The Ongoing Hobson, Solms, Domhoff Debate Points Up the Superficiality of Modern Dream Theories

1 Introduction *Published on hdbkpersonality.com 6/20/2005*)

In a very real sense, the criticisms I will level at the dream theories of J. Allan Hobson, Mark Solms, and William G. Domhoff will be somewhat misdirected. The problems with these theories should be seen as outgrowths of a much larger problem confronting the so-called "soft sciences," including many fields other than sleep and dream research.

I was trained as a *theoretical* physicist, a fact that in itself indicates a fundamental difference in the way the "hard" sciences of physics and chemistry operate and advance from that characteristic of the life sciences. In physics, say, a graduate student is expected to choose an area of interest in either *theoretical* or *experimental* physics. All physics grad students, of course, get a general grounding in theory. Graduate students in experimental physics then seek training in designing, performing, and interpreting experiments that test physical theory as it applies to their area of interest, while grad students in theory focus on learning how to advance some portion of physical theory, with an eye toward discovering new theoretical implications that may be tested by experimentalists. Generally speaking, the distinction between theorists and experimentalists is rigid, due to the highly technical requirements of the respective fields. The technicality of theoretical physics arises from the need to apply specialized mathematical techniques that vary with the area of interest.

The chief benefit of this system is the maintenance of a unified theoretical perspective. Scientific experiments yield highly precise answers to extremely focused questions. Those questions must come from somewhere. When the questions derive from an overarching theoretical perspective, experiments are able to shine pinpoints of light on that perspective, and the theory can advance in minute ways in an orderly fashion, as theorists work with the experimental results in refining the theory.

Experimentalists, of course, need hypotheses to test, whether or not there are theorists around to provide a basis for them. When there is in effect no one to mind the theoretical store, experimentalists have no recourse but to get the hypotheses they need on an ad hoc basis or through the development of "minitheories," which typically integrate data taken only from the experimentalist's narrow area of interest, in effect discounting the relevance of data from related areas. Once an ad hoc hypothesis or minitheory is published, it takes on a life of its own, serving as the basis for more experimental efforts, as other experimentalists seek to fill in the gaps left by the initial inquiry. The three dream theories I will discuss are examples of what I am calling minitheories.

From the beginning, sleep research has progressed through the development and testing of ad hoc hypotheses and minitheories. Little effort has been expended in formulating an overarching theory of sleep. Thus, over the years, sleep theory has become more fragmented as it has become increasingly technical, as ever more detailed neurophysiological studies have become possible. Additionally, the presumption that

neurophysiological realities form the basis for sleep- and dreaming-related phenomena has led to a greater focus on interpreting the neurophysiological data, which has been true of the three dream theories.

In the discussions among the three minitheory authors (Domhoff 2005a,b, 2004, 2003; Hobson 2005, 2004, 2002; 2000; Hobson, Pace-Schott, and Stickgold 2000a,b; Solms 2004, 2002, 2000, 1997; Solms and Turnbull 2002), the charge has often been made that the other authors have both misinterpreted the data they considered and ignored other pertinent data. In reality, all of the theories have misinterpreted at least portions of the neurophysiological record and have admitted for consideration only a miniscule fraction of the data that is pertinent to judging the credibility of their claims. From my perspective, the latter circumstance is the cause of the former.

I point to the fact that, despite great advances, our understanding of how neuronal structures function and interact remains rudimentary. This situation permits researchers great latitude in making neurophysiological interpretations, particularly if the researchers concern themselves with only a very small data set, as the three dream theory authors do. The only way to rein in interpretation under present circumstances is to cast one's theoretical net as widely as possible. I submit that focusing on a peripheral phenomenon such as dreams without serious regard to the question of function is exactly the wrong tact to take if one's ultimate goal is to contribute to an understanding of sleep.

1.1 An Alternative Minitheory

Before I begin looking at the three dream theories in detail, I feel that I should reveal my own position regarding sleep. Actually I have already done this (Comello 2004a,b,c,d), but the fragmented character of that discussion has probably made it difficult to understand what I strove to do. Found here are elements of a minitheory that focuses on understanding normal adult human sleep in terms of a continuous cognitive process. The theory interprets the EEG data (Figure 1 in Comello 2004b) as a physicist would. That is, the data is not chopped up to become fodder for numerical analysis, but rather is interpreted in all of its variability as it flows naturally on a subject-specific basis. The theory integrates the EEG data with that regarding body movements, galvanic skin responses, and many of the physiological characteristics of the mammalian REM state (Comello 2004a,b). Integrated also is the mental activity report data (Comello 2004a) and the EEG data pertaining to naps and sleep and REM-period deprivation (Comello 2004c). Capping off the effort is a new way of interpreting dreams (Comello 2004d) that relies minimally on interpretive license and which suggests that dreams are not at all fanciful and most certainly not indicative of a state of delirium.

This minitheory of normal adult human sleep was formulated thirty years ago and as published has been updated to only a minimal extent. Accordingly, some of the language of the theory will not survive the incorporation of current neurophysiological data, which I will attempt. Nevertheless, the main position statements of the theory will be seen to be quite compatible with this data, although it should be added that these positions have not been specifically subjected to experimental test. Actually the same could be said of the

tenets of the three dream theories under discussion, too. What I would like to defend at this time is the approach taken in formulating the theory, since the approach is one that a physicist would take under certain circumstances, and as such may seem bewildering upon first glance.

The human brain consists of innumerable neurons that interact with one another in complicated ways; the physical analog of this would be an ensemble of highly interacting atoms. The preferable way of understanding the brain in sleep is in terms of its neuronal interactions, just as the preferable way of understanding the behavior of the atomic ensemble would be to input exact formulas governing their interactions. The problem with taking the preferred course with regard to sleep thirty years ago was that details about the neuronal interactions during sleep were largely unstudied. In physics, the problem is usually somewhat different but the end result is the same. It's often possible to write fairly accurate expressions for atomic interactions, but use of these expressions typically leads to mathematical equations that defy solution. In both cases, then, taking the preferable route leads to intractable difficulties.

In physics, one would resort to a thermodynamic approach. In a thermodynamic approach, one works at a phenomenological level that does not explicitly recognize the existence of individual atoms. Built into a thermodynamic approach are general principles governing the macro-level behavior of large numbers of atoms along with perhaps generic equations containing arbitrary constants whose values can be ascertained empirically. The theory of human sleep I developed thirty years ago was a thermodynamic-type theory whose language gave a macro-level sense of what is going on, but which was not directly relatable to the neuronal level except with regard to the REM state. One of the interesting things that has happened over the years is that it has become possible to do better. While the macro-level approach cannot be completely abandoned, it is now possible to sharpen the macro-level language to begin accounting for neuronal interactions.

Resorting to macro-level language alone, however, did not create a path to solution thirty years ago, just as resorting to thermodynamics alone does not in itself generally provide a path to solution in the physical sphere. General solutions are not possible when interactions are complex, so what one does is limit oneself to particular cases. With a physical ensemble, one might limit oneself to studying high-temperature, low-density behavior, or alternatively behavior at absolute zero temperature. With such a foothold, one could then get broader solutions using the mathematical approximations available to perturbation theory.

Sleep presumably performs several functions concurrently, which means that the neurophysiological data gathered by sleep researchers is an amalgam whose components cannot be easily separated from one another. My approach to this problem was to settle upon a special case to study. The first thing I did was assume that the scheduling of electroencephalographic events varied from one species to another, depending on the relative importance of the various sleep functions. This implied that the sleep of the most adaptable animal on the planet may be dominated by an adaptive function to such an

extent that one may ignore other concurrent activities in making one's interpretations. This assumption would be presumably most true of the sleep of adult humans during the normal night. Therefore, my research began as an attempt to understand the electroencephalographic data pertaining to the normal night of adult human sleep in terms of macro-level language. My goal was to portray that data as being indicative of a continuous learning process. The articles that I have pointed to (Comello 2004a,b,c,d) are evidence of the success of that research program.

1.2 References

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