Dreams are embodied simulations that dramatize conceptions and concerns: The continuity hypothesis in empirical, theoretical, and historical context

Commentary on "The continuity and discontinuity between waking and dreaming: A Dialogue between Michael Schredl and Allan Hobson concerning the adequacy and completeness of these notions"

G. William Domhoff

Psychology Department, University of California, Santa Cruz, USA

The Schredl/Hobson discussion of continuity and discontinuity between dreaming and waking goes astray from the outset because Schredl provides an inadequate characterization of Calvin S. Hall's "continuity hypothesis" in his opening statement and in Box 1. More generally, their discussion minimizes and trivializes Hall's main ideas and findings to the borderline of caricature. His continuity hypothesis and its anticipation of later developments in cognitive psychology deserve better.

To grasp and appreciate the power and importance of the continuity hypothesis, it is necessary to explain the empirical, theoretical, and historical context within which Hall presented it, and to report the refinements he and others made to it that are not alluded to in the Schredl/Hobson discussion. Only then is it possible to realize that both Schredl and Hobson are wrong in their separate ways about the nature of the continuity hypothesis, and about dreaming more generally. Such a discussion also makes it possible to show how the continuity hypothesis played a key role in the expansion of Hall's cognitive theory of dreams into the present-day idea that dreams are embodied simulations, which enact (dramatize) the "conceptions" and "concerns" at the heart of Hall's theory.

Trained as a purposive behaviorist and behavioral geneticist at the University of California, Berkeley, in the early 1930s by two of the leading figures in American psychology at the time, Edward Chace Tolman and Robert Tryon, Hall made several original contributions to understanding the inheritance of temperament and emotionality through the careful breeding of rats and mice in the first decade of his research career (Domhoff, 2002; Lindzey, 1985). He then turned his attention to the study of dream content and dream meaning in the early 1940s with the same attention to appropriate sample sizes, detail, and quantification that characterized his work in behavior genetics. He began by collecting and reading through thousands of dream reports from students in college classrooms, which slowly led to an emphasis on thematic analyses of short dream series from individual students as well as a set of categories that could be used to classify and quantify most of the elements that appear regularly in dreams, such as settings, characters, social interactions, emotions, objects, and descriptive adjectives.

Although Hall always had great respect for the work of Freud and Jung on dreams, and incorporated many of their ideas into this own thinking, especially in the case of Freud, he was also gently critical of them by the early 1950s because he had concluded that most dreams are more transparent than they claimed and had a direct relationship to personal concerns of which most dreamers are well aware. According to Hall, both Freud and Jung overemphasized the discontinuities between waking thought and dreams in their theorizing, Freud through the idea that dream meaning was disguised by the dreamwork, Jung through his key concept that many dreams were compensatory for aspects of the psyche that were underdeveloped in waking life. Hall's belief that dreams were more continuous than discontinuous with waking thought than Freud or Jung claimed was already apparent in his first published empirical paper on dreams, "Diagnosing Personality By the Analysis of Dreams" (Hall, 1947), but the paper did not present an alternative theory or discuss continuity and discontinuity.

This 1947 paper, the first of many by Hall and/or his numerous graduate students, made use of thematic analyses of diaries containing 15 to 25 dreams from each of several college students. However, the "blind analyses" (that is, the inferences were based only on the dream texts) made clear that he believed that dreams were embodiments of people's primary conflicts, concerns, and preoccupations. Shortly thereafter, he published a quantitative paper on "What People Dream About" in The Scientific American (Hall, 1951), which used a preliminary form of the later Hall and Van de Castle (1966) coding system to make frequency counts for a wide variety of dream elements. Among many things, it showed that people don't dream very often about politics, economics, or the mundane routines of their everyday lives. So Hall knew decades before Ernest Hartmann (2000), who is given credit for this kind of discovery by Schredl and Hobson, that most dreams are about personal concerns, not about how many hours of the day are spent on reading, writing, working, or one task for another. (And just for the record, David Foulkes (1982), another cognitively oriented dream researcher, reported the same kind of finding for children ages 3.5 to 14 in his classic study of their dreams

Corresponding address:
Prof. G. William Domhoff, Department of Psychology, University of California, Santa Cruz, 95064, USA.
E-mail: domhoff@ucsc.edu

inside and outside the sleep laboratory, well before the Hartmann publication in the year 2000; children spend most of their time in school or watching TV, but that's not what they dream about.) I mention these studies by Hall and Foulkes not only so readers can see the empirical basis of their cognitive theorizing, but also so they can begin to understand just how much of the scientific literature on dreams that Schredl and Hobson have ignored or overlooked throughout their discussion.

Hall's thematic and quantitative studies of thousands of dreams led to a paper entitled "A Cognitive Theory of Dreams," published in the Journal of General Psychology in 1953, as well as to "A Cognitive Theory of Dream Symbols" in the same year in the same journal (Hall, 1953a, 1953b). The cognitive theory of dreams paper claimed that dreams dramatize a person's conceptions of self, family, friends, impulses, and personal conflicts; the images of a dream, Hall wrote, are the "embodiment of thoughts." A dream "resembles a motion picture or dramatic production in which the dreamer is a participant-observer." (This paper can be found on line on dreamresearch.net at http://psych.ucsc.edu/dreams/Library/hall_1953b.html)

In particular, the emphasis is on "conceptions" as ideas that we have about ourselves, our friends, and our personal conflicts. For example, does a given dreamer conceive of him or herself as weak or fearful, do they conceive of their father as arbitrary, is sexuality conceived of as enjoyable, and so on. These conceptions are inferred from how dreamers portrays themselves, others, and social interactions. Are they always portrayed, for example, as the victims in aggressive interactions, which leads to the inference that they conceive of themselves as weak? Hall's emphasis on conceptions as the key to dreaming meaning is best expressed in the following formulation, which encompasses what Hobson means with his unnecessary and off-putting neologism, "autocreative," in his discussion with Schredl:

> *"If dreaming is defined as thinking that occurs during sleep, and if thinking consists essentially of generating ideas, then dreaming is also a process of conceiving and the resulting dream images may be viewed as the embodiment of conceptions. That which is invisible, namely a conception, becomes visible when it is transformed into a dream image. The images of a dream are pictures of conceptions. A dream is a work of art which requires of the dreamer no particular talent, special training, or technical competence. Dreaming is a creative enterprise in which all may and most do participate."*

The paper also added complexity to these basis ideas in two ways. First, it noted that dreamers have more than one conception of themselves and the main people in their lives. Mothers can be conceived of as supportive in some contexts, but as restraining in others, for example. These different conceptions for self and others in different contexts become readily apparent if enough dreams from the person are available. Secondly, Hall emphasized that "Conceptions are organized into conceptual systems, and these systems are the antecedents of behavior." Thus, he arrives at a complex view of the dreaming mind through the idea of "conceptual systems," even though he begins with the simple idea that dreams express conceptions and concerns, and he links dreaming and waking thought by stressing that conceptual systems are "the antecedents of behavior."

Hall's other 1953 paper presented a metaphoric theory of dream symbols, based on the work of the philosopher Suzanne Langer, Philosophy in a New Key (1948). Drawing on Langer's understanding of metaphor in waking thought, this paper expressed several empirical objections to Freud's disguise theory of symbolism on the basis of studies of student dreams. Hall's basic conclusion was that metaphoric expressions in dreams were sometimes used in dreams because they best expressed a conception, just as metaphors are so used in waking life. As part of this argument, he presented his study of sexual slang in English-speaking countries, showing that the "Freudian" sex symbols in dreams were all present in waking slang for the genitals and sexual intercourse. The paper's reference to the four principal tropes in everyday speech—synecdoche, metonymy, metaphor, and irony--anticipated theorizing about the dreamwork as based on waking tropes by cognitive linguist George Lakoff (1997). In other words, the emphasis of Hall's second 1953 paper is on the continuity between waking thought and dreaming in the seemingly arcane study of "dream symbolism," but he does not use the term "continuity."

During the 1950s Hall and his graduate students did many studies that attempted to relate dream content to personality through the use of both projective techniques and objective tests, but the correlations were very low at best and did not lead in any new directions. Moreover, Hall (1953/1966), in a new introduction to the second edition of his popular book, The Meaning of Dreams, reported he had been wrong in his inferences about the personalities and leadership qualities of two of the 17 mountain climbers who wrote down their dreams for several weeks as one part of a larger study of the 1963 American Mount Everest Expedition. The two men he thought were the most popular, the most psychologically mature, and the most effective leaders turned out of be "the least liked, the most immature, and had no leadership or morale building assets whatsoever." Hall (1953/1966, p. xx) called it a "sobering experience" to discover "the enormity of the misjudgments that can be made in assessing a person's waking behavior from his dreams."

However, these failures led Hall to a new conclusion, which I summarized in my 1996 book, Finding Meaning in Dreams, a book that is in good part a compilation of his ideas and findings. Dreams do not tell us much if anything about personality. Instead, they tell us what is on the dreamer's mind, with the point being that people with very different personalities could have similar conceptions and concerns, such as fears of a mother that they conceive of as domineering, or fears that a pregnancy might end with a miscarriage or a deformed baby. Drawing on Hall's words in various places, and my hundreds of substantive conversations with him between 1959 and 1985, I summarized his thinking on this issue as follows:

> *"Because of the meager findings with personality tests for both dream content and daydream themes, we have adopted a new working assumption: dream content may not be about "personality" in the usual sense of the term. Instead, dream content may provide us with different information about people than most personality tests do. Since we have found dream content reveals conceptions and concerns, that should be our starting point in developing or selecting objective tests for the study of the correspondence between dream content and waking behavior" (Domhoff, 1996, p. 157). (This chapter can be found in the dream library on dreamresearch.net at http://psych.ucsc.edu/dreams/Library/fmid8.html .)*

It was not until Hall began to study dream series from adults about whom he could find considerable autobiographical or biographical information, or who were available to respond to the inferences he drew from a blind analysis of their dream series, that he made any progress in understanding the relationship between dreaming and waking thought, and to conceptualize this relationship in terms of "continuity." Although Hall (1968, p. 65) briefly introduced this notion in a semi-popular paper in Psychology Today on the personal dreams written down by Freud and Jung by saying that "frequencies and proportions" show that "there are important continuities between dreams and waking life," his work on dream series and their relationship to waking thoughts and behavior began in earnest with his co-authored 1970 book on the Dreams, Life, and Literature of Franz Kafka, which was based on a content analysis of the 37 dreams in Kafka's diaries (Hall & Lind, 1970). After making various predictions about Kakfa's waking conceptions and concerns that derived from a comparison of the content findings for Kafka with the male norms that he and Van de Castle developed for their methodological book, The Content Analysis of Dreams (1966), Hall and his co-author turned to a careful reading of Kafka's diaries and letters, which they had purposely ignored up to this point, as well as to a reading of biographies and remembrances of Kafka. The final chapter, on "Realizations," begins by noting that "modern dream theories," for all their differences," all emphasize that dreams are "discontinuous with waking life" (Hall & Lind, 1970, p. 89).

Contrary to all the theorists who emphasized discontinuity, the chapter continues with the following statement, which explains Hall's emphasis on "continuity" and puts his choice of terms in the historical context of the past discontinuity theorists that are ignored by Schredl and Hobson in their discussion of the continuity hypothesis: "This study of Kafka's dreams in relation to his life indicates that dreams are more likely to be continuous with waking life" (Hall & Lind, 1970, p. 89). In other words, the idea of "continuity" was not trivial or obvious at the time Hall wrote, contrary to what Hobson implies in his discussion with Schredl. It was a frank disagreement with Freud and Jung. However, the concept of a "continuity hypothesis" is not introduced in this book.

The Kafka book was followed a year later by Hall's study of the 1,368 dreams that a child molester wrote down over a four-year period between 1963 and 1967 for his own reasons and later gave to a clinical psychologist at the prison mental hospital in which he was incarcerated (Bell & Hall, 1971). Due to the huge sample size, Hall was able to make many inferences that were supported by clinical materials collected by the psychologist at the facility and by the dreamer's written replies to questions formulated by Hall. In this study Hall drew on his earlier finding that the frequency of an element in a series or set of dream reports reveals the intensity of a concern. For example, if a person dreams far more frequently about his mother than is the case for the male norms, as this dreamer did, "it is inferred that the mother plays an important role in his life," as was indeed the case in this instance (Bell & Hall, 1971, p. 117). There then follows the first mention of the continuity hypothesis, with the italics in the original sentence: "This may be called the *continuity hypothesis* because it assumes there is a continuity between dreams and waking life." Please note that the hypothesis concerns the content of the dreams, that is, the quantifiable elements in the dream reports, not the kind of discontinuity issues unrelated to dream content that Hobson emphasizes in belittling the concept (gee, we don't even realize we are in bed and asleep while we are dreaming).

It is also important to add that the sentence I just quoted is followed by a qualifying statement showing that further work was needed to refine the concept: "There are difficulties with this hypothesis as we have seen, but first let us reconsider some of the kinds of information that dreams provide" (Bell & Hall, 1971, p. 117). And what are the "difficulties" that Hall is alluding to? Sometimes the continuity is with both waking thought and behavior, but sometimes only with waking thought. The clearest examples of continuity with only waking thought had to do with sexual and aggressive elements, which also has proved to be the case with dreamers other than the child molester. Dreamers often fantasize about sex in waking life, or about sex with specific persons, but it doesn't follow in all cases that they are sexually active, or are having sexual relations with the person they are fantasizing about. But I don't think this is a "difficulty," as Hall calls it, or even a problem. It is an example of how a new hypothesis can lead to findings that send us in new directions. In this instance, for example, it causes us to ask if there are aspects of dream content that can allow us to distinguish between dream portrayals that are related only to fantasies and those that are related to waking behavior as well as waking preoccupations.

Hall did further studies related to the continuity hypothesis, adding new wrinkles and evidence, until shortly before his death in 1985. Some of them are discussed in the popular book by Hall and his research assistant, Vernon Nordby, The Individual and His Dreams (1972), which is the only publication concerning the continuity hypothesis mentioned by Schredl, other than his own papers in the early 2000s. But for those who are interested in the scientific study of dream content and in learning more about the continuity hypothesis, the starting should be the chapter in Finding Meaning in Dreams entitled "The Continuity Between Dreams and Waking Life," which brought together and summarized the key aspects of all the work Hall and others did related to the continuity hypothesis, including the studies of Freud and Jung, Kafka, and the child molester (Domhoff, 1996, Chapter 8). http://psych.ucsc.edu/dreams/Library/fmid8.html

The chapter in Finding Meaning in Dreams also spells out the mistaken inferences Hall drew and the lessons that were learned from them. In the case of the child molester, for example, Hall inferred based on several dreams in which the dreamer was masturbating that he was a frequent and compulsive masturbator. However, the dreamer said this was untrue and noted that he was able to resist urges to masturbate for weeks at a time. He thought masturbation was wrong and often felt depressed afterwards (1971, pp. 25, 94). He worked hard to overcome his preoccupation with his body and was very interested in spirituality and meditation. Hall and his co-author (1971, p. 96)) therefore concluded that "an analysis of the dream content reveals very little about his defensive maneuvers," which is a very useful lesson that was taken into account in future studies.

The chapter includes a detailed unpublished study Hall did of 58 dreams from a neurotic patient in psychotherapy, in which Hall's 42 inferences were corroborated or rejected by the psychotherapist. Most of his inferences proved to be correct, but it is his mistakes that were the most useful. In particular, he wrongly inferred on the basis of only one dream, a dream in which the patient and his brother were

trapped in their mother's apartment, but did not interact with her, that he had a negative relationship with his mother. This inference proved to be quite wrong. Hall in effect over generalized when he explained, "I figured that anyone who had such poor relations with women, including his wife, and then has a dream in which he is trapped in her apartment, must also have poor relations with his mother." The lesson here is that hostility toward a general category, such as women, should not be presumed to include specific significant others who are included in that category unless there is hostility toward them as well. In effect, Hall fell back on psychodynamic theory in making this inference rather than relying on specific portrayals of interactions within several dreams. This mistake was not repeated again.

There's also the very interesting case of Karl, an engineer in his early 30s who sent Hall over 1,000 dreams and mailed Hall detailed answers to his inferences. Once again, Hall got most things right, but it is the mistakes that are useful for further understanding. First of all, Karl had many highly aggressive dreams, especially toward his father, so Hall inferred he got into fights occasionally and harbored generally angry feelings, but Karl reported that he never engaged in fights and regarded himself as being a friendly, warmhearted, peaceful person. In this instance, Hall made the opposite type of mistake to the one made with the neurotic patient. With the neurotic patient Hall used hostile interactions with various women to infer that he disliked his mother, and was wrong. With Karl he used hostility toward Karl's father, mother, and wife to infer aggressive interactions with a wider range of people, and he was wrong. The general lesson is that inferences drawn from dreams should focus on specific people, not on generalities. In Karl's case, he readily acknowledged anger toward his mother, father, and wife, but his dreams do not tell us he is in general an angry, violent person.

Karl's 65 dreams reports that included athletic activity, mostly playing football, led Hall to the simple prediction that he was very interested in football, but Karl said that he had no interest in the game after he quit playing it at the end of his first year in college. He added that he never watched games after that either. However, it turned out that he never really gave up his interest in playing football, which is what he continued to do in his dreams. A year or two later he wrote Hall with some embarrassment that several years after he was out of college, just five years before he started the dream journal, he tried out for a professional football team, but was not successful. He also wrote that he still would like to work out with a professional team if he had the opportunity. "Who knows," he wrote, "maybe I'm kidding myself about not liking football. Perhaps I do, and don't want to admit it. I don't really know, but there's some sort of hang-up rooted in it."

In my view, Karl's football dreams are a classic example of the "unfinished business" that people often dream about—failures in relationships, sports, school, or jobs. They are revealing of unresolved issues that crop up now and then in waking thought, but that are more dramatically portrayed in dreams. I think they fit with the continuity hypothesis in a useful way; they show how dreams can tell us things that are not easy for people to admit or discuss in waking life. However, please note, because Hobson likes to claim that anyone who disagrees with him is influenced and tainted by Freud, I am not talking about "repression" or "the unconscious."

Hall also did several smaller studies of the dreams of everyday average people who showed continuity on topics of interest to them unrelated to sex or aggression or personal conflict. The everyday people included a woman who often was traveling in foreign countries in her dreams. She is of interest because she in fact rarely traveled, but she read many travel books and daydreamed about doing more traveling, which shows that relatively mundane daytime preoccupations and daydreams on topics of interest to the dreamer can find expression in dreams.

In 2003 I extended and added further complexity to the continuity hypothesis through a detailed case study of 3,116 dreams written down over a 25-year period by a middle-aged women whom we call "Barb Sanders." After my

Table 1. Barb Sanders' social interactions with signficant people in her life, compared to a baseline 250 sample.

	Numbers of characters	A/C Index	F/C Index	A/F%	Aggressor Percent	Befriender Percent
Baseline 250	884	.33	.32	49%	50%	53%
Mother	239	.70	.27	72%	46%	48%
Father	213	.36	.37	50%	47%	42%
Oldest daughter	81	.51	.65	44%	73%	77%
Middle daughter	165	.92	.52	64%	79%	70%
Youngest daughter	83	.36	.81	31%	63%	61%
Favorite brother	97	.23	.69	25%	59%	60%
Friend: Ginny	96	.26	.89	23%	52%	53%
Friend: Lucy	59	.39	.63	38%	78%	78%

Note. The A/C index is the ratio of aggressions per appearance of that character in a dream, the F/C index is the ratio of friendliness per appearance of that character in a dream, the A/F percent is the number of aggressive interactions divided by aggressive plus friendly interactions, the aggressor percent is the percentage of aggressive interactions in which the dreamer is the aggressor, and the "befriender percent" is the percentage of friendly interactions in which the dreamer takes the initiative.

research assistants coded a random sample of 250 of the dreams, further studies were carried out on dreams involving major figures in her life, as well as dreams that related to theatrical productions. Then I interviewed her and four of her close friends at length so I could compare her responses to my inferences with those by her friends. The results, as you might expect by now, replicated all previous findings by Hall on this issue and added further evidence by showing how perfectly her pattern of aggressive and friendly interactions with important figures in her life matched her relationships with them (Domhoff, 2003, Chapter 5).

To put some of Table 1 into relatively plain English, here are some examples. Her mother is the most important and difficult people in the dreamer's life. She says her mother is "an angry, isolating person, and she also has good things too, don't get me wrong. But she and I have had a personality clash as long as I can remember. I feel that she keeps herself so distant that I didn't feel I was getting nurturing mother love." Her mother, the most frequent character in her dreams, appears in 239 dream reports, or 7.7 percent of the total dream series, a figure we could ascertain in a few seconds using the word-search program that Adam Schneider created on dreambank.net, an archive containing over 26,000 dreams (Domhoff & Schneider, 2008b). (The paper about dreambank.net is also on dreamresearch.net at http://psych.ucsc.edu/dreams/Library/domhoff_2008c.html). Returning to the case of Barb Sanders, her A/C index with her mother is .70, well above her average in the baseline 250 for all characters, .32. Her A/F percent with her mother is 72, well above the dreamer's normative figure of 49.

Sanders' middle daughter is almost as problematic for her as her mother. This daughter was 4.5 years old at the time Barb Sanders decided to divorce her husband, and she was the child who was most upset by the parting of ways. This daughter appears in 165 dream reports. The A/C index is .92, even higher than Barb Sanders aggressions per interaction ratio with her mother, and the F/C index is also very high at .52 (mostly because Sanders is trying to help this daughter), well beyond Sanders average for all characters. The A/F percent is 64, and Sanders initiates 79 percent of the aggressive interactions and 70 percent of the friendly interactions, far above her averages for all characters. These indicators provide an accurate summary of how Sanders conceives of their relationship.

The dream reports also capture her positive relationships with the favorite people in her life. For example, Sanders has great affection for the brother closest to her in age, who appears in 97 dream reports, which is one more than the total for her other two siblings combined. The A/F percent with him is a low 25, almost the mirror opposite of her predominantly negative interaction pattern with her mother. Sanders met her closest friend of long standing, Ginny, when she returned to college for her M.A. Ginny married after graduating from college, moved to another city, and raised a family, but she and Barb Sanders remained in close touch. Ginny appears in 96 dream reports and has an A/F percent of 23, the most positive balance with any known character.

To provide an example of a striking continuity finding that is not in the table, a study of a subset of dreams about a man she became infatuated with some years after her divorce mirrored the rise and fall of her hopes in relationship to him. Although they never even dated, because he had no interest in her, there was enjoyable sex early in the subseries, then dreams of him betraying her, and then his disappearance from her dream life with the end of her infatuation. I was able to corroborate that these dreams reflect her initial hopes and growing disappointment in relation to this man, thanks to the interviews with her friends. Perhaps the relative haste with which he disappeared from her dream life is an indication that there was no reality to this fantasy affair, which provides one possible way to distinguish wishful subsets of dreams from reality-based subsets in future studies.

Conversely, her upsetting dream encounters with her ex-husband, which she saw as re-enactments of what she conceived of as a terrible marriage, continued for 15-20 years after their divorce, at which time the aggressive interactions in these dreams declined somewhat, just when her friends said she could almost think of him in waking life without becoming angry. This is the stuff of the continuity hypothesis that is trivialized by the brainstem reductionist, who showed his exasperation with a cognitive theory of dreams a few years back by calling dreams "cognitive trash" (Hobson, 2002, p.. 23). And perhaps the persistence of this highly negative theme hints at its reality base, as if she is still "stuck" in the past, which presents another hypothesis for future studies of how wishful and reality-based subseries might be differentiated without resort to information from waking life.

Ah, but the study also reports some examples of dream content that was not continuous with her waking thoughts and concerns, so the belaboring of this point about the continuity hypothesis by Schredl and Hobson is hardly novel. Instead, their criticisms reveal that they have not followed the development of the concept on the basis of new systematic research. For example, in her dreams Barb Sanders often worried about starving or sickly cats, especially stray kittens, but she had no such concerns in her waking life, which included two or three well-fed cats that could fend for themselves as they meandered freely in and out of her house. In some dreams she shot guns and rode horses with zest and skill, leading to the inference that she learned to shoot and ride when she was younger, and enjoyed both, but such was not the case.

So, the study of the Barb Sanders series concluded that there was strong continuity when it came to characters and her conceptions of them, and with her interest in acting and theatrical productions, I might add, although I have not discussed those findings in this paper. However, the study also concluded that there were elements that were not continuous, such as the sickly cats and the shooting and riding. But instead of despairing, the chapter suggests that these discontinuities provide new opportunities to deepen our understanding of dreams. Are the discontinuities metaphoric? Are they cognitive glitches? All of the dream reports from Barb Sanders, including 1,138 new ones we did not study, along with all my interview materials, can be found at http://www.dreambank.net/. An updated and extended report of our work on Barb Sanders is available at http://psych.ucsc.edu/dreams/Findings/barb_sanders.html. So anyone is welcome to check up on what I've claimed and then advance our knowledge of when dream content is and is not continuous with waking concepts and concerns.

Barb Sanders' dreams of shooting and riding, which usually contained no familiar settings or characters known to her, led us to wonder if some dreams are more like adventure stories, with few or no connections to waking conceptions and concerns. Drawing on dream reports from Ger-

man college students kindly provided to us by Schredl, my German-born and completely bilingual research assistant, Katrin Meyer-Gomes, who came to live in the United States permanently over ten years ago when she was a college student, coded several hundred dreams using our new categories to determine the degree to which the dream reports involved people and activities from everyday life (see Table 2). There were four categories for familiar characters: (1) parents or siblings; (2) spouses, boyfriends, or girlfriends; (3) other family members; and (4) friends. There were five categories for commonplace leisure activities: (1) traveling or vacationing; (2) watching or playing sports; (3) going to parties, cafes, or bars; (4) watching entertainers or shows; and (5) shopping. There also was a single category for involvement in work, school, or politics.

The everyday nature of most of these dreams is seen in the fact that 75.2 percent of the women's dreams and 62.1 percent of the men's had at least one instance of one of the four categories of familiar characters (see Table 2). Similarly, 42.3 percent of the women's dreams and 27.4 percent of the men's had at least one instance from one of the five leisure-time categories. The routine matters of work, school, or politics appear in 20.3 percent of the women's dreams and 29.5 percent of the men's dreams. Overall, only 12.6 percent of the women's dreams and 20.0 percent of the men's have no instance of any of the above categories. Compared to women, the men's dreams are less likely to have familiar characters and familiar leisure time activities, and more likely to have instances of school/work/politics (Domhoff, Meyer-Gomes, & Schredl, 2005-2006), a finding that is consistent with findings on gender differences using the Hall and Van de Castle coding system (Domhoff, 2005b).

Table 2. The percentage of German women and men's dreams reports with at least one instance of sev eral ad hoc categories.

Category	Women's Reports (N=246)	Men's Reports (N=95)
Parents/Siblings	26.8%	14.7%
Spouses/Partners	19.9%	13.7%
Other Family	10.2%	4.2%
Friends	46.7%	44.2%
Any Familiar Character	75.2%	62.1%
Travel/Vacation	16.3%	6.3
Sports	7.3%	9.5%
Entertainment/shows	7.7%	9.5%
Parties/Cafes/Bars	11.4%	6.3%
Shopping	9.8%	2.1%
Any Leisure Activity	42.3%	27.4%
School/Work/Politics	20.3%	29.5%
Dreams With No Familiar Elements	12.6%	20.0%

These findings raise the possibility that some dreams are not the usual soap operas about our personal lives. Some of them are more like sagas or adventure stories. And it turns out that Foulkes (1999, p. 136), the best laboratory dream researcher of the twentieth century, once again was there first. Like Hall, he stresses that the dreams he collected in the sleep laboratory over the decades are mostly about personal concerns, but he also collected some dreams that did not fit that mold. In keeping with his cognitive perspective, he calls such dreams "narrative-driven" to contrast them with dreams that seem to be based on personal concerns. So there's now a new question: how do narrative-driven dreams relate to the continuity hypothesis, if at all? Are they more like parables, that is, stories seemingly about random issues, but actually generated by our basic conceptions of self? Are narrative-driven dreams more similar from individual to individual than dreams about personal concerns?

We also wondered if narrative-driven dreams might have more bizarre elements in them than do dreams with one or more familiar elements, either because they are highly metaphoric, or are somehow more haphazard because they are not focused on personal concerns. For this pilot study Meyer-Gomes coded four random samples of 100 dream reports containing between 50 and 300 words, using the same "familiar/unfamiliar scale" we used in the 2005/2006 study of German student dreams, along with a bizarreness scale developed by Inge Strauch (2004, 2005) as part of her important longitudinal study of the dreams and waking fantasies of Swiss children between the ages of 9 and 15, which replicated and added to the earlier longitudinal work by Foulkes (1982). The four samples were drawn from the male and female dream reports used by Hall and Van de Castle (1966) in constructing their norms and from the home and laboratory dreams Hall and Van de Castle collected from 11 young college men in Miami in the early 1960s. (All four of these dream collections are available on dreambank.net.)

Meyer-Gomes first found that narrative-driven dreams comprised from 18 to 30 percent of the four samples, with the women's sample the lowest at 18 percent, which is similar to, although larger than, the gender difference with German college students (see Table 2). Of greater interest here, she found that the narrative-driven dreams generally contain more bizarre elements, as can be seen in Table 3. This is especially the case for the smaller percentage of narrative-driven dreams reported by women in the Hall and Van de Castle normative sample, over half of which contain a bizarre element. I am a long way from claiming these very tentative pilot-study results are a "solid" finding because I believe strongly in large sample sizes and replications, as I have said repeatedly (Domhoff, 1996, p. 313; 2003, pp. 90-94). Instead, I present these preliminary findings with the hope that other cognitively oriented dream researchers will be intrigued enough to focus their attention on the significant minority of dream reports that have no familiar characters, settings, or activities. It is possible that narrative-driven dreams will lead us to new insights and theories, just as the continuity hypothesis has.

Due to Schredl and Hobson's discussion of the incorporation of everyday events into dreams as part of their criticism of the continuity hypothesis, even though incorporation is not part of the concept, it is relevant to mention here that I discussed the issue of incorporation of the day's concerns in 2007 in a lengthy chapter on realistic simulation and bi-

Table 3. The familiar, the unfamiliar, and the bizarre in four samples of 100 dream reports that contain between 50 and 300 words.

Dream sample	Parents/sibs	Friends	Shows, Cafes, Partying, etc.	School, Work, or Politics	No Familiar Elements
HVDC Male norms	8 (12.5%)	32 (37.5%)	7 (57.1%)	19 (15.8%)	26 (42.3%)
HVDC Female norms	24 (20.8%)	37 (18.9%)	8 (37.5%)	27 (25.9%)	18 (55.6%)
Miami Lab (Male)	8 (0%)	22 (13.6%)	4 (25.0%)	23 (17.4%)	30 (36.7%)
Miami Home (Male)	10 (20.0%)	33 (36.4%)	3 (33.3%)	20 (25.0%)	29 (41.4%)
Total Dreams	50 (16.0%)	124 (27.0%)	22 (40.9%)	19 (21.3%)	103 (42.7%)

Note. The numeral in each cell presents the number of dreams that have at least one element that fits the given category; therefore, some dream reports contribute to more than one of the four 'familiar' categories. The percentage in parentheses states the percent of dreams with at least one bizarre element.

zarreness in dreaming and waking thought. To provide context for my comments later in this paper on what they claim is ignored by Hall's continuity hypothesis, here's a summary of the most relevant conclusions:

"Continuity is not with day-to-day events, but with general concerns. Three studies [by Roussy and her colleagues (2000; 2000; 1996)] that tried to match detailed waking reports of daily concerns with dream reports, two based on REM awakenings, one based on morning recall at home, found that blind judges could not reliably match records of daily concerns or events with dream content. The content of the dreams often revolved around daily life, such as family, friends, and school, but if the actual events of the day were incorporated in any specific way, it was not understandable to independent raters" (Domhoff, 2007,p. 19).

It is also relevant to any informed discussion of the continuity hypothesis that Kelly Bulkeley has developed 40 word strings that can be used in studying dream content. In the studies so far, continuity is the rule, and the word-string findings are consistent with findings with the Hall/Van de Castle study in the cases in which both methods have been used (Bulkeley, 2009; Bulkeley & Domhoff, 2010). These word strings now make it possible to study continuity on a wider range of issues with much larger sample sizes in a matter of seconds when the archive and search engine on dreambank.net is employed. This work already has added new dimensions to the continuity hypothesis. One dreamer, Paul, age 81, had a considerable number of sex dreams even though he has not been sexually active for years, but he does think about times when he was sexually active in the past. Another dreamer, Bea, a teenager, had dreams of sexual relations before she actually became active sexually, but she reports that she had fantasized about having sex based on her urges and what she had read and seen (Bulkeley, 2011).

In concluding this lengthy discussion of what the continuity hypothesis actually involves, I submit that it is far more specific, empirically developed, and refined over time than Schredl or Hobson realize. I therefore suggest that the following starting point for future research is better than the ones offered by either of them: "Future studies of the degree to which dreams are continuous or discontinuous with waking thoughts and concerns would benefit by starting with the idea that dreams dramatize conceptions and concerns, and are generally continuous with waking thoughts. Then the deviations and discrepancies from continuity could be used to add nuance to the picture. In particular, unusual features and elements in some of the dreams in a dream series should be studied more closely to see if they have plausible figurative meanings within the constraints provided by the many realistic simulations within the series. If such an analysis fails to find figurative meaning for various types of unusual elements, then they could be studied to see if they share common features that can be attributed to one or another type of cognitive defect during dreaming" (Domhoff, 2007, pp. 22-23).

The Claims By Schredl and Hobson

Now that readers know the empirical, theoretical, and historical contexts that stand behind the continuity hypothesis, it is possible to show the shortcomings of the discussion between Schredl and Hobson about "continuity and discontinuity between waking and dreaming." Their discussion goes off track and wanders on to irrelevant topics the minute that Schredl claims that the continuity hypothesis "simply says that we dream of our waking life experiences (thoughts, feelings, events, etc)." But of course the hypothesis is not about "experiences," but about the same "conceptions and concerns" being expressed in dreaming and waking life. He then trivializes the idea further by talking about Freud's idea of "day residues," which has zero relationship to the continuity hypothesis. Furthermore, day residues have proven to be only half as frequent as Freud claimed and are unlikely to play the role in the origins of a dream that Freud assigned to them, so it makes no sense to me to discuss them in connection with the continuity hypothesis. In Box 1, however, Schredl comes closer to the mark by talking about "concerns." He then jumps to his criticism that the concept is "too broad." However, as I have just shown, it is Schredl, not Hall, who makes the concept too broad by dragging in "experiences" and "day residues," and by ignoring the further refinement of it after 1972.

Schredl tells us that he is interested in "what factors affect the incorporation of waking life experiences into subsequent dreams," a minor question from the cognitive point of view, especially when it is added that Foulkes (1985, 1996) concluded that there is very little "incorporation" of anything into dreams based on his own studies as well as his reading of 40 years of laboratory dream studies by many different researchers. This claim by Foulkes was later supported once again in the studies by Roussy and her colleagues (2000; 2000; 1996). Schredl and Hobson are talking about old issues that were answered long ago by very solid research.

Schredl's ideas about the relationship between dreams and waking life should be called the "experiential hypothesis," not the continuity hypothesis, so as not to hopelessly cloud theoretical discussions, because he is talking about the influence of waking life events on dreams. Although I admire Schredl's ability to think and write in two languages, perhaps specificity is lost in the switch back and forth from English to German to English in his theorizing. In any event, it appears to me from what he writes in English that he is more of a behaviorist, for whom experience writes its message on the mind, than he is a cognitive theorist.

Turning to Hobson's comments and assertions in the discussion with Schredl, it is apparent that he has little interest in or respect for a cognitive approach, which he has made clear in numerous contexts. After all, as he tells us at one point in his discussion with Schredl, "One of the advantages of a cross-species neurobiological approach like the one I used to study the brain basis of dreaming is the opportunity to explore the implications of theory not just in humans but in animals where certain kinds of experiments can be performed which are not possible in people." He then goes on to talk about dreaming in animals on the basis of electrical recordings of orientation patterns in the hippocampal neurons of rats before and after they completed a maze-learning task.

I began my discussion of Hobson's general comments using this particular quote due to the fact that it is indicative of his REM reductionism—ie, if there's REM, there's dreaming, unless there has been a lesion in upstream parts of the neural substrate that enables dreaming. For Hobson, it's the physiological consequences and concomitants of REM, not cognitive processes, which shape dream structure and dream content. The quote is also indicative of his tendency to ignore or forget what others have written on the topics of interest to him. In this instance, Foulkes (1983) long ago took a careful look at the studies that might imply that animals are dreaming, but he concluded that there is no support for this hypothesis, even with Jouvet's famous decorticated cats or a graduate student's accidental and anecdotal observations of a few monkeys deprived of visual in-put as part of a study of the development of vision, which led to unexpected and lengthy REM-like periods day and night after the blinders were removed. (This dissertation research, which was not meant to be about sleep or REM, was never published, so Foulkes is probably one of the few dream researchers who has actually read it.) Although there seems to be no way of knowing at present, it may be that other animals lack the cognitive capabilities that are necessary for dreaming, an idea that many researchers besides Hobson are unable to contemplate.

In making his claim about the strong correlation between REM and dreaming, Hobson again ignores the laboratory-based evidence that pre-school children do not dream often or well (Foulkes, 1982). Indeed, Hobson and his colleagues (2000) rejected this finding many years ago, adding that they can imagine that even newborns are having indescribable dream experiences. But if we take empirical evidence seriously, then the only creatures that we know for sure are dreaming are human beings over the age of four or five, which of course pushes REM reductionism to the side and focuses research and theorizing on whether it is the ability to generate mental imagery, or the acquisition of an autobiographical self, or some combination of these and other cognitive abilities, that makes dreaming possible.

Hobson's failure to take the laboratory studies of the development of dreaming in young children seriously also compromises his hypothesis that "emotion is generated as a primary event in REM" because dream reports from REM awakenings show there is little or no emotion in children's dreams until they are in their preteens. Even if he wanted to argue that emotions become central to REM and dreaming only in the teens and adulthood, there is still the problematic empirical finding that 25 to 30 percent of REM dream reports do not contain emotions, as shown in two different laboratory awakening studies (Foulkes, Sullivan, Kerr, & Brown, 1988; Strauch & Meier, 1996) and one home-based study in which participants were monitored and awakened with a portable EEG (Fosse, Stickgold, & Hobson, 2001). So there is no basis for making emotions primary to dreaming.

Hobson also offers other unlikely ideas that have nothing to do with the continuity hypothesis, or even dreaming. He suggests that we dream to forget, which, if true, brings up the issue of what we should make of the finding that people tend to dream of the same people, themes, etc, over years and decades with great consistency (Domhoff, 1996, Chapter 7, for a summary of the incredibly detailed studies Hall did on this issue using several lengthy dream journals) http://psych.ucsc.edu/dreams/Library/fmid7.html. And if we think of the repetition of unpleasant dream themes, such as Barb Sanders' encounters with her ex-husband over a 15-20 year period, what are we to make of an adaptive mechanism that works very slowly at best or often fails?

In addition to making unlikely statements about dreaming in human infants, and about dreaming to forget, Hobson also ropes in alleged "memory consolidation" during sleep as somehow relevant to a discussion of dreams. Perhaps he momentarily forgets that he suggested in 2009 that memory consolidation now seemed to him to be very trivial in sleep, and I quote:

> *"If sleep is essential to memory, we must wonder why semantic memory does not seem to be strongly enhanced by sleep, why the enhancement of procedural learning by sleep, although statistically significant, is so weak, why neither selective REM nor selective slow wave sleep (SWS) deprivation impairs memory consolidation and why the suppression of REM sleep with selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SnRIs) actually enhances learning" (Hobson, 2009, p. 807).*

After making this succinct and accurate statement that seems to accept most of what skeptics have been saying about memory consolidation for several years (Siegel, 2001; Vertes, 1995; Vertes & Eastman, 2000; Vertes & Siegel, 2005), Hobson then speculates that sleep has an even bigger adaptive function than mere memory consolidation. Sleep may be necessary for the maintenance of the whole memory system so that there is no memory loss during long periods of sleep. It is as if he has partially absorbed the critique of the memory consolidation literature and then doubled down on a failed idea with an even more unlikely conjecture. I quote once again:

> *"Could it be that updating memory with newly learned material is only a small part of the learning maintenance task of the sleeping brain? Could it be that we must relearn all that we already know, as well as integrate new experiences into that vast storehouse of data? Or do we simply need to rerun our built-in virtual reality simulation*

circuits to prevent disuse-induced memory loss?" (Hobson, 2009, p. 807).

Ignoring the vast literature showing individual, gender, and cross-cultural differences in dream content that have clear waking correlates, Hobson marches on to discuss the "generic" nature of dreams. He does so to suggest that dreams are a "preplay," a way to prepare the brain for the many situations it will face in waking life, which takes us far afield from the continuity hypothesis and into the realm of major speculation. True enough, dreams sometimes dramatize worst-case scenarios about future events that are laden with uncertainty—for example, dreams of weddings and pregnancy. But at other times dreams re-run upsetting events from the past, such as a failed marriage in the case of Barb Sanders, which seem more like replays than preplays.

Moreover, Adam Schneider and I published a refutation of his methodologically flawed study of the alleged generic nature of dreams, which relied on judges sorting among extremely small sets of dreams from a few individuals (Hobson & Kahn, 2007). We did so by analyzing varying sample sizes using randomization statistics that made possible thousands of trials utilizing dreams already coded with the Hall/Van de Castle system (Domhoff & Schneider, 2008a). We found that it usually takes at least 50 to 125 dream reports for reliable differences to appear because most dream elements appear in half or less of dream reports and the effect sizes for most elements are small. However, the patterns are clear in our studies, as seen in the "h-profiles" we use to display individual differences, and they lead to inferences that are corroborated by the dreamer, as seen in the Barb Sanders study, but also in many studies that came before that one. And as other work by Hall has shown, samples of dreams from groups of people in any part of the world are more similar than different on several dream elements, but there are also gender and cross-cultural differences in these samples, and individual differences as well when there are enough dreams to study individuals (Domhoff, 1996, Chapter 6, for a summary of Hall's unpublished work on this issue). http://psych.ucsc.edu/dreams/Library/fmid6.html

Hobson mentions his new idea of "protoconsciousness," which appeared in the same 2009 article in which he speculated that sleep might be needed to regenerate the whole memory system anew each night. In that article, as well as in his discussion with Schredl, REM sleep is claimed to be the basis for the later development of human consciousness: "The development of consciousness is thus seen as a gradual, time-consuming and lifelong process that builds on, and constantly uses, a more primitive innate virtual reality generator, the properties of which are defined for us in dreams" (Hobson, 2009, p. 808). However, these speculations seem to be contradicted by the psychiatric diagnosis he applied to dreams just a few years earlier when he claimed that they are a form of "delirium," an organic brain disease characterized by disorientation, illogical cognition, distracted attention, unstable emotion, and dull intellectual functions (Hobson, 2002, p. 23; Kahn & Hobson, 2005, p. 436). It seems unlikely that "cognitive trash" produced by delirium could become a stepping-stone to waking consciousness in humans. As often, he has everything backwards in terms of the likely evolution of the human brain and consciousness.

Finally, Hobson's general discussion of cognitive theory and the continuity hypothesis shows his lack of knowledge of the cognitive tradition when he writes that "dreaming is not only the replay of waking experience" and is "not entirely derived from waking experience," as if cognitive theorists ever thought otherwise. His statement that dreaming is "much more interesting than continuity theory recognizes" is typical of the way he distorts rival theories. It is also all wet to call Freud a continuity theorist and say that latter-day continuity theorists derive from Freud. As I showed earlier, the opposite is the case as far as the original proponent of the continuity hypothesis—Hall--is concerned.

Aside from their several individual mistakes, Schredl and Hobson also share three unsupported claims. First, they agree that dreams are more "bizarre" than waking thought. Contrary to their claim, I assert that we don't know whether that common assertion is true or not because there are no good studies using the thought-sampling methods developed by Klinger and his co-workers (Klinger, 1999, 2009; Klinger & Cox, 1987-1988) or Hurlbert and his co-workers (Heavey & Hurlburt, 2008; Hurlburt & Schwitzgebel, 2007) to study the same people in both waking and sleeping. Based on the evidence at hand, however, it seems certain that waking thought is far more "bizarre" during moments of drifting thought and daydreaming than Schredl or Hobson seem to realize. Elsewhere I have summarized the findings raising doubts about large differences in bizarreness between dreams and waking thought, so I will not to spell out the evidence here (Domhoff, 2007).

Second, Schredl agrees with Hobson that the differences between waking and dreaming are "best explained by the AIM model," which I think has failed on every count for reasons I have stated at length elsewhere (Domhoff, 2003, pp. 147-157; 2005a). It is also noteworthy that two neuroscientists who took a fresh look at the entire dream literature from their perspective as consciousness researchers came to a conclusion similar to mine about the shortcomings of the AIM model, although they say so very politely, and only at the end of their overview, in a powerful marshaling of the evidence (Nir & Tononi, 2010 p. 97).

It is especially surprising that Hobson and Schredl believe that the different "neuromodulators" present in REM as compared to waking are the key to the differences between dreaming and waking. There is not a shred of empirical evidence for this speculative hypothesis (Domhoff, 2005a). It is one of those "it just must be so" assumptions that are made by a REM reductionist such as Hobson without any evidence that these differences actually connect to cognitive differences. More specifically, this speculation involves two giant leaps. There's the one I just mentioned, but there's also the unproven claim that dreams are far more bizarre than waking thought. For Hobson and Schredl, dreaming and drifting waking thought are far different (unproven), so it must be due to the effects of their different neuromodulatory environments (unproven).

These speculative claims, which sound all so hard-nosed and full of common sense, also fly in the face of the very dreamlike Stage 2 NREM dreams that have been collected late in the sleep period (Cicogna, Natale, Occhionero, & Bosinelli, 1998; Fosse, Stickgold, & Hobson, 2004; McNamara, McLaren, & Durso, 2007). The study by Cicogna, et. al. (1998) is especially difficult for the neuromodulatory hypothesis. This unique large-scale laboratory study analyzed 72 dream reports from spontaneous morning awakenings for 36 young adults (20 female, 16 male), who spent at least two and sometimes more nights in the laboratory so they could each contribute two reports on the few occa-

sions when there was no waking recall on one of the first two nights. Seventy-four percent of the spontaneous awakenings were from NREM, usually in Stage 2, and 36 percent from REM, which is consistent with earlier studies of the percentage of morning awakenings from REM and NREM; recall rates were 95 percent from REM awakenings and 91 percent from Stage 2 awakenings (Cicogna, et al., 1998, p. 466).

Contrary to what Hobson and Schredl would expect, there were virtually no differences between the NREM and REM reports on a variety of rating scales that were applied by blind coders to a single randomized portfolio that included both sets of dream reports. The one difference, not readily understandable from a REM reductionist perspective, revealed the NREM reports to be more "bizarre" in terms of "spatio-temporal units," such as "the fusing of different places," or "impossible or incongruous spaces and times," even though the two sets of dream reports were similar on a global measure of bizarreness (Cicogna, et al., 1998, p. 467).

Perhaps this study would not be replicated if someone tried to do so, but given the Cicogna laboratory's good track record over decades, the canons of scientific thinking say the study has to be taken seriously until it is proven wrong. That's because we should be theorizing on the basis of the best systematic evidence, not hunches and anecdotes. Until shown otherwise, then, this study tells us that we must assume that activation in Stage 2 NREM late in the sleep period leads to dreams comparable to those generated in REM sleep. The only escape hatch for Hobson, aside from showing the Cicogna lab was wrong in claiming similarities in dream content from the two sleep stages, would be if someone shows that the neuromodulatory environment of Stage 2 NREM late in the sleep period is much like that in REM than waking. For now, though, it seems more likely that the activation in NREM is if anything more like the waking state than the REM state. That means the issue in understanding when dreaming occurs is level of brain activation, not sleep state.

Cicogna et al.'s (1998) demonstration of "real" dreaming during NREM sleep should have put an end to Hobson's REM reductionism for those new to dream research in the past ten or fifteen years, as several earlier studies of REM and NREM dream reports did for most dream researchers well before Hobson and McCarley (1977) wrote their article on the brain as a dream state generator without bothering to cite a single article based on the 20+ years of laboratory dream research that had been carried out by the time they wrote. In other words, their 1977 article is based strictly on neurophysiological research and some anecdotal talk about unusual—and very rare—dreams, such as flying under one's own power, which turn out to be about half a percent of all dreams (Domhoff & Schneider, 2008b). The article was an anachronistic revival of REM reductionism after REM reductionism had been slowly and reluctantly abandoned by the pioneers in laboratory dream research based on compelling evidence against their initial starting point (Domhoff, 2004; Herman, Ellman, & Roffwarg, 1978).

Third, Schredl and Hobson seem certain that dreams must have an adaptive function, although they don't agree on what it might be. Nor do they discuss the evidence that contradicts every one of the many hypotheses that have been offered to explain the alleged adaptive function of dreaming, including the rehearsal and problem-solving theories that most closely resemble the ideas they discuss (Domhoff, 2003, Chapter 6). Because they ignore this evidence, and the unlikelihood of every adaptive hypothesis that has been put forward over the past 100+ years, they never once confront the most likely hypothesis concerning the adaptive function of dreaming—there is none. Having surveyed that evidence, the academic cognitive psychologists who study dreams have concluded that dreaming is most likely a spandrel of the mind, an accidental by-product of waking cognitive adaptations (Antrobus, 1993; Blagrove, 2000; Domhoff, 2003; Foulkes, 1993).

Dreams As Embodied Simulations That Express Conception and Concerns

Having shown what I think are some of the main problems with Schredl and Hobson's theorizing about dreams, I want to turn to a statement of the latest version of a cognitive theory of dreams so readers have an alternative to consider. The emphasis in a cognitive theory of dreaming on the continuity of the conceptions and concerns in dreaming and waking thought fits with several other findings on the similarities between dreaming and waking cognition. For example, laboratory studies reveal that the speech acts in dreams are as well executed and context-appropriate as in waking life (Foulkes, et al., 1993; Meier, 1993). Then, too, the loss of the ability to produce visual dream imagery in some patients studied in the sleep lab is paralleled by their loss of waking visual imagery (Kerr, 1993). More generally, several different types of deficits and excesses of dreaming have waking cognitive parallels in neurological patients who report changes in their dreaming patterns (Solms, 1997). In turn, these neuropsychological findings are consistent with laboratory studies of young children, which suggests that dreaming is a gradual cognitive achievement that depends upon the development of cognitive abilities that are also important in waking life, particularly visuospatial skills (Foulkes, 1982, 1999; Foulkes, Hollifield, Sullivan, Bradley, & Terry, 1990). It is also relevant that traces of dreaming are found in 15-20 percent of waking thought probes when participants are lying quietly in a darkened room, with their waking state monitored by the EEG (Foulkes & Fleisher, 1975; Foulkes & Scott, 1973).

It is also noteworthy that about one-third of all dream reports in Hall and Van de Castle (1966) normative samples of 500 men's and 500 women's dream reports contain "misfortunes," which range from being lost to illness to the death of a loved one, and that the negative emotions of sadness, anger, confusion, and apprehension, when taken as a whole, greatly outnumber the expression of happiness. More generally, when the number of dream reports in the normative sample with at least one aggression, misfortune, failure or negative emotion is totaled, 80 percent of men's dreams and 77 percent of women's have at least one of these negative elements. On the other hand, only 53 percent of dreams for both men and women have at least one of several positive elements, such as friendly interactions, good fortune, success, and happiness. These findings parallel the negativity effect in waking life, that is, the tendency to pay greater attention to negative than positive information (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001).

Taken together, these several different kinds of findings show that there are more parallels between dreaming and awaking cognition than Schredl and Hobson realize with

their continuing endorsements of the AIM model. Based on the many parallels between dreaming and waking cognition, dreams are best understood as simulations, as Foulkes (1985) long ago noted on the basis of laboratory dreams studies. Moreover, dreams have the basic qualities that cognitive psychologists refer to when they say that simulations are based on "embodied cognition," in which mental imagery is subjectively "felt" as the experienced body in action, and in which the areas in the brain supporting visual and auditory responses are activated when people call up seemingly abstract "mental imagery" (e.g., Gibbs, 2006; Gibbs & Berg, 2002). It is therefore relevant that the substrates for the conceptual and perceptual systems involved in mental imagery are activated during REM sleep (Domhoff, 2011).

Synthesizing these various findings, it may be that dreams are the most dramatic and complex embodied simulations that the human mind can produce. They are the quintessential embodied simulation first of all because they have elaborate story lines. Second, they are often enacted with exquisite sensory involvement. Third dreams unfold over a period of several minutes to half an hour or more. Finally, there is the striking fact that dreams are usually experienced as real while they are happening.

Although the emphasis in a cognitive theory of dreams is on the generally realistic nature of the simulations in dreams, as convincingly documented in detailed research on laboratory-collected dream reports (Dorus, Dorus, & Rechtschaffen, 1971; Snyder, 1970; Snyder, Karacan, Tharp, & Scott, 1968), it is also the case that Hall and Van de Castle's (1966) normative studies of home dream reports support claims that dreams are not a perfect simulation of everyday life. For example, 7 percent of the familiar male settings and 14 percent of the familiar female settings were in some way different from the way they actually were in waking life, and almost 2 percent of the characters were dead, imaginary, or turned into another character.

As for the neurocognitive level that Hobson vainly struggles to reach from his basement starting point in brainstem reductionism, dreaming is best understood within a cognitive theory as the product of a subsystem of the brain's default network, located in medial and lateral brain regions, which also provides the neural substrate for spontaneous thought, mind wandering, and daydreaming in relaxed waking states (Andrews-Hanna, 2011; Domhoff, 2011). It is likely that this subsystem is operative whenever there is (1) an intact and fully mature neural substrate for dreaming, a qualification that allows for the impact of lesions on the functioning of this substrate and for the lack of dreaming in young children; (2) an adequate level of cortical activation, which, contrary to Hobson's emphasis in his AIM model, can be provided by generally higher brain activation at sleep onset and in Stage 2 NREM late in the sleep period as well as by the REM mechanism; (3) an occlusion of external stimuli, most likely through gates in the thalamus; and (4) the loss of conscious self-control, i.e., a shutting down of the prefrontal executive systems that connect us to the external world by integrating the massive amounts of external and internal information they are constantly receiving.

As many research studies show, dreams contain a considerable degree of psychological meaning in terms of the coherency of most individual dreams, the consistency of dream content over months, years, and decades, and the correspondences of dream content with waking psychological variables, including continuity with waking concerns and concerns (e.g., Domhoff, 2007; Zadra & Domhoff, 2011). Perhaps due to their considerable psychological coherence, and certainly due to their sometimes overwhelming dramatic quality, dreams have been put to use by people in many different times and places as important parts of religious and healing ceremonies, which means that they have an emergent cultural function due to human inventiveness, as anthropologists and experts on the world's religions have shown (Bulkeley, 2008; D'Andrade, 1961; Tedlock, 1991).

However, dreams probably do not have any adaptive value as evolutionary theorists use the term. They may simply be dramatic simulations of our conceptions, concerns, and interests that occur when a specific constellation of neural regions and cognitive systems are activated in a context where there is no engagement with the external world. From a neurocognitive point of view, then, psychological meaning and cultural usefulness have to be distinguished from each other and from the issue of adaptive function in order to develop an adequate theory of dreams.

Most of the empirical and theoretical points I have highlighted in this concluding section, along with the distinction between psychological meaning, cultural uses, and biological adaptation, are absent from the discussion between Schredl and Hobson. This absence reveals the opposite starting points of the reductionistic AIM model, which starts in the brainstem, and a neurocognitive model, which starts with waking thought and the concepts derived from studying waking cognition, including mind wandering. Schredl and Hobson's commentary therefore fails as a reasonable and literature-based discussion of Hall's continuity hypothesis, for the many reasons I have stated throughout this paper. Even worse, the general ideas and speculations they put forth cannot explain the systematic findings on dream content, the development of dreaming in children, or the many parallels between dreaming and waking thought. Schredl's vague experiential eclecticism goes nowhere and Hobson's monomaniacal REM reductionism hit a dead end years before he reintroduced it in 1977.

References

Andrews-Hanna, J. (2011). The brain's default network and its adaptive role in internal mentation. The Neuroscientist, In Press.

Antrobus, J. (1993). Dreaming: Could we do without it? In A. Moffitt, M. Kramer & R. Hoffmann (Eds.), The Functions of Dreaming (pp. 549-558). Albany, NY: State University of New York Press.

Baumeister, R., Bratslavsky, E., Finkenauer, C., & Vohs, K. (2001). Bad is stronger than good. Review of General Psychology, 5, 323-370.

Bell, A., & Hall, C. (1971). The personality of a child molester: An analysis of dreams. Chicago: Aldine.

Blagrove, M. (2000). Dreams have meaning but no function. Behavioral and Brain Sciences, 23, 910.

Bulkeley, K. (2008). Dreaming in the world's religions: A comparative history. New York: New York University Press.

Bulkeley, K. (2009). Seeking patterns in dream content: A systematic approach to word searches Consciousness and Cognition, 18, 909-916.

Bulkeley, K. (2011). Dreaming in adolescence: A 'blind' word search of a teenage girl's dream series. Dreaming, Submitted for publication.

Bulkeley, K., & Domhoff, G. W. (2010). Detecting meaning in dream reports: An extension of a word search approach. Dreaming, 20, 77-95.

Cicogna, P., Natale, V., Occhionero, M., & Bosinelli, M. (1998). A comparison of mental activity during sleep onset and morning awakening. Sleep, 21(5), 462-470.
D'Andrade, R. (1961). Anthropological studies in dreams. In F. Hsu (Ed.), Psychological Anthropology (pp. 296-332). Homewood, IL: Dorsey Press.
Domhoff, G. W. (1996). Finding meaning in dreams: A quantitative approach. New York: Plenum.
Domhoff, G. W. (2002). A brief biography of Calvin S. Hall. The Quantitative Study of Dreams. http://psych.ucsc.edu/dreams/About/calvin.html
Domhoff, G. W. (2003). The scientific study of dreams: Neural networks, cognitive development, and content analysis. Washington, DC: American Psychological Association.
Domhoff, G. W. (2004). Why did empirical dream researchers reject Freud? A critique of historical claims by Mark Solms. Dreaming, 14, 3-17.
Domhoff, G. W. (2005a). Refocusing the neurocognitive approach to dreams: A critique of the Hobson vs. Solms debate. Dreaming, 15, 3-20.
Domhoff, G. W. (2005b). The dreams of men and women: Patterns of gender similarity and difference The Quantitative Study of Dream Content. (http://psych.ucsc.edu/dreams/Library/domhoff_2005c.html)
Domhoff, G. W. (2007). Realistic simulation and bizarreness in dream content: Past findings and suggestions for future research. In D. Barrett & P. McNamara (Eds.), The new science of dreaming: Content, recall, and personality correlates (Vol. 2, pp. 1-27). Westport, CT: Praeger. (http://psych.ucsc.edu/dreams/Library/domhoff_2007b.html)
Domhoff, G. W. (2011). The neural substrate for dreaming: Is it a subsystem of the default network? Consciousness and Cognition, 20(Dec.): In press.
Domhoff, G. W., Meyer-Gomes, K., & Schredl, M. (2005-2006). Dreams as the expression of conceptions and concerns: A comparison of German and American college students. Imagination, Cognition & Personality, 25, 269-282. (http://psych.ucsc.edu/dreams/Library/domhoff_meyer_schredl_2006.html)
Domhoff, G. W., & Schneider, A. (2008a). Similarities and differences in dream content at the cross-cultural, gender, and individual levels. Consciousness and Cognition, 17, 1257-1265.
Domhoff, G. W., & Schneider, A. (2008b). Studying dream content using the archive and search engine on DreamBank.net. Consciousness and Cognition, 17, 1238-1247.
Dorus, E., Dorus, W., & Rechtschaffen, A. (1971). The incidence of novelty in dreams. Archives of General Psychiatry, 25, 364-368.
Fosse, R., Stickgold, R., & Hobson, J. A. (2001). The mind in REM sleep: Reports of emotional experience. Sleep, 24, 947-955.
Fosse, R., Stickgold, R., & Hobson, J. A. (2004). Thinking and hallucinating: Reciprocal changes in sleep. Psychophysiology, 41, 298-305.
Foulkes, D. (1982). Children's dreams. New York: Wiley.
Foulkes, D. (1983). Cognitive processes during sleep: Evolutionary aspects. In A. Mayes (Ed.), Sleep mechanisms and functions in humans and animals: An evolutionary perspective (pp. 313-337). Wokington UK: Van Nostrand Reinhold.
Foulkes, D. (1985). Dreaming: A cognitive-psychological analysis. Hillsdale, NJ: Erlbaum.
Foulkes, D. (1993). Data constraints on theorizing about dream function. In A. Moffitt, M. Kramer & R. Hoffmann (Eds.), The Functions of Dreaming (pp. 11-20). Albany, NY: State University of New York Press.
Foulkes, D. (1996). Dream research: 1953-1993. Sleep, 19, 609-624.
Foulkes, D. (1999). Children's dreaming and the development of consciousness. Cambridge, MA: Harvard University Press.
Foulkes, D., & Fleisher, S. (1975). Mental activity in relaxed wakefulness. Journal of Abnormal Psychology, 84, 66-75.
Foulkes, D., Hollifield, M., Sullivan, B., Bradley, L., & Terry, R. (1990). REM dreaming and cognitive skills at ages 5-8: A cross-sectional study. International Journal of Behavioral Development, 13, 447-465.
Foulkes, D., Meier, B., Strauch, I., Kerr, N., Bradley, L., & Hollifield, M. (1993). Linguistic phenomena and language selection in the REM dreams of German-English bilinguals. International Journal of Psychology, 28(6), 871-891.
Foulkes, D., & Scott, E. (1973). An above-zero baseline for the incidence of momentarily hallucinatory mentation. Sleep Research, 2, 108.
Foulkes, D., Sullivan, B., Kerr, N., & Brown, L. (1988). Appropriateness of dream feelings to dreamed situations. Cognition and Emotion, 2, 29-39.
Gibbs, R. W. (2006). Embodiment and cognitive science. New York: Cambridge University Press.
Gibbs, R. W., & Berg, E. (2002). Mental imagery and embodied activity. Journal of Mental Imagery, 26, 1-30.
Hall, C. (1947). Diagnosing personality by the analysis of dreams. Journal of Abnormal and Social Psychology, 42, 68-79.
Hall, C. (1951). What people dream about. Scientific American, 184, 60-63.
Hall, C. (1953a). A cognitive theory of dream symbols. Journal of General Psychology, 48, 169-186. (http://psych.ucsc.edu/dreams/Library/hall_1953a.html)
Hall, C. (1953b). A cognitive theory of dreams. Journal of General Psychology, 49, 273-282. (http://psych.ucsc.edu/dreams/Library/hall_1953b.html)
Hall, C. (1953/1966). The meaning of dreams (Second ed.). New York: McGraw-Hill.
Hall, C., & Domhoff, G. W. (1968). The dreams of Freud and Jung. Psychology Today, 2, 42-45.
Hall, C., & Lind, R. (1970). Dreams, life and literature: A study of Franz Kafka. Chapel Hill: University of North Carolina Press.
Hall, C., & Nordby, V. (1972). The individual and his dreams. New York: New American Library.
Hall, C., & Van de Castle, R. (1966). The content analysis of dreams. New York: Appleton-Century-Crofts.
Hartmann, E. (2000). We do not dream of the 3 R's: Implications for the nature of dreaming mentation. Dreaming, 10, 103-110.
Heavey, C., & Hurlburt, R. (2008). The phenomena of inner experience. Consciousness and Cognition 17, 798–810.
Herman, J., Ellman, S., & Roffwarg, H. (1978). The problem of NREM dream recall reexamined. In A. Arkin, J. Antrobus & S. Ellman (Eds.), The mind in sleep: Psychology and psychophysiology (pp. 59-62). Hillsdale, NJ: Erlbaum.
Hobson, J. A. (2002). Dreaming: An introduction to the science of sleep. New York: Oxford University Press.
Hobson, J. A. (2009). REM sleep and dreaming: Towards a theory of protoconsciousness. Nature Reviews Neuroscience, 10, 803-813.
Hobson, J. A., & Kahn, D. (2007). Dream content: Individual and generic aspects. Consciousness and Cognition, 16, 850-858.

Hobson, J. A., & McCarley, R. (1977). The brain as a dream state generator: An activation-synthesis hypothesis of the dream process. American Journal of Psychiatry, 134, 1335-1348.
Hobson, J. A., Pace-Schott, E. F., & Stickgold, R. (2000). Dreaming and the brain: Toward a cognitive neuroscience of conscious states. Behavioral and Brain Sciences, 23(6), 793-842.
Hurlburt, R., & Schwitzgebel, E. (2007). Describing inner experience? Proponent meets skeptic. Cambridge: MIT Press.
Kahn, D., & Hobson, J. A. (2005). State-dependent thinking: A comparison of waking and dreaming thought. Consciousness & Cognition, 14, 429-438.
Kerr, N. (1993). Mental imagery, dreams, and perception. In D. Foulkes & C. Cavallero (Eds.), Dreaming as Cognition (pp. 18-37). New York: Harvester Wheatsheaf.
Klinger, E. (1999). Thought flow: Properties and mechanisms underlying shifts in content. In J. Singer & P. Salovey (Eds.), At play in the fields of consciousness (pp. 29-50). Hillsdale, NJ: Erlbaum.
Klinger, E. (2009). Daydreaming and fantasizing: Thought flow and motivation. In K. Markman, W. Klein & J. Suhr (Eds.), Handbook of imagination and mental simulation (pp. 225-239). New York: Psychology Press.
Klinger, E., & Cox, W. (1987-1988). Dimensions of thought flow in everyday life. Imagination, Cognition, and Personality, 7, 105-128.
Lakoff, G. (1997). How unconscious metaphorical thought shapes dreams. In D. Stein (Ed.), Cognitive Science and the Unconscious (pp. 89-120). Washington: American Psychiatric Press.
Langer, S. (1948). Philosophy in a New Key. New York: Penguin Books.
Lindzey, G. (1985). Calvin Springer Hall, 1909-1985. American Psychologist, 42, 185.
McNamara, P., McLaren, D., & Durso, K. (2007). Representation of the self in REM and NREM dreams. Dreaming, 17 113-126.
Meier, B. (1993). Speech and thinking in dreams. In C. Cavallero & D. Foulkes (Eds.), Dreaming as cognition (pp. 58-76). New York: Harvester Wheatsheaf.
Nir, Y., & Tononi, G. (2010). Dreaming and the brain: From phenomenology to neurophysiology. Trends in Cognitive Sciences, 14, 88-100.
Roussy, F. (2000). Testing the notion of continuity between waking experience and REM dream content. Dissertation Abstracts International: Section B, 61(2-B), 1106.
Roussy, F., Brunette, M., Mercier, P., Gonthier, I., Grenier, J., Sirois-Berliss, M., et al. (2000). Daily events and dream content: Unsuccessful matching attempts. Dreaming, 10(2), 77-83.
Roussy, F., Camirand, C., Foulkes, D., De Koninck, J., Loftis, M., & Kerr, N. (1996). Does early-night REM dream content reliably reflect presleep state of mind? Dreaming, 6, 121-130.
Siegel, J. (2001). The REM sleep-memory consolidation hypothesis. Science, 294, 1058-1063.
Snyder, F. (1970). The phenomenology of dreaming. In L. Madow & L. Snow (Eds.), The psychodynamic implications of the physiological studies on dreams (pp. 124-151). Springfield, IL: Thomas.
Snyder, F., Karacan, I., Tharp, V., & Scott, J. (1968). Phenomenology of REM dreaming. Psychophysiology, 4, 375.
Solms, M. (1997). The neuropsychology of dreams: A clinico-anatomical study. Hillsdale, NJ: Erlbaum.
Strauch, I. (2004). Träume im Übergang von der Kindheit ins Jugendalter: Ergebnisse einer Langzeitstudie. Bern: Huber.
Strauch, I. (2005). REM dreaming in the transition from late childhood to adolescence: A longitudinal study. Dreaming, 15, 155-169.
Strauch, I., & Meier, B. (1996). In search of dreams: Results of experimental dream research. Albany, NY: State University of New York Press.
Tedlock, B. (1991). The new anthropology of dreaming. Dreaming, 1, 161-178.
Vertes, R. (1995). Memory consolidation in REM sleep: Dream on. Bulletin of the Sleep Research Society, 1, 27-32.
Vertes, R., & Eastman, K. (2000). The case against memory consolidation in REM sleep. Behavioral and Brain Sciences, 23, 867-876.
Vertes, R., & Siegel, J. (2005). Time for the sleep community to take a critical look at the purported role of sleep in memory processing. Sleep, 28, 1228-1229.
Zadra, A., & Domhoff, G. W. (2011). The content of dreams: Methods and findings. In M. Kryger, T. Roth & W. Dement (Eds.), Principles and Practices of Sleep Medicine (Fifth ed., pp. 585-594). Philadelphia: Elsevier Saunders.