

The Nature and Functions of Dreaming

Dreams make connections, guided by emotion. Dreams picture emotion and the power of the dream image measures the power of the underlying emotion.

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Introduction

After outlining very briefly the tenets of what my associates and I call The Contemporary Theory of Dreaming, we will start by plunging straight into the tsunami – the tidal wave dream – which was the starting point of our research and is also in our opinion the best starting point for understanding the dream.

Here is an outline of the theory. If some points are not entirely clear in this abbreviated form, please read on. Each point will be considered in more detail later, with a discussion of relevant research.

- 1) Dreaming is a form of mental functioning. It is one end of a continuum of mental functioning which runs from focused waking thought at one end, through reverie and daydreaming, to dreaming at the other end.
- 2) Dreaming is hyperconnective. At the dreaming end of the continuum connections are made more easily than in waking, and connections are made more broadly and loosely. Dreaming avoids tightly structured, overlearned material.
- 3) The connections are not made randomly. They are guided by the emotions of the dreamer.
- 4) The dream, and especially the Central Image of the dream, pictures or expresses the dreamer's emotion. The Central Image is a measure of the power of the emotion. The more powerful the emotion, the more powerful (intense) is the Central Image.
- 5) This making of broad connections guided by emotion probably has an adaptive function, which we conceptualize as "weaving in" new material – in other words taking new experiences, especially if they are traumatic, stressful, emotional, and gradually connecting them, multiply connecting them, into existing memory.
- 6) In addition to this basic function of dreaming, the entire focused waking-to-dreaming continuum has an adaptive function. It is useful for us to be able to think in clear, focused, serial fashion at certain times, and at other times to associate more broadly, and loosely – in other words to dream.

The tidal wave dream

I was walking along a beach with a friend, I'm not sure who, when **suddenly a huge wave, maybe forty feet high, swept us away**. I struggled and struggled in the water. I'm not sure whether I made it out. Then I woke up.

This dream, or something like it, is very common in people who have recently experienced a trauma of any kind (Hartmann, 1998; Hartmann, et al. 2001). I have heard it from victims of rape or attempted rape, victims of attacks, from people whose close relatives or friends were killed or attacked, and from people who have barely escaped from a burning house.

My associates and I consider this dream especially important, in fact paradigmatic, because it lets us see so clearly what is going on. The dream does not picture the actual traumatic experience – the burning house or the rape. It pictures the powerful emotion of the dreamer – “I am terrified. I am overwhelmed.” Similar tidal wave dreams have been reported after a major fire by Siegel (1996). The image is not always literally a tidal wave, We have many examples, from people who have experienced a severe trauma, of images such as being swept away by a whirlwind, being tortured, or being chased off a cliff.

Most dreams of course are not so straightforward. The simple picturing of an emotional state seems to occur most when there is a single powerful emotion present, as in someone who has just been traumatized. Terror is perhaps the most straightforward emotion in these situations, but there are others, which are also pictured in dreams. For instance vulnerability is often pictured:

I dreamt of a small animal lying in the road bleeding.

Several of us were wandering around on a huge plain. There was no shelter. There was rain beating down on us. We had no place to go. We were all lost and helpless.

There were shellfish creatures, like lobsters or crayfish, lying there with their shells torn off, all white and pink and very exposed.

Guilt, especially survivor guilt, is a very powerful emotion, often pictured in dreams. For instance, a man who escaped from a burning house in which his brother had died dreamt:

I dreamt of a fire somewhere, in a house very different from ours. In the dream my brother and everyone else escaped, but I was still in the house getting burned when I woke up.

Sadness is also frequently portrayed very clearly. Here are dreams from two different women in the week after their mothers' deaths.

There was an empty house, empty and barren, the furniture all gone. All the doors and windows were open and the wind was blowing through.

A huge tree has fallen down right in front of our house. We're all stunned.

In all these cases, the central imagery of the dream seems to be picturing, very clearly though metaphorically, the emotions of the dreamer (Hartmann, 1998). However all the above can be considered "anecdotal evidence," illustrating rather than demonstrating its point. Therefore we went on to see whether we could develop actual research evidence for this view of dreams. This takes us right into the center (points 3 and 4) of the Contemporary Theory of Dreaming.

Studies of the Central Image (CI) of the Dream

We first called the tidal wave image and similar powerful central images the Contextualizing Image (CI) since it appeared to provide a "picture-context" for the emotion of the dreamer (Hartmann, 1996; Hartmann, et al. 1997; Hartmann, et al. 1998). However this term was found unwieldy and confusing by some, so the image is now called simply the Central Image, keeping the abbreviation CI. A scoring sheet for the CI has been developed (figure 1) which can be used on any written or recorded dream report. It has now been used in about fifty different research studies.

The scorer, who knows nothing about the dreamer or the circumstances surrounding the dream, looks at a dream report and first decides whether or not there is a scorable Central Image. If there is (this turns out to be the case in 50 to 60% of dreams scored) the scorer jots down a few words describing the image, and then scores the intensity of the image on a seven-point scale (0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0) based on how powerful, vivid, bizarre and detailed the image seems. ("0" means no CI and "3" means about as powerful an image as you have seen in dreams.) She then tries to guess what emotion or emotions, from a list of emotions provided, might be pictured by this image. The Central Image Intensity (CII) turns out to be an especially important measure.. Although it is of course a subjective judgment by the scorer, there is good agreement between scorers -- inter-rater reliability of $r = .70$ to $r = .90$ (Hartmann, et al. 1998; Hartmann, et al. 2001a). We will discuss a number of studies using Central Image Intensity (CII)

to examine the question (point 4 of the outline) of whether the power of the CI is related to the power of the underlying emotion.

Since there are eighteen emotions to choose from, it has been more difficult to obtain good inter-rater reliability on the individual emotion pictured by the dream imagery. However there is quite good agreement between raters when emotions are grouped into three categories: 1) fear/terror and helplessness/vulnerability; 2) other negative emotions (#s 3-10 on rating sheet); 3) all positive emotions (#s 11-18). (Hartmann, et al. 2001b)

First we showed that, on a blind basis, CII is rated higher in dreams than in daydreams (Hartmann, et al. 2001a) as expected. We also found, as expected, that CII is higher in content from REM awakenings than from Non-REM awakenings, which in turn score higher than material from waking periods (Hartmann and Stickgold, 2000).. We then went on to look at whether CII is related to emotion and the power of the dreamer's emotion.

In one study we found that CII is rated higher in "dreams that stand out" than in "recent dreams" from the same persons. (Hartmann, et al. 2001a) Likewise CII is scored higher in dreams characterized as "the earliest dream you can remember" than in "recent dreams" (Hartmann and Kunzendorf, 2006-2007). Thus CII appears to be high in dreams that are remembered and are presumably emotionally important.

In one study we specifically examined dreams considered "important" by the dreamer. A group of 57 persons each sent us a recent dream they considered "important" and a dream they considered "unimportant" or less important. CII was significantly higher in the "important" dreams (Mean for Imp. dreams 1.193, mean for Unimp. dreams 0.807. Difference = .386, S.D. 1.048; $t = 2.78$, $p < .007$) (Hartmann, et al. 2006).

We also studied one group of "especially significant" dreams. A group of 23 students very interested in their dreams each reported one "especially significant" dream. The mean CII in these 23 ds was 2.617 (means of two experienced raters). This is the highest mean CII score of any group we have seen, much higher than means of recent dreams in various groups.. These students did not supply a "non-significant" dream for a direct comparison. However, comparing these "highly significant" dreams with our largest group of recent dreams, from 286 students, we found a highly significant difference: (Mean for Signif. Dreams 2.62, S.D. 0.48; mean for recent dreams 0.75, S.D. 1.03. $t = 16.0$, $p < .0001$) (Hartmann, et al. 2006).

Some further studies examined trauma and stress – situations involving strong and mainly negative emotions. We found that CII is higher in Ss who have suffered a recent trauma than in those who have not. (Hartmann, et al. 1998; Hartmann, et al. 2001). CII is also higher in recent dreams of students who check off on a questionnaire that they had suffered either physical or sexual abuse at any time, than in students who check off no abuse ($p < .02$)(Hartmann, et al. 2001).

Trauma and abuse are difficult to study systematically, since the trauma is different in each person, and the methods of dream collection differed as well. Therefore we did a more systematic study, using 9/11/01 as a day that was we considered was traumatic or at least very stressful for everyone in the United States.. We found a number of people who had been recording all their remembered dreams for years, and were willing to send us twenty dreams – the last ten they had recorded before 9/11/01 and the first ten dreams after 9/11. Our first study involved 320 dreams from 16 subjects before and after 9/11/01. When the code was broken, we found that the “after” dreams had significantly higher CII than the “before” dreams ($p < .002$). Somewhat to our surprise, the before and after dreams did *not* differ on length, “dream-likeness,” “vividness,” or presence of towers, airplanes or attacks. CII was the only measure that clearly differentiated the after dreams vs. the before dreams (Hartmann and Basile, 2003).

We have now expanded that study to 880 dreams from 44 subjects (Hartmann and Brezler, 2006). Again, in the larger sample, CII was significantly higher in dreams after 9/11 ($p < .001$). This confirms our earlier studies finding higher CII at times of stress or emotional arousal. With the larger N there was now a slight but significant increase in content involving “attacks”, though there was still no before vs. after difference on the other measures.

In all these results after trauma, abuse, or after 9/11, there was also a shift in the ratings of “emotion pictured by the CI” towards group 1 emotions (Fear/terror and helplessness/vulnerability). This shift was usually statistically significant, but was not as clearcut and dramatic as the increase in CII – probably because of the difficulty in scoring and reaching agreement on the exact emotion pictured.

All these studies show that when we can know or estimate the power of the dreamer’s emotion, the power of the Central Image of the dream appears to correspond – increasing in situations of increased emotion. And, after trauma or stress, when the emotions felt can be presumed to be negative, the negative emotions, especially fear/terror and helplessness/vulnerability, were the ones rated as being pictured by the Central Image.

We also examined this view of dreams as imagery picturing powerful emotion in a different way. We suggested that perhaps sleep and REM-sleep, though the usual place for dreams, were not absolutely necessary. If a dream was made of imagery influenced by powerful emotion, could we introduce these conditions in waking persons and produce a dream or something like a dream? In fact this is exactly what we found. Forty-four

students in a classroom setting each were asked to write down four things, after appropriate instructions: 1) a recent dream; 2) a recent daydream; 3) a daydream or reverie allowed to develop right there in class, in a relaxed state, with no other instruction than to let imagery develop; and 4) a daydream or reverie allowed to develop in a relaxed state, after they had chosen an emotion that felt close to them and had tried their best to intensify their emotion, allow it to envelop them and become as strong as possible. All the written material was examined on a blind basis, and rated on standardized scales of “dream-likeness” and “bizarreness.” Results showed that material written under condition 4 (imagery while experiencing emotion) was rated significantly more dreamlike and more bizarre than material from conditions 2 and 3, and was rated almost exactly as dreamlike and bizarre as condition 1, the recent dream (Hartmann and Kunzendorf, 2000; Hartmann, et al. 2002-2003). Thus the CI paradigm – imagery under intense emotion – can produce a dream, or very dream-like material, even in the waking state.

All this research supports point 4 of the Contemporary theory -- the CI pictures the underlying emotion or emotional concern, and the power of the CI is related to the power of the underlying emotion. This view is also consistent with a great deal of earlier research on emotion and dreams which did not deal specifically with the Central Image. For instance, a careful sleep laboratory study was done decades ago in which judges examined dream reports as well as “daily activity records” and picked one activity from the daily record that appeared to show up in the subjects’ laboratory-recorded dreams that night. The activities had all been given an “emotional intensity” rating by other judges. The activities that showed up in dreams had been rated significantly higher than the other daytime activities (Piccione et al 1977). And Domhoff and his collaborators, who have studied and done “content analysis” on numerous long series of dreams, conclude overall that people dream about what is emotionally important to them (Domhoff, 1993; 1996).

We can now go on to consider point 5, which suggests that these dreams have a function of “weaving in” new material. Again we can look at this most easily after trauma or stress.

Dreaming as Weaving In New Material

My colleagues and I have collected many series of dreams from people who have experienced a sudden trauma, or loss or stressful event. Here is a case of relatively mild trauma. A sensitive boy, fourteen years old, on a trip with his parents, was inadvertently locked into a hotel room for a day and a half. No one heard him when he yelled, and he became extremely upset for a time. He summarizes what happened over the next months:

I then had many dreams and nightmares about this event. I was always locked in, enclosed and trapped in some way but the dreams gradually changed. Sometimes I was trapped in a room like the actual one, sometimes in a very different situation. I also dreamt of being caught in a fire and of drowning in a tidal wave. Sometimes my parents

were there, sometimes scenes from my childhood entered into the dreams. My dreams were playing with the theme of my being trapped in a room and bringing in all kinds of related stuff from my life, from stories I'd read and from my imaginings.

Here's a situation with a more severe trauma. This was a thirty-year-old man who lived in Oklahoma City at the time of the Federal Building bombing in 1995. One of his friends died in the bombing.

He was a good dream recaller and shared about 200 of his dreams before, and for a year after, the bombing. Before the date of the bombing he had a whole lot of dreams involving his work and his friends, and a few nightmares as well. On the day of the bombing his sleep and his dreams changed drastically. For a few nights he slept poorly and couldn't remember dreaming. Then for a few days he had brief dreams of simply driving to the Federal Building and sitting there in his car. Then he had similar dreams that included his driving there and looking around, noticing that the streets were empty; he was the only one there. He saw the scene very powerfully and vividly, but nothing happened. In one dream he drove to the building, opened his car door and got out. Once there were other people there, and a friend opened the car door for him. Then a dream of a large stadium. A police helicopter dropped a man – the chief suspect in the bombing – into the stadium, and the whole crowd, all 85,000 or so, went after him to hurt or kill him. Then some dreams of himself in an auditorium, feeling very uncomfortable. He was being grilled – questioned – by people up on the podium. Then dreams of being chased by gangsters, and especially of a friend being hurt by gangsters. Dreams of a Ryder truck, the same kind used in the bombing, coming to his house. Dreams of storm clouds, violent whirlwinds, many kinds of danger. Dreams of fighting. Dreams that incorporated places from his childhood along with recent scenes related to the bombing. The dreams all had very powerful images, usually dangerous ones.

Only very gradually, about six months after the bombing, did the violent themes start to subside, and his dreams gradually calmed down, with more dreams of friends and girlfriends, concerns about his work etc., and with less powerful images (lower CII scores).

A 40-year old man whose much-loved mother has just died, has some powerful dreams in the first weeks, with striking images obviously relating to the death. These are the first two dreams he recorded.

A mountain has split. A large round hill or mountain has split into two pieces. Arrangements have to be made to take care of it.

Walking around in a large park. A huge tree has fallen down, maybe a hollow tree. A man tells me he saw it fall. Then it happens again, in front of me. I approach the tree, see it shake a bit. I run away, then run back to it. I watch it fall.

Then many other powerful image. He dreams of large strange-looking silver rings, being in prison, travels to strange places,. He dreams of a beautiful six-year-old girl running over the water, sort of walking on water. Startling, unusual images. Over the

next months images of his work, his family, his ex-wife, his current girl-friend, find their way into his dreams, and the imagery becomes less dramatic, less intense, more familiar. It takes some months for these elements of his life to become the most common elements of his dreams, as they had been before his mother's death.

A 35-year old woman barely escaped with her life from a raging fire in California. Her house and most of her possessions were lost in the fire. In the weeks after the fire she has dreams with images so powerful they wake her up, she says. The images involve fires in various places, earthquakes, crimes being committed, strange unknown figures appearing. After a month or two she begins to dream of co-workers, and she has some powerful sexual dreams. The images gradually become less intense and the dreams deal more with people and events important in her current life. A year after the fire she has a kind of "anniversary reaction," becoming more anxious and depressed for a time. In the months after that she feels better, and her dreams become less violent and intense. Her dreams now often deal with building new houses or adding rooms to a house.

These cases and many others all support the idea that the dream is somehow 'weaving in' new traumatic material, gradually combining it with old material. And one can easily see how this could be a function of dreaming. So far, however, we have found no way to do quantitative research to prove that this weaving in takes place, or to prove that if it does take place, it has an adaptive function. (Function is notoriously difficult to prove. There is still no real agreement on the functions of sleep, which one might think would be more straightforward than the functions of dreaming.) Our view is that this weaving in of new material probably happens all the time (every night) but we can see it most clearly when there is a trauma or emotional event.

In any case, I suggest that what is happening is somewhat like this. A trauma or stressful experience produces powerful activation or excitation in the nets of the mind (mostly in the cerebral cortex). This can be disruptive to normal functioning. Dreaming makes connections, it interconnects the traumatic or other new material. This connecting or spreading out of activation may be useful first as "calming a storm", allowing the net to function better, in a more harmonious state. But more importantly the cross-connections inevitably alter the future functioning of the net. The trauma, or any disturbance, is cross-connected, "woven in" by dreaming as numerous new connections and contexts are established. This process is likely to be useful for future functioning since a later trauma or disturbance will be less serious, will produce less "storm-waves" since appropriate contexts and cross-connections are already present. In anthropomorphic terms, once dreaming has done its work, a future trauma or disturbance will produce relatively less of the reaction: "HELP! THE WORLD IS ENDING", "THIS IS THE MOST HORRIBLE THING THAT HAS EVER HAPPENED," "HOW CAN ANYONE SURVIVE THIS?" and more of "YES, THIS FEELS BAD BUT IT'S A BIT LIKE.....", "I'VE EXPERIENCED SOMETHING LIKE THIS. I'VE GOTTEN TO KNOW THESE FEELINGS", or "I'VE DEALT WITH A NUMBER OF EVENTS SOMEWHAT LIKE THIS ONE," ETC. (Hartmann, 1998).

Thus, I suggest that the broad making of connections and contextualizing has a function which can be seen as both restorative/adaptive in an immediate sense (spreading

excitation, calming the storm) and as producing changes in memory networks which are adaptive for the future. This change in networks is not a consolidation of memory but a broadening of memory through cross-connections — an increase in connections, a weaving in of new experience.

Looking at this same process in different terms, I have suggested that dreaming has a quasi-therapeutic function (Hartmann 1995), which again can be seen most clearly after trauma. Dreaming, like therapy, can be considered the making of connections in a safe place. I reviewed many similarities between dreaming (whether or not remembered) and the process of psychotherapy, especially after trauma. Both good psychotherapy after trauma, and dreaming, first provide a safe place for work to be done. In therapy the safe place is much more than the physical setting; it involves the safe "boundaries" of the therapeutic situation and the gradual trusting alliance formed between patient and therapist. In dreaming — especially in REM sleep — the safe place is provided by being in bed, usually in REM sleep, with its well-known muscular inhibition which prevents activity and the acting out of dreams.

Once a safe place is established the therapist allows the patient, especially the traumatized patient, to go back and tell her or his story in many different ways, making connections between the trauma and other parts of the patient's life — overall making connections and trying to integrate the trauma. I believe that dreaming performs at least some of these same functions. It is another way of making connections broadly in a safe place. As connections are made between the terrible recent event and other material, the emotion becomes less powerful and overwhelming and the trauma is gradually integrated into the rest of life. Thus, dreaming appears to have a quasi-therapeutic adaptive function which can be seen most easily after trauma though I believe again that trauma is a paradigm and that dreaming has the same function, though less easily discernible, at other times.

Presumably all this occurs whether or not the dream is later remembered. However, when the dream is remembered, it can then be used in making further connections, with or without the help of a therapist. Thus a remembered dream can clearly have additional functions, helping with self-knowledge and relationships, and sometimes producing new solutions to problems, new works of science and art (see for instance Barrett, 2001).

The Continuum running from Focused Waking to Dreaming

We have reviewed above research on the central portions of the Contemporary Theory of Dreaming – showing that the Central Image of the dream is related to, and pictures, the underlying emotion, and that the intensity of the image is a sort of measure of the power

of the emotion. Let us now return to fit this into the overall theory, presented in outline form on the first page.

The first tenet of the theory is: 1) Dreaming is a form of mental functioning. It is one end of a continuum which runs from focused waking thought at one end, through reverie, daydreaming and dreaming at the other end.

This is a kind of framework for our thinking. There is supporting research, but we cannot prove conclusively that this is the best way to look at dreaming. Admittedly there is an intuitive sense that dreaming is something totally separate from other states, and REM sleep, when most though not all dreaming occurs, differs in many ways from NREM sleep and from waking. Thus at first glance, dreaming seems completely different from other forms of mental functioning such as thought or daydreaming. In dreams we appear to be totally involved in an imagined world, and we have no control over what happens. However these are not absolute distinctions. Numerous clinical interviews have convinced us that some people experience reveries and daydreams that become as real as dreams. In our studies of people with frequent nightmares, we found that many of them had frightening daydreams as well, and would speak of “daymares” -- meaning daydreams that got out of control and became increasingly terrifying (Hartmann 1984). And the copious literature on lucid dreaming illustrates the fact that we often do have some control even in our dreams. In fact there is great variation in the degree of lucidity and control over the dream (Barrett 1992). So perhaps dreaming is not a totally unique state. It may be useful to think of dreaming as part of a continuum.

The idea of a continuum between daydreaming and dreaming is not a new one. Research by Reinsel et al. (1992) demonstrates that daydreams can be as bizarre as dreams, and work by Singer (1993) demonstrates that daydream imagery can be as metaphoric as dream imagery. Furthermore we know that very dreamlike material sometimes occurs at sleep onset (Vogel et al. 1966) or under conditions of sensory isolation (for instance Reinsel et al. 1992). There is still some disagreement about whether such material should be called dreaming or something else.

We performed one research study clearly demonstrating the continuum between dreams and daydreams, and showing that daydreams could be very like dreams, depending on the personality of the student. A group of 40 students each provided one recent dream and one recent daydream, which were scored on a blind basis. Overall we found, as expected, that dreams were scored far more “dreamlike” and “bizarre” than daydreams. However dreams of thin-boundaried students (see below) were scored more dreamlike and more bizarre than dreams of thick-boundaried students. Daydreams showed the same pattern. The differences were sufficiently large so that the **daydreams** of thin-boundaried students were scored just as dreamlike and just as bizarre as the **dreams** of the thick-boundaried students (Kunzendorf, et al. 1997). This suggests a continuum between daydreams and dreams, with the thin-boundaried students shifted towards more dream-like and bizarre imagery.

(For those not familiar with the concept of thick and thin boundaries, let me summarize briefly. Boundaries represent a dimension of personality, measured by the Boundary Questionnaire (BQ) now taken by over 10,000 persons. A person with very thick boundaries is one who keeps things in separate compartments. For instance, she's fully awake or fully asleep. He does not let his emotions interfere with his thoughts. She thinks in black and white, feels men are totally different from women, and her group is totally different from other groups, etc. Someone with very thin boundaries is the opposite: he may experience in-between states; she cannot imagine a thought without emotion, thinks in shades of grey, sees masculine as well as feminine in herself, sees similarities between groups etc. These examples illustrate extremes – very thick or very thin boundaries. Some people of course have medium-thick boundaries. There is a whole continuum, from very thick to very thin boundaries; scores on the BQ have an approximately normal distribution. There are some people who have thick boundaries in one area and thin boundaries in others. However scores on the BQ cohere to a great extent. Some one who scores “thick” in one area is quite likely to score thick in other areas as well. For reviews, see Hartmann 1991, Hartmann et al. 2001c. The Boundaries dimension is not closely related to any scale of the MMPI or any other standard measure of personality, with one exception: the personality factor known as Openness to Experience. Openness correlates highly with thin-ness of boundaries, but involves only the positive, desirable aspects of thin boundaries.)

All of this suggests that for many purposes it is useful to think of a continuum of mental functioning (Figure 2) rather than an absolute divide between dreaming and waking cognition. At the left-hand end of the continuum, in focused waking thought, we deal mainly with sensory input, and thoughts, and we employ words, numbers, mathematical symbols -- whatever our task demands. We process material serially, we tend to think in straight lines, moving logically from one item to the next. We employ categories, keeping things in their places, and our thinking remains mostly within a region or subsystem. As we move to the right, through reverie and daydreaming towards dreaming, all this changes. There is less sensory input and we are less involved in a task. We process more loosely, more broadly, we think less serially, we make jumps from one subsystem to another.. This has been discussed in detail elsewhere (Hartmann 1998).

It is striking that this focused waking-to-dreaming continuum bears considerable similarity to the continuum we have discussed above, from thick boundaries to thin boundaries. The waking-to-dreaming “state” continuum can be superimposed on the “trait” continuum of thick-to-thin boundaries. In other words, regardless of our typical boundaries, we all function in a more “thick-boundary” mode when we are hard at work solving a math problem, and in a more “thin-boundary” mode when daydreaming and dreaming (Hartmann, 1999).

People characterized by thin boundaries overall tend to be more aware of, and be more comfortable in, the daydreaming/dreaming end of the continuum. This relates to our consistent finding of a high correlation between thin boundaries and dream recall frequency (Hartmann and Kunzendorf, in press).

Furthermore it is worth noting that emotion has a greater influence on our imagery and mental processing as we move towards the dreaming end of the continuum (Hartmann 1998). Emotion always influences us. Even wide awake and thinking, we tend towards seeing what we want to see. There is research showing that when we are happy we really do see “la vie en rose” (Kunzendorf and Paroskie, 2000-2001). But in a focused waking mode, we usually try to be objective; we usually try to minimize the effects of our emotions. People with thick boundaries especially emphasize this separateness—keeping their emotions from their thinking. But this objectivity fades as we move towards daydreaming and dreaming. Now emotion becomes increasingly important for all of us. And again the effect is most prominent in those with thin boundaries. People with thin boundaries have more powerful and emotional dreams. Their dreams are scored higher on CII. (Zborowski, et al. 1998; 2003-2004). In other words their dreams have more powerful central images – the part of the dream that seems to be most closely related to the underlying emotion.

So despite the fact that at first glance dreams seem so totally different, we find it useful to consider dreaming as one end of a continuum of mental functioning. Our mental apparatus (and this involves chiefly our cerebral cortex) is always producing images. When we are wide awake, at the left end of the continuum, our imagery (sometimes referred to as “sensorium”) is influenced to a large extent by our sensory input (what we see and hear, etc) and by the task we are engaged in. Our memory systems are always active too, providing memory image relating to what we are experiencing or thinking about. And our emotions always influence us to some extent influence us as well. As we get into reverie and daydreaming, with our eyes open or even more clearly if we close our eyes, our imagery is less influenced by our sensations and our immediate tasks, and more by material in our memory systems – actual memories and also new combinations and creations (imagination) – and by our emotions. Finally when we are dreaming there is little or no sensory input and little or no “task,” so we are left with our actual and recombined memories, and our emotions. Here emotion has the most powerful effect.

This is very consistent with studies on the brain biology, of dreaming which we are not discussing in this chapter. It is discussed in detail elsewhere in these volumes. But overall, the biological data, including brain imaging studies comparing REM sleep (when most but not all dreaming occurs) to Non-REM sleep and Waking are very compatible with the Contemporary Theory of Dreaming. The most definite findings are that REM sleep involves clear activation of the amygdala and other portions of the “limbic system” dealing with emotion, and de-activation of the dorsolateral frontal cortex which deals with thinking, planning, organizing (Maquet, et al. 1996; Sutton, et al. 1997; Braun, et al. 1997).

Dreaming is Hyperconnective. The connections are broader and looser than in waking.

This is the second major tenet of the theory. Actually there is little disagreement on this point. Dreams obviously throw together a great deal of material in our minds. We all remember dreaming about a person who is like A but also somewhat like B. I often have dreams set in a house that is partly my current house and partly a previous house. Also I'm sometimes in a city that is both Boston and New York.

Freud called the first and most prominent mechanism of the dreamwork "Condensation," and he had exactly this hyperconnectivity in mind. When analyzing a dream by free association, one pulls apart the elements of the condensation, looks for associations to each part, and gradually tries to reconstruct the "latent dream thoughts" – the thoughts underlying the dream. Freud's view was that most or all parts of a dream are over-determined – they are produced by the coming together of several underlying thoughts.

Biologically oriented researchers also often speak of hyperconnectivity. However what they have in mind is throwing things together randomly. They usually consider dreaming to be a state of random activation, exciting many parts of the forebrain and thus throwing together all sorts of material from the memory stores.

Basically everyone agrees that dreams are hyperconnective. And there is little argument about the connections being broader and looser than in waking. But I believe that this "broader and looser" is an extremely important aspect of the nature, and also the functions and uses, of dreaming, so it is worth further discussion here. And attempts have been made to study it experimentally (below).

First I want to describe a striking observation on a personal and clinical level. I hear dreams a great deal from friends and also from patients in psychotherapy. Over the past years I have heard the following dream from five different women, including both friends and patients. The dream goes something like this:

A powerful vivid dream. I dreamt about my boyfriend Jim, but then he turned into someone else – he seemed to be my father.

Each of the five women continued: "on waking up I thought about it and I realized Jim really is a lot like my father. He's (and they would enumerate a number of similarities between their boyfriend and their father). But you know something fascinating. I had never thought of it before! I had never noticed the obvious similarities until I had this dream!"

I think this provides a significant insight into the way our minds work. Apparently these women kept their thoughts, feelings, memories etc about Jim in one part of their minds – one compartment -- and their thoughts, feelings about Father in another. The compartments were entirely separate while they were awake. It took a dream to make the connection – to cross the boundary from one compartment to another.

In other words while awake our thinking stays in a groove, or a rut. We keep thinking along the same straight lines. In dreaming we can jump out of the groove or rut. This is responsible for our sometimes having all sorts of new insights based on our dreams, and occasionally making new discoveries or creating new works of art. Of course, daydreams sometimes work as well or almost as well as night dreams, as expected from our discussion of the continuum above.

It may even be possible to demonstrate this “broader and looser” characteristic of dreaming experimentally. Some years ago I showed, in a very small unpublished study that people given a standard word association test shortly after being awakened from REM sleep produced more “distant associations” than when awakened from NREM sleep. The idea was that the broader, looser functioning of the mind and brain in REM-sleep dreaming would continue for a few minutes after awakening.

Robert Stickgold and his associates (1999) performed a much more elegant version of this study, and obtained significant results. They measured the exact time in milliseconds required for subjects to recognize close or strong associations between pairs of words, versus distant or weak associations. They found that after REM-sleep awakenings the weak associations were made more quickly.

My group performed a large study related to this tenet of the theory – that dreaming makes connections more broadly and loosely, and avoids the tightly structured, overlearned material. We did this by investigating the extent to which we read, write and calculate in dreams. Reading, Writing, and Arithmetic (the “three R’s of our schooling”) represent perhaps the most tightly structured overlearned portions of our mental functioning.

First we examined a total of 456 dreams, from various sources for any mention of reading word-for word, writing or typing word-for-word, or calculating (any form of math or arithmetic). Two independent scorers agreed perfectly in their scoring: there were zero instances of reading, zero instances of writing, and one instance of arithmetic. Even this one instance was only a description: *I was at my desk doing my math homework when....* The math numbers or symbols did not actually appear in the dream.

Second, we sent a questionnaire to 400 people interested in dreams, who mostly could recall a great many of their dreams, and obtained 240 completed forms. In answer to simple multiple-choice questions, about 90% of the respondents stated that they “never” or “almost never” did any reading, writing or arithmetic in their dreams. In order to look further into this, we also asked each respondent to consider six different activities: walking, writing, talking with friends, reading, sexual activity, typing. This list includes three of our tightly structured activities, and three other activities which not only differ greatly from these, but differ greatly from one another. Respondents were asked to rate each activity on a 7-point scale running from (1) “This activity is far more prominent in my waking life than in my dreams. It occurs little or not at all in my dreams” to (7) “This activity is far more prominent in my dreaming life; it occurs little or not at all in my waking life.”

The results were clear-cut. The three activities Writing, Reading, and Typing had mean scores of 1.4 (far more prominent in waking). The three other activities -- Walking, Talking with friends, Sexual activity -- had mean scores of 2.9 to 3.4 (almost as prominent in dreaming as in waking; slightly more in waking). The difference between the two groups of activities was highly significant ($p < .0001$). The activities within groups did not differ significantly from each other (Hartmann, 1996; 2000). These findings strongly support the point that dreaming avoids tightly structured cognitive material such as reading, writing, typing, calculating. It deals with (makes connections in) the broader, looser and perhaps more emotionally important (see below) portions of our mental networks.

The connections are not made randomly. They are guided by the emotions of the dreamer.

As we have just reviewed, dreaming is characterized by making connections broadly, avoiding the tightly structured regions, such as the “three Rs.” But the connections are not random and meaningless. Emotion plays an important part, as we have noted at length in our studies of dreams after trauma and stress. Emotion appears to make the condensed or connected images more powerful. For example, we reviewed two pages back the five powerful dreams, by five different women, of a boyfriend turning into father, followed by an aha experience. These dreams were introduced to demonstrate that connections are made more broadly in dreams. However the dreams obviously involved figures that were emotionally important to the dreamer, which probably accounted for the power of the images.

Here is an even more dramatic example of this sort of connection or condensation, guided or driven by powerful emotion:

A woman had been sexually abused by her older brother for eight years, from the time she was 2 or 3, to the time she was 10 years old. She was terribly frightened of her brother, and could not make it clear until she was ten that she hated the abuse and would do anything to stop it. Not surprisingly she suffered from anxiety and depression and had numerous problems growing up. She got married at age 25, and although the marriage ended in a divorce after twelve years, she reports that overall the marriage was a stabilizing force in her life. However she could never really enjoy sex with her husband, and she reports that for the entire twelve years of her marriage, she constantly had vivid dreams, both sexual and non-sexual, which involved a man whose identity is unclear. He is either her husband or her older brother. Sometimes she’s not sure who it is, and often the figure is both her husband and her brother at once. Here there is little question that the powerful emotion originally related to her sexual abuse were responsible for the

connections repeatedly made by her dreams between her brother and her husband, and the powerful combined images in her dreams.

I believe that the only quantitative research available to support this part of the theory is the research we reviewed earlier starting with the tidal wave dream. The research demonstrates that, at least when the emotion is strong and clear, the central dream imagery pictures the emotion, and the intensity of the image is a measure of the strength of the emotion.

There is a great deal of data on emotion in dreams, but it is only marginally relevant to our discussion of the Contemporary Theory. The focus of most studies has been the extent to which emotion occurs in dreams. Some early studies emphasized that emotion is only mentioned in about one third of dream reports (Snyder 1970), and even more rarely in laboratory collected dreams (McCarley and Hobson, 1979). Negative emotions usually predominate. However, when the dreamers are questioned in detail about emotion, emotions are found to be present in at least two thirds of dreams (Nielsen, et al. 1991). And the emotion is generally appropriate to the content of the dream (Foulkes et al 1988).

We have found that when an emotion is specifically mentioned in the dream report, it is almost always close to the emotion pictured by the CI. All this supports the fact that emotion is important in most dreams. Most clearly the emotion is pictured by the CI. In addition, the emotion is often, but not always felt by the dreamer in the dream, and then it may or may not be mentioned when the dream is written down or reported. Even in the powerful “tidal wave dreams” we have studied, after stress or trauma, the emotion (I was frightened, I was terrified, I felt overwhelmed) is not always written down. In a few cases where the powerful image – tidal wave or whirlwind -- had been reported but without any mention of emotion, I was able to interview the dreamer about emotion, and was told “ Oh yes, sure there was emotion. I was terrified. I thought that was obvious.”

This takes us back to points 4 and 5 of the theory, which we have already discussed in detail.

The entire focused waking-to-dreaming continuum has a function

We have now reviewed research providing strong support for all the tenets of the theory except the last one – point 6. This last point – that the entire continuum has a function -- is very difficult to prove definitively, as is any statement about function, but it appears self-evident. As we think of human beings living normal human lives, focused waking thought is obviously useful. It is clearly important and functional for us to be able to think directly and clearly, to accomplish a task, to make and carry out plans for the future. To take a very simple case, when we are in the outfield, trying to catch a fly ball, we turn our minds/brains insofar as possible into straightforward navigational machines to observe the ball’s trajectory and move in exactly the right way to meet it. We try not to let our emotional concerns or our daydreams influence us while we are engaged in this pursuit. We do not want to think broadly or widely. Similarly when we are balancing a checkbook or doing some kind of math problem, we want to focus directly and totally on the task for a time, with as little distraction as possible.

However, focused waking thought is not what we need all the time. It sometimes gets us into a channel or a rut. We miss the obvious similarities between boyfriend and father (see above). Our thinking is stuck in a rut and can't make the broad imaginative leaps sometimes required. This is where daydreaming and dreaming are useful. Dreaming has played a role in any number of new ideas in the arts and sciences (for a review see Barrett, 2001, Hartmann 1998). The broad connections of dreaming can also be useful in helping to make major decisions such as choosing one's direction or path in life (Hartmann 1998). There is no question in my mind that these abilities found in daydreaming and dreaming can be useful to us, and that a human being is thus better off (better adapted) when the full range of mental functioning is available, from focused waking thought to dreaming.

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Figure 1

SCORING DREAMS FOR THE CENTRAL IMAGE

Definition: A Central Image (contextualizing image) is a striking, arresting, or compelling image — not simply a story — but an image which stands out by virtue of being especially powerful, vivid, bizarre, or detailed.

List of Emotions

- | | |
|--|--------------------------------|
| 1. fear, terror | 11. power, mastery supremacy |
| 2. helplessness, vulnerability, being trapped, being immobilized | 12. awe, wonder, mystery |
| 3. anxiety, vigilance | 13. happiness, joy, excitement |
| 4. despair, hopelessness (giving up) | |
| 5. anger, frustration | |
| 6. disturbing — cognitive dissonance, disorientation, weirdness | |
| 7. guilt | 14. hope |
| 8. grief, loss, sadness, abandonment, disappointment | 15. peace, restfulness |
| | 16. longing |
| 9. shame, inadequacy | 17. relief, safety |
| 10. disgust, repulsion | 18. love (relationship) |

If there is a second contextualizing image in a dream, score on a separate line.

Dream ID#	1. CI? (Y/N)	2. What is it?	3. Intensity (rate 0 – 3)	4. What emotion?	5. Second emotion?

Figure 2

Figure 2: A Continuum

	Focused Waking thought	Looser, Less-structured Waking thought	Reverie free association daydreaming	Dreaming
What dealt with?	Percepts: Math symbols signs, words		fewer words, signs, more visual-spatial imagery	almost pure imagery
How?	logical relationship — If A then B		less logic, more noting or picturing of similarities, More metaphor	almost pure picture - metaphor
Self- reflection:	highly self-reflective — “I know I am sitting here reading.”		less self-reflective, more “caught up” in the process, the imagery	in “typical dreams” total <u>thereness</u> , no self-reflection
Boundaries:	solid divisions, Categorizations, thick boundaries		less rigid categorization, thinner boundaries	merging condensation loosening of categories, thin boundaries
Sequence of ideas or images:	$A \rightarrow B \rightarrow C \rightarrow D$	$A \rightarrow B$ \swarrow C \searrow D	$A \rightarrow B$ \swarrow C \searrow D	$A \leftrightarrow B \leftrightarrow C \leftrightarrow D$
Processing:	relatively serial; net functions chiefly as a feed-forward net.			net functions more as an auto-associative net.
Subsystems:	activity chiefly <u>within</u> structured			activity less <u>within</u> , <u>across</u> or <u>outside</u> of structured subsystems.

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