

Theory of Mind in Dreaming: Awareness of Feelings and Thoughts of Others in Dreams

David Kahn and Allan Hobson

Harvard Medical School

If the awareness of what others are thinking and the ability to attribute feelings to others characterizes both waking and dreaming consciousness, it suggests that a social species like man has a state-independent need for a theory of mind; that is, an ability to know that others have feelings. The authors performed 2 studies, the first of which consisted of 35 participants who submitted 320 dream reports containing more than 1,200 dream characters and the second consisted of 24 participants who submitted 151 dream reports with 543 dream events. Participants reported that as subjects in their own dreams they were aware that their dream characters had feelings and thoughts about them. This finding shows that awareness of what others are feeling is a robust aspect of consciousness that is maintained despite the changed chemistry and changed activation patterns of the brain's neuronal connections during dreaming.

KEY WORDS: dreaming, consciousness, theory of mind, social species, intentions of others

People take for granted the ability to know what others are thinking by observing their actions, their facial expressions, their body language. For example, if one sees a colleague take a book from a shelf, he or she assumes that the colleague wants to see something in the book. People are able to guess what is on another person's mind, though the guess might be wrong; that is, people are able to attribute mental states to others (Frith, 2001). If this same colleague opens the book to a particular page and one discerns that the expression on his or her face has changed from neutral to sad, one is able to guess that their colleague is feeling sad because of what he or she has just read. And if the colleague looks at one in a way that is inviting and also points to the page in the book, one assumes that our colleague would like us to look at this page. One is thus able to know what his or her colleague intends to communicate. One is able to process his or her colleague's mental state. People are able to think about their own and other people's thoughts and feelings.

David Kahn and Allan Hobson, Department of Psychiatry, Harvard Medical School.

We thank Chris Robles for helping with the data analysis in Study 2.

Correspondence concerning this article should be addressed to David Kahn, Department of Psychiatry, Harvard Medical School, The Landmark Center, 401 Park Drive, 2nd Floor East, Boston, MA 02215. E-mail: david_kahn@hms.harvard.edu

By the age of 4 or 5 years, children have this ability to “mentalize” or to read other people’s minds, that is, to have a “theory of mind” (Frith, 2003). It is this particular ability that autistic children lack to a significant degree. In the autistic spectrum, children are severely impaired in reading other people’s minds and emotions. This is what Baron-Cohen (1995) calls *mind blindness*. It is, however, true that autistic children and autistic adults often learn to use compensating mechanisms to learn what other people are thinking. Compensatory learning is needed because autistic people cannot attribute mental states to others (Frith, 2003). Compensatory learning is generally enhanced by inculcating other ways to function in a social setting, such as developing conscious and explicit rules for how to engage in conversation. Autistic individuals also learn about the social world and the way it works by making use of information about social interactions. There are many examples of people who function reasonably well on a social level by using such compensatory means. Although the way they relate socially to others is distinctly different because of their impaired ability to empathize, they are able to function in social relations (see Baron-Cohen, 2003 for examples of well known people with Asperger’s syndrome, a mild form within the autistic spectrum).

Empathy is defined by Baron-Cohen (2003) as the capacity to “. . . identify another person’s emotions and thoughts, and to respond to them with an appropriate emotion. . . . Empathy arises out of a natural desire to care about others” (p. 2). Baron-Cohen goes on to relate mind reading and a theory of mind to cognitive and affective aspects of empathy. The cognitive aspect of empathy is the ability to understand another’s feelings, to be able to take the other’s perspective, and to infer what people might be thinking or intending. The affective aspect is the ability to give the appropriate emotional response to another’s emotional state (Baron-Cohen, 2003). One cannot have empathy without an ability to attribute mental states to others, that is, to have a theory of mind (Frith, 2003).

The mechanism for a theory of mind was suggested by Leslie (1987) and further developed by many researchers including Baron-Cohen (1995, 2003), Frith (2001, 2003), Humphrey, (1984), and Dennett, (1987). Although there is general agreement on the neuroanatomical and neurodevelopmental origin of autism, much work has yet to be done to fully understand the neural bases for autism. At present, there is evidence that a functioning medial prefrontal cortex is necessary for a theory of mind and that autism may result from impaired functional connections between it and the superior temporal sulcus at the temporal parietal junction and the amygdaloid complex (Frith, 2001). It is noteworthy that all of these areas are highly activated during the REM stage of sleep (Maquet et al., 1996, 2000; Braun et al., 1997, 1998; Nofzinger et al., 2002). It would be interesting to determine whether these areas are not activated during the REM stage of sleep in autistic people.

We have shown that orientation (Hobson et al., 1987), thinking (R. Fosse, Stickgold, & Hobson, 2001b, 2004; Kahn and Hobson, in press), and episodic memory (M. J. Fosse, Fosse, Hobson, & Stickgold, 2003) may be quite limited during dreaming. Yet in a recent study about the number and kinds of feelings generated in dreams (Kahn, Pace-Schott, & Hobson, 2002), participants almost always reported that they were aware of what they and other characters were feeling within the dream. We also discovered that one pervasive aspect of participants’ dreams was the dreamer’s interest in what other people were feeling about

the dreamer. Another pervasive aspect of their dreams was the dreamer's interest in feelings about characters in the dream. These findings prompted us to perform a second study in which participants were explicitly asked about their interest in what dream characters were thinking about them. The reason for undertaking this second study was to directly confirm what information was indirectly gleaned from our first study.

We report here on the two studies whose data show the extent to which dreamers report feelings for their dream characters, their characters' feelings for the dreamer, feelings among characters and the extent to which the dreamer thinks about the intentions of dream characters. As we shall see, mind reading does occur in dreams of the healthy population we studied. The studies taken together provide some evidence that support Revonsuo's (2000) hypothesis that dreaming about the intentions of others may serve an adaptive function.

There is a significant literature on emotion and social interaction in dreams that have informed our two studies. These include Bechara, Damasio, and Damasio (2000); Bechara, Damasio, Damasio, and Anderson (1994); Cicogna, Cavallero, and Bosinelli (1991); Dennett (1987); Derryberry and Tucker (1992); Domhoff (2001, 1999); R. Fosse (2001); R. Fosse et al. (2001a); Hall and Van de Castle (1966); Hall, Domhoff, Blick, and Weesner (1982); Hall (1951); Hamann (2001); Merritt, Stickgold, Pace-Schott, Williams, and Hobson, (1994); Newell and Cartwright (2000); Nielsen, Deslauriers, and Baylor (1991); and Schredl and Doll (1998). In particular, Pace-Schott (2001, 2004) has directly addressed the questions we have sought to understand, our ability to imagine the intentions of others in our dreams.

METHOD

Study 1 asked participants to report on the feelings that they and their dream characters experienced. This study consisted of 35 participants (17 men, 18 women) who took a course in the Spring of 1999 called "The Biopsychology of Waking, Sleeping, and Dreaming" at the Harvard University Extension School. As a result of open enrollment of the general public, the age range of the participants varied from late teens to the elderly, with the majority being in their 20s and 30s. Similarly, their level of prior education varied from high school to graduate school. The participants were asked to write down their dreams over a 2-week period and to record specifics about characters that appeared in their dreams. Institutional Review Board approval and informed consent were obtained. The participants were also asked to list all of the characters that appeared in their dreams, to record whether these characters evoked feelings in the dreamer, whether the dream character had feelings for the dreamer, and whether dream characters had feelings for one another. If a group of characters appeared in a crowd, this was scored as one character. The study was structured as a graded class exercise, which helped motivate students to comply with the complex instructions that followed. The students were instructed to record their dreams on a dream report form as soon as possible after waking, to sequentially number the characters in the dream on the dream report form, and to complete entries in that day's character log for each character in the dream of the night. Additional details for each character were

entered in the dream character detail log. The 35 participants returned 320 dream reports containing 1,205 dream characters over a 2-week period. The details of this study have been reported elsewhere (Kahn et al., 2002).

In Study 2, participants were asked to write down their dreams upon waking and were asked to report whether they wondered what their dream characters were thinking during the dream. Specifically, the participants were asked “In the dream, did you notice whether you were wondering, thinking, or being concerned about a dream character’s thoughts or intentions? (Y, N, ?). Comments?” This study consisted of 24 participants (15 women, 9 men) between 18 and 22 years of age attending a local college in 2004 who were not familiar with dream studies. The participants met with the experimenters on three different occasions for 90 min. sessions. During these sessions, the experimenters explained the project to the participants who were encouraged to ask questions about what the experiment was about. They were told that we were interested in finding out whether during the dream they were thinking, wondering, or were concerned with what their dream characters were thinking about them during the dream. To limit demand characteristics, the participants were repeatedly assured that the hypothesis of the study was unproven and that their honesty and thoroughness were essential to its scientific integrity.

All participants were told that after writing down a dream, they should pick out segments or scenes of the dream in which they were thinking. These were called *dream events*. The participants themselves defined a dream event as one in which some thinking occurred. If there was a character in the event, they were told to answer *yes*, *no*, or *do not recall* to the question “In the dream, did you notice whether you were wondering, thinking, or being concerned about a dream character’s thoughts or intentions? (Y, N, ?), Comments?” The participants provided comments to accompany their answers. If there was no character present, they were told to leave the answer blank. The 24 participants returned 151 dream reports consisting of 543 dream events over a 2-week period.

Both studies thus used an affirmative probe. Our protocol did not use judges to read and glean information from the reports. Instead, we asked the participants themselves to provide the information sought by those conducting the study. The advantages and disadvantages of the affirmative probe methodology has been discussed elsewhere (Kahn, Pace-Schott, & Hobson, 2002; Kahn & Hobson, 2002). Although participants were instructed to write down their feelings as they occurred during the dream, we cannot rule out the possibility that some participants may have erroneously reported feelings that occurred only upon waking. We believe this overinclusiveness was minimized in our studies because of the extensive instructions given to the participants.

Results From Study 1

On average, participants submitted over nine dream reports ($SD = 6.1$) over the 2-week period. On the average, each report contained 229 words ($SD = 138$). The descriptive statistics for the number of reports, number of words per report, and the total number of characters per report (not including the dreamer) are shown in Table 1. It is worth noting that the dream subject of social encounters is

Table 1. Study 1: Descriptive Statistics for Dream Reports, Words per Dream Report, and Dream Characters per Dream Report Using the Statistical Statview 5.0 Software Package

Descriptive statistic	<i>M</i>	<i>SD</i>	<i>SE</i>	No. of participants	Minimum	Maximum	No. missing
No. reports	9.143	6.141	1.038	35	1.000	37.000	0
Words per report	228.683	137.669	23.270	35	63.429	786.000	0
Dream characters per report	3.999	2.104	0.356	35	1.000	9.000	0

common as evidenced by there being almost four dream characters per dream report, or five dream characters per dream report if we also include the dreamer. This aspect of dreams being highly social with this many dream characters is in agreement with the norms found previously (Hall et al., 1982; Hall & Van de Castle, 1966).

Feelings Are Associated With Dream Characters in Almost Every Dream Report

Participants reported that characters in almost every dream evoked feelings in them (as dreamer). The statistics are that participants reported that such feelings were absent in only 19 out of 320 dream reports (6%). In other words, in 301 out of 320 dream reports (94%), the dreamer reported that feelings were evoked in him by the presence or the actions of a dream character.

Feelings Are Attributed to Dream Characters by the Dreamer

In addition to stating that feelings were evoked by the presence of dream characters, the dreamer also stated that, in the dream, feelings were attributed to dream characters. That is, the participant thought that dream characters were feeling something toward or about him or her. The statistics are that in 264 out of 320 dream reports (82.5%) there was at least one dream character who was reported by the participant to have had some feeling for the dreamer. These findings are tabulated in Table 2.

We can get an idea of the kinds of feelings that were being reported from reading the excerpts below that were taken from the dream reports of several participants in the study:

Table 2. Study 1: Participants' Reports of Their Feelings Within the Dream (as Dreamer) and Their Characters' Feelings

Subjects' report of their feelings within the dream as dreamer	No. reports	% Reports
Subject reports no feeling evoked from a dream character	19	6.0
Subject reports one or more feelings evoked from a dream character	301	94.0
Subject attributes no feeling to a dream character	56	17.5
Subject attributes one or more feelings to a dream character	264	82.5

Table 3. Study 1: Descriptive Statistics per Dream Report Using the Statistical Statview 5.0 Software Package

Descriptive statistic	<i>M</i>	<i>SD</i>	<i>SE</i>	No. of participants	Minimum	Maximum	No. missing
SubjFeel/Rpt	4.104	2.960	0.500	35	0.167	16.000	0
ChFeel/Rpt	2.347	2.056	0.347	35	0.167	11.000	0
ChChFeel/Rpt	1.228	1.293	0.218	35	0.000	5.286	0

Note. SubjFeel/Rpt = feelings evoked in the dreamer by his or her dream characters; ChFeel/Rpt = feelings attributed to the dream characters by the dreamer; ChChFeel/Rpt = feelings among the dream characters.

I was on a beach with an unidentified companion. It was a romantic setting. The person had feelings for me and I for her.

. . .but then I felt that he was not playing seriously and he was trying to lose, so that I can feel better.

I notice that there's a man sitting at the first table in the café staring at me. I do not know him, but I somehow know that he wants to have sex with me.

Feelings per Dream Report and per Dream Character

For each participant, a mean value was calculated from which we derived an overall mean value. This procedure minimizes the influence of any 1 participant. On the average a participant reported experiencing more than four feelings in each dream as shown in Table 3. On the average more than two feelings per dream report were attributed to dream characters. These characters were identified as having feelings about the dreamer. The participant also reported being aware of feelings between dream characters. Table 3 gives the descriptive statistics for the feelings in the dreamer and in the dreamer's dream characters per dream report. Table 4 gives the descriptive statistics for the feelings in the dreamer and in the dreamer's dream characters per dream character.

Results From Study 2

In our second study there were 24 subjects between the ages of 18 and 22. For each participant a mean value was calculated from which we derived an overall

Table 4. Study 1: Descriptive Statistics per Dream Character Using the Statistical Statview 5.0 Software Package

Descriptive statistic	<i>M</i>	<i>SD</i>	<i>SE</i>	No. of participants	Minimum	Maximum	No. missing
SubjFeel/Ch	1.061	0.527	0.089	35	0.077	2.600	0
ChFeel/Ch	0.586	0.327	0.055	35	0.077	1.312	0
ChChFeel/Ch	0.310	0.231	0.039	35	0.000	1.000	0

Note. Subjects could have more than one feeling for a dream character. SubjFeel/Ch = feelings evoked in the dreamer by his or her dream characters; ChFeel/Ch = feelings attributed to the dream characters by the dreamer; ChChFeel/Ch = feelings among the dream characters.

Table 5. Descriptive Statistics for the Mean Number of Reports, Words per Report, and Dream Events per Report for Study 2 Using the Statistical Statview 5.0 Software Package

Descriptive statistic	<i>M</i>	<i>SD</i>	<i>SE</i>	No. of participants	Minimum	Maximum	No. missing
No. rpts	6.292	2.596	0.530	24	3.000	12.000	0
Words/rpt	218.718	115.698	23.617	24	79.200	445.667	0
Drm events/rpt	3.939	2.126	0.434	24	0.800	8.333	0

Note. rpt = report; Drm events/rpt = dream events per report.

mean value. On the average, participants submitted over 6 dream reports ($SD = 2.6$) over a 2-week period. On the average each report contained 219 words ($SD = 116$) and contained nearly 4 dream events ($SD = 2.1$) per report as identified by the participants. The descriptive statistics are shown in Table 5.

Participants were asked, "In the dream event, did you notice whether you were wondering, thinking, or being concerned about a dream character's thoughts or intentions?" Figure 1 shows the participants' answers to this question. Participants could answer *yes*, *no*, or *do not recall*. Participants reported that they were aware of a dream character's thoughts or intentions twice as often as they reported not being aware of a dream character's thoughts or intentions.

DISCUSSION

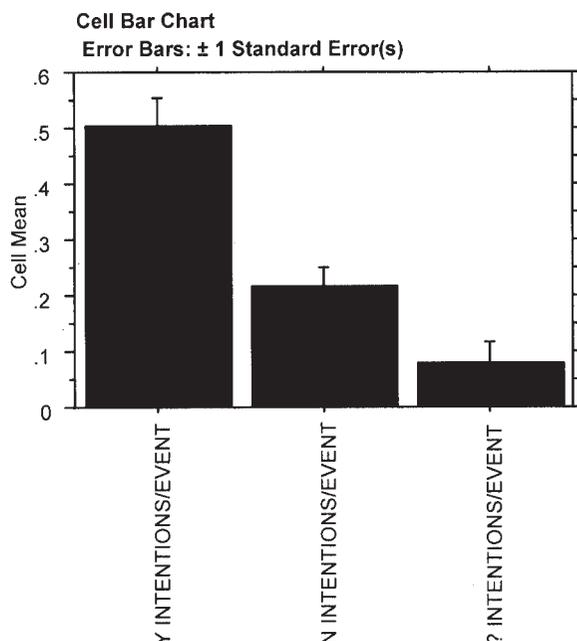
In Study 1 we showed that in over 80% of the dreams, participants encountered at least one character who had feelings for the dreamer; and in more than 90% of dreams, participants had feelings associated with dream characters (see Table 2). In Study 2 we showed that participants wondered what the intentions of their dream characters were (see Figure 1).¹ Thus, a significant amount of time is spent wondering what dream characters are thinking or planning. Some thoughts are positive: *As he holds me I feel a mix of love and desire for him, and I know he feels the same*, whereas others are negative: *Then I am in the office and looking up at the man I do not trust and then I know that he intends to kill me*, and still others are contemplative as in *I notice that there's a man sitting at the first table in the café staring at me. I do not know him, but I somehow know that he wants to have sex with me*.

Are these dream experiences simply a reflection of our waking concerns, and/or, do they perhaps help prepare us for social encounters in our waking life? We speculate that dreaming about the intentions of others might reflect more than a simple continuity between our waking and dream lives. Because thinking about the intentions of others is important to survival in a social species, it might be important enough to occur in both dreaming and waking. We both live and dream our awareness of the feelings of others. That this awareness cuts across both waking and dreaming consciousness suggests to us that man (and other social animals) have

¹ We note that very similar results were obtained on a per report basis as well as on a per dream event basis; namely, that there were twice as many *yes* answers to the question about being aware of a dream character's thoughts as not being aware. The difference between the *yes* and the *no* answers was highly significant ($p = .0016$).

Descriptive Statistics

	Mean	Std. Dev.	Std. Error	Count	Minimum	Maximum	# Missing
Y INTENTIONS/EVENT	.504	.253	.052	24	.091	1.000	0
N INTENTIONS/EVENT	.215	.168	.034	24	0.000	.524	0
? INTENTIONS/EVENT	.080	.178	.036	24	0.000	.636	0



Paired t-test

Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
Y INTENTIONS/EVENT, N INTENTIONS/EVENT	.289	23	4.427	.0002
Y INTENTIONS/EVENT, ? INTENTIONS/EVENT	.425	23	5.917	<.0001
N INTENTIONS/EVENT, ? INTENTIONS/EVENT	.135	23	2.537	.0184

Figure 1. Study 2. Top: Descriptive statistics for participants’ answers to the question “In the dream event, did you notice whether you were wondering, thinking, or being concerned about a dream character’s thoughts or intentions?” If the answer was *yes* this is shown as (Y Intentions/Event). If the answer was *no* this is shown as (N Intentions/Event). If the participant reported unable to recall this is shown as (? intentions/event). Middle: Graphical representation of above. Bottom: paired *t* test showing that the difference between *yes* responses (Y Intentions/Event), *no* responses (N Intentions/Event) and *cannot recall* responses (? intentions/event) that their dream characters were thinking about them was statistically significant.

a need for a theory of mind, that is, for knowing what are the intentions of others. Dreaming about the intentions of others could, therefore, prepare us for social encounters when awake. Perhaps, one function of dreams is to prepare us for social encounters when we are awake, to flee, fight, or mate.

The two studies undertaken here support the idea that dreaming may provide a simulation of waking life as suggested by Revensuo (2000), though not restricted to only threatening events. Instead, the data of these studies suggest that if dreaming is a simulation process, it is a simulation that provides a way of knowing and dealing with the intentions of others, both positive and negative.

In closing, it is important to emphasize that although our data support the idea that dreaming provides a simulation of waking life, the data does not prove this functional interpretation. Further studies are needed to provide evidence both in support of this functional interpretation and in response to the suggestion that dreaming may be a simulation of “social intelligence,” not simply a simulation of threatening events. The data does indicate that a theory of mind is state independent occurring in both the waking and dream states.

REFERENCES

- Baron-Cohen, S. (1995). *Mindblindness: An essay on autism and theory of mind*. Cambridge, MA: MIT Press.
- Baron-Cohen, S. (2003). *The essential difference*. New York: Basic Books.
- Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, *50*, 7–15.
- Bechara, A., Damasio, H., & Damasio, A. R. (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral Cortex*, *10*, 295–307.
- Braun, A. R., Balkin, T. J., Wesensten, N. J., Carson, R. E., Varga, M., Baldwin, P., et al. (1997). Regional cerebral blood flow throughout the sleep-wake cycle. *Brain*, *120*, 1173–1197.
- Braun, A. R., Balkin, T. J., Wesensten, N. J., Gwady, F., Carson, R. E., Varga, M., et al. (1998, January 2). Dissociated pattern of activity in visual cortices and their projections during human rapid eye-movement sleep. *Science*, *279*, 91–95.
- Cicogna, P., Cavallero, C., & Bosinelli, M. (1991). Cognitive aspects of mental activity during sleep. *American Journal of Psychology*, *104*, 413–425.
- Dennett, D. (1987). *The intentional stance*. Cambridge, MA: MIT Press.
- Derryberry, D., & Tucker, D. M. (1992). Neural mechanisms of emotion. *Journal of Consulting and Clinical Psychology*, *60*, 329–338.
- Domhoff, G. W. (1999). New directions in the study of dream content using the Hall/Van de Castle coding system. *Dreaming*, *9*, 115–137.
- Domhoff, G. W. (2001). A new neurocognitive theory of dreams. *Dreaming*, *11*, 13–33.
- Fosse, M. J., Fosse, R., Hobson, J. A., & Stickgold, R. J. (2003). Dreaming and episodic memory: A functional dissociation. *Journal of Cognitive Neuroscience*, *15*, 1–9.
- Fosse, R. (2001). REM sleep: A window into altered emotional functioning. *Sleep*, *24*, A178.
- Fosse, R., Stickgold, R., & Hobson, J. A. (2001a). The mind in REM sleep: Reports of emotional experiences. *Sleep*, *24*, 1–9.
- Fosse, R., Stickgold, R., & Hobson, J. A. (2001b). Reciprocal variation in thoughts and hallucinations. *Psychological Science*, *12*, 30–36.
- Fosse, R., Stickgold, R., Hobson, J. A. (2004). Thinking and hallucinating: Reciprocal changes in sleep. *Psychophysiology*, *41*, 298–305.
- Frith, U. (2001). Mind blindness and the brain in autism. *Neuron*, *32*, 969–979.
- Frith, U. (2003). *Autism* (2nd ed.). Oxford, England: Blackwell.
- Hall, C. S. (1951). What people dream about. *Scientific American*, *184*, 60–63.
- Hall, C. S., Domhoff, G. W., Blick, K. A., & Weesner, K. E. (1982). The dreams of college men and women in 1950 and in 1980: A comparison of dream contents and sex differences. *Sleep*, *5*, 188–194.
- Hall, C. S., & Van de Castle, R. L. (1966). *The content analysis of dreams*. New York: Appleton-Century-Crofts.

- Hamann, S. (2001). Cognitive and neural mechanisms of emotional memory. *Trends in Cognitive Sciences*, 5, 394–399.
- Hobson, J. A., Hoffman, E., Helfand, R., & Kostner, D. (1987). Dream bizarreness and the activation-synthesis hypothesis. *Human Neurobiology*, 6, 157–164.
- Humphrey, N. (1984). *Consciousness regained*. England: Oxford University Press.
- Kahn, D., & Hobson J. A. (2002). Stereotypical gender-based emotions are not detectable in dream reports. *Dreaming*, 12, 209–222.
- Kahn, D., & Hobson, J. A. (in press). State-dependent thinking: A comparison of waking and dreaming thought. *Consciousness and Cognition*.
- Kahn, D., Pace-Schott, E. F., & Hobson, J. A. (2002). Emotion and cognition: Feeling and character identification in dreaming. *Consciousness and Cognition*, 11, 34–50.
- Leslie, A. (1987). Pretence and representation: The origin of “theory of mind.” *Psychological Review*, 94, 412–426.
- Maquet, P., Laureys, S., Peigneux, P., Fuchs, S., Petiau, C., Phillips, C., et al. (2000). Experience-dependent changes in cerebral activation during human REM sleep. *Nature Neuroscience*, 3, 831–835.
- Maquet, P., Peteres, J. M., Aerts, J., Delfiore, G., Degueldre, C., Luxen, A., & Franck, G. (1996, September). Functional neuroanatomy of human rapid-eye-movement sleep and dreaming. *Nature*, 383, 163.
- Merritt, J., Stickgold, R., Pace-Schott, E., Williams, J., & Hobson, J. A. (1994). Emotion profiles in the dream reports of men and women. *Consciousness and Cognition*, 3, 46–60.
- Newell, P. T., Cartwright, R. D. (2000). Affect and cognition in dreams: A critique of the cognitive role in adaptive dream functioning and support for associative models. *Psychiatry*, 63, 34–44.
- Nielsen, T. A., Deslauriers, D., & Baylor, G. W. (1991). Emotions in dream and waking event reports. *Dreaming*, 1, 287–300.
- Nofzinger, E. A., Buysse, D. J., Miewald, J. M., Meltzer, C. C., Price, J. C., Sembrat, R. C., et al. (2002). Human regional cerebral glucose metabolism during non-rapid eye movement sleep in relation to waking. *Brain*, 125, 1105–1115.
- Pace-Schott, E. F. (2001, Summer). “Theory of mind”: Social cognition and dreaming. *SRS Bulletin*, 7, 33–36.
- Pace-Scott, E. F. (2004). Postscript: Recent findings on the neurobiology of sleep and dreaming. In E. F. Pace-Scott, M. Solms, M. Blagrove, & S. Harnad (Eds.), *Sleep and dreaming: Scientific advances and reconsiderations* (pp. 335–350). England: Cambridge University Press.
- Revonsuo, A. (2000). The reinterpretation of dreams: An evolutionary hypothesis of the function of dreaming. *Behavioral and Brain Science*, 23, 877–901.
- Schredl, M., & Doll, E. (1998). Emotions in diary dreams. *Consciousness and Cognition*, 7, 634–646.