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Problems with the Cognitive Psychological Modeling of Dreaming

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It is frequently assumed that dreaming can be likened to such waking cognitive activities as imagination, analogical reasoning, and creativity, and that these models can then be used to explain instances of problem solving during dreams. This paper emphasizes instead the lack of reflexivity and intentionality within dreams, which undermines their characterization as analogs of the waking world, and opposes claims that dreams can complement and aid waking world problem solving. The importance of reflexivity in imagination, in analogical reasoning and in creativity means that dreaming, being usually single-minded, cannot be subsumed into these categories. Freud's hypothesis that dreams result from the translation of latent thoughts into manifest content is taken to support this idea of cognitive deficiency during dreaming. Dream content, however, can still represent and reflect the dreamer's waking concerns.

This paper aims to compare the thinking present in dreams with waking thought. It is a common assumption that these two types of cognition are quite similar. For example, Haskell (1986a) states that "the dream is not as different from waking thought as was once considered to be the case" (p. 135), and Antrobus (1986) claims that "characteristics of dreaming should not be described by a special model . . . but rather as modifications of models of waking cognition" (p. 194). Similarly, on grounds of parsimony and bioevolution, Globus (1987) states that "the mechanism underlying the dream life is fundamentally the same as the mechanism underlying the wake life" (p. 98), and Foulkes, Hollifield, Bradley, Terry, and Sullivan (1991, p. 50) claim that "REM dream data offer unparalleled opportunities to explore" consciousness.

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Foulkes (1985) details the excellent simulation of waking life in dreams, and noting the orderliness of dreams, concludes that the cognition needed for dream production is complex. Foulkes (1990) states that dreaming, although involuntary and unreflective, shares with waking conscious episodic recollection "an ability to generate off-line simulations of what one's experience has been or might be" (p. 52), and that the lack of voluntary control in dreaming "should not blind us to the functional continuity of dreaming with an active, selective, integrative, waking consciousness that forges coherent, plausible world models" (p. 49). He notes, however, the loss of self-consciousness in dreaming (1985, pp. 42–43): this paper explores the consequences of this loss for various theories of dream cognition. I will argue that the lack of self-consciousness and reflexivity during dreaming causes a functional discontinuity with our active, adaptive waking thought, because many types of waking thought have been shown to rely upon reflexive supervision.

The lack of reflexivity in dreams has been termed "single-mindedness" by Rechtschaffen (1978); the term refers to "the strong tendency for a single train of related thoughts and images to persist over extended periods without disruption or competition from other simultaneous thoughts and images" (p. 97), even when there are bizarre occurrences (although see States, 1993, chapter 1, for a critique of the notion of dream bizarreness). Despite this deficient cognition during dreams many theories hold that one can act within the dream world in a similar adaptive manner to when one is awake, even to the extent of successfully addressing waking and dreamt problems. For example, Ullman (1969, p. 699) states that the dream elements are "of relevance" to a significant recent event; that "the dreamer embarks upon a longitudinal exploration of relevant past data," and that as a consequence "the dreamer moves towards the resolution of any resulting psychological disequilibrium." Dreams are thus held to be firstly meaningful, secondly a type of exploratory thinking, and finally adaptive for waking life. Fiss (1986) makes the similar claim that "dreaming serves the function of forming new psychic structures" (p. 179), and that this occurs "throughout life" (p. 186), and McManus, Laughlin, and Shearer (1993) claim "dreaming acts as a psychic glue to hold together the thought system and enrich it with the capacity for expansion and development" (p. 21).

Similarly, Koukkou and Lehman (1993) hold that in dreams there is "the reorganization of knowledge and assimilation of old material and coping strategies with new ones without inducing wakefulness" (p. 99), and that some of these older memories and cognitive strategies are "unavailable during wakeful life" (p. 100). Globus (1993) suggests that in REM sleep "it may be that our knowledge even increases (that is, less probable solutions become available)" [p. 127], and that the dream is "essentially meaningful in that a good solution is found to a multiple constraint satisfaction problem . . . .

[T]he dream is presented here as intrinsically problem solving" (pp. 127–128). Schatzman (1984) states that "problem-solving dreams are especially interesting to me [Schatzman] in that they display that a part of the dreamer's mind can know or appear to know something that other parts of the same mind appear not to know." Stewart and Koulack (1993) have the similar position that "dreams may facilitate adaptation to stressful waking events," and Hill, Diemer, Hess, Hillyer, and Seeman (1993) hypothesize that "dreams may serve a problem-solving function" and "lead to information about the self that would be difficult to come by otherwise." Such effects have even been claimed to arise during the dream itself, prior to waking, for example, in Kramer's (1981) "assimilative" function of dreaming, and, at least for the case of lucid dreams, with Tholey's (1988) view that "the activity of the dream ego can exercise an immediate influence on the personality structure without a rational mediative process" (p. 279).

Evidence for these claims is provided by Barrett (1993), who found that, for subjects using their dreams to incubate problems, "approximately half of the subjects recalled a dream which they felt was related to the problem. Seventy percent of these believed their dream contained a solution to the problem" (p. 118). Also, Cartwright (1991) found that separated partners who in their dreams "incorporate the former spouse appear to be actively working through the problem of the upcoming divorce while asleep" (p. 8), although the caveat is made that this "does not prove any causal connection between the earlier dreams and later adjustment to the divorce."

These statements exemplify the common description of dreams as an imaginary world, or environment, in which creative thinking occurs, often through the use of metaphors and analogical reasoning. The applicability of the cognitive models underlying these characterizations will be examined below, given the lack of evidence that dreams do have an explorative, adaptive, problem solving function (Blagrove, 1991, 1992a, 1992b, 1992c, 1993). Claims that dreaming, or the interpretation of dreams, is adaptive, will then be shown to be problematic. Before the examination of cognitive models of dreaming, the empirical work on dream single-mindedness will first be reviewed.

The Process of Dreaming — The Problem of Self-Reflectiveness, Intention, and Control

Many studies have shown that dreams in general have a lack of self-reflectiveness and conscious control. Purcell, Mullington, Moffitt, Hoffmann, and Pigeau (1986) used a nine category scale of self-reflectiveness in dreams, ranging from "dreamer not in dream; objects unfamiliar; no people" to "dreamer can consciously reflect on the fact that he or she is dreaming." For high-frequency dream recallers Purcell et al. located the modal category at 3:

"dreamer completely involved in the dream drama: no other perspective," and for low-frequency dream recallers the modal category was 2: "dreamer not in dream; people or familiar objects present." They state that "categories 3 and 5 appear to represent normative dreaming (category 5: "dreamer thinks over an idea or has definite communication with someone.") For these high and low-frequency recallers, of 84 dreams collected from REM sleep, only two were of category 9. Purcell et al. found that cognitive training increased the amount of self-reflectiveness, inducing some lucid dreams (category 9), that is, dreams in which one has consciousness that one is dreaming, and may even have control over some events of the dream. However, the authors report that, following the training, "most of the lucid dreams (15 of 23 dreams) were fleeting or brief," that in some of these cases "the dreamer awakened spontaneously upon recognizing the lucidity," that in many cases there was no control of the dream, despite the lucidity, and that sometimes the control just enabled the dreamer to wake up purposefully from a stressful dream situation, or it was the "mundane variety" of control in which "the dreamer handled situations well," or "the control was of a passive variety in which the dreamer 'decided' not to intervene in dream events." Such brevity is not addressed by Purcell, Moffitt, and Hoffmann's (1993) finding that subjects can be trained to increase the frequency of lucid dreaming above the spontanous incidence rate of "about 1 percent" of dreams (p. 230). Furthermore, Bradley, Hollifield, and Foulkes (1992) found that reflective awareness during REM dreaming "was more often absent than present in situations judged likely to provoke reflection in wakefulness" (p. 161), and Darling, Hoffmann, Moffitt, and Purcell (1993) found no progressive increases or decreases in self-reflectiveness within single dream reports.

In accordance with these results LaBerge (1985) states that "in most of our dreams, our inner eye of reflection is shut and we sleep within our sleep" (p. 6), and he proceeds to state that although "this condition of ignorance" (pp. 6–7), and the "general rule of unconsciousness in dreams" (p. 18), can be halted by becoming lucid, even then "probably only relatively experienced lucid dreamers function on a level comparable to their better moments while awake" (p. 108). Even for the rare case of lucid dreams, Barrett (1992) found that "most often the lucid dreamers did not reflect at all on . . . implications of their current experience being a dream. When they did, they were accurate only about half the time and deluded the other half" (p. 226). Instances of this lack of reflection within lucid dreams are also described by Worsley (1988). Moreover, LaBerge states that it is difficult to maintain conscious awareness during dreams, and to do so he advises emotional detachment (p. 119) and "not to 'daydream' or think too much during the dream" (p. 135).

In addition to this lack of self-reflectiveness, we also generally lack intentionality within dreams. Even for lucid dreams, LaBerge (1985, p. 133) describes the "power of expectation," rather than intention, as determining what happens in the lucid dream. He cites Ouspensky's (1931/1960) statement that "I had a certain control over [lucid] dreams. I could create them and could see what I wanted to see, although this was not always too successful and must not be understood too literally. Usually I only gave the first impetus, and after that *the dreams developed as it were of their own accord*, sometimes greatly astonishing me by the unexpected and strange turns they took" (LaBerge, 1985, p. 37, italics added).

Dreams thus feel automatic, as if they happen to us. Yet this feeling of automaticity, and lack of intentionality, during dreams, is quite different from the occasional automaticity present in waking life. Vallacher and Wegner (1987) state that, in waking life, when the components of an action become familiar and automatic it is then "larger units that become the basis for conscious control of the action," leading to "more comprehensive understanding of the action," such that "*mindless action* is a somewhat misleading term" (italics in original), occurring when "the observer (or psychologist, for that matter) is identifying the action at a different level" to that being used by the subject. Such mindless action or single-mindedness, however, is the rule for dreams. Globus (1987, p. 82) states that the concept of dream single-mindedness "reduces to the observation that while dreaming we do not reflect on our waking situation, which does not mean we are always unreflective while dreaming, only that our reflection occurs within the dreaming rather than the waking horizon." Yet it is this curtailment of access to a source of information, the waking world, that augments the deficiency of dream mentation. Accordingly, States (1993, p. 146) notes that we do not attempt dream interpretation from within the dream state, this activity occurs instead in what he calls the "double-minded" waking state.

There are anyway empirical difficulties with the ascription of intention to the dream-ego and other dreamt characters, because on waking the dream report may be edited, or added to, to make it more coherent. Such fluidity of memory should alert us to the possibility of reading into dreams during recall connecting statements that were not part of the original experience. Knowledge of a character's supposed motive interferes with accurate recall of details of a narrative (Owens, Bower, and Black, 1979), and subjects asked to recall forward the chronology of an event add more schema-based intrusions than if it is recalled backward (Geiselman and Callot, 1990). Subjects can revise a narrative by the addition of statements about motivation or intention. Weinstein, Schwartz, and Ellman (1988) provide evidence that reported self-participation and self-reflectiveness during dreaming is increased by delaying dream recall for some minutes after awakening; allow-

ing subjects a post-waking "rehearsal time" before the dream report is given can falsely increase the reported incidence of self-reflectiveness (possibly as a function of subject's internal locus of control; Blagrove and Tucker, 1994), just as slow awakenings result in more coherent dream reports than do abrupt awakenings (Goodenough, Lewis, Shapiro, Jaret, and Sleser, 1965).

Given this evidence about the rarity of self-reflectiveness and conscious intentional actions in dreams, the first characterization of dreams to be examined here is that in the dream world the dreamer has, as in the waking world, choices and intentions which direct the events that occur. This will be contrasted with a representational view of dreaming.

The Dream as a Real World Analog — The Problem of the Representation of Intention

Contrary to Ullman's (1969, p. 699) statement about longitudinal exploration occurring within the dream, Freud held that there could be no instances of supposed intellectual activity in the manifest content of a dream, stating that the dream-work "does not think, calculate or judge in any way at all; it restricts itself to giving things a new form" (1900/1953, p. 507). For Freud the causes of the dream contents are thus the latent dream-thoughts, rather than the previous elements of the manifest dream: "the dream content seems like a transcript of the dream-thoughts into another mode of expression" (p. 277). Freud denied any apparent sense or coherence in the manifest dream, counterposing to such linear cause–effect relationships within the dream his methodology of dismembering the dream elements by free-association. Globus (1987) details the conflict between Freud's semiological stance, in which "the dream life is indeed a mere composition of previous waking life episodes" (p. 21), versus the emphasis on living in "the manifest life-world of dreams" (p. 15), in which the dreamer has "authentic feelings and actions" (p. 23).

This conflict is crucial to evaluating the prevalent problem solving paradigm used in dream research (e.g., Breger, 1967; Cartwright, 1986). The linear explorative view of dreams, as opposed to Freud's derivation of manifest from latent elements, has much in common with Boss' (1957) phenomenological school of dream research, in which the dream is studied as a world in itself, without continual reference to its dependence on structures in the waking world. The common feature of these phenomenological and problem-solving accounts is that the plot of the dream can derive from some intention in the dream to achieve a goal, such that during the dream there are problem-solving choices, and even struggles (e.g., Tholey, 1989). The intention to achieve a solution or to make choices may be attributed to the

dreamer, or to the characters themselves, as in Baylor and Deslauriers' (1986) description of dream characters trying out "new behavior" (p. 47) which leads to the breaking of habitual waking life scripts.

The phenomenological account allows that some of the parts of a dream symbolise parts of waking life, but the main causes of the content are held to be within the dream. States (1993, p. 177) remarks that for the phenomenological account, the dream is "creating a meaning, not passing one along." This accords with Shanon's (1990a) claim that "dreams are experienced as events, not as a language that is not understood" (p. 238), and that they are activities which "unfold as the sequence goes on" (p. 240). Similarly, LaBerge (1985) claims that as the physiological effects in both body and brain of such dreamt actions as singing are similar to the effects of the waking action, then dreaming in general is "more like actually doing than like merely imagining" (p. 96), which suggests that dreams are not just representational but also enactive. However, this view may be countered, firstly, because such doing in dreams seems to lack volition, and so seems to be a different kind of doing from that present in waking life, and secondly, because imagining an action is anyway known to share physiological characteristics (Williams, Rippon, Stone, and Annett, 1995) and cognitive processing (Segal and Fusella, 1970) with doing an action.

We thus have a tension between enactive explanations from within the dream, and representational explanations from without: in the former there is held to be some novelty in the dream, in the latter there is dependence on waking structures and knowledge. In support of the former phenomenological view Boss (1957, pp. 77–79) recounts a dream in which a woman feels tremendous love toward her family, but then worries about the Russians invading. This leads to her deciding that the family's garage could be used as a hiding place. Boss writes of the dream world in which this was going on:

> She experienced the unity of her past, her present and her future quite clearly. Indeed the dream plan about a garage hideout proved to be excellent, when she examined it after waking. She not only stuck to it but got her husband's agreement. This dream plan, just like the subsequent very deliberate decision, involving a strong effort of will not to be oppressed by sad thoughts of a possible Russian invasion, is evidence of the possibility of human freedom even during a dreaming existence. (p. 86)

However, this view ignores the common feeling that during a dream one is certainly not free, intentions are not usually present. LaBerge (1985) describes being in such non-lucid dreams as being "sentenced to a virtual prison" (p. 11). The fact that when relating a dream we are not held responsible for it, and that at most dreams are seen as symptomatic, points to a common-knowledge of lack of cause–effect attribution within the dream. When hearing of a dream the listener doesn't say "why didn't you wake up?"

or "how could you have done that?" Instead, the accent is shifted automatically to the dreamer's waking life, to ask what does the dream show about waking life attitudes and structures. Stefanakis (1995) explores this conceptualization that "the dreamer is the innocent and passive recipient (victim?) of the dream." Similarly, although Globus (1987) depicts the dream life as a "life we lead" (p. 79), he also states that the dream life only appears "authentic" when we are dreaming, and that when dreaming we do not notice its single-mindedness.

Shanon (1990a) is thus surely wrong to claim that in dreams "the mind is left alone to freely act on and by itself" (p. 244). Yet Boss (1957) criticises those accounts in which it is claimed that "dreaming is the condition of man in which he wills nothing, whereas waking and willing are one and the same thing. Even in popular language a dreamer is somebody who lets life slip by in brief snatches" (p. 129). His objection is that these are "generalizations derived from one kind of dream only. Time after time we find that dreamers decide to intervene in the course of events and that they carry out their decisions most consistently" (p. 129). States (1988) has the following similar description: "I respond to the dream situation as I might in waking life, even to assessing the motives and intentions of other people in the dream. I think, I feel, I evaluate, I am myself. The dream has deprived me of none of my mental equipment except the ability to discern that I am using it in a situation that is not real" (p. 39). However, although Boss provides numerous examples of dream characters apparently willing or choosing, as do Baylor and Deslauriers (1987–88), for many of these cases the apparent choices and decisions may be just part of scenes that represent such waking life activities as choosing and willing, but without their real presence.

This notion of passive representation can be illustrated by a dream that the author had when considering leaving psychotherapy. In this dream I was digging up explosive materials from underneath a lake, but with some hesitation. Although the meaning of this dream is quite obvious, the hesitation in the scene does not mean that there was indecision about the dreamt digging, as if a choice could be made during the dream about continuing the digging, with the possibility of the dream then ending differently; rather, indecision was being represented. The complexity of the content of dreams, which includes sometimes the representation of intention, may derive from the complexities of waking scripts and structures (see States, 1993, p. 130), which are reflected in the dream language. This is the basis of the translation/reflection view of dreaming (Blagrove, 1992a; Freud, 1900/1953, p. 507). Thus, any supposed novelty or creativity of dreams resides in the way that the dream rebus translates, represents or reflects waking life (Blagrove, 1992b, 1993), rather than there being originality, decisions and goal-directedness during the dream itself.

An example of a dream which fits well the translation thesis is actually given by Boss (1957); the dreamer was "utterly insensitive . . . considered women exclusively as sexual objects. Then for the first time in his life he had fallen in love with a very beautiful and lovable girl. But even towards her his feelings were fickle, and could change from hour to hour" (p. 189). He dreamt of being in a small shabby room with her, outside it was raining with a deep grey, cloudy sky. "Suddenly the sun broke through. The room became bright. At the same time I felt very attracted to my girl-friend, and found her very pleasant" (p. 190). The room became large, but this did not last for long. It became a "doll-like little inn again," they became bored, and his feelings toward her continued to ebb and flow rhythmically, as did the size of the room.

However, nothing was depicted as causing these changes within the dream itself, and it seems more parsimonious to see the changes, for example, becoming bored, or the changes to the room, as metaphorical depictions of the dreamer's waking fickleness. Many of Boss' examples of dreams with "apparently free-decision and capacity for independent action . . . [with] remnants of intelligent insight" (p. 152) can be similarly reassessed as translations of waking scripts into concrete images. Even dreams which contain another dream (pp. 151–154) can be seen as relying on the second dream as a symbol or as a qualification of a piece of information introduced into the dream, a point also made by Freud (1900/1953, p. 338), rather than as evidencing a further cognitive ability within the dream state.

Thus, to dream of a decision does not mean that a real decision is taking place. In the same way, for Holt (1989), theater actors are merely acting, in that "they can represent an action which cannot be included within their personality" (p. 172). Similarly, Ryle states that "'mental pictures' no more denotes pictures than 'mock-murders' denotes murders" (1949/1967, p. 126). I wish to emphasize this notion of representation, as distinct from the claim that in the theater, or in dreams, a new cause–effect exploratory world is formed. So at most we *dream of* exploration and of discovery, rather than, as claimed by Ullman, actually exploring in the dream. This distinction poses problems for Greenberg, Katz, Schwartz, and Pearlman's (1992) investigation of what they call "successful dreams" (p. 543), as if the dream plot had to struggle to turn out as it did, because it is better to describe them as dreams of success. The same problem is present with what Greenberg and Pearlman (1993, p. 368) define as a "failed dream," one in which "no adaptation has occurred." Ryle (1949/1967, p. 118) claims that if one states one can "see" in one's imagination the home of one's childhood, then the quotation marks around see act as a factual disclaimer of the presence of seeing: the case is similar for that of "deciding" or "succeeding" or "failing" in dreams, a dreamt "decision" is simply not a decision. This undermines the idea that some

dreams are "attempting to resolve conflicts" (Fiss, 1986, p. 176), or that "the dream may be viewed as a task needing to be accomplished or consummated" (p. 174). The alternatives, of intention versus the representation of intention, are illustrated in the ambiguous statement by Stewart and Koulack (1993) that "poststress mastery dreams . . . represent a continuation of the dreamer's waking attempts to master the stressful experience." The ambiguity is in whether mastery is being attempted in the dream, or is only being represented. Similarly, whereas for Globus (1987, p. 45), "the passively experienced traumas of my waking life are not reiterated in my dream life but are replaced by an attempt at active mastery," the question again is whether mastery is present and being attempted, or is only being represented. The same argument would hold for apparent problem solving across a series of dreams, as investigated by Kramer, Whitman, Baldridge, and Lansky (1964).

Macdonald (1953/1967) likewise states that "from the fact that I saw the Hebrides in a dream it does not follow that I saw any more than that which I saw was the Hebrides" (p. 258; a similar point is made by Malcolm, 1959/1962, p. 51, but see Dilman, 1966). Although it looks like the waking world, the dream world does not have the same cause–effect intentional relations as does the waking world, or even, as shown in the next section, as does conscious imagination. Similarly, Van Inwagen (1983) writes that fictional characters can have certain properties which real people can have, for example, having a certain number of children, but that they do not have the properties in the same way that people do. Furthermore, Gallop (1991) writes that "fictional utterances are related to factual utterances somewhat as Monopoly [the board game] transactions are related to real ones. The former are entirely derivative from the latter" (p. 9).

It is thus as if the meaning of a dream is already part of waking life, to be represented, rather than that the dream characters have to generate meaning by their actions. Along these lines, States (1992) writes that "dreams do not add, or give meaning to our lives; they 'instantiate' meaning that is already there. Dreams are not like Copernicus discovering something about the solar system that wasn't known before; they are simply a repetition, under different conditions, of the experiential 'orbit,' so to speak, of the individual" (p. 252). He proceeds: "Indeed, we dream about things whose meaning we already know in an emotional and preconceptual sense, and that is probably why we dream about them and why dreams make a certain kind of essentialized sense. The dream is the instantiation of a felt meaning which is *the cause of the dream, not its effect*; it is brought directly into sleep from the day's experience" (p. 260, italics added).

There is thus a first problem with likening dreams to waking life, in that intentions are predominantly absent in dreams: dreams are usually representations that happen to us, and are derivative of waking experience, inten-

tions and structures. There are further philosophical difficulties with the ascription of intentions and goals to dream characters. Anscombe (1963, p. 11) gives the example of sawing some wood which belongs to the person Smith: one can have the intention of sawing the wood, but not have the intention of sawing Smith's wood, even though these motions would look identical. With such a delicacy in assigning motivations and goals when actions occur in waking life, the difficulties are compounded when we examine dreamt actions. Certainly, dreams often pass Ainscombe's (1963) test of the lack of intentionality, in that it can usually be remarked afterwards "I was not aware I was doing that" (p. 25). Schwartz and Godwyn (1988) define deliberate action as occurring when "a choice in ways of achieving the goal is recognized, and various versions, conflicts, and repercussions of the action can be considered" (p. 422), and they then deny the presence of such deliberate action in most dreams. One indication that dream events are not the intentional product of other actions within the dream is that it is not possible to argue against what was done in a dream: Dennett (1969/1986) states that intentional actions "are actions one can argue against" (p. 177). Along the same lines, Anscombe (1963) holds that "it establishes something as a reason if one argues against it . . . in such a way as to link it up with motives and intentions: 'You did it because he told you to? But why do what he says?'" (p. 24). Furthermore, Dennett (1969/1986, p. 174) describes the importance of knowing one's recent and background actions when working out whether one had acted deliberately or not. Obviously such knowledge is not always present during waking life actions, but it is not precluded as it almost always is during dreams.

Vallacher and Wegner (1987) theorize that one can think about an ongoing action at a lower level, to do with how it is done, or a higher level, concerned with why it is done, and they give evidence that one can switch between these levels depending on the real world difficulties, implementation and consequences of an action. It must be questioned whether in our dreams we are as competent at this switching as when awake, and it must also be noted that Vallacher and Wegner warn that without real world feedback there is a "potential for flights of fancy" in thinking about and identifying actions, and that without real world feedback while the identities we give to any actions "could well make sense at the time of their emergence, they may have a tenuous relation at best to any subsequent behavior" (p. 5). Such tenuous relationships between actions may well be said to characterize dreams, especially as Vallacher and Wegner claim that the maintenance of level of thinking about and identifying actions is a "delicate process," which is shaped by real world context and feedback. The lack of real world feedback would thus have a deleterious effect on dream cognition. The importance to consciousness of remembering one's real world circumstances is also

explored by Natsoulas (1981). Vallacher and Wegner furthermore claim that "act identities at high levels hold greater potential for defining one's self than do lower level act identities." Such higher level conceptual control of actions results in greater flexibility, and thus less inconsistency and impulsiveness, and yet it must be doubted how frequent this control occurs in dreams. Also, we may doubt that there is the fluid switching between the levels of initiation, implementation, and termination intents, that Heckhausen and Beckmann (1990) show to be present in waking life.

Obviously automatic behavior and thinking does occur in waking life, but this is made possible because of the presence of a constant predictable world, and yet dreams feel automatic despite the absence of the waking, constant world, and despite the whole scene being created by the dreamer. The deficit of memory and the lack of biography in dreams augment this feeling of the dream being automatic, of a lack of choice and decisions as shown by the empirical work on self-representation in dreams, reviewed above.

However, even if dream events cannot be described as deliberate actions, or as showing intentions, being instead representations, dreams may still be likened to the manipulation of representations, that is, to imagination. In the next section this characterization will be examined. I appreciate that there are arguments about the nature of representation (e.g., Fodor, 1985; Lyons, 1990, 1991); my aim here is not to detail these arguments, but rather to contrast the effects of having conscious control, versus no conscious control, of representations.

Dreaming as Imagination — The Problem of Reflexivity

When awake we frequently imagine the rehearsal of actions, and imagine consequences and possible reactions of other people. Such turning over of our concerns is demonstrated in the studies of Antrobus, Singer, and Greenberg (1966) and Becker, Horowitz, and Campbell (1973), in which the presentation of a radio newsflash or an unpleasant film led to intrusive thoughts about the stimulus. Gilhooly (1988) suggests that such daydreaming has functions of "anticipating, reminding about outstanding concerns" (p. 166). Similarly, of sparring at boxing, with its pretense of attack and retreat, Ryle (1949/1967) writes that the boxers "are not trying either to hurt or to avoid hurt, but only to practise ways in which they would hurt and would avoid hurt, if engaged in serious fights" (p. 134). Such practicing is described by Shanon (1990b) as the adaptive maintaining of "mentation in an arena similar to that encountered in the external world" (p. 148). The similar idea that night dreaming can be used to imagine solutions and consequences to waking life problems has been proposed frequently, for example, by Kramer, Whitman, Baldridge, and Lansky (1964) for successive dreams of

the night, in Cartwright's (1986) emotional information processing hypothesis, and in Wright and Koulack's (1987) disruption–avoidance–adaptation model. As Fiss (1986) puts it, "dreaming about what concerns us in the waking state helps us cope with it more adaptively" (p. 174). Baylor and Deslauriers (1987–88) claim that dreams may even provide a safer and more productive state for our imagination in which to work. However, the anticipation and evaluation of imaginary actions and consequences in daydreaming, although utilizing a "loose degree of control over the model running process" (Gilhooly, 1988, p. 166), as night dreaming is often characterized as showing, do require the keeping in mind of goals, antecedents, and alternatives. It is this keeping in mind which is not provided in the single-minded running of the dream plot, and in this regard night dreaming is quite cognitively deficient.

Imagination has been found to affect subsequent performance. For example, Anderson (1983) showed that imagining oneself performing a task increases one's intentions of performing that task, with this increase positively correlated with the number of times the imagining occurred, whereas changes in personal intentions do not occur after imagining someone else performing the task. Imagery has also been found to be useful for aiding performance on simple cognitive tasks (Shaver, Pierson, and Lang, 1974–75). However, two important characteristics of images that result in mental practice effects are that they have to be controllable and also accurate (Denis, 1989/1991, p. 179). For example, good control of the image is important in the mental practice of pursuit rotor tracking (Marks, 1977). It should be noted, however, that the effects of mental imagery on performance can be due to factors other than mental practice, for example, Murphy (1990) found that imagining a successful outcome of an action can have a greater benefit than rehearsing the motor movements needed for the action. Similarly, Budney and Woolfolk (1990) found that imagery may work by increasing an athlete's expectation of success, but that pre-performance imagery may disrupt performance, even if the imagery is of success, and especially if the imagery is of failure. Note should also be taken of the findings of Kosslyn, Seger, Pani, and Hillger (1990), that subjects in their everyday life diary study rarely used imagery for recall or mental simulation, and that most imagery did not have any specific purpose: they caution that "simply because we can devise a possible use of imagery does not mean that people actually exploit such a function" (p. 133).

Dream imagery differs from this waking imagination in its general lack of conscious control. To illustrate the deficiencies of imagination in dreaming I will contrast dreaming with the reading or watching of fiction. Walton (1978) writes of how one can be said to fear a horrific fictional scene in a film. The example given is of Charles, who watches a green slime monster on

a film: "The fact that Charles, and others, call it 'fear' is not conclusive, even if we grant that in doing so they express a truth. For we need to know whether the statement that Charles was afraid is to be taken literally" (p. 7). Walton conceives of Charles as being involved in a game of make-believe (p. 23), in which he is a character (p. 18), rather than there being a complete suspension of disbelief during which Charles would actually believe in the events' occurrence. He writes that such engaging in make-believe, as in role-playing, can aid discovery, acceptance and purgation. One can even want to hear a story again and again, "one's emotional needs may require the therapy of several or many repetitions" (p. 27): in hearing a story again one can play the role of one who does not know the ending. But one also stays apart from this fictional world, as one does when imagining.

I propose that this distance is what makes the imaginative model inapplicable to dreaming, for as in the case of reading or watching fiction, in imagination there is reflexivity and a mixture of belief and disbelief (Hanfling, 1983): such distance between observer and observed is also necessary for self-awareness (Morin, 1993). Thus the important difference between imagining and dreaming is that in the former we usually imagine actions *as if* they were real, whereas in the latter the dream is taken for real (see States, 1993, p. 31 and p. 63). Along the same lines Mounce (1980) writes of how, when watching a play, one can be shocked at, say, a murder, but only react in some respects as if a real murder had taken place. For example, one may feel sadness, but not rush onto stage with a gun to stop the proceedings.

In contrast, when dreaming, the dream-ego usually takes the action and events for real. There isn't the same willing and knowing partial suspension of disbelief as there is for *as if* scenes, such as in watching plays, in improvising a bedtime story (States, 1993, p. 100) and in imagining, which can result in alternative possibilities being entertained, or the consideration of counterfactuals. Using the terms put forward by Shanon (1990b), we are "embedded" (p. 139) in the dream, rather than being differentially and focally aware of "well-defined entities or states" (p. 140). Even during lucid dreams, that is, dreams in which one is conscious of dreaming, the dreamer usually fails to realise that the whole dream and all events and consequences are imaginary (Barrett, 1992; Worsley, 1988). Importantly, LaBerge (1985, p. 135) reports that the use of imagination during a lucid dream can lead to lucidity being lost, and Globus (1987) states that when awake "our horizons shift more fluidly . . . there is a certain inertia to the dream horizon" (p. 83).

Dreaming thus appears to be somewhat different from consciously monitored waking imagination. Macdonald (1953/1967) states that having images, fancying and pretending can occur in daydreams, but that these words cannot be applied to dreams, because one is not in conscious control of the dream; for example, one cannot decide within a dream "to continue or

abandon a train of thought" (p. 262) as one does in waking life. As with Rechtschaffen's (1978) idea of single-mindedness, this emphasizes the lack of conscious control and of reflection during dreams. This distinction between waking visualisation and dreaming is wrongly downplayed by Nikolinakos (1992): his evidence that some waking reveries are akin to dreams, or that they may have some neural processes in common, does not obviate this distinction between imagery over which one has some control, and imagery over which one does not.

We thus usually can't stop the dream, change its course, or exercise control or overview. This fact makes problem solving by means-end analysis, defined as working backwards from the goal (Sweller, Mawer, and Ward, 1983), difficult in dreams. The importance of self-evaluation and conscious control during problem solving is shown by the use of evaluative utterances during tasks (Klinger, 1974), and by the use of verbalization and metacognitive processing (Ahlum–Heath and Di Vesta, 1986; Berardi–Coletta, Buyer, Dominowski, and Rellinger, 1995; Berry, 1983; Gagné and Smith, 1962). These are akin to Dennett's (1982, p. 224) description of consciousness as a technique of "self-stimulation," yet these metacognitions are usually absent when dreaming. The importance of such self-talk to self-awareness is shown by Morin (1993).

Thus, although a dream appears like the real world, or at least like waking imagination, we do not have all our waking cognitive abilities during it: this has deleterious consequences for theories of adaptive problem solving during dreaming. However, it may be argued that although dreams are obviously in some ways unlike waking life, the cognitive processes used in their production could be very similar to waking processes. For example, although some types of thinking are precluded from most dreams, it has been proposed that metaphorical, or analogical reasoning is present: this claim is examined in the next section.

Dreaming and Metaphorical or Analogical Thinking — The Problem of Retrieving Useful Analogs

The use of analogies or metaphors during dreams has been put forward by, among many others, Antrobus (1977, 1978), Baylor and Deslauriers (1986–87), Tolaas (1980), Ullman (1969) and Webb (1992). [In this section the differences between metaphors and analogies will not be addressed, as there are common objections to dream theories based on either metaphors or analogies.] Haskell (1986b) proposed that dreams may use "abstract feature analysis," which is "similar to the mathematical function of transformation of invariance" (p. 371). Breger (1967) hypothesized that as a result of dreaming of analogies "the present [waking] conflict is made potentially solvable, just as the similar situation was in the past," and in the dream "the previous situ-

ation . . . is *symbolically blended* with the present one" (p. 24, italics in original): a similar theory is proposed by Palombo (1983). States (1988) suggests that "the dream state, because of its isolation from the immediate concerns of social orientation and its intensified metaphorical capability, may have a greater access to the overall materials of the dreamer's experience. In other words, one might learn something about oneself from dreams" (p. 30). Similarly, Koukkou and Lehman (1993) claim that "during sleep a wider spectrum of the individual's knowledge is accessible" (p. 93).

Analogies and metaphors are widespread in waking life. Spellman and Holyoak (1992) report a recent influential analogy concerning the Gulf war, explicitly presented in the context of political argumentation. Gick and Holyoak (1980) note anecdotal reports of the importance of analogies in creative thinking, such as in the hydraulic model of the blood circulation system, the planetary model of atomic structure, and the billiard ball model of gases. To investigate the use of analogies, Gick and Holyoak (1980) gave subjects Duncker's (1945) radiation problem of how to avoid damage to healthy surrounding tissue when radiating a tumor. Before presentation of the radiation problem, subjects were given various military type analogous stories, involving the capture of a fort, and these stories were available for reference when tackling the problem. The ideal solution is to apply small doses of the radiation from many directions, all converging onto the tumor.

Gick and Holyoak found that spontaneous use of the analogies to solve the radiation problem was rare; subjects usually had to be directed to use the analogous story. The authors concluded that "the overall impression created by the problem-solving protocols is that the generation of analogous solutions involves a *conscious* process of mapping correspondences between the story and the target problem" (p. 331, italics added). The necessity of explicitly directing subjects to prior knowledge has also been shown by Perfetto, Bransford, and Franks (1983), who state that if not so directed, subjects engage in "uninformed spontaneity" (p. 31). Spencer and Weisberg (1986) found that only direct hints from the experimenter to use the analogy enabled subjects to overcome the "wide gap between the availability and the access of relevant knowledge during problem solving" (p. 445). Contrary to frequent assumptions about the diffuse activation of memories during dreaming being of help in problem solving (e.g., Breger, 1967; Globus, 1993), Weisberg, DiCamillo, and Phillips (1978) found that in waking cognition "the individual items in a problem do not specifically arouse associated information in memory in some diffuse manner" (p. 227) as part of the production of a solution. Rather, they found that only if the subject was consciously informed about the usefulness of an analogy would it be accessed. Reed, Ernst, and Banerji (1974) similarly found that subjects had to be told about the relationship between two problems in order to use one to help solve the other, and

the authors emphasize the complex cognition needed in recognizing, retrieving and utilizing analogous information. It should also be noted that Erdelyi and Kleinbard (1978) have shown the power of conscious search (termed "internal review," p. 286) to reverse the Ebbinghaus forgetting curve.

There is thus a robust finding that in problem solving tasks subjects fail to spontaneously access prior analogous material from memory: Gentner (1989) states that "there is converging evidence for the gloomy finding that relational commonalities often fail to lead to access" to relevant memories (p. 229). Schank (1988) notes that creativity may often be an "intentional misapplication" of explanation patterns relevant to previous problems, and is hence "heavily dependent on reminding" (p. 238), and Ross (1984) shows the importance of reminding in the process of learning. The question is thus whether dreams are the place for such adaptive reminding, given the findings that the mere similarity between a problem and an analog is not enough to lead to the analog being accessed. Despite this evidence for the importance of conscious search to analogical problem solving, it is nevertheless possible that when we are asleep these analogies may spring to mind, as if they were being held back by a supposed convergently biased and constraining waking consciousness. Along these lines Koukkou and Lehman (1983) state that "the change from waking to sleep does not interrupt the flow of mentation; dreaming in the sleeping brain is the equivalent of thinking in the waking brain. But mentation becomes different during sleep . . . with activation of cognitive strategies and memories from storages not directly accessible to the waking adult" (p. 226), with the result that "earlier experiences can be used for current problems" (p. 221).

Contrary to this view, however, is the possibility that dreams may only provide unenlightening analogies. Novick (1988) investigated "spontaneous negative transfer," in which a retrieved and superficially similar earlier problem is irrelevant to the current problem, or even misleading. Gilovich (1981) found that expert football commentators, and undergraduate political scientists, are influenced by associations to irrelevant factors in a problem, for example, in assessing a football player, by the association that the player came from the same home town as another, famous player, or, in assessing a hypothetical political crisis, by superficial resemblances to actual historical events. Gilovich concludes that "specific comparisons to past situations can be misguided and overused and thus tend to interfere with rather than aid sound decision making . . . . [T]hose who do not forget the past can be led to misapply it."

The issue of analogies that impair knowledge acquisition has also been explored by Spiro, Feltovich, Coulson, and Anderson (1989). They give numerous examples from medicine where "simple analogies . . . become serious impediments to fuller and more correct understandings" (p. 498). This

can occur because the source domain may have a salient characteristic which is "not central to the pedagogical point of the analogy, but which adversely influences understanding of a parallel characteristic in the topic domain" (pp. 503–504). Spiro et al. give an example of teaching the concept of opposition to blood flow by using the analogy of the changing diameter of household plumbing. Although students don't have the misconception that blood vessels are rigid, this analogy can lead to misconceptions. The authors state that these convenient reductive explanations must be opposed by the effortful production of multiple analogies, each of these helping to make up for the deficiencies of the others. The question for us is whether dreams are the place for the meeting or production of such multiple analogies, rather than for just the uncritical adoption and repetition of misleading analogies. It is important to note here that Perfetto, Bransford, and Franks (1983) find that if subjects are not directed to use the appropriate analogy "inadequate self-generated answers may lead to even greater deficits in accessing relevant information and problem solving in future attempts to solve the same or similar problems" (p. 30), and this occurs even if on the second attempt subjects are told the correct analogy. Thus, "initial failures to access relevant information can lead to . . . deficits in later problem solving performance" (p. 30). To dream of an incorrect solution may thus be worse than not dreaming at all! (Although, obviously in some cases, the dream may beneficially affect our waking mood, as shown by Kramer, 1993.)

Cummins (1992) states that the tendency of novices to use surface similarity in retrieving solution-relevant information leads to the "bleak results" of analogical transfer. Using mathematics problems, Schoenfeld and Herrmann (1982) show that novices perceive problems on the basis of "surface structure," rather than in a more expert manner, and Ross (1987) found that novices, in their use of superficial similarities between statistics problems, are influenced by relevant but also irrelevant aspects of a task in retrieving memories. Holyoak and Koh (1987) also showed the strong influence of surface similarities in selecting an analog. It may be that dreams utilize such surface structure, which, Schoenfeld and Herrmann (1982) state, relies on "naive characterization of a problem, based on the most prominent . . . objects that appear in it . . . or the general subject area it comes from" (p. 486). Could dreams be a way of getting past this predeliction for surface similarities, to obtain "structure-driven" analogies (Gentner, 1989, p. 217)? On the contrary, we may instead be even more likely to fail to do this when we are dreaming, because "similarity-based access may be a rather primitive mechanism, a low-cost low-specificity, high quantity process, requiring little conscious effort. Analogical maping and judging soundness are rather more sophisticated. They are often somewhat *effortful,* they often involve *conscious reasoning*" (Gentner, 1989, p. 230, italics added). Following Holyoak (1985),

it is thus possible that in many instances dreams use surface analogies while in waking life structural analogies are needed. The idea that taking away conscious controls and search mechanisms will result in more productive thinking really does hark back to Freud's (1908/1959) repression theory, that creativity is restrained by a dominating consciousness, as opposed to being effortful and requiring conscious direction.

It is thus not clear how adaptive are the memories accessed to produce dream images. Yet there is often an assumption that adaptive novelty occurs in dreams, for example, Ullman (1969) says of dreams "they do say something new or at least new in the sense of its unfamiliarity to waking consciousness" (p. 697). Similarly, Nikolinakos (1992) cites Hunt's claim that dreams contain knowledge which goes beyond previous understanding; yet there is little evidence for this, or evidence that dreams can explore tacit knowledge and, as in Kosslyn's (1980) theory of imagery, enable the subject "to make new judgements based on information extracted from old sensory experience" (Nikolinakos, 1992, p. 407). Hence, rather than Nikolinakos' taking of Kosslyn's theory of imagery as the counterpart for Freud's theory of dreams, I suggest that Pylyshyn's (1973, 1981) findings, that images are derivative of already known propositions, and that there are massively confounding effects of subject and experimenter expectancies, can account for much of what appears in dreams. DeJong (1989) has a similar objection, illustrated with Duncker's radiation problem, to the theory of original reasoning from analogies:

> It would appear that the system does indeed already know that the concept *split* can be applied to x-ray beams . . . . If the abstraction already exists, there is no reason to form an analogical mapping. Any interesting causal inference is better made via the abstract explanation. (p. 361, italics in original)

This is an important objection to claims that the concrete, analogical dream world can provide novel solutions to waking problems, as in, for example, Haskell's (1986b) statement that "presumably, the story presented in a dream is somehow parallel to the real-life conflict situation, and when resolution occurs in the dream story, it is thereby resolved in the psychological reality" (p. 372). Instead, the dream analogy can be produced from the already-known abstraction (cf. Pylyshyn, 1973, 1981): dreams containing analogies may be doing no more than redepicting waking life and knowledge, rather than being explorative. A similar didactic or expressive rather than exploratory view of analogy is described by DeJong (1989): the analogy is used to teach to a student an abstraction already discovered and known by others, so that "the analogy is then not spontaneous on the part of the student but rather serves to convey difficult abstract concepts" (pp. 361–362).

Concerning the assumption that dream analogies are novel or inventive Blagrove (1989/1990, 1993), Gibbs (1992) and Lakoff (1993) have proposed that the concrete images of dreams derive from a literal translation of metaphors used in everyday language, the translation of short linguistic phrases into hypnagogic imagery having been shown by Silberer (1909/1951) and the similar translation of event memories into hypnagogic imagery by Nielsen (1995). This proposal follows from Lakoff and Johnson's (1980) work on structural metaphor, and Johnson's (1987, 1991) theory of embodied schemata. According to Lakoff and Johnson (1980) our thinking is based on metaphors, and these metaphors have an experiential, embodied, basis. They argue that meaning, rationality and everyday thought are tied to bodily experience, as shown, for example, in the correspondences MORE MEANS UP and TIME EQUALS MONEY. Lakoff (1993) shows how the LOVE IS A JOURNEY correspondence leads to such metaphorical expressions as "look how far we've come," and "we may have to go our separate ways." The large number of phrases that can be derived from an initial correspondence shows the problem with the claim of Globus (1987) that there is "creativity in the sheer variety of unique life-worlds that dreaming constitutes" (p. 57), because the instances in this variety may not themselves be novel.

This derivative characteristic has been used by Blagrove (1989/1990, 1993) to argue that dreams may not be as novel as they first appear, for they may just be translating into concrete form some common phrase. The assumption of novelty is seen in Rycroft's (1979/1991) reference to dreams as "involuntary poetry." The problem here is that this description begs the issue: if the literal imaging of a poem appears dream-like and even creative, so may the literal imaging of almost any phrase or figure of speech, for example, even the hackneyed phrases analysed by Lakoff. States (1988) rightly suggests that a dream is like being trapped inside a metaphor (p. 92), but this of course need not entail that the dream created the metaphor, or that the metaphor is in any way original. Dreams may thus be derivative of waking cognitive and experiential structures, with cognitive deficiencies leading to this lack of originality. Thus although Globus (1987) claims that dream sources are abstract synthetic rather than mnemic copies of the waking world, and states that the former can lead to the "novel dream experiences," (p. 31), the degree of novelty is still at issue.

The objection to Globus' (1987) claim that a dream can open up "new waking possibilities" (p. 149) is thus not, as he shows, that the interpretation of the dream could be "arbitrary" (p. 149), but instead that the interpretation may not be new or enlightening. He does, in fact, proceed to acknowledge that the issue behind one dream he reports was not completely unconscious, but rather just unclear. The problem is then his claim that in waking thought "alternatives are not available" (p. 151), with dreams instead being able to

express a "more balanced presentation of all our possible ways of Being" (p. 151). On the contrary, dreams seem to be more single-minded than this, they may be no better at presenting alternatives than our waking cognition is, they may even be worse, and they may have no privileged access to knowledge unavailable to waking cognition.

To summarize, the idea that dreams utilize adaptive thinking based on metaphors or analogies is problematic in two ways: firstly, many metaphors are highly derivative, not at all original, do not enhance knowledge, and can be misleading even when we are awake — they may thus not be adaptive; secondly, the retrieval and use of metaphors, or memories, for problem-solving is highly dependent upon reflexive conscious supervision, or direct instruction by others. These problems are augmented by the memory deficiencies present during dreaming; for example, firstly, in most dreams it is not possible to recall deliberately one's waking life (LaBerge, 1985); secondly, within a dream one may only be able to recall the more recent fraction of the dream, with the earlier parts being forgotten (Dement and Kleitman, 1957); and thirdly, there is the importance of conscious attention at encoding for producing long term memory (Kellogg, Cocklin, and Bourne, 1982; Koriat and Feuerstein, 1976; Leahey and Holtzman, 1979). Given these problems, we will now examine a type of supposedly unconscious processing that has been proposed for dreaming, that of creativity.

Dreaming and Creativity — The Problem of Unconscious Mentation

Many authors have linked dreaming to creativity or divergent thinking (e.g., Domino, 1976; Fiss, 1986, p. 182). Lewin and Glaubman (1975) theorized that "dreaming and REM sleep should enhance performance on tasks that demand divergent thinking" (p. 350). Koulack, Prevost, and De Koninck (1985) suggest that the "mastery function" of dreaming works better when the subject remains asleep and does not recall the dream, because they then have a number of ways of dealing with a stressful event, rather than using the waking "single track of conscious thought" (p. 251). Hunt (1986) states that "dreaming *can* be utilized in the service of creativity and discovery" (p. 225, italics in original), and Globus (1987) holds that "the study of dream creativity is a very direct route to understanding the true creativity of which human beings are capable" (p. 4). He also claims that dreaming is "an apparently infinitely creative operation" (p. 31), and that "surely dream creativity is analogous to the creativity of speakers" (p. 38). Many criticisms have already been made of the connection between dreaming and creativity (e.g., Blagrove, 1992b; Rudofsky and Wotiz, 1988; Wood, Sebba and Domino, 1989–90): this section seeks to advance these criticisms by attacking the notion of unconscious incubation of problems, upon which the idea of creative dreaming is based.

Wallas (1926) quoted Helmholtz's claim that, in creativity, "happy ideas come unexpectedly without effort, like an inspiration" (p. 80). Wallas split the process of creativity into preparation, when the problem is investigated; incubation, when the problem is not thought about consciously, but is being processed ouside of consciousness; illumination, and finally verification. The first stage has the "voluntary use of logical methods," hopefully resulting in the setting of a clear question. The last stage is also fully conscious. Regarding the second stage Wallas contrasts a sermon writer who would pose a problem on Monday, so that incubation could occur during the week, versus a lawyer who only considers a brief at the last possible moment, resulting in a "certain want of depth . . . due to his conscious thought not being sufficiently extended and enriched by subconscious thought" (p. 87). Wallas states that the stage of incubation should include a large amount of actual mental relaxation, and cites the case of Darwin being "compelled by ill-health to spend the greater part of his waking hours in physical and mental relaxation" (pp. 87–88).

Poincaré (1921) reported that, when sleepy, he observed ideas in his creative unconscious "collide until pairs interlocked, so to speak, making a stable combination" (p. 387). The link with modern theories of dreaming is easily apparent, for example, Hartmann (1991) hypothesizes that "dreaming basically *connects*, or *joins:* it *brings together that which is usually kept apart* — at least in waking. It connects thoughts, images, memories, wishes, fears, in new ways" (p. 25, italics in original). However, the first problem here is that there is debate about how sophisticated (Shevrin, 1986), or "dumb" (Loftus and Klinger, 1992) unconscious processes are. For example, although single-word subliminal priming can occur, Greenwald (1992) claims that unconscious cognition cannot extract the meaning of a two-word sequence as opposed to the meaning of the individual words. This indicates that attentionless unconscious cognition acts in a routine rather than a sophisticated manner. Similarly, Kihlstrom, Barnhardt, and Tataryn (1992) note that in blindsight "responses are typically limited to questions of presence or absence, relative location, or gross movement; the patients cannot make accurate judgements about color, form, or identity" (p. 789).

The second problem is that, contrary to the assumptions behind the theory of incubation, for many problems people do not incubate or free-associate the solution. The ideas produced are based on what the solver is consciously trying to do, and on what they currently know. For example, Weisberg (1986, pp. 6–9) used verbal protocols to allow the intermediate steps prior to the discovery of solutions to Duncker's (1945) candle problem to be seen; solutions were shown to evolve from the consciously acknowledged inadequacies of earlier solutions, rather than as a creative leap by the unconscious. He states that it may be the hard work involved in these changing directions toward a solution, or the excitement of reaching a solution, that results in

the feeling that the creative process is different from ordinary incremental problem-solving. Indeed, rather than resulting from individuals' unconscious thinking, advances in science often follow from new technology, for example, the invention of the telescope, and what appear to be moments of insight, such as the discovery of the theory of evolution, are the culmination of slow, long-term, and mainly social, processes (Simon, 1966). This holds also for artistic achievements, such as the invention of the mobile (Weisberg, 1986, pp. 111–113), collage (pp. 113–115), Picasso's painting Guernica (pp. 120–128), and the explicit borrowing from other composers in the production of Baroque music (pp. 130–134). Further arguments and data against the theory of sudden inspiration or unconscious restructuring of a problem's gestalt are provided by Burnham and Davis (1969) and by Weisberg and Alba (1981). Even if a break is found to be helpful before finally solving a problem, this may be because fatigue is overcome, or because forgetting was needed to alter one's approach, rather than due to a period of information-processing continuing outside consciousness. We may even have difficulty spotting what stimuli come to us to help in producing solutions (Maier, 1931), and this difficulty can lead to bias in attributing the finding of a solution to unconscious incubation.

One method claimed to encourage creativity is brainstorming, in which the critical judgement of ideas is temporarily withheld in order to encourage original or wild ideas (Brilhart and Jochem, 1964; Parnes and Meadow, 1963): again, the similarities with theories of dream creativity are apparent. However, Weisberg (1986, p. 65) shows that subjects who do not temporally separate the generation from the evaluation of ideas have a better ratio of good ideas to total ideas than those who follow standard brainstorming instructions. Similarly, Weisskopf–Joelson and Eliseo (1961) gave brand-name invention tasks to brainstorming groups, and to groups emphasizing critical analysis. The critical analysis groups produced fewer ideas, but the same number of high-quality ideas. This finding of effortful critical analysis being as productive as the uncritical encouragement of wild ideas as a method of encouraging creativity goes against theorizing that in REM sleep the looser constraints on thinking in dreams will "promote spontaneous associations among and abstractions upon the recently formed memory traces as well as the more firmly established ones" (Clark, Rafelski, and Winston, 1985, p. 246). For other objections to such theories, see Blagrove (1991). These dream theories do seem dependent upon a rather simple dichotomization between constraint and freedom, as if the constraints of present knowledge and of effortful criticism undermine the search for novelty. Instead, it is the effortful, reflexive search for solutions which is needed for novelty, as shown by Weisberg, DiCamillo, and Phillips (1978) with Duncker's candle problem, rather than the supposed diffuse activation of information from past

experience. A further concern is that the theory of unconscious incubation emphasizes the individual as the prime cause of creative products. Csikszentmihalyi (1990) opposes this person-centred view of creativity, believing that "creativity is not an attribute of individuals but of social systems making judgements about individuals" (p. 198). Corresponding to this conscious social role-playing view, Hudson (1968, p. 68) reported that after students were tested for divergent thinking their scores could be changed by asking them (giving them permission?) to act as a constrained or as a bohemian person. This work points to aspects of creativity that are conscious, social and role-related, rather than individualistic, and is problematic for theories of creativity that emphasize the waking personality (Weisberg, 1993, p. 79) or the sleeping cognition of the individual.

Csikszentmihalyi (1990) claims that it is the formulation of new problems which is the hallmark of creativity, whereas standard "divergent" thinking tests (e.g., the Consequences test of creativity, by Christensen, Merrifield, and Guilford, 1958) have the experimenter setting the task for the subject. In support of this, Mansfield and Busse (1981, chapter two) show that performance on divergent thinking tasks is not related to scientific creativity. Furthermore, Csikszentmihalyi (1990) found that artists' use of discovery-orientation, rather than problem-solving ability, correlated with artistic success seven and 18 years later. This suggests the possibility that dreams may produce problem-formulation, rather than actual problem-solving, a weaker claim but one that may be more easily defensible, in that actual resolution of the problem that the dream alerts one to has then to be left to the waking, social, conscious self. This accords with Ullman and Storm's (1986) "vigilance theory" of dreaming, in which "dreaming consciousness is oriented to what the dreamer experiences as novel in the form of a residual tension that has yet to be resolved" (p. 443), much as one is vigilant to novel external stimuli when awake. Similarly, Falk and Hill (1995) claim that dreams may help "elucidate concerns that are not yet conscious." To this extent the dream content may be novel, and even adaptive if remembered. This would certainly accord with the findings of one of the few studies to show beneficial results of attempting to retrieve and discuss one's dreams, the preparation program for psychotherapy by Cartwright, Tipton, and Wicklund (1980).

However, although Falk and Hill (1995) found that a dream interpretation condition led to better insight and self-esteem than did a wait-list control condition, they admit that there is a confound with the effects of group therapy itself. Furthermore, Hill, Diemer, Hess, Hillyer, and Seeman (1993) found no significant difference in changes in insight between subjects interpreting their own dreams and a control group the members of which used the dream interpretation method on a recent troubling event. Similarly, Cogar and Hill (1992) did not find that a dream interpretation condition promoted

changes in self-esteem or symptomatology better than either dream recording or wait-list control conditions, and Koulack, Prevost, and De Koninck (1985), Kramer, Schoen, and Kinney (1984), and Lavie and Kaminer (1991) found that recall of dreams about highly stressful events correlated with a lack of adaptation to the event, hypothesizing that dream suppression may be adaptive for severely traumatized patients. These findings question the view that dreams are a source of adaptive creative thinking.

The links between dreams and creativity thus appear tenuous. Most dreams are mundane and do not show bizarreness (Dorus, Dorus, and Rechtschaffen, 1971; Snyder, 1970), and real life creativity seems anyway not to be the result of unconscious incubation. Furthermore, there is debate about the degree of insight and behavior change that dreams can effect.

Conclusion

This paper has detailed four ways in which various theorists have attempted to model the cognition involved in dreaming, and which have been used to account for the supposed problem solving ability of dreams. It has been argued that not only is it doubtful on empirical grounds that dreams do have this problem solving ability (e.g., Rudofsky and Wotiz, 1988), but the cognitive psychological theories of thinking usually applied to dreams (imagination, analogical reasoning, and creativity) each have, in waking life, conscious or reflexive goal directed control as an important component, and so are largely inapplicable.

Globus (1987, p. 65), in writing of similarities between the dream- and the wake-world, states that "these dream and wake lives as unreflectively lived are indiscernable . . . . The dream life is like the wake life, except that there is no flowing array of sensory stimulation available to modulate it." This rightly indicates that it is the opportunities for reflection, and the feedback from outside stimulation, that are distinctive features of waking life and cognition, but importantly these are absent during dreaming. Globus states that the differences between the dream- and wake-world, as lived, can only be spotted when we are awake, and are a result of the sensory disconnectedness of the sleeping condition (p. 87). The important consequence is that, unlike when awake, reflection cannot be built upon and sustained across separate dreams (p. 89). This suggests a severe deficiency in the abilities of dream cognition.

Ullman (1969, p. 700) gives the following example of a dream about waking concerns. A man "devotes four successive Sundays to the completion of his work" but by the fourth Sunday his wife was in "a fretful and irritable mood." He then fell asleep and dreamt of phoning the weather bureau to ask if a hurricane was expected to hit the city that afternoon. This dream may well meet Ullman's first characterization of dreams, that they are meaningful,

but surely isn't clever enough for the next two, that dreams are explorative and adaptive. The dream seems to just represent what the dreamer knew when awake anyway, for Ullman reports that when awake the man could hear "the occasional sounds of his wife's quarrels with the children . . . while he was intensely preoccupied with the work." This may indicate the weaker (representational) position that metaphors in dreams are "expository" and expressive, or possibly even that they are involved in "assaying" (p. 702) our needs, but not the stronger (adaptive and intentional) position that there is "an active exploratory process extending throughout the period of activated sleep" (p. 701).

Greenberg and Pearlman (1993, p. 376) make the strong claim that "the solutions in the dream may be new to the patient" and that "dreams can be more or less successful," but they also state the weaker position that "the dream *represents* the dreamer's effort to cope with a currently meaningful issue" (p. 375, italics added). The strong view is also taken by Fiss (1993), who writes, in his signal detection model of dream function, that "the quality of the dream experience may determine how people cope" (p. 401), and that dreams themselves can serve the purpose of "forming new psychic structures" (p. 403), but he also allows the weaker position in stating that "dream content can be effectively used as a marker or predictor of response to treatment" (p. 409).

This debate about what cognitive abilities are present during dreaming follows on from the distinction made by Kramer (1981) and by De Koninck (1991) between what we do with dreams once we recall them, and what the dream can do itself. In claiming that dreams "highlight movement change and the interplay of old patterns and newly evoked responses" (Ullman, 1969, p. 701), it must be remembered that dreams do the highlighting, and waking life the movement, because of the importance of reflexivity and consciousness to any original thinking. This distinction is utilized by Domhoff (1993), who states that "I am therefore hesitant to say that evolution has bequeathed us a form of thinking during sleep that is 'meant' to help us solve our personal problems . . . . Dreams as we are dreaming them . . . may have no function, but dreams can be 'useful' to waking consciousness in a variety of ways, and in that sense we have invented 'functions' for them" (p. 315). Falk and Hill (1995) suggest one function, that dream interpretation "helps people reveal personal information much more quickly than they might in other therapeutic modalities" (p. 30). Along the same lines, Ullman (1995, p. 59) has recently stated that "for the intrinsic healing potential of a dream to be realized the dream has to be 'socialized.' " This accords with the distinction made by Ross (1989) between the initial noticing, and the full retrieval and use, of past analogies. Ullman (1994) states that to share a dream with other people, who react to it, means that the initial "somewhat

ephemeral creation comes back as a more real, more palpable, and now a more public creation" (p. 227), and that the others in the dream-sharing group can help to orchestrate and integrate the dream elements and responses to the dream. This socialization view, however, seems to de-emphasize the cognitive abilities of the dream itself.

Ullman (1969) states that in dreams there is "the capacity to engage with the new" which "requires the power of abstraction. The dreamer, forced to employ a sensory mode, has to build the abstraction out of concrete blocks in the form of visual sequences" (p. 699). He states that during a dream "thought processes become bound to concrete presentations" (p. 698), but that, because the brain is asleep, this alters the way in which "abstraction is arrived at and the way in which it gains expression" (p. 698). Abstractions, according to Ullman, are thus not only being expressed, but are also formed in the dream. Contrary to this, the evidence reviewed here shows that abstractions seem not to be built during the concrete dream, but that instead the dream is dependent on abstractions built during waking life. Although Globus (1987) is correct to emphasize that dreams do not result from mnemic copies of waking life, but are generated from abstract meanings (p. 95), the point is rather the degree of novelty of what is generated, and the constraints and deficiencies on such generation during sleep.

Obviously dreams are frequently surprising, but even an apparently novel expression in a dream may not be new in Ullman's (1969) sense of being "surging, forward-looking, exploring, chance-taking" and confronting "heretofore unrecognized unintended consequences of one's own behavior" (p. 700). We must beware ascribing too much to the dream: in common with Spiro, Feltovich, Coulson, and Anderson (1989) I would emphasize that the use of past metaphors, and memories, is often quite unenlightening, constraining, and even misleading. Although Kuiken and Smith (1991) state that "certain dreams have greater metaphoric potential than others," the question still remains about how novel or enlightening these metaphors are. Barrett (1993) claims that following a period of dream incubation many of the solutions obtained by her subjects "appear to be ones of which the dreamers were not already consciously aware" (p. 120). However, although the solutions she details do have an obvious and often clever metaphoric relation to each dreamer's initial waking problem, they do appear simple, and rather obvious, as if the subjects could easily have known them already. For example, one young man who didn't know which college and which course to apply for realizes that "there is a lot wrong with staying at home," whereas someone thinking of giving up doing a sport to just watch it realizes "I don't think I'd be happy with just going to the games." At most these thoughts could be claimed to be part of implicit memory (Schacter, 1987), and the dream could then be used, as claimed by Fiss (1993, p. 404), as a "promoter

of self-awareness," or to induce a temporary beneficial mood change or highlight how one feels (Kramer, 1993), but the thoughts are hardly novel.

It may be objected here that all thinking involves the taking in of old thoughts and recombining them, and that dreams can at least do this. For example, Potter and Wetherall (1987) object to Chomsky's notion that we have a competence for language which can produce an infinite variety of performances by stating that "much natural language use is highly stereotyped and quite predictable. Far from being impossibly unique, performance data is [sic] often boringly repetitive" (p. 13). My point, though, is that in the psychological models described above conscious direction affects the choice of which thoughts to combine, and this conscious direction is missing in single-minded dreams, which may just provide the more obvious easier analogies, or solutions, by the process of "uninformed spontaneity" (Perfetto, Bransford, and Franks, 1983). The simplicity of many claimed dream solutions, and the lack of evidence for any more complex cognitive ability in dreams has been documented by Blagrove (1992b). Dreams may have a commonality with some repetitive waking thoughts, and "single-mindedness . . . is part of all fantasy, not unique to dreams" (Kramer, 1991), but the level of usefully recombinative ideas in dreams (Hunt, 1982) still appears low. Even as part of a positive account of dream existence, Globus (1987, p. 90) states that dreaming cognition is incapable of sustaining phenomenological reflection because of its disconnection from sensory input, which in the waking world has a "modulating function on operative concepts" (p. 90), dream concepts being "unbridled, persisting, and unreflective" (p. 90). It is up to those who think that dreams are a type of adaptive thought to show that dreams can have this function in the absence of conscious direction, self-reflection and social feedback.

In attempting to show similarities between waking and sleeping mentation, for example, in terms of word length of single uninterrupted themes (Reinsel, Wollman, and Antrobus, 1986), or in terms of content (Breger, Hunter, and Lane, 1971), this discontinuity in reflexivity and consciousness has been under-emphasized. Obviously dream-like bizarreness can be mimicked and utilised in waking life cognition (Brodsky, Esquerre, and Jackson, 1990–91), and short involuntary hallucinatory images do sometimes occur in daydreaming (Foulkes and Fleisher, 1975), the dissimilarity between waking and dream cognition, however, is in waking-like consciousness rarely being operative in dreams. Domhoff (1991) reviews the work of Hall as showing "a great continuity between dream life and waking life," such that "dreams reveal our preoccupations and conceptions," but again this shows a continuity of content, rather than of cognitive processes, a continuity of content that indicates meaningfulness (Kramer, Hlasny, Jacobs, and Roth, 1976), but which cannot be taken as evidence of purpose or function.

In modeling dream cognition it has rarely been recognized that various theories of waking thought, which depend on the presence of reflexive and conscious supervision, are inapplicable to dreams. Dreams have been characterized as a mixture of many types of thinking, with the hope that if such types are all added together the deficiencies of each one will be compensated for by the others. However, dreams may feel like they are a mixture of a real world, imagination, analogy production, and brainstorming-like creativity, but actually may be quite different, much as Freud (1900/1953, p. 603) contrasted primary to secondary processing. In accord with this, Rechtschaffen (1978) states that although we usually understand a phenomenon by its relationships to other phenomena "dream isolation emphasises the lack of relationship between dream consciousness and other phenomena." The problem is quite similar to that of imagery, where Pylyshyn (1973) has warned:

> Just because we know that we . . . "see" certain objects in our "mind's eye" or "hear" ourselves rehearsing a series of numbers, etc., we cannot assume that the contents of such subjective knowledge can be identified with the kind of information-processing procedures which will go into an explanatory theory. (p. 3)

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