbolically represent events or objects (Kosslyn, 1984, p. 179). When images represent an object symbolically, we first assess what is being depicted literally and then use propositional associations that tell us what the image parts stand for so that the relationship between the objects represented symbolically may be assessed. This dual capacity of the content of images indicates that "the content is determined not just by the image itself but also by how the interpretive processes 'read' the image" (Kosslyn, 1981, p. 216). It seems that the Freudian practice of dream interpretation rests squarely on the appreciation of this dual capacity of images.

Furthermore, images can also represent symbolically abstract concepts (Kosslyn, 1980, p. 223). Images for abstract words are formed by searching for encodings of associated words and by looking up image encodings of the objects denoted by such words. The name of such image encoding will be stored with the abstract word and the link between the abstract word, and the word of the concrete object associated with it will be, at least initially, tenuous. For example, the word "justice" may recall the image of scales which is an image associated with the word and not an image of the word as such. Although the associates of abstract words do not call up the abstract words reliably (1980, p. 279), these findings give support to Freud's claims on the dream-work operations and more specifically to his remarks on displacement and the considerations of representability.[9] If abstract relations and objects can be represented by concrete images then free association can be used to recover the abstract relations or objects that are associated with the dreamer's concrete dream images. Although these remarks do not satisfy Freud's hope for the discovery of rules that connect abstract knowledge with symbols, they still provide some justification for the practice of dream interpretation.

[9]Considerations of representability is the operation transforming dream thoughts, even of the most abstract kind, into concrete visual images. This is achieved by choosing an image to represent an abstract thought via the use of a bridging expression, e.g., the concept "aristocrat"—the related expression "someone highly placed"—the visual image of a high tower (Laplanche and Pontalis, 1980, p. 390).

Conclusion

If the analysis presented in this paper is correct then the research on mental imagery has important implications for the psychoanalytic account of dreams. Although the full implications still need to be considered, I think that I have managed to show that there are sufficient grounds for taking such research seriously. On the other hand, I also hope to have shown that Freud's account of dreams is in many respects not alien to the concerns and findings of such research.

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