
Dreamless Sleep, the Embodied Mind, and Consciousness

The Relevance of a Classical Indian Debate to Cognitive Science

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One of the major debates in classical Indian philosophy concerned whether consciousness is present or absent in dreamless sleep. The philosophical schools of Advaita Vedānta and Yoga maintained that consciousness is present in dreamless sleep, whereas the Nyāya school maintained that it is absent. Consideration of this debate, especially the reasoning used by Advaita Vedānta to rebut the Nyāya view, calls into question the standard neuroscientific way of operationally defining consciousness as “that which disappears in dreamless sleep and reappears when we wake up or dream.” The Indian debate also offers new resources for contemporary philosophy of mind. At the same time, findings from cognitive neuroscience have important implications for Indian debates about cognition during sleep, as well as for Indian and Western philosophical discussions of the self and its relationship to the body. Finally, considerations about sleep drawn from the Indian materials suggest that we need a more refined taxonomy of sleep states than that which sleep science currently employs, and that contemplative methods of mind training are relevant for advancing the neurophenomenology of sleep and consciousness.

Keywords

Access consciousness | Advaita vedānta | Anaesthesia | Awareness | Buddhism | Consciousness | Cross-cultural philosophy of mind | Dreamless sleep | Meditation | Memory | Neurophenomenology | Nrem (non-rapid eye movement) sleep | Nyāya | Phenomenal consciousness | Self | Self-experience | Sleep | Yoga

1 Introduction

Many neuroscientists and philosophers today think of dreamless sleep (see [glossary](#)) as a blackout state in which consciousness is entirely absent. Indeed, they often appeal to this apparent fact in order to define consciousness:

Everybody knows what consciousness is: it is what vanishes every night when we fall into a dreamless sleep and reappears when we wake up or when we dream. (Tononi 2008, p. 216)

Consciousness consists of inner, qualitative, subjective states and processes of sentience and awareness. Consciousness, so defined, begins when we wake in the morning from a dreamless sleep and continues until we fall asleep again, die, go into a coma, or otherwise become “unconscious”. (Searle 2000, p. 559)

I will call the view that consciousness vanishes or ceases in dreamless sleep the *default view* of the relationship between consciousness and dreamless sleep. One aim of this paper is to argue that the

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Glossary

1. Canonical physiological sleep states according to polysomnography	<p style="text-align: center;"><i>“Light Sleep”</i></p> <ul style="list-style-type: none"> • Stage 1: closed eyes, slow eye-rolling movements, EEG alpha waves (8–12 Hz) subside, slower theta waves (4–8 Hz) arrive. • Stage 2: eye movements cease, 12–14 Hz bursts (sleep spindles) and brief high voltage waves (K-complexes) occur. <p style="text-align: center;"><i>“Deep Sleep” or “Slow-Wave Sleep”</i></p> <ul style="list-style-type: none"> • Stage 3: a mixture of sleep spindles and high-amplitude, slow frequency delta waves (0.5–4 Hz). • Stage 4: delta waves almost exclusively. • REM (Rapid Eye Movement) or “Paradoxical Sleep”: fast-frequency, low-amplitude waves, limb muscles paralyzed, eyes closed with rapid eye movements.
2. Phenomenological sleep terms	<ul style="list-style-type: none"> • Sleep mentation: sleep thoughts and images. • Dreaming: immersion in the imagined dreamworld; “immersive spatiotemporal hallucination” (Windt 2010). • Lucid Dreaming: knowing that one is dreaming while dreaming; being able to direct one’s attention to the dream as a dream (Windt & Metzinger 2007). • Dreamless sleep (Western conception): sleep lacking mentation. • Dreamless sleep (Indian conception): sleep lacking mentation; phenomenal character of peaceful, non-intentional awareness. • Lucid dreamless sleep (Indian conception): sleep lacking mentation; phenomenal character of peaceful, non-intentional awareness; non-conceptual meta-awareness (“witness consciousness”) of the dreamless sleep state.

Glossary of Indian philosophical systems

CONSCIOUSNESS IN DREAMLESS SLEEP	
Yoga	<ul style="list-style-type: none"> • <i>Yoga Sūtras</i>, traditionally ascribed to Patañjali, though authorship is uncertain (c. 3rd–4th century CE). The commentary attributed to Vyāsa may in fact have been written by Patañjali.
Advaita Vedānta (Advaitins)	<ul style="list-style-type: none"> • Śaṅkara (788–820 CE). • Sureśvara (c. 9th century CE). • Madhusūdana (c. 16th century CE).
Buddhism	<ul style="list-style-type: none"> • The Theravāda school postulates a basal and passive “life continuum” or “factor of existence” consciousness (<i>bhavaṅga</i>) that occurs in dreamless sleep (c. 3rd century BCE–2nd century CE). • The Yogācāra school postulates a basal “store consciousness” (<i>ālaya-vijñāna</i>), which persists in dreamless sleep (c. 4th century CE).
NO CONSCIOUSNESS IN DREAMLESS SLEEP	
Nyāya (Nyāyīyikas)	<ul style="list-style-type: none"> • <i>Nyāya Sūtras</i>, authored by Gautama (c. 2nd century BCE). • Vātsyāyana (c. 450 CE). • Udyotakara (c. 550 CE). • Udayana (c. 10th century CE).

default view is not as obvious or strong as it is often thought to be. Another aim is to propose that we need a finer taxonomy of sleep states than that which sleep science currently employs, in order to allow for the possibility of states or phases of dreamless sleep in which consciousness is present. There are forceful reasons, if not decisive ones, for describing certain kinds of dreamless sleep as modes of consciousness rather than as the absence of consciousness. These reasons derive from the debate about dreamless sleep between the Advaita Vedānta and Nyāya schools of Indian philosophy (see [glossary](#)). Examining this debate in the light of cognitive science raises important conceptual and methodological issues for the cognitive neuroscience of consciousness. Furthermore, considerations about sleep drawn from Indian philosophy suggest new experimental questions and protocols for the cognitive neuroscience of sleep and consciousness. By weaving together these different traditions—Western cognitive science and Indian philosophy—I hope to show the value of cross-cultural philosophy of mind for cognitive science.

2 The experience of waking up

Before turning to the Indian debate, I would like to motivate the examination of dreamless sleep and consciousness by considering the experience of waking up from deep sleep and what this experience reveals about our experience of the self.

One of the best descriptions of waking up comes from Marcel Proust. In a long passage at the beginning of the first volume of *In Search of Lost Time*, the unnamed narrator describes awakening from sleep:

A sleeping man holds in a circle around him the sequence of the hours, the order of the years and world. He consults them instinctively as he wakes and reads in them in a second the point on the earth he occupies, the time that has elapsed up to his waking; but their ranks can be mixed up, broken. If towards morning, after a bout of insomnia, sleep overcomes him as he is reading, in a position too different from

the one in which he usually sleeps, his raised arm alone is enough to stop the sun and make it retreat, and, in the first minute of his waking, he will no longer know what time it is, he will think he has only just gone to bed. If he dozes off in a position still more displaced and divergent, for instance after dinner sitting in an armchair, then the confusion among the disordered worlds will be complete, the magic armchair will send him travelling at top speed through time and space, and, at the moment of opening his eyelids, he will believe he went to bed several months earlier in another country. But it was enough if, in my own bed, my sleep was deep and allowed my mind to relax entirely; then it would let go of the map of the place where I had fallen asleep and, when I woke in the middle of the night, since I did not know where I was, I did not even understand in the first moment who I was; all I had, in its original simplicity, was the sense of existence as it may quiver in the depths of an animal; I was more bereft than a cave-man; but then the memory—not yet of the place where I was, but of several of those where I had lived and where I might have been—would come to me like help from on high to pull me out of the void from which I could not have got out on my own; I passed over centuries of civilization in one second, and the image confusedly glimpsed of oil lamps, then of wing-collar shirts, gradually recomposed my self's original features. ([Proust 2003](#), p. 9)

Proust depicts the moment of awakening from deep sleep as one where we have lost all sense of the self derived from memories of the episodes of our lives. Instead of the autobiographical or narrative sense of self as a person with a storyline through time, there remains only the sensation of existing at that moment. What marks the first instant of awakening is not the self of memory but the feeling of being alive, or what Proust calls “the sense of existence as it may quiver in the depths of an animal.”

The moment of awakening thus reveals two kinds of self-experience. The first kind is the embodied self-experience of being alive in the present moment, or the experience of being sentient. The second kind of self-experience is the autobiographical experience of being a person with a storyline, a thinking being who mentally travels in time. The first kind of embodied sense of self we experience immediately upon awakening, but as we reach automatically for the second kind of autobiographical sense of self, it sometimes goes missing.

This distinction between two modes of self-experience, one of which remains present in the sleep–wake transition even if the other is lost, suggests the following tentative phenomenological line of thought leading towards the idea of consciousness being present in certain phases of dreamless sleep.

Consider that although deep sleep creates a gap or a rupture in our consciousness, we often feel the gap immediately upon awakening. Our waking sense that we were just asleep and unknowing is not outside knowledge—like the kind we have when we know about someone else’s having been asleep; it is inside, first-hand experience. We are aware of the gap in our consciousness from within our consciousness. Although we may forget many things about ourselves when we first wake up—where we are, how we got there, maybe even our name—we do not have to turn around to see who it was who was just asleep and unknowing, if by “who” we mean the sense of self as the embodied subject of present-moment experience in contrast to the sense of self as the mentally represented object of autobiographical memory. This intimate and immediate bodily self-awareness that we have as we emerge from sleep into waking life suggests that there may be some kind of deep-sleep awareness, operative at least for some stretch of time prior to waking up, a taste of which we retain in the waking state, despite there being no specific mental content to recall. If there is a deep-sleep awareness we can retain in this way, then there may, at least for certain phases of deep sleep, be a phenomenal character to deep sleep or something “it is like” (Nagel 1974) to be deeply asleep—in which case consciousness

cannot be entirely absent from deep sleep (Sharma 2001).

This line of thought finds its strongest philosophical expression in classical Indian philosophy, so if we wish to see whether we can sharpen it into a more compelling argument, we need to look at the Indian discussions.

3 A classical Indian debate

In the earliest texts of the *Upaniṣads*, dating from the seventh century B.C.E., dreamless sleep is singled out as one of the principal states of the self, along with the waking state and the dream state. Various characterizations of dreamless sleep are given. Some texts characterize it as a state of oblivion, while other texts describe it as a mode of unknowing or non-cognitive consciousness that lacks either the outer sensory objects of the waking state or the inner mental images of the dream state (Raveh 2008). It is this second characterization that we find in the later texts of the Yoga and Vedānta schools. These texts also present a basic form of philosophical argument for dreamless sleep being a mode of consciousness. The argument runs as follows: When you wake up from a dreamless sleep, you are aware of having had a peaceful sleep. You know this directly from memory, so the argument asserts, not from inference. In other words, you do not need to reason, “I feel well rested now, so I must have had a peaceful sleep.” Rather, you are immediately aware of having been happily asleep. Memory, however, presupposes the existence of traces that are themselves caused by previous experiences, so in remembering that you slept peacefully, a peaceful feeling must have been experienced. To put the thought another way, the memory report, “I slept peacefully,” would not be possible if awareness were altogether absent from deep sleep; but to say that awareness is present in deep sleep is to say that deep sleep is a mode of consciousness.

To my knowledge, the earliest version of this argument comes from Vyāsa’s third or fourth century C.E. commentary on Patañ-

jali's *Yoga Sūtras*.¹ Patañjali defines yoga as the stilling or restraining of the “fluctuations” of consciousness (*Yoga Sūtras* I:2). When this stilling is accomplished, the “seer” or “witness” can abide in its true form, namely, pure awareness; otherwise the “seer” identifies with the fluctuations of consciousness—with the movements of thought and emotion (I:3–4). Patañjali identifies five kinds of fluctuations or changing states of consciousness: correct cognition, error, imagining or conceptual construction, sleep, and memory (I:5–6), and he defines sleep as a state of consciousness that is based on an “absence” (I:10).

As the traditional commentaries indicate, “absence” does not mean absence of consciousness; it means absence of an object presented to consciousness.² Deep and dreamless sleep is a kind of consciousness without an object. When we are awake we cognize outer objects, and when we dream we cognize mental images. When we are deeply asleep, however, we do not cognize anything—there is no object being cognized and no awareness of oneself as knower. Nevertheless, according to Yoga, we feel this peculiar absence while we sleep and we remember it upon awakening, as evidenced by our saying, “I slept peacefully and I did not know anything.”

Before we examine the debate arising from this argument, let me mention an obvious objection that would occur to us today, especially given what we know from sleep science. The objection is that retrospective subjective evaluations of sleep may be unreliable (Baker et al. 1999), so we cannot assume that the subjective feeling upon awakening of having slept peacefully is based on a veridical memory of a peaceful sleep. An extreme case of the unreliability of self-reports about sleep comes from insomnia patients (Perlis et al. 1997; Rosa & Bonnet 2000; Zhang & Zhao 2007). These patients frequently display sleep-state misperception; that is, their subjective

assessments of the quantity and quality of their sleep deviate strongly from the objective, polysomnographic measures. For example, they often identify themselves as having been awake when they are woken up from polysomnographically-defined sleep, they tend to overestimate sleep-onset latency (the length of time it takes to go from full wakefulness to sleep), and to underestimate total sleep time as compared with polysomnographic measures (Perlis et al. 1997). Even in healthy individuals, the feeling of having slept well could sometimes deviate from objective measures. One could feel refreshed upon awakening, yet the objective measures might show that one's sleep was physiologically restless or intermittent; or one could feel fatigued upon awakening, yet the objective measures might show that one's sleep was physiologically deep and undisturbed. In short, although it is conceptually true that a veridical episodic memory implies having undergone an experience whose content corresponds, to some degree, to that of the memory, it is an empirical matter whether or to what degree any given waking memory impression of sleep is veridical. It is also an empirical question whether episodes of peaceful sleep typically lead to the awareness of having slept peacefully and whether this feeling can occur even when sleep is disturbed.

This line of thought, however, is not decisive against the Yoga argument. Strictly speaking, all this argument needs is the possibility of there being veridical waking memories of having been deeply and dreamlessly asleep in order logically to establish that awareness can be present in at least certain phases or types of dreamless sleep. The argument does not need to establish that waking memory impressions are typically veridical, only that they can be. Indeed, as we will see later, the Yoga viewpoint can allow that ordinary sleep-state perception and retrospective subjective sleep-state evaluations may be unreliable. I will come back to this point at the end of the paper.

A more direct objection to the argument, however, is to challenge the premise that wak-

1 For a translation of the *Yoga Sūtras* with Vyāsa's commentary, see Āraṇya (1983). Other useful translations can be found in Arya (1989); Bryant (2009); Chapple (2008); Iyengar (1996); and Phillips (2009).

2 Arya (1989, pp. 178–184); Bryant (2009, pp. 41–43); Iyengar (1996, pp. 59–60).

ing retrospective reports of sleep are ever memory reports. The philosophers of the Nyāya school (Naiyāyikas) make this challenge. They maintain that the statement, “I slept peacefully and I did not know anything,” expresses an inferential cognition, not a memory report, and that consciousness is entirely absent in dreamless sleep. Given how one feels upon awakening, one infers one had a peaceful sleep and no memory of any dreamless sleep awareness is involved.

Advaita Vedānta, in turn, argues against the Nyāyan viewpoint. The debate between them focuses in particular on the ignorance occurring in dreamless sleep, and specifically on how we know or establish the waking report, “I knew nothing.” While we are asleep we know nothing of this ignorance; we come to know it only upon waking up. Yet given that we do not remain ignorant of our own ignorance, how is this knowing of not-knowing possible? The Naiyāyikas claim that we infer we were ignorant because we do not remember anything, but the Advaitins argue that retrospective oblivion is no proof of a prior lack of consciousness. Moreover, when we wake up we have the feeling of having been asleep and having not known anything. This feeling, the Advaitins claim, is better regarded as a kind of memory brought about by the traces of previous experience. So, in some sense, we must experience our ignorance—the unknowing stillness of our mind—in dreamless sleep.

In reply, the Naiyāyikas claim that we have no consciousness in dreamless sleep, and that when we wake up we make an inference by reasoning in the following way: “While I was in deep sleep, I knew nothing, because I was in a special state (I was not awake) and I lacked the necessary means for knowledge (my senses and mental faculties were shut down).” Of course, the Naiyāyikas are not saying that we explicitly make this inference when we wake up. What they are saying is that what looks like memory is really a case of implicit reasoning taking this inferential form.³

³ My account of the Nyāyan position and of the Advaita Vedānta rebuttal relies heavily on Gupta (1995, pp. 56–66, 99), and Gupta (1998, pp. 84–86). My account simplifies a number of the complexities on both sides of the debate.

In order to understand the kind of inference that the Naiyāyikas think we make, as well as why the Advaitins reject the Nyāyan position, it will be helpful to state the inference in the form of the standard Nyāyan syllogism, which forms an important part of the Nyāyan theory of inferential knowledge.

Suppose we are looking at a hill and you say to me, “There is fire on the hill.” I doubt what you say, however, so you need to convince me. You point to the hill and say, “There is smoke on the hill.” I see the smoke and I am convinced. According to the Nyāya, if we want to unpack how perception and inference have worked together to convince me that you are right, we need to formulate the inferential cognition in the following five steps:

1. There is fire on the hill.
[This is the proposition to be proven. It is what you think when you look at the hill, and it is what you want to convince me is the case.]
2. Because there is smoke on the hill.
[This is the reason you give to support what you say.]
3. Wherever there is smoke there is fire.
[This step states the universal concomitance between the presence of smoke and the presence of fire.]
4. As in the case of the kitchen.
[This step provides an example or actual case of the concomitance, to which we both agree.]
5. There is fire on the hill.
[This step states the conclusion, which is the proposition with which we began, but now stated as established and generated by the preceding inferential process.]

Let us now take this five-step syllogism and apply it to the case of dreamless sleep.⁴ The Nyāya view is that our knowledge that we knew nothing in dreamless sleep is based on the following sort of inference:

1. While I was in dreamless sleep, I knew nothing (there was an absence of knowledge in my self).

⁴ The following inference is my reconstruction of the Naiyāyikas’ reasoning as understood by their Advaita Vedāntin opponents. See Gupta (1995, pp. 56–66, 99), and Gupta (1998, pp. 84–86).

2. This is because (i) I (my self) was in a special state (that is, not awake) or (ii) I (my self) lacked the necessary means for knowledge (that is, my senses and mental faculties were shut down).

3. Whenever (i) I (my self) am in a special state (whenever I am not awake) or (ii) I (my self) lack the necessary means for knowledge (whenever my senses and mental faculties are shut down), I know nothing (there is an absence of knowledge in my self).

4. As in the case of fainting or a blow to the head.

5. While I was in dreamless sleep, I knew nothing (there was an absence of knowledge in my self).

Notice the parallel between the previous inference concerning fire and the present inference concerning dreamless sleep. In the previous case, our concern is to establish the presence of fire on the hill. In the present case, our concern is to establish the absence of knowledge in the self during dreamless sleep. Nevertheless, the form of reasoning is the same.

Again, the Naiyāyikas are not saying that we explicitly go through this inference step by step when we wake up. What they are saying is that we know by inference that we were ignorant during dreamless sleep, and that our inference can be shown to be correct when we make explicit all the steps that it contains. So there is no need to suppose that there is any kind of consciousness during dreamless sleep.

The Advaitins respond by arguing that this inference is faulty and cannot be how we know that there is an absence of knowledge during sleep. The problem is that I need some way to know or establish the reasons for inferring that I knew nothing—namely, that I was in a special state and that I lacked the means for knowledge—and there seems to be no way for me to do this without my relying on the kind of memory these reasons were supposed to obviate.

The first reason the Naiyāyikas give for me to infer that I knew nothing is that I was in a special state, that is, a state different from the waking state. But how do I know that I was

in a special state? If I say, “Because I knew nothing in this state,” then I am reasoning in a circle.

The second reason the Naiyāyikas give for me to infer that I knew nothing is that the means for knowledge were lacking—that is, that my senses and mental faculties were shut down. But here too we need to ask, how do I know that these means were lacking? How do I know my senses and mental faculties were inactive?

Suppose I say, “I infer my senses were shut down because they feel refreshed when I wake up.” But here the same basic problem repeats itself. How do I know or establish that there is a relationship between my senses feeling refreshed and their previously having been inactive? Would I not need to have some experience of knowing that my senses were inoperative together with an experience of knowing I feel refreshed in order to establish a relationship between the two? But while I am asleep I do not have any experience of knowing my senses are inactive; I know this only upon awakening. So how do I establish this relationship? If I appeal to yet another inference, then it looks like I am headed off on an infinite regress.

More generally, the only way I can know that the means for knowledge were absent in deep sleep is by knowing that there was no knowledge present in this state. Only by knowing the effect—my not knowing anything—can I infer the cause—the absence of the means for knowledge. So unless I already know what the inference is trying to establish—that I knew nothing—I cannot establish the reason on which the inference relies.

The Advaita Vedānta conclusion is that I know on the basis of memory, not inference, that I knew nothing in deep sleep. In other words, I remember having not known anything. But a memory is of something previously experienced, so the not-knowing must be experiential.

It is important to highlight the larger metaphysical disputes about the self and cognition that drive this debate. For the Naiyāyikas, the self is a non-physical substance. Unlike Descartes, however, who held that consciousness is the essence of the non-physical mind, the

Naiyāyikas maintain that the self is the substratum of consciousness and that consciousness is an adventitious quality of this substratum that is present only given the appropriate causal conditions, namely when the sensory and mental faculties are functioning to cognize objects. In addition, cognition consists in the taking of a separate object as content and never in taking itself as its own content.⁵ (In the case of introspection, a second-order cognition takes a separate first-order cognition as its object.) For the Advaitins, however, the self is pure consciousness, that is, sheer witnessing awareness distinct from any changing cognitive state. Thus, unlike the Naiyāyikas, the Advaitins cannot allow that consciousness disappears in dreamless sleep, since they think (as do the Naiyāyikas) that it is one and the same self who goes to sleep, wakes up, and remembers having gone to sleep. In addition, for the Advaitins, cognition consists in a reflexive awareness of its own occurrence as an independent prerequisite for the cognition of objects (Ram-Prasad 2007). In other words, the defining feature of cognition is reflexivity or self-luminosity, not intentionality (object-directedness), which is adventitious. Thus, during dreamless sleep, although object-directed cognition is absent, consciousness as reflexive and objectless awareness remains present.

It may help to use the modal notions of necessity and possibility to describe the difference between these views. For the Naiyāyikas, to be in a conscious state is to be in an object-directed state. Given that dreamless sleep is not an object-directed state, it is necessarily the case that consciousness is absent from this state. Nevertheless, if it could be shown that object-directed cognition can occur in dreamless sleep, then the Nyāya could allow for the possibility of consciousness during dreamless sleep. Such consciousness, however, would have to be intermittent or episodic, since object-directed cognitions come and go. What the Nyāya cannot allow is that consciousness is intrinsically reflexive or self-revealing (self-luminous), or that it can occur without an object. Furthermore, for the Nyāya, consciousness requires a

substratum, since consciousness is a mental quality, and mental qualities require the substratum of the self. Therefore, although the self continues to be present during dreamless sleep, consciousness is absent. The Advaitins agree with the Naiyāyikas that the self remains continuously present during dreamless sleep, but they maintain that the self is pure consciousness—consciousness as intrinsically reflexive and self-revealing, not as contingently and adventitiously object-directed. So, for the Advaitins, consciousness cannot ever be absent from dreamless sleep, which is to say that it is necessarily the case that consciousness is present throughout dreamless sleep.

Given these differences, the Nyāya might be thought to be more flexible than Advaita Vedānta with regard to the specific issue about dreamless sleep, since the Nyāya can allow for the possibility of intermittent consciousness during dreamless sleep, whereas Advaita Vedānta cannot allow for any absence of consciousness in this state.

Despite this limitation of the Advaita Vedāntan view, it is possible to extract a key phenomenological idea from its metaphysical commitments. This idea is that when I wake up from a dreamless sleep, it seems that I can sometimes knowingly say I have just emerged from a dreamless sleep, and this saying seems to be a reporting of my awareness, not the product of having to reason things out (Kesarcondi-Watson 1981). It is this thought that provides a premise of the Advaita Vedāntan argument for consciousness continuing in dreamless sleep, and this thought is logically distinct from the Vedāntan belief that the self is essentially pure consciousness.

This phenomenological thought, however, is open to the objection that, given an apparent memory, it does not follow that the state apparently remembered was consciously experienced. For example, we may have apparent memories of childhood events, yet their presence does not imply that these events were consciously experienced, for the memory impressions may have been acquired from other sources of information, such as things our parents told us or family photographs. Similarly, during dreamless

⁵ See Ram-Prasad (2007, Ch. 2) for discussion of the different Indian views about the nature of cognition and consciousness.

sleep, information may accumulate non-consciously from a variety of interoceptive and exteroceptive sources, and upon awakening we may realize that something was going in our mind while we were asleep, though at the time we had no experience of it.

At one level—the level of the empirical psychology of memory—we can make the same reply here that we made above to the objection to the Yoga argument, namely that all the argument requires is the possibility of there being genuine veridical episodic memories upon awakening of having been peacefully asleep; the argument does not need to establish that every apparent waking memory is such a memory. Unlike remote memory (of the sort we have for childhood events) or semantic memory (memory for learned facts or words), episodic memory is standardly taken to require that the events “encoded” in memory are experienced at the time of encoding. So, if there are possible cases upon awakening in which there is any kind of genuine episodic memory “retrieval” of the dreamless-sleep state, it follows that in such cases something about the state of being dreamlessly asleep must have been experientially encoded.

At another level—the level of cross-cultural philosophy of mind—we can see in the Vedāntan phenomenology the basis of a transcendental argument. Transcendental arguments aim to deduce what must be the case in order for some aspect of our experience to be possible. In the present case, the aspect of experience with which we are concerned is not simply that we sleep but that we know that we sleep. What are the necessary conditions of possibility for this kind of self-knowledge? To put the question in a more phenomenological way, how is it possible for you as a conscious subject to experience yourself as one and the same being who falls asleep, who does not actively know anything in being asleep, and who emerges from sleep into waking life? The Vedāntan view is that a retrospective inference across the gap of a complete absence of consciousness will not suffice to make this kind of unified self-experience possible. Rather, you must have some kind of experiential acquaintance with dreamless sleep as a mode of your conscious being.

We can take a further step and think about the Vedāntan argument not just from a Kantian transcendental perspective but also from a Husserlian transcendental phenomenological perspective. From this perspective, the core of the Vedāntan argument concerns not so much episodic memory in the sense of the distinct mental act of recollection but rather what Husserl calls “retention”—the holding onto the just-past as an intentional content belonging to our consciousness of the passage of time, including our own mental lives as flowing in time. The Advaita Vedāntan thought is that, at the moment of waking up, I can experience by retentional awareness my having just been asleep and my having not known anything. What Nyāya fails to see, according to Vedānta, is that I need this kind of retentional awareness in order to have the first-person knowledge that I slept and to ground any retrospective inference I may subsequently make.

Of course, even if we suppose that there is or can be such a direct memory in the form of a retentional awareness of the deep sleep state, the presence of such a memory would not suffice to prove the continuous presence of consciousness throughout the entirety of dreamless sleep. After all, the presence of such a memory seems compatible with there having been moments or periods during which consciousness vanishes completely, with the sleeper remembering only the later smoothed-out and mentally-merged, conscious parts of sleep. Nevertheless, if dreamless sleep allows for or includes phases in which awareness is present, then this state cannot be defined as one in which consciousness is absent.

Another important Advaita Vedāntan thought is that when I say I just woke up from a dreamless sleep, the first-person pronoun does not refer to my autobiographical self—my self as I represent it in personal memory. Rather, it picks out my consciousness or subjectivity itself. To use a phenomenological idiom, it picks out the “ipseity” or minimal selfhood of consciousness in contrast to the ego as a mentally represented object of memory or reflection. But whereas the Advaitin takes this minimal selfhood to be a transcendental “witness consciousness” (Gupta 1998), it is open to us today to

maintain that it is my embodied self or bodily subjectivity, or what phenomenologists would call my “pre-personal lived body.” In this way, we may be able to remove the Advaita Vedāntan conception of dreamless sleep from its native metaphysical framework and graft it onto a naturalist conception of the embodied mind—a conception that should also appeal to the Cārvāka or naturalist school of Indian philosophy (see Ganeri 2012, pp. 69–97), besides being tractable for cognitive science.

Cognitive science is also relevant to an interesting disagreement between Yoga and Advaita Vedānta concerning cognitive activity during dreamless sleep. Advaita Vedānta maintains that cognitive activity ceases during dreamless sleep and only consciousness remains, whereas Yoga maintains that cognitive activity continues during dreamless sleep (see Dasgupta 1922, pp. 460–61). To understand this difference it is important to note that both traditions distinguish between consciousness, which is the self-luminous (reflexive) and passive witnessing awareness, and the mind, which is the intentional or object-grasping cognitive system. Moreover, in the Yoga view, the mind is material, and so is not different from the body (see Schweizer 1993). According to Yoga, deep sleep is a subtle or reduced state of the mind, specifically of the “inner sense” (*antaḥkāraṇa*), which includes both mental cognition (*manas*, which processes and integrates sensory material, and *buddhi*, which intellectually discriminates and judges) and the sense of ego (*aḥamkāra*, the feeling, “I am”). Thus, for Yoga, cognitive activity, particularly the formation of memories, continues subliminally in deep sleep, and this process is physical or physiological. According to Advaita Vedānta, however, the mind, specifically the inner mental sense, shuts down entirely in deep sleep, leaving only the passive “witness consciousness” and the life processes of the body. If we set aside the question of consciousness and ask whether cognitive activity, specifically memory formation, occurs during deep sleep, the answer from cognitive science is unequivocal, for evidence from psychology and neuroscience indicates that memory processes are strongly present in deep sleep (Diekelmann & Born 2010; Walker 2009).

These processes include both passive and active forms of memory consolidation (the strengthening of newly-acquired memories and the integration of them with older ones). Of course, this kind of memory consolidation is thought to occur in the absence of consciousness, so this evidence does not support the Yoga and Vedāntan view that consciousness continues in dreamless sleep. Nevertheless, the evidence does support the Yoga view that physiologically-instantiated cognitive processes continue in dreamless sleep, contrary to both Advaita Vedānta and Nyāya, which believe the mind shuts down in dreamless sleep.

The claim that mental activity ceases in dreamless sleep while consciousness remains creates another difficulty for the Advaita Vedāntan view. If the inner sense stops functioning in dreamless sleep, then how is the waking memory, “I slept peacefully and I did not know anything,” formed? Episodic memory requires the encoding of experience, so if there is no experience of “I” in dreamless sleep, then how can I remember that I slept well?

The Advaita Vedānta answer is clever (see Dasgupta 1922, pp. 460–461). In deep and dreamless sleep, ignorance completely envelops the mind. Since the ego sense is inoperative, it doesn’t appropriate this ignorance to itself, so there is no feeling of the ignorance belonging to an “I.” At the moment of awakening, however, the ego sense, grounded on the felt presence of the body, reactivates, and the mind starts up its cognitive workings. Immediately, the ego sense appropriates the lingering impression or retention of not-knowing and associates this retention with itself, thereby generating the retrospective thought, “I did not know anything.”

From the Vedānta perspective, this “I” is not the true self; it consists in a mistaken superimposition of the self onto the mind-body complex. The true self is the egoless “witness consciousness” (egoless, because it is not a function of the ego sense). The Advaitin take this “witness consciousness” to be transcendental and not essentially embodied. It is open to us today, however, to suppose that if there is some kind of egoless and basal consciousness that can continue to be present in dreamless sleep, then it is a funda-

mentally embodied consciousness, perhaps a minimal mode of sentience consisting in the feeling of being alive. This thought provides another example of how it may be possible to separate the Advaita Vedāntan conception of consciousness in dreamless sleep from its original metaphysical framework and graft it onto a contemporary naturalist conception of the embodied mind.

If we project some terminology from contemporary philosophy of mind onto Yoga and Advaita Vedānta, then we can say that dreamless sleep counts for these Indian philosophers as a “phenomenal state” or a state of “phenomenal consciousness”—a state that has a phenomenal character or for which there is something it is like to be in that state. What is it like? Yoga and Vedānta describe deep and dreamless sleep as peaceful, as one undifferentiated awareness not divided up into a sense of being a distinct subject aware of a distinct object, and as blissfully unknowing. From a contemporary naturalist perspective, this conception could be taken as a description of a quiescent and tranquil form of sentience or the feeling of being alive. Under this description, dreamless sleep would not count as a state of “access consciousness”—a state whose phenomenal content or character we can cognitively access, hold in working memory, and use to guide our attention and thinking. We seem to have no cognitive access to being asleep during sleep; rather, we gain access retrospectively in the waking state. On this conception, in dreamless sleep we are phenomenally aware but we have no cognitive access to that awareness at the time.

Ultimately, however, this way of conceptually parsing the Yoga and Vedāntan view will not work. A central commitment of Yoga and Vedānta, as well as Indo-Tibetan Buddhism, is that we can gain access to the state of dreamless sleep through meditative mental training. I will come back to this idea at the end of this paper. But first we need to consider the default view of consciousness and dreamless sleep in cognitive neuroscience.

4 Assessing the default view

Why have neuroscientists thought that consciousness disappears during dreamless sleep?

One reason comes from the reports that people give when they are woken up from NREM (non-Rapid Eye Movement) sleep, especially when the EEG shows slow waves in the delta frequency range (0.5–4 Hertz) during sleep stages 3 and 4 (so-called slow-wave sleep). When given the instruction, “report anything that was going through your mind just before waking up,” people tend to report short and fragmentary thoughts or not being able to remember anything at all (Nielsen 2000; Tononi & Koch 2008, p. 243). On the basis of such reports, scientists conclude that the sleepers were aware of little or nothing at all prior to being woken up, and hence that slow-wave sleep is a state of reduced or absent consciousness.

We need to be cautious here, however. The fact that one has no memory of some period of time does not necessarily imply that one lacked all consciousness during that time. One might have been conscious—in the sense of undergoing qualitative states or processes of sentience or awareness—but for one reason or another one was not able to form the kind of memories that later one can retrieve and verbally report.

This point is familiar to scientists who study the effects of anaesthetics (Alkire et al. 2008). At certain doses, some anaesthetics prevent memory formation while sparing awareness. Near the threshold of unconsciousness, some anaesthetics block working memory, but patients may still be aware and fail to respond because they immediately forget what to do. At lower doses, patients under general anaesthesia can sometimes carry on a conversation using hand signals, but after the operation they deny ever being awake.

Although dreamless sleep and anaesthesia are not the same condition, the general point that retrospective oblivion does not prove a prior lack of consciousness must be kept in mind whenever we are tempted to infer that consciousness is absent in deep sleep because people report not being able to remember anything when they are woken up.

We also need to think about the kinds of verbal reports that people are asked to make when they are woken up in the sleep lab. The instruction to report “anything going through

your mind just before waking up” encourages you to direct your attention and memory to the objects of your awareness—to anything you might have been thinking about. But what about the felt qualities or phenomenal character of your state of awareness? A different instruction would be to report “anything you were feeling just before waking up.” This instruction encourages you to direct your attention and memory to the felt quality of your sleep. Did you have any feeling of being aware? Was your sleep peaceful and clear, or was it agitated, restless, or sluggish? Or do you have no impression of any feeling or quality of awareness? The point here is to guide people away from focusing exclusively on the intentional objects of consciousness, which may be absent in deep sleep, and to orient them towards the felt qualities or phenomenal character of awareness itself.

Another reason neuroscientists think that consciousness fades away in deep sleep comes from comparing brain activity during slow-wave sleep with brain activity during waking consciousness. For example, during wakefulness, when an electrical pulse is used to stimulate a small region of the brain, the pulse generates an EEG response that lasts for 300 milliseconds and that is made up of rapidly changing waves that propagate in specific directions over long distances in the cortex (Massimini et al. 2005; Tononi & Massimini 2008). During deep sleep, however, although the initial EEG response to the stimulation is stronger than during wakefulness, the response remains localized to the stimulated region instead of travelling to distant regions, and it lasts only 150 milliseconds. In short, whereas the waking brain responds to stimulation with a complex pattern of large-scale activity across many interconnected regions, the deeply sleeping brain responds with localized and short-lived activity. These findings are interpreted as showing that “effective connectivity”—the ability of neural systems to influence each other—breaks down in deep sleep. As a result, “large-scale integration” (Varela et al. 2001) in the brain cannot happen—that is, the brain cannot generate the kinds of dynamically-changing large-scale patterns of activity that are known to characterize consciousness in the waking state.

But what is it about the loss of effective connectivity and large-scale integration that makes neuroscientists think that consciousness disappears in deep sleep? To put the question another way, what is the connection between the presence of consciousness and the presence of effective connectivity and large-scale integration?

To answer this question, neuroscientists usually rely on the idea that a content of consciousness is a reportable content, and that reportable contents are ones that can be attentionally selected, held in working memory, and used to guide thought and action. Such cognitive processes—selective attention, working memory, sequential thought, and action guidance—require the large-scale integration of brain activity.

One of the more theoretically-principled versions of this idea is Giulio Tononi’s “integrated information theory” of consciousness (2008). According to this theory, any typical conscious experience has two crucial properties. First, it is highly “informative,” in the technical sense that it rules out a huge number of alternative experiences. Even an apparently simple conscious experience, such as lying on your back and seeing the clear blue sky throughout your whole visual field, is richly informative in the sense that it rules out a vast number of other experiences you could have had at that moment. Second, the experience is highly “integrated,” in the sense that it cannot be subdivided into parts that you experience on their own, such as the top and bottom portions of your visual field, or the color and the space of the sky.

Given this model of consciousness as “integrated information,” Tononi proposes that the level of consciousness of a system at a given time is a matter of how many possible states (information) are available to the system as a whole (integration). In the waking state, many possible states are available to the whole system (the system is rich in integrated information), whereas in deep sleep this repertoire drastically shrinks to just a few states (the system is poor in integrated information). Transposed onto the brain, the idea is that during slow-wave sleep

there is a massive loss of integrated information in the brain. Effective connectivity breaks down, leaving isolated islands that cannot talk to each other (loss of integration), while the repertoire of possible states contracts to a few largely uniform states (loss of information). Hence, according to the integrated information model, deep sleep is a state where consciousness reduces to a very low level or disappears entirely.

Although the integrated information theory offers a useful way of thinking about the qualitative richness and coherence of consciousness in informational terms, the theory has serious limitations as a theory of phenomenal consciousness, so it would be a mistake to use the theory to rule out the possibility of consciousness during dreamless sleep.

Despite Tononi's bold claim that "consciousness is one and the same thing as integrated information" (2008, p. 232), integrated information does not seem sufficient for consciousness. On the one hand, even simple systems have some degree of integrated information, so the equation of consciousness and integrated information implies that even simple systems, such as a photodiode, have some degree of consciousness. On the other hand, complex digital computers can possess a high amount of integrated information. Yet neither system is conscious (at least the attribution of consciousness to such systems seems highly implausible) (see Searle 2013). As Ned Block (2009) points out, the integrated information theory fails to distinguish between intelligence, in the sense of being able to solve complex problems by integrating multiple sources of information, and consciousness, in the sense of sentience or felt awareness (phenomenal consciousness). Since integrated information does not seem sufficient for consciousness—let alone identical to it—the presence or absence of integrated information cannot be the crucial mark of whether a state is conscious or not conscious.

We also need to keep in mind the distinction between "phenomenal consciousness" and "access consciousness." To be phenomenally conscious means to be in a state that has some subjective or phenomenal character. To be ac-

cess conscious means to be in a state where there is cognitive access to the contents of awareness. Whether a state's being phenomenally conscious requires that it be cognitively accessible is currently a matter of debate (Block 2011; Cohen & Dennett 2011). Although large-scale integration in the cortex is crucial for cognitively accessed or reported conscious experience, it may not be crucial for every kind of phenomenal consciousness; for example, it may not be crucial for the kind of cognitively unaccessed consciousness that Yoga and Vedānta maintain is present in dreamless sleep (though they also maintain, as we shall see, that this kind of consciousness is accessible if one is highly trained in certain types of meditation).

The upshot of this critical assessment of the default view is that neither the subjective report data nor the objective neurophysiological data suffice to rule out the possibility of a subtle mode of phenomenal consciousness occurring in certain phases of dreamless sleep. To put the point another way, the sleep science construct of "dreamless sleep," defined electrophysiologically as slow-wave sleep, may need phenomenological refinement. We need to allow for the possibility that certain types of slow-wave sleep may have a phenomenal character—a possibility that could in turn lead to refinements in the physiological construct of slow-wave sleep. It follows from these considerations that the standard neuroscientific definition of consciousness as "that which disappears in dreamless sleep and reappears in waking and dreaming states" is not acceptable. At the very least, it needs qualification in light of the present considerations, and it may need to be either substantially revised or abandoned in light of further research.

The case of dreamless sleep suggests that we need to allow at least for the possibility of there being modes of phenomenal consciousness that may not be cognitively accessible in the usual ways. At the same time, Yoga and Vedānta, as well as Indo-Tibetan Buddhism, maintain that aspects of the mind in deep and dreamless sleep can become cognitively accessible through meditative mental training. This is the last topic I wish to discuss. My main point

will be that considering sleep from this contemplative angle suggests new experimental questions and protocols for the cognitive neuroscience of sleep and consciousness.

5 New experimental questions and protocols

In juxtaposing the Indian and neuroscience conceptions of deep sleep, I have proceeded so far as if the Indian notion of dreamless sleep corresponds to NREM slow-wave sleep. But we can now see that this correspondence is too simplistic. The Indian conception of dreamless sleep suggests that we need a finer taxonomy of sleep states—a taxonomy that is not just physiological but also phenomenological, and that accommodates the ways that sleep may be culturally variable as well as flexible and trainable through meditative practices.

Consider that the fourth century C.E. author, Vyāsa, in his commentary on Patañjali's *Yoga Sūtras*, distinguishes three types of sleep that are recalled upon awakening—peaceful sleep, disturbed sleep, and heavy sleep. According to the cosmology that informs Yoga, these three types of sleep result from whichever one of the three qualities or tendencies (*guṇas*) predominates in the psychophysical complex. Overall, the quality of dullness or the tendency to inactivity (*tamas*) dominates the mind in ordinary sleep. Sleep is heavy or stupefying when this quality is not modified by either of the two other qualities or tendencies. Sleep is disturbed and restless when the quality of excitation or tendency to activity (*rajas*) is present. And sleep is peaceful and refreshing when the quality of lightness or tendency to clarity (*sattva*) is present. When the Vedānta philosophers describe deep and dreamless sleep as blissful, it is deep sleep, with this quality of clarity, that they have in mind.

When sleep-lab participants are roused from NREM sleep, however, they sometimes report that they have been thinking while they were asleep, and often they describe going around in a repetitive loop of rumination. Although this kind of thinking probably occurs mainly in stage 2 NREM sleep, it is also repor-

ted during awakenings from deeper slow-wave sleep.

Owen Flanagan appeals to this finding to argue that there is no such thing as dreamless sleep and hence no sleep completely lacking in consciousness (2000). Contrary to the standard neuroscience view, Flanagan thinks we are always conscious while asleep because we are always dreaming. Dreaming, he proposes, is any conscious mental activity occurring during sleep, not just mental activity involving sensory imagery. If ruminative thinking occurring in NREM sleep counts as dreaming, and if this kind of mental activity can happen during slow-wave sleep, then all sleep stages involve dreaming and at least some degree of consciousness.

From the Indian perspective, however, we need to distinguish clearly between two things. One is whether there is such a thing as dreamless sleep; the other is whether we are conscious while we sleep. Yoga and Vedānta agree that consciousness is present while we sleep, but this is not because we are always dreaming, even if we define “dreaming” widely to mean any kind of thinking during sleep. On the contrary, what Yoga and Vedānta mean by “dreamless sleep,” as we have seen, is that sleep state in which there are no sensory or mental objects of awareness, that is, no images and no thoughts. Nevertheless, they maintain, there is awareness, so this state is a conscious state; it is a mode of consciousness without an object.

In the Yoga framework, reports of ruminative thinking upon awakening indicate a coarser or shallower sleep state—one closer to the surface of thinking consciousness—and a state with a strong quality of excitation or tendency toward movement of the mind.

Consider now the reasons that sleep scientist J. Allan Hobson gives for doubting the reliability of waking reports of ruminative thinking during slow-wave sleep:

Reports of antecedent mental activity elicited following awakenings from deep sleep are rendered unreliable by the brain fog through which they must pass [...]. Even if the deeply sleeping brain were capable of

the low-level ruminations sometimes implied by experimental reports, it is unlikely that they would survive the inertia of awakening. It may even be that the tumult of the awakening process triggers the chaotic and fragmentary mentation that is reported. And even when deep sleepers are sufficiently aroused to be interviewed, they may still generate huge slow waves in their EEGs, indicating that they are in a semitorporous state quite different from either sleeping or waking. Indeed, they may even hallucinate, become anxious, and confabulate as if they suffered from delirium. This is precisely what happens in the night terrors of children. (1999, pp. 142–143)

Clearly, this too is a far cry from the Indian conception of dreamless sleep. Neither reports of ruminative thinking nor waking hallucinatory confabulations correspond to the Yoga and Vedāntan descriptions of dreamless sleep as a peaceful or blissful state free of mental activity, from which one awakens feeling alert and refreshed. From the Yoga perspective, what Hobson describes are sleep states strongly marked by a quality of dullness combined with mental excitation upon awakening.

My point here is not at all that sleep science should refine its taxonomy using the Yoga framework. It is rather that ultimately we cannot map the Indian notion of dreamless sleep using already-established scientific categories, especially the physiologically-defined sleep stages, which, even from a scientific perspective, are now recognized as too crude to capture the moment-to-moment dynamics of electrical brain activity during sleep, let alone the experiences with which they may be correlated (Nir & Tononi 2009). Not only is the Indian notion phenomenological and metaphysical, rather than physiological, it is also embedded in a normative framework that understands sleep in contemplative terms. So, to bridge from sleep science and the neuroscience of consciousness to the Indian conception of dreamless sleep, we need to view sleep as a mode of being that is trainable through meditation.

From the Yoga perspective, entering a state of blissful dreamless sleep on a regular basis requires leading a calm and peaceful life guided by the fundamental value of nonviolence (*ahimsā*), practicing daily meditation, and treating going to sleep and waking up as themselves occasions for meditation—for watching the mind as it enters and emerges from sleep.

In addition, from a yogic perspective, we need to distinguish between ordinary dreamless sleep and lucid dreamless sleep. Ordinary dreamless sleep is the sleep of ignorance, in which awareness is described as being in total darkness. Lucid dreamless sleep is described as a state in which awareness is luminous and without an object (free of thoughts and images). Whereas lucid dreaming consists in knowing that you are dreaming, lucid dreamless sleep is said to consist in being able to witness the state of dreamless sleep and recall its phenomenal clarity upon waking up. Although the background metaphysics of Yoga, Vedānta, and Indo-Tibetan Buddhism differ in significant ways, they all describe lucid dreamless sleep as disclosing a basal level of pre-personal consciousness that lies deeper than the modes of awareness that characterize the ego-centred waking and dreaming states.⁶

At this point you may wonder whether we have strayed back into the realm of metaphysics. Does this conception of dreamless sleep really have any descriptive phenomenological content or is it simply a consequence of the Indian metaphysical views that identify the true self with pure consciousness (as in the case of Vedānta) or that maintain that there is no self but only an ownerless stream of consciousness that continues in dreamless sleep (as in Indo-Tibetan Buddhism)?

From a purely textual perspective, the metaphysical and the phenomenological are thoroughly intertwined in the Indian discussions. From a cognitive science perspective, however, we can ask whether the idea of inducing lucid dreamless sleep through certain types of meditation is experimentally testable,

⁶ For further discussion, see Thompson (2014).

and, more generally, whether meditation is associated with altered sleep patterns or has measurable effects on sleep. Two neuroscience studies of sleep in relation to meditation are suggestive in this regard.

One recent study comes from the laboratories of Giulio Tononi and Richard Davidson (Ferrarelli et al. 2013). They examined slow-wave sleep in highly experienced Theravāda Buddhist and Tibetan Buddhist meditation practitioners. They found that the long-term meditators, compared to non-meditators, had significantly increased fast-frequency gamma activity, as recorded by high-density EEG, in a parietal-occipital region of the scalp during NREM sleep. In addition, the higher gamma activity was positively correlated with the length of meditation training. This finding is notable because gamma-frequency electrical brain activity is a well-known neural marker of conscious cognitive processes (Tononi & Koch 2008), including certain types of meditative states in long-term meditation practitioners (Lutz et al. 2004). Gamma activity has also been shown to distinguish lucid dreaming from non-lucid dreaming in REM sleep (Voss et al. 2009; see also Voss & Hobson this collection). During NREM sleep, however, gamma activity tends to decrease, so the higher gamma activity in the meditators could reflect a capacity to maintain some level of awareness. More generally, the study suggests that there may be distinct slow-wave sleep states associated with meditation practices.

Another older study examined long-term practitioners of TM (Transcendental Meditation) who reported what they called the subjective experience of “witnessing” during sleep (Mason et al. 1997). They described this experience as one of feeling a continuous and peaceful awareness without dreams while one sleeps and as resulting in one’s feeling refreshed upon awakening. The main finding was that the long-term meditation practitioners, compared to short-term practitioners and non-meditators, showed a unique EEG pattern during slow-wave sleep, one in which faster alpha and theta waves were superimposed on the slower delta waves. Although we cannot draw clear conclusions

about what these distinctive physiological patterns mean, including whether they are due to TM practice or some other cause, the authors of the study interpret them as supporting the presence of a different kind of slow-wave sleep state in individuals who report witnessing of sleep.

These two studies reinforce the point that we cannot use already established categories from sleep science to map the Indian conception of dreamless sleep. This conception, besides being closely tied to a specific phenomenology, which in turn reflects a specific metaphysics, is embedded in a normative cultural framework that aims to bring about and promote certain kinds of contemplative sleep states. Instead of trying to fit these states into a physiological scheme derived from studying the way twentieth-century Americans and Europeans sleep in the sleep lab, we need to enlarge the conceptual framework of sleep science to include contemplative ways of training the sleeping mind. This project will require that sleep scientists, cognitive neuroscientists, cognitive anthropologists, and Western and Indian philosophers work together to map the sleeping mind. In short, we need a cross-cultural cognitive science and neurophenomenology (Lutz & Thompson 2003) of the wake–sleep cycle, one that draws on the combined expertise of Western and Asian theoretical traditions.

One benefit of such a cross-cultural cognitive science is that it could offer new data relevant to our guiding question about consciousness and dreamless sleep. Consider the following testable, neurophenomenological hypothesis: In highly-experienced practitioners of certain types of meditation, compared to individuals without this kind of experience, we should observe a stronger correlation between subjective reports of phenomenal qualities of sleep and various objective measures of brain activity. Specifically, if highly experienced meditators were able to provide reports upon awakening about qualities of their experience of the state they call dreamless sleep, and if cognitive neuroscientists were able to relate these reports to fine-grained features of sleep physiology and to familiar aspects of the neural correlates of consciousness, then we would have new evidence

from experimental science that a certain type of dreamless sleep in certain individuals counts as a mode of phenomenal consciousness whose felt qualities can be made accessible to verbal report.⁷

This hypothesis also cast lights on our earlier discussion of sleep-state misperception. From a contemplative perspective, when little attention is given to sleep as an occasion for the practice of mindfulness, it is not surprising that sleep-state perception will be unreliable, even in ordinary individuals, let alone patients suffering from insomnia or other sleep disorders. In contrast, sleep-state perception may be more reliable when sleep is valued in a contemplative way and is treated as an opportunity for cultivating mindfulness. Whether these assumptions are correct is something that neurophenomenology should test.

6 Conclusion

The definition of consciousness as “that which disappears in dreamless sleep and reappears when we wake up or dream” is unsatisfactory. It rules out the possibility of states or phases of dreamless sleep in which some kind of consciousness is present. A strong case for taking seriously this possibility can be constructed by combining resources found in Indian philosophy, Western philosophy of mind, the neuroscience of consciousness, and sleep science. The main message of this paper—besides that of needing to revise the above definition of consciousness—is that we need a more refined taxonomy of sleep states than the one that sleep science and the neuroscience of consciousness currently employ, and that contemplative methods of mind training are relevant for advancing the neurophenomenology of sleep and consciousness.

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⁷ For further discussion, see [Thompson \(2014\)](#).

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