Dreamless Sleep, the Embodied Mind, and Consciousness

The Relevance of a Classical Indian Debate to Cognitive Science

Evan Thompson

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

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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

Glossary

1. Canonical physiological sleep states according to polysomnography	*"Light Sleep"* • 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. *"Deep Sleep" or "Slow-Wave Sleep"* • 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	• 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	• *Yoga Sūtras*, 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)	• Śaṇkara (788–820 CE). • Sureśvara (c. 9th century CE). • Madhusūdana (c. 16th century CE).
Buddhism	• The Theravāda school postulates a basal and passive "life continuum" or "factor of existence" consciousness (*bhavaṅga*) that occurs in dreamless sleep (c. 3rd century BCE–2nd century CE). • The Yogācāra school postulates a basal "store consciousness" (*ālaya-vijñāna*), which persists in dreamless sleep (c. 4th century CE).
NO CONSCIOUSNESS IN DREAMLESS SLEEP	
Nyāya (Nyaiyāyikas)	• *Nyāya Sūtras,* 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 caveman; 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]

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).

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.

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.

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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 (Kesarcordi-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" (*antaḥkaraṇa*), which includes both mental cognition (*manas,* which processes and integrates sensory material, and *buddhi*, which intellectually discriminates and judges) and the sense of ego (*ahaṃkāra,* 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 unequivoval, 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 access 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 reported 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 semistuporous 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 (*ahiṃsā*), 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.

7 For further discussion, see Thompson (2014).

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Just in Time—Dreamless Sleep Experience as Pure Subjective Temporality

A Commentary on Evan Thompson

Jennifer M. Windt

In this commentary, I propose a strategy for extending Evan Thompson's argument on the existence of dreamless sleep experience. My first aim is to show that the Indian debate on reports of having slept peacefully is importantly similar to debates in scientific dream research and contemporary Western philosophy on the trustworthiness of dream reports. This analogy leads to a surprising conclusion: the default view of conscious experience as that which disappears in dreamless sleep, though widely accepted in cognitive neuroscience, is in fact inconsistent with the methodological background assumptions of scientific dream research. Importantly, the methods already used in scientific dream research, as well as the theoretical justification on which they are based, can be extended to the investigation of dreamless sleep experience. Second, I sketch the outlines of a conceptual model of dreamless sleep experience as involving pure subjective temporality, or phenomenal experience characterized only by the phenomenal *now* and the sense of duration, but devoid of any further intentional content. I suggest that understood in this manner, dreamless sleep experience is a candidate for minimal phenomenal experience, or the simplest form in which a state can be phenomenally conscious. This model also extends existing work on minimal phenomenal selfhood in dreams. Third, I discuss three empirical examples that I take to be particularly promising candidates of dreamless sleep experience. These are certain forms of minimal or imageless lucid dreams, white dreams, and sleep-state misperception of the type most dramatically seen in subjective insomnia.

Keywords
Dreaming | Dreamless sleep | First-person reports | Insomnia | Lucidity | Minimal phenomenal experience | Minimal phenomenal selfhood | Sleep-state misperception | Time consciousness | White dreams

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1 Introduction

The default view in philosophy of mind and cognitive neuroscience has long been that the very notion of phenomenal experience occurring during dreamless sleep is nonsensical and involves a conceptual contradiction.[1] In this view, consciousness is „that which disappears in dreamless sleep and reappears when we wake up or dream" (Thompson 2015, this collection, p. 1), and dreamless sleep is simply characterized by the absence of conscious experience.[2] In his target article, Evan Thompson casts doubt on this view. Drawing from classical Indian philosophy as well as evidence from sleep and dream research, he argues that dreamless sleep experience is a theoretically coherent and empirically tractable target for future research. Yet, in order to even begin to make sense of dreamless sleep experience, a more fine-grained taxonomy of sleep states and new experimental protocols integrating disciplined first-person reports as well as neuroscientific methods are needed.

Here, I take up this challenge and attempt to sketch the outlines of a positive account of dreamless sleep experience. This commentary has three main aims. The first is to propose that Thompson's case for dreamless sleep experience can be strengthened by constructing a rough analogy between the historical Indian debate on dreamless sleep and contemporary Western debates from scientific dream research and philosophy on the epistemic status of dream reports. Based on this analogy, I argue that the default view is inconsistent with the methodological background assumptions of scientific sleep and dream research. This internal inconsistency lends additional urgency to Thompson´s demand for a more fine-grained taxonomy of sleep states. I then use the Indian debate as a foil to sketch the outlines of an integrated theoretical position on the trustworthiness of first-person reports of dreams and dreamless sleep experience. I take this approach to be in the spirit of the type of cross-cultural approach recommended by Thompson and hope to show that valuable lessons can be learned on both sides.

My second aim is to sketch the outlines of a positive account of dreamless sleep experience. Here, my key claim is that dreamless sleep experience can be described as pure temporal experience. By this I mean phenomenal states that aside from their temporal structure are devoid of any further intentional content and characterized only by the subjective experience of time. Pure temporal experience (or pure subjective temporality, as I will also sometimes call it) is not structured around perceptual objects, events or emotions; it is the experience of being *just in time*.[3] This account of dreamless sleep

1 In some readings of the term dreamless sleep, the default view in not just obviously false, but it is also unclear that it is actually endorsed by many researchers working on dreaming and sleep. Most would acknowledge, for instance, that hypnagogic imagery during sleep onset or repetitive and non-progressive types of sleep thinking involve phenomenal experience during sleep; yet, because they are also commonly distinguished from full-fledged dreaming, they can be said to occur in dreamless sleep. This, however, is different from the type of dreamless sleep experience that Evan Thompson has in mind and that is the focus of this commentary. As will become clear later, in the narrower reading endorsed by Thompson, dreamless sleep "is that sleep state in which there are no sensory or mental objects of awareness, that is, no images and no thoughts" (p. 14); the question, denied by the default view, is whether this state of sleep can sometimes involve phenomenal experience. Dreamless sleep experience of this type, if it exists, is also distinct from experiences occurring during sleep-wake transitions in that it is thought to occur during deep sleep. In the context of this commentary, I will always, unless explicitly noted otherwise, use the term dreamless sleep experience in this narrow sense. In other readings, the default view may be thought to be trivially true: if one defines dreams as involving *any* kind of phenomenal experience during sleep (Flanagan 2001), then the occurrence of phenomenal experience during dreamless sleep is indeed ruled out by conceptual considerations. This reading, however, is too permissive in that it fails to acknowledge the distinction between different types of experiences occurring during sleep, ranging from imagistic, narratively complex, and often emotional dreams to thought-like activity. For now, this suggests that the default view is too simple: the question is not whether there are experiences during sleep that fall short of full-fledged dreaming in some particular sense but whether there is a further group of experiences—call them dreamless sleep experience in the narrow sense—that is distinct from *any* of the established forms of conscious experience during sleep, including hypnagogic imagery and sleep-thinking. Thompson acknowledges this issue (p. 14) and I only emphasize it here to avoid misunderstanding.

2 Note that throughout this commentary, I will use the terms "experience", "subjective experience", and "consciousness" interchangeably to describe states that have phenomenal character, or for which there is something it is like to have them.

3 At first sight, there is an inherent ambiguity in the concept of pure subjective temporality in that it can refer to the experiential character of *nowness*, but also to the experience of duration and of succession. In section 4, it will become clear that in the account defended here, the two aspects of *nowness* and duration are not strictly dissociable: the simplest forms of temporal experience are characterized by both a phenomenal *now* and the experience of duration, because

experience is attractive, or so I claim, because it offers a way of spelling out not just what is distinctive about dreamless sleep experience, but also how dreamless sleep experience can be integrated into a broader theoretical framework describing different kinds of sleep experiences, including dreams. The key idea is that while even the simplest forms of dreaming are characterized by phenomenal selfhood, or the experience of being or having a self, the transition from dreaming to dreamless sleep experience occurs when even this minimal form of phenomenal selfhood is lost. While the analysis of dreaming can help identify the conditions for minimal phenomenal selfhood, the analysis of dreamless sleep experience may provide a glimpse of an even simpler (and perhaps even minimal) form of phenomenal experience. In the final part of the commentary, I identify what I take to be the three most promising candidates for a future research program on dreamless sleep experience. These are lucid dreamless sleep, white dreams, and sleep-state misperception of the type most commonly seen in subjective insomnia. These examples broaden the scope of the target phenomenon by suggesting that the theoretical and experimental investigation of dreamless sleep experience extends beyond the case of expert meditators discussed by Thompson.

2 From the classical Indian debate to a new taxonomy of experience during dreamless sleep

In *Dreamless Sleep, the Embodied Mind, and Consciousness*, Evan Thompson retraces the steps of the classical Indian debate between the Advaitins and the Nyaiyāyikas on the occurrence of conscious experience during dreamless sleep (see also Thompson 2014, chap. 8). The classical Indian debate is important, according to Thompson, because if the Advaita Vedānta and Yoga claims about the persistence of consciousness during dreamless sleep are correct, the default view of consciousness as that which disappears during dreamless sleep is false and requires revision. In this section, I briefly reconstruct Thompson's main arguments and sharpen the precise points of agreement and disagreement in the classical Indian debate, as well as their overlap with questions raised in cognitive science and contemporary philosophy of mind. I also introduce three challenges to Thompson's view.

Thompson's reconstruction of the classical Indian debate starts out from a deceptively simple question: How, after awakening from sleep, do we know that we have slept peacefully? The Yoga and Advaita Vedānta schools argue that retrospective reports of having slept peacefully are memory reports: we directly and non-inferentially remember (and hence are able to report) a state in which we were phenomenally conscious, but did not experience any particular thoughts or images. Dreamless sleep experience is, in this view, devoid of intentional content; it is a state of knowing nothing and at least in principle, it can be remembered and accurately reported upon awakening. The Nyāyas disagree, arguing that reports of having slept peacefully are inferential. Their point is that if dreamless sleep involves a particular form of ignorance, or of not-knowing, this not-knowing cannot itself be known, either during sleep or retrospectively. Because the means for knowledge are lacking during dreamless sleep, we can at best infer, when we wake up feeling refreshed and remember nothing, that we must have slept peacefully.

As Thompson (sec. 3) points out, the classical debate about conscious experience during dreamless sleep has to be seen in the larger context of how these schools construe the relationship between consciousness and the self. For the Nyāyas, consciousness is an adventitious property of the self, meaning that the self can persist throughout sleep even when consciousness ceases. They also claim that cognition always involves taking something as its object, where this object is necessarily distinct from the cognitive state itself. This view is compatible with

the phenomenal *now* itself is temporally stretched. Though for reasons of space, I cannot discuss this any further here, note that once the distinction between the phenomenal *now* and the experience of duration collapses, the experience of seriality or of succession disappears as well: if the phenomenal *now* is no longer embedded within a larger temporal reference frame, then there will be no separate events that can be experienced as succeeding each other.

the occurrence of object-directed thought and dream-related imagery during sleep, but prohibits the occurrence of objectless cognitive states. For the Advaitins, the situation is different. Because for them, the self is pure, reflexive (or self-luminous) consciousness, they cannot allow that consciousness can disappear altogether even during sleep, because this would entail a disappearance of the self. Unlike the Nyāyas, the Advaitins do not, however, take consciousness to be necessarily object-directed. Instead, they regard the essentially reflexive and self-luminous character of consciousness and the self as separate from and indeed as the very condition of object-directed thought. A prediction would be that "pure" cases of reflexive, self-luminous consciousness should occur even in the absence of object-directedness, for instance during sleep.

Despite these differences, the debate on dreamless sleep experience unfolds before a background of mutual agreement. Both schools agree, for instance, that object-directed consciousness can (and does, for instance in the form of dreams) occur during sleep, but also that it does not persist throughout sleep. Both also agree that dreamless sleep is a state in which object-directedness is lost. And finally, both agree that the self persists throughout dreamless sleep, even in the absence of object-directedness. Their disagreement thus hinges, first, on what exactly it means to say that the self persists during dreamless sleep, understood in the sense of a state in which object-directed thought is lost, and second, on how to construe the relationship between consciousness, the self, and memory reports. Both points are relevant, as we will see, for assessing the relationship between the Indian debate and contemporary research as well.

How, then, to adjudicate between the two sides in the debate? Thompson (p. 6) reconstructs the Nyāya claim that our knowledge of dreamless sleep is inferential as involving a five-step syllogism. His discussion of the Nyāya syllogism is already so clear that nothing would be gained from rehearsing it once more here. Instead, I want only to recall to readers' attention that Thompson's reconstruction of the Adavaitin response shows the Nyāya syllogism to be inherently fallacious: it is either circular or results in an infinite regress. In order to infer from the fact that I was in a special state that I knew nothing in this state, I must first have a reason for saying that I was indeed in a special state; and if this reason is that I knew nothing in this state, I am presuming what is supposed to be shown and the argument is circular. Alternatively, if I say that the means for knowledge were lacking in this special state, for instance because the mental faculties and the senses were inactive, then this further claim has to be backed up by independent evidence. Saying that I felt refreshed upon awakening will not do—for in order to know that feeling refreshed after awakening is correlated with the inactivity of the mental faculties and the senses during sleep, I would either once more have to appeal to memory (which, on pains of circularity, I cannot do), or I would be headed for an infinite regress. Thompson sums up his critique of the Nyāya syllogism by formulating a general principle:

> 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. (p. 7)

The Advaitin view offers an easy way out. As Thompson points out, it can be reconstructed as involving the phenomenological claim

> 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. (p. 8)

At least in principle, the subjective impression of having awakened from dreamless sleep can be

reflected in veridical reports of awareness during dreamless sleep.

It is important to see that Thompson's assessment of the Indian debate does not lead to a whole-hearted endorsement of the Advaitin view; the view he promotes is in fact much more subtle, and also more humble. Thompson's main goal is to establish the logical possibility of dreamless sleep experience. For this, it is sufficient that veridical memories of having slept dreamlessly are possible in principle (p. 5, p. 9). He also explicitly allows that there could be cases in which one's memory of having slept peacefully and dreamlessly is mistaken. Thompson's view is also weaker than the Advaitin position in that it is not committed to the persistence of conscious experience throughout sleep, but leaves room for periods of unconsciousness during sleep. According to Thompson, the mere possibility of dreamless sleep experience challenges the default view and highlights the need for a refined taxonomy of sleep states, because such a refined taxonomy is the condition for investigating dreamless sleep experience experimentally (p. 3).

To be sure, Thompson also offers some factual evidence for thinking that dreamless sleep experience actually exists: experienced meditators report witnessing or becoming lucid during dreamless sleep, and they show a changed pattern of EEG activity during slow wave sleep. Meditative training may, as Thompson suggests, facilitate cognitive access to the state of dreamless sleep (p. 11) and with it, more accurate reports. But his main point is that conceptual and empirical questions about dreamless sleep experience are well worth asking and that in order to do so, prominent theories of sleep, but also of consciousness (such as Tononi's *Integrated Information Theory*; see Tononi 2008) should at least make room for the possibility of its occurrence and require revision.

While I find Thompson´s case for the logical possibility and conceptual coherence of dreamless sleep experience compelling, I worry that its humility makes it vulnerable to three related objections. A proponent of the default view could acknowledge that veridical reports of dreamless sleep experience are logically possible but could insist that unless such veridical reports are identifiable and can be distinguished from nonveridical ones, such reports cannot be used for the experimental investigation of dreamless sleep experience, or only in a very small and admittedly special group of highly trained subjects. Thompson's own suggestions for the future investigation of dreamless sleep experience assume that this basic problem has been solved. For instance, he proposes that because dreamless sleep experience is supposed to be devoid of intentional objects, asking participants to report anything that was going through their minds before awakening, which is a question about the objects of awareness or the contents of consciousness, might be poorly suited to the target phenomenon. A good alternative, he suggests, would be to direct participants' attention to the phenomenal character of sleep itself, for instance by asking them to report any feelings or any qualitative states experienced before awakening (p. 12). Here, the proponent of the default view might object that this strategy falls short of a methodology for investigating dreamless sleep experience: In order to use reports of dreamless sleep experience as evidence, some rationale for distinguishing veridical reports from nonveridical ones is needed. Without this, the large-scale revision of standard sleep-state taxonomy demanded by Thompson may seem premature; Thompson's case for the mere possibility of dreamless sleep experience lacks the empirical grounding and research methodology to justify such a move.

A related problem is that in order to empirically investigate the occurrence of dreamless sleep experience, it is not enough to identify veridical reports of such experiences and distinguish them from nonveridical ones. Instead, in order to determine the frequency of dreamless sleep experience, one has to determine whether subjects can reliably report not just the presence of dreamless sleep experience, but also its absence. This problem is especially pronounced because Thompson's claim is not that experience persists throughout sleep. As we saw earlier, his view departs from the Advaitin claim in that he thinks that dreamless sleep experience occurs only occasionally and contrasts

with periods of genuine unconsciousness during sleep. A report-based methodology for investigating dreamless sleep experience will consequently have to assume not only that reports of dreamless sleep experience reliably indicate the presence of such experience during the preceding sleep period, but also that the absence of such experiences can be reliably reported, or at least that it can be inferred from the absence of reports of dreamless sleep experience. Unless this second condition is fulfilled, reports of dreamless sleep experience could be highly reliable in that they occur only when dreamless sleep experience was in fact present during the preceding sleep period, but could nonetheless fail to be sensitive to its actual frequency, for instance by only following a small proportion of such sleep experiences (for a discussion of the reliability and sensitivity of first-person reports, see Fink unpublished manuscript).

Thompson himself shies away from both commitments. In fact, he casts doubt on the assumption, common in cognitive neuroscience, "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" (p. 12). Relatedly,

> 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. (p. 11)

Here, he might be read as effectively denying the possibility of using retrospective reports as a source of evidence for the scientific investigation of dreamless sleep experience. Moreover, given these doubts about the reliability and sensitivity of retrospective reports, Thompson's (p. 17) proposal that meditation makes positive occurrences of dreamless sleep experience accessible to verbal report is not enough; a proponent of the default view could object that expertise of the relevant type is acquired only if meditation enables periods of unconscious sleep to be retrospectively reported as well (or at least to be measured indirectly through the inability to report conscious experiences from the preceding sleep period).

Finally, a proponent of the default view might grant that reports of expert meditators are more trustworthy than those of laypeople in both respects: meditators can report both when dreamless sleep experience was present and when it was absent.[4] Yet, it could still be objected that the example of expert meditators is simply too remote to justify the large-scale revision of sleep-state taxonomy that Thompson has in mind. For all practical purposes, or so the objection might go, the default view of consciousness and dreamless sleep as diametrically opposing and mutually exclusive states stands.

To be clear, I do not think these objections are particularly worrisome; but I do think they help set the agenda for how best to develop Thompson's view, defend it against skeptical objections, and place it on broader empirical grounding. The first step, taken in the next section, is to introduce a stronger defense of the trustworthiness of reports of dreamless sleep experience, as well of reports of its absence. If successful, this provides a sound methodological basis for the experimental investigation of dreamless sleep experience. The second step is to provide a broader theoretical and empirical basis by proposing a conceptual framework of dreamless sleep experience as well as additional candidates for its future investigation.

3 Are reports of dreamless sleep experience trustworthy? The analogy between the Indian debate on dreamless sleep and the contemporary debate on dream reports

In this section, I draw an analogy between the Indian debate on dreamless sleep experience and the contemporary debate on the trustwor-

4 It remains controversial whether different forms of meditation actually enhance introspective accuracy. While there is some evidence in support of this claim (Fox et al. 2012; Sze et al. 2010), at least one study has suggested that meditators may feel more confident than controls about their ability to successfully perform interoceptive tasks (such as heartbeat detection), but that this confidence is not paralleled by an actual improvement in task performance (Khalsa et al. 2008).

thiness of dream reports. This analogy provides the resources for overcoming the first two challenges to Thompson's argument. In particular, it reveals the default view to be inconsistent with the methodological background assumptions of scientific sleep and dream research. Given their own methodological commitments, researchers in these fields should reject the default view.

3.1 The methodological background assumptions of scientific dream research: Lessons for the investigation of dreamless sleep experience

The first step towards seeing why the default view is inconsistent with scientific dream research is to realize that this field, at least implicitly, relies on the assumption that reports of conscious experience during sleep are trustworthy: at least when they are given under certain (sufficiently) ideal conditions and immediately after awakening from sleep, such reports are taken to reflect what was experienced during the preceding sleep period, and indeed whether anything was experienced at all. What exactly the (sufficiently) ideal conditions for reporting sleep experiences consist in is an empirical question, and in scientific dream research, much work has been dedicated to its investigation (for discussion and further references, see Windt 2013, 2015, chaps. 3 and 4). There is widespread agreement that temporal proximity is a crucial factor: reports given immediately after awakening are commonly taken to be least vulnerable to forgetting. The sleeping environment (at home versus in the laboratory), method of awakening, interaction with experimenters, and precise wording of questions also play an important role (Domhoff 1996, 2003; Hall & Van de Castle 1966; Kramer 2013; Winget 1979). Different reporting techniques may be suitable for different research questions, and aside from being asked for verbal reports, participants may be encouraged to produce a dream drawing or compare the visual imagery in their dream with photographs with varying degrees, for instance, of color saturation or brightness (Rechtschaffen & Buchignani 1992). While there may be uncertainty, in a given case, as to the sincerity of a report, this is a practical matter, not a deep theoretical problem.[5] The key idea is that by improving reporting conditions and tailoring the reporting technique used in a given study to the specific research question, this risk can be minimized. For now, my main point is that this strategy, which is already well established in scientific sleep and dream research, only makes sense against a background of basic trust in at least a subset of dream reports.

This basic idea is very much in keeping with Thompson's proposal of asking participants to report any feelings or qualitative states experienced prior to awakening, rather than asking them to focus on the contents of conscious thought. By directing participants' attention to certain aspects of sleep experience or even introducing new experiential categories for their description (an excellent example of this strategy is Lutz et al. 2002), the expressive granularity[6] of individual reports can be increased: types of experiences can be rendered reportable that would otherwise be forgotten. A compelling possibility is that in the case of dreamless sleep experience, such improvements in reporting conditions may not just supplement training, as suggested by Thompson, but may even facilitate the investigation of dreamless sleep experience in participants who lack any particular introspective training.[7]

Admittedly, this approach does not provide a fail-safe method for avoiding or even identifying nonveridical reports. Rather than fo-

5 Researchers occasionally worry, for instance, that participants may underreport embarrassing dream content; censorship of this type may be why sexual dream content is only rarely reported in laboratory studies (Hobson 1988); see also Rosen's (2013) discussion of willful narrative fabrication of dream reports. For the investigation of dreamless sleep experience, which is, after all, thought to be devoid of such content, such worries about censorship do not seem to apply.

6 I owe this term to Sascha Fink; see for instance Fink 2015, p. 23; for discussion, see Windt 2015, p. 92.

7 As Solomonova et al. (2014) note, it is important to distinguish questions about the range of possible experiences in dreams (or the "depth" of dreaming) from those about their typical characteristics in the general population (or the "breadth" of dreaming), and what counts as the ideal reporting conditions in the context of a given study depends on which of these questions is being addressed. For now, note that because expertise is likely most useful for answering questions about the depth of experience, and because expert reports may not be representative of the breadth of the target phenomenon, broadening the investigation of dreamless sleep experience beyond expert groups is an important goal for future research.

cusing on the veridicality of individual reports, the strategy is to identify which types of reports are best tailored to a given question and under which conditions they are most likely to be obtained. The problem of identifying individual reports of a certain type for which this strategy has failed is thus not obliterated, but minimized.[8] What is more important is that there is, in this view, a distinction to be drawn between *general opinions* about experience and *reports of individual experiences*. Note that reports, in this context, are broadly construed as the product of (verbal or nonverbal) behaviors conducted with the *sincere intent of conveying or recording certain relevant information about a specific dream* (for details, see Windt 2015, chap. 3.3) Questionnaires asking participants to assess the general frequency with which, for instance, they dream in color do not count as experience reports in this narrow sense. Indeed, there are good reasons for doubting the trustworthiness of responses to such general questionnaires, and in some cases, they have even been shown to be at odds with individual reports (Schwitzgebel 2002, 2011, chap. 1; Windt 2013, 2015, chap. 4.3). At best, such general questionnaires tap into opinions about experience, but whether these opinions match the phenomenal character of the corresponding experiences is a separate question. Importantly, questions about the relative trustworthiness of responses to general questionnaires can be meaningfully investigated only if the trustworthiness of at least a subgroup of dream reports is assumed (Windt 2015, chap. 4.4). This subgroup can then act as a baseline and can be used to determine the relative trustworthiness of answers to general questionnaires, but also of different types of reports. While the exact details continue to be debated (for instance on the laboratory effect), there is widespread agreement in scientific dream research that dream reports gathered immediately upon awakening, as is common in laboratory studies using timed awakenings from different sleep stages, are the gold standard against which other types of dream reports (such as home dream diaries compiled following spontaneous awakening) can be measured (again the debate on dream color is a good example; see Hoss 2010; Murzyn 2008; Schredl et al. 2008).

Importantly, as discussed earlier, the assumption that dream reports are trustworthy translates into a research strategy only if reports of nondreaming are taken to be equally trustworthy as reports of dreaming, at least when they are gathered under the same conditions. If the reporting conditions used in a given study are (sufficiently) ideal, it would, surely, be arbitrary to disqualify a subset of these reports on the basis of their content alone. In order to do so, some independent reasons for at-

8 Strictly speaking, it cannot be ruled out that even for reports obtained under seemingly ideal conditions—for instance immediately after awakening, and using appropriately worded questions—certain subject groups are particularly prone to memory failure or confabulation (Rosen 2013), or that results are distorted because of further disturbing factors that have so-far been overlooked. The challenge will then be to identify such potentially disturbing factors, manipulate them experimentally, and derive certain predictions on how they will affect data obtained from the analysis of dream reports. These factors can then be integrated into a future, improved and more empirically plausible account of the ideal conditions of dream reporting. For now, my main point is that this strategy only makes sense if one already assumes that some subset of dream reports can be used as a baseline against which other, less trustworthy ones can be measured. The study of dream emotions is a nice example of how this strategy has been put to work in dream research. Views on the both the frequency and the types of emotions experienced in dreams have changed quite dramatically as new methods of collecting and scoring dream reports have been developed. Whereas older studies using classical dream content analysis suggested that dream emotions are relatively rare (Hall & Van de Castle 1966), the frequency of reported dream emotions increases tenfold when subjects are specifically asked to report their emotions on a line-by-line basis (Merritt et al. 1994). Affirmative probes of this sort suggest that dreams are "hyperemotional", with emotions being mentioned in 95 percent of dream reports and the average dream report containing several different types of emotions. A plausible explanation is that dream emotions are underreported in free dream reports of the type used in older studies; free dream reports, in this view, are insufficient to capture the actual frequency of dream emotions. Until very recently, the accepted view was that the types of emotions experienced in dreams differ from those experienced in wakefulness in that dream emotions are predominately negative (Hobson et al. 2000). However, a recent study compared external ratings of emotions in dream reports to scores obtained when participants answered a standard emotion questionnaire themselves. Sikka et al. (2014) found that external ratings underestimate not only the frequency but also the types of emotions experienced in dreams. A particularly surprising result was that self-ratings showed positive dream emotions to be six times more frequent than negative ones. The systematicity of the differences is compelling and the same pattern was found in a number of follow-up studies (Sikka et al. 2014), suggesting that the use of self-ratings is a more reliable method for capturing the frequency and types of dream emotions than the use of external raters. This is not so say that the conditions for reporting and scoring dream emotions cannot be further improved. But this example does illustrate that theoretical views on dream emotions changed in tandem with changed and likely improved reporting and scoring conditions. Again, the idea is that methodological adjustments can obscure or render visible different aspects of the phenomenology of dreaming.

tributing reports of nondreaming to disturbing factors would be needed. It does not make sense to trust dream reports, but selectively distrust reports of nondreaming gathered under the same conditions and in the absence of any empirical evidence for distrusting them. Put differently, dreams will have to be regarded as reportable experiences, in the sense that given sufficiently ideal reporting conditions, their presence or absence, respectively, can actually be reported. Importantly, both assumptions are implicit in the scientific investigation of dreams. A brief excursion into the history of philosophical and scientific theorizing about sleep and dreaming illustrates this point.

The beginning of scientific dream research coincided with a new experimental paradigm: the practice of obtaining polysomnographic measurements of EEG activity, muscle tone and eye movements from subjects sleeping in the sleep laboratory and of obtaining mentation reports following timed awakenings. This methodology revealed reports of dreaming to be most frequent following awakenings from REM (rapid eye movement) sleep, whereas awakenings from NREM (non-REM) sleep were typically followed by an inability to recall any dreams. In their groundbreaking paper on the correlation between dreaming and REM sleep, Aserinsky & Kleitman (1953) optimistically claimed that that the method of timed awakenings from REM sleep "furnishes the means of determining the *incidence and duration of periods of dreaming*" (Aserinsky & Kleitman 1953, p. 274; my emphasis).[9] They very naturally took the reports given by their subjects to reflect conscious experience during the preceding sleep period, noting that "of 27 interrogations during [sic] ocular motility, *20 revealed detailed dreams* usually involving visual imagery" (Aserinsky & Kleitman 1953, p. 273; my emphasis). Because the method of obtaining reports following timed awakenings in the laboratory is, arguably, the backbone of scientific dream research, this assumption is not unique to Aserinky and Kleitman's original study. Instead, scientific dream research generally relies on the assumption that dream reports (at least when gathered under ideal reporting conditions, of which timed awakenings in the laboratory are taken to be a prime example) are epistemically transparent in the sense that they are trustworthy sources of evidence about the occurrence and phenomenal character of experience during sleep. I call this the *transparency assumption* (Windt 2013, 2015).[10]

It is important to see that on its own, the transparency assumption would be insufficient to establish the presumed correlation between dreaming and REM sleep. Claims about the sleep-stage or neural correlates of dreaming require that reports of dreaming and of nondreaming, when gathered under the same conditions, are equally trustworthy: if only reports of dreaming were trustworthy, but reports of nondreaming were not, then the analysis of dream reports would be insufficient to determine the occurrence and frequency of dreams during different sleep stages. Saying that dream reports are transparent is not quite enough: one will also have to assume that dreams are reportable experiences in the sense that had any dream occurred in a given sleep stage, one would in fact be able to report it, at least under sufficiently ideal reporting conditions. I call this the *reportability assumption* (for details, see Windt 2015, chap.s 3 and 4). Only this added assumption casts reports of dreaming and of nondreaming as equally trustworthy and thus enables reports to be indicative of the occurrence and frequency of dreaming in different sleep stages. The emerging picture is that scientific dream research not just uses dream reports, *under the assumption of transparency*, to investigate *conscious experience during sleep*, but that in doing so, it is also *methodologically constrained by the space of reportable dreams*. Its implicit commitment to the

9 Today, it is widely recognized that dreams can occur in all stages of sleep and are not exclusively a REM sleep phenomenon. Incidentally, this recognition may also lead to refined sleep-stage scoring systems and a blurring of the borders between REM and NREM sleep (Nielsen 2000; see also Windt 2015, chap. 2).

10 Here, I use the concept of epistemic transparency in a non-technical and metaphorical sense, intending to capture the intuition that dream reports are the closest researchers can come to "watching the sleeping mind" (Cartwright 2010, p. 17). The choice of terminology also reflects the fact that dream reports are not identical with, but better conceived of as separate from dreaming. Finally, transparency is a nod to the historical situation that the theoretical problems raised by dream reporting were nearly invisible throughout most of the history of philosophical theorizing about dreaming.

trustworthiness of reports of dreaming and of nondreaming means that it cannot go beyond what is in fact reported without risking internal inconsistency; it can only strive to render further aspects of dreaming reportable. Metaphorically speaking, the space of reportable dreams can be expanded; it can be broadened to cover more aspects of what characterizes typical dreams, or perhaps also to include more diverse types of dreams; and it can be deepened, by probing the unique aspects of certain types of dreams (such as nightmares) or the dreams of certain subject groups (such as meditators) in more detail (see Solomonova et al. 2014). Importantly, this reliance on dream reports is not a liability, a problem to be overcome: it is built into the very nature of dream research. Conversely, studies relying only on the polysomnographic analysis of sleep stages and/or neuroimaging data gathered independently of dream reports do not form part of dream research proper (Windt 2015, chap. 3.2).

How does this account of dream reporting help address the objections to Thompson's argument discussed at the end of the last section? The strategy of focusing on reports gathered under (sufficiently) ideal reporting conditions and working towards a continuous improvement of these conditions is clearly relevant to the first objection, according to which the mere possibility of veridical reports is not enough. As soon as we broaden our focus from reports of dreamless sleep experience to reports of sleep experience (including dreams) more generally, it becomes clear that scientific dream research has long been centered on the project of identifying and optimizing the trustworthiness of such reports, as well as on determining the adequacy of different kinds of reports for addressing various research questions. Indeed, the very existence of scientific dream research hinges on the assumption that this can be done. Moreover, we have seen that the assumption that reports of dreaming and of nondreaming are equally trustworthy is implicit in this research strategy. This assumption is directly relevant to the second objection, according to which reports of dreamless sleep experience can be used for the investigation of dreamless sleep experience only if they help detect both its presence and its absence.

Moreover, this proposal is, I think, compatible with Thompson's own strategy of focusing on reports from certain expert groups and improving the wording of questions. Indeed, this strategy of directing participants' attention to certain aspects of their experience rather than asking for a free report nicely parallels recent work suggesting that a self-scoring method, where participants respond to a standard questionnaire, for instance, about the emotions experienced in a particular dream, is a better measure of dream emotions than data obtained by external raters scoring free dream reports (Sikka et al. 2014; see footnote 8 for discussion). This suggests that Thompson does not mean to reject, as a matter of principle, the claims that conscious experiences are reportable and that an absence of memory is sufficient to infer an absence of experience. Rather, I think his position involves the weaker claim that we should not easily and uncritically trust just any type of experience report to actually reflect the presence of such experience, nor should we easily and uncritically trust just any failure to remember previous experience as indicating an absence of such experience. But this weaker position is in keeping with the account of dream reporting outlined in this section. The challenge then becomes how to narrow the gap between experiences that are in fact reported and those that could (and would) be reported, given sufficiently ideal conditions. I think this is exactly the problem that large parts of report-based dream research are already trying to address.

Note that nothing I have said so far suggests that the transpareny and reportability assumptions are theoretically justified (but see Windt 2013, 2015); if my analysis is correct, however, both are implicit in and in fact crucial for the entire field of scientific dream research. This shifts the burden of proof: while reports of dreamless sleep experience may seem to be an easy target, if only because of the novelty and alleged remoteness of Thompson's proposal for investigating dreamless sleep experience, we can now see that the proponent of the default view

will in fact have to take on the entire field of (report-based) scientific dream research as well. This raises the bar considerably; but first, more has to be said about how the methodological background assumptions of scientific dream research actually parallel questions asked in the classical Indian debate.

To begin with, note that the transparency assumption is analogous to the Advaitin and Yoga claim that upon awakening from dreamless sleep, we can veridically remember and report that we experienced nothing during sleep. To be sure, this type of report describes an experience marked by the absence of the complex imagery and narrative contents that characterize dreaming. Yet, in the Advaitin view, these are reports of an experiential state: in reporting having slept dreamlessly, we are reporting that we *experienced* nothing, in the relevant sense, during sleep;[11] we are not reporting the absence of experience. Thompson suggests that in order to turn the Advaitin view into a research strategy, the most reasonable and cautious approach is to assume that dreamless experience exists only intermittently, rather than persisting throughout dreamless sleep. The frequency with which dreamless sleep experience is reported to occur upon awakening will then be regarded as indicative of the actual occurrence of such experience. This is analogous to the reportability assumption. To endorse the stronger claim that dreamless sleep experience persists throughout sleep, at least prior to empirical investigation, would be to legislate an answer to the question of dreamless sleep experience. The weaker claim complements the assumption, implicit in scientific dream research, that periods of dreaming contrast with periods of nondreaming, which is quite different from saying that dreaming persists throughout sleep.

By combining my analysis of the methodological background assumptions of scientific dream research with Thompson's proposal on the investigation of dreamless sleep experience, we can see that if we were to translate the Yoga and Advaitin view into a research methodology, we would find it to rely on assumptions that run parallel to those of scientific dream research. Dreamless sleep experiences, or so a modern-day, scientifically-minded Advaitin would be forced to admit, are reportable experiences; and if it should happen that (under sufficiently ideal reporting conditions, such as immediately after having awakened from sleep) one were unable to recall any such experience having happened during sleep, this would indicate that no such experience had occurred.

This also tells us that reports of nondreaming should be further qualified: reporting the absence of experience during sleep is not the same as reporting dreamless sleep experience. The former is an instance of reporting an absence of experience, the latter is an instance of reporting a form of experience characterized by the absence of intentional objects; but it is still an experience report. Yet, while this requires terminological adjustments and shows that the concept of reporting a state of nondreaming is ambiguous, this adjustment is consistent with the familiar methodology; indeed, it falls out of the methods already used in dream research, when they are applied to the target of dreamless sleep experience.

From this, we can conclude that the default view of dreamless sleep as being characterized by the absence of subjective experience is intrinsically flawed for two related reasons. The first is that by treating dreamless sleep experience as a conceptual absurdity rather than as an open and empirically tractable question, it misconstrues the nature of the question of dreamless sleep experience. The second is that it stands in outright contradiction to the assumptions implicit in the scientific investigation of conscious experience during sleep. Dream research, understood as the scientific investigation of conscious experience during sleep, should be expanded to include dreamless sleep experience as well. And while this certainly will involve an adjustment of its conceptual resources, the good news is that its existing methodological background assumptions can remain largely intact.

11 At this point, it might be objected that this formulation rides on a reification of the word "nothing", as if "nothing" itself could be turned into an object of experience. I return to this problem in section 4; as will hopefully become clear, my own positive model of dreamless sleep experience avoids this problem by introducing a qualified reading of what is described, in the Advaitin view, as experiencing or knowing nothing.

3.2 The Indian debate revisited: Lessons for the philosophical debate on the trustworthiness of dream reports

The analogy between the Indian debate on dreamless sleep experience and the background assumptions of scientific dream research not only highlights the inconsistency of the default view. There are also valuable lessons to be learned in the other direction, and considering the historical Indian debate can enrich contemporary debates on the status of dream reports as well. In particular, note that it is one thing to say that scientific dream research is implicitly committed to the transparency and reportability assumptions; but it is another to say that these assumptions are also theoretically justified. Elsewhere, I have defended the view that explanatory considerations justify the transparency and reportability assumptions: construing dream reports as (largely veridical) memory reports provides a *better explanation* of dream reporting behavior than skeptical alternatives that construe dream reports as the result of inference, misremembering or outright confabulation (Windt 2013, 2015, chap. 4). Here, I want only to point out that similar considerations apply to reports of dreamless sleep experience. In fact, Thompson's response to the Nyāya argument against dreamless sleep experience shows that casting reports of having slept dreamlessly as based on inference rather than memory is not a proper explanation at all. Instead, it leads to an argument that either results in an infinite regress or is circular. Again, there is a striking similarity to a similarly skeptical account of dream reporting from the 20th century. This time, the analogy with the historical Indian position will lend additional support to anti-skepticism about dream reporting.

To see why, another brief excursion into the history of theorizing about scientific dream research is instructive. Let us consider Norman Malcolm's (1956, 1959a) skeptical argument against the claims that dreams are conscious experiences occurring during sleep and that dream reports transparently show this to be the case. This argument was a direct reaction to early attempts, following the discovery of REM sleep, to operationalize dreaming as a REM sleep phenomenon. Malcolm's argument hinges on the conceptual claim that "if a person is in *any* state of consciousness it logically follows that he is not sound asleep" (Malcolm 1956, p. 21). According to Malcolm, even though we use the same language to describe dreams and waking experiences, dreams (or at least such dreams as occur during sound sleep, which Malcolm, again for conceptual reasons, takes to be representative of dreaming proper) are not experiences, and for the same reason dream thoughts, feelings, and emotions are not real instances of their kind. As Malcolm puts it,

> if a man had certain thoughts and feelings in a dream it no more follows that he had those thoughts and feelings while asleep, than it follows from his having climbed a mountain in a dream that he climbed a mountain while asleep. (Malcolm 1959a, pp. 51-52)

Malcolm's view is complex and a detailed discussion is beyond the scope of this commentary; suffice it to say that one of its more controversial upshots is that dream recall is not a real instance of remembering experience during sleep. Instead, "statements of the form 'I dreamt so and so' are always inferential in nature" (Malcolm 1959a, p. 65): one infers that one has dreamt when one realizes, upon awakening, that the events one seems to remember did not in fact occur. This claim struck many of his critics as contradicting both the common-sense understanding and the phenomenology of dream recall (see Dunlop 1977 for a collection of some of the most important critical essays; see Windt 2013, 2015, chap. 1 for discussion). Elsewhere, (Malcolm 1959b) explains that he takes dream recall to be inferential not in the psychological sense of actually drawing this inference when we notice that we have dreamt, but in the sense that we could give grounds for our belief that we dreamt if pressed to do so. However, because he fails to clarify what exactly these grounds are, his account remains sketchy. By applying Thompson's reconstruction of the Nyāya syllogism to Malcolm's claim, it quickly becomes

clear that even a more complete reconstruction of the inference would be intrinsically flawed. The result would be something like this:

1. While I was sound asleep, I had no experiences, including sensations, conscious thoughts, feelings, beliefs, or emotions.
2. This is because (i) I was in a special state (that is, not awake) or (ii) I lacked the necessary means for having experiences, including sensations, conscious thoughts, feelings, beliefs, or emotions (that is, my senses and mental faculties were shut down).
3. Whenever (i) I am in a special state (that is, whenever I am not awake) or (ii) I lack the necessary means for having experiences, including sensations, conscious thoughts, feelings, beliefs, or emotions (whenever my senses and mental faculties are shut down), I do not have experiences, including sensations, conscious thoughts, feelings, beliefs, or emotions.
4. As in the case of fainting or a blow to the head.
5. While I was sound asleep, I had no experiences, including sensations, conscious thoughts, feelings, beliefs, or emotions.

Malcolm concludes that sound sleep is comparable to other states of unconsciousness, and "to a person who is sound asleep, 'dead to the world,' things cannot even seem" (Malcolm 1956, p. 26).

If we follow this reasoning, then dream reports cannot ever be veridical experience reports: if we cannot have thoughts, feelings or emotions during sleep, then we also cannot have them during dreams, and we cannot actually remember (or veridically report) having had them after awakening. Rather, we sometimes awaken with the impression of having had such thoughts, feelings and emotions during sleep; and when we realize that they did not in fact occur, we infer that we dreamt.

To be fair, there might well be cases in which dream recall does have such an inferential nature. To use Malcom's example, it seems possible that I could awaken with the particularly vivid impression of having climbed a mountain and then might realize, from the simple fact that I was lying in bed and nowhere near a mountain, that I had not actually climbed a mountain, but had been asleep. However, even if I was now quite sure that I had merely dreamt that I had climbed a mountain, it would not follow that the thoughts and feelings I remember having in the dream did not really occur. In order to draw this further inference, I would have to know that dreaming is a special state that is devoid of any experiences whatsoever.[12] As is the case for the Nyāya syllogism, this immediately invites the dual threats of circularity and of infinite regress: If I say I was in a special state because the thoughts and feelings I experienced in my dream were not real instances of their kind, I am reasoning in a circle. And if I say that I was in a special state because the mental faculties required for having thoughts and feelings were shut down (or because, as would better befit Malcolm's argument, I had temporarily lost the capacity for producing the types of behavioral evidence that would enable another person to verify that I had been dreaming), then independent evidence would be needed—and so on. Again, without appealing to memory, no such evidence is available.

At this point it might seem that there is an easy solution: Perhaps, independent evidence for saying that dreaming is a special state has, in the meantime, become available. Malcolm's analysis of dreaming was a direct reaction to early studies, discussed in section 3.1, on the correlation between REM sleep and dreaming, and his argument made much of the alleged impossibility of acquiring independent evidence,

12 Incidentally, note that if it were the case that dreams are devoid of any experiences whatsoever, it would be utterly mysterious why we should awake with the vivid impression of having had such experiences in the first place. Indeed, Malcolm provides no explanation of why this happens. By contrast, my erroneous impression of having climbed a mountain during sleep is nicely explained by saying that during sleep, I had experiences that were sufficiently similar to their waking counterparts to create this impression. Again, this comes back to the idea that explanatory considerations favor the view that dream reports are actual memory reports, and not inferential. Perhaps, the difference between dreams that are belief-inviting beyond the borders of sleep, for instance by making us actually believe, if only for a moment, that the corresponding events actually occurred, and more commonplace dreams that do not induce such false beliefs can even be described in phenomenological terms (for a first proposal of how this might be done, see Windt 2015, chap. 10).

over and above dream reports, for the occurrence of dreams during sleep. Among Malcolm's critics, there was widespread agreement that he was simply mistaken about this latter point: sleep behavior, (for instance in patients with REM sleep behavior disorder, who are thought to act out their dreams due to a loss of REM sleep-related muscular atonia; see Schenck 2005, Valli et al. 2012) sleep talking, and also polysomnographic measurements were (and continue to be) thought to provide exactly such independent evidence, perhaps even to the point of enabling researchers to verify dream reports (see for instance Ayer 1960; Rosen 2013; signal-verified lucid dreams are another example, as proposed by Revonsuo 2006; see sec. 5.1 for a fuller discussion). Yet, even though the appeal to scientific dream research slightly changes the content of the argument, this merely restates the familiar syllogism, including its problems in a new guise.

To see why, let's say that rapid eye movements had indeed been found (as stated by the so-called scanning hypothesis; see Dement & Kleitman 1957, to be directly related to visual dream imagery. Could we now analyze these eye movement patterns to diagnose the occurrence (and perhaps even the content) of dreaming even in the absence of (or in contradiction to) dream reports (see Dennett 1976 for the discussion of this possibility)? Note that this is not an abstract philosophical issue: dream researchers have long dreamt the dream of moving beyond dream reports in the study of dreaming altogether. This ranges from science fictional visions of televising dreams (Hall & Van de Castle 1966) or of perhaps modeling them as an immersive, interactive virtual environment, as in Antti Revonsuo's (2006, pp. 300-303) dream catcher test, to real-world attempts to predict the content of dream reports from behavioral (Leclair-Visonneau et al. 2010) or neuroimaging (Horikawa et al. 2013) data. Again, the idea is that in the future, the analysis of neuroimaging data might be a way to verify dream reports, or even to move beyond their collection and analysis altogether. Elsewhere, I have argued that such attempts are circular: Dream reports, under the assumption of transparency, are used to identify potential sleep-stage and neural correlates of dreaming; but the evidence such potential correlates provide is only as strong as the correlation, and so one cannot then turn around and use such measures as independent evidence to verify dream reports. Now, the Nyāya syllogism and its failure present a nice and crisp illustration of why this is the case. I think this is a nice example of the fruitfulness of a cross-cultural perspective on the methodological and conceptual issues involved in studying the occurrence of consciousness during sleep.

But there is another lesson to be learned. This is that the Nyāya syllogism is not an outdated problem, but one that persists even if we place it in the context of scientific dream research. The question of whether reports of having slept dreamlessly are experience reports or inferential is not of mere theoretical interest, but makes a real difference: assuming such reports, at least when given under ideal reporting conditions, to be veridical memory reports is the condition for a report-based scientific investigation of the relevant experiences in the first place. The historical debate, and Thompson's reconstruction of it, nicely highlights the need for acknowledging the relevance of first-person reports. Together, they also strengthen the theoretical case against skepticism about the trustworthiness of dream reports. With this anti-skeptical account in place, we can now move forward. In the next section, I sketch the outlines of a conceptual framework for describing dreamless sleep experience and its relation to dreaming.

4 From minimal phenomenal selfhood to minimal phenomenal experience: Towards a conceptual model of experience during dreamless sleep as pure subjective temporality

If what I have said so far is on the right track, then the question of whether dreamless sleep, at least on occasion, involves phenomenal experience is open to empirical investigation, and progress towards answering it can be made by applying the methods already used in scientific dream research, for instance by combining

timed awakenings in the sleep laboratory with questionnaires that are carefully calibrated to direct participants' attention towards the relevant features of such experiences and facilitate their reportability. Even occasional reports of dreamless sleep experience will support the claim that dreamless sleep experience exists. The next step towards turning the question of dreamless sleep experience into a scientifically tractable research project is to draw a more precise conceptual map of the territory. Sketching at least the rough outlines of such a conceptual map is my aim in this section.

Thompson's reconstruction of the classical Indian debate as well as his own positive proposals for how to study dreamless sleep experience provide a helpful point of departure. To begin with, as Thompson points out, the concept of dreamless sleep itself requires phenomenological refinement (p. 13). If dreamless sleep experience exists, then it is not enough to characterize dreamless sleep by the absence of dreaming or its electrophysiological correlates. Rather, dreamless sleep can now be seen to be a blanket term covering different types of conscious and nonconscious mental activity. Some forms of conscious mental activity that are commonly contrasted with dreaming (and in this simple sense can be said to occur in dreamless sleep), such as hypnagogic imagery during sleep onset or repetitive and non-progressive types of sleep thinking, are not candidates for the kind of dreamless sleep experience described in the Indian debate. Dreamless sleep experience in this narrow sense, if it exists, is a form of phenomenal experience characterized by nonintentional awareness (Thompson 2015, p. 2): "When we're deeply asleep [...] we don't cognize anything—there's no object being cognized and no awareness of the 'I' as knower. Nevertheless, [...] we feel this absence while we sleep and remember it upon awakening" (Thompson 2015, p. 238). Dreamless sleep experience is not just characterized by the absence of certain object-directed forms of conscious experience, but by the fact that this is an *experienced* absence. Moreover, it is not just the objects of experience that are absent, but also the subject of experience, or the "I". A very basic experiential feature, namely that of being an epistemic agent or a potential possessor of knowledge, has been lost (cf. Metzinger 2013 for a fuller discussion of the term of an "epistemic agent model"). Dreamless sleep experience is characterized by a dissolution of subject-object duality, or, to put a more contemporary gloss on this, by a breakdown of even the most basic form of the self-other distinction (Windt et al. 2014).

This last point is important because it suggests a way of differentiating between dreaming and dreamless sleep experience. Many different definitions of dreaming exist—indeed, the lack of a uniform definition is an important desideratum for theoretical and experimental work on dreaming—but work on dreaming in philosophy of mind often focusses on a structural feature of dream experience. The assumption that dreaming involves the experience of a self in a world marks a point of convergence for philosophers of different stripes, ranging from contemporary philosophers of mind working towards an empirically informed theory of dreaming (Metzinger 2003; Revonsuo 2006) to authors working in the tradition of classical phenomenology (Husserl 2006; Conrad 1968).[13] Studies have shown that an overwhelming majority of dream reports describe the presence of a dream self (Strauch & Meier 1996) though the precise way in which the dream self is represented is variable (Occhionero et al. 2005; McNamara et al. 2007). The description of dreams as involving not just a self in a world, but an intersubjective world has even informed theories on the functions of dreaming (see for instance

13 Note that this way of thinking about phenomenal selfhood is quite different from the way the term "self" is used in the classical Indian literature. In his reconstruction of the Advaita Vedānta concept of witnessing, Fasching (2010) notes that the "'witness' (sāksin) is not understood as an observing entity standing opposed to what it observes, but as the very taking place of 'witnessing' itself, and 'witnessing' is nothing other than the taking place of the experiential *presence* of the experiences, in which the experiences have their very being-experienced and thereby their existence." (p. 204) In this conception, "the 'self' is nothing other than becoming aware of experiential presence (consciousness) as such" (p. 207); it is "*not* a structural moment of what is given, but is *the very taking place of givenness itself*" (p. 210). Recall that one of the points of agreement between the Advaitins and the Nyāyas was that the self persists throughout sleep. But this is not the reading of the concept of "self" that Thompson (2014; see for instance chap. 10) has in mind when he says that in dreamless sleep experience, there is no longer an awareness of the "I", or what I mean when I speak of phenomenal selfhood.

Revonsuo et al.'s 2015 theory of dreaming as a simulation of social reality). Importantly, the description of dreaming as the experience of a self in a world also informs Thompson's own work on dreaming. In *Waking, Dreaming, Being*, he tells us that "the core feature of full-blown dreaming is the experience of immersion in the dream world" (Thompson 2014, p. 127), and also that this immersive quality is exactly what distinguishes hypnagogic imagery during sleep onset from dreaming (pp. 135ff.). The hypnagogic state is a state of absorption, in which attention is fully captured by a series of dynamically changing and often short-lived images; "the hypnagogic state blurs the boundaries between inside and outside, self and world" (p. 124).

This description coincides nicely with my own theoretical work on dreaming. Elsewhere, I have argued that the analysis of self-experience is the key towards understanding not just different types of dreaming (Windt 2010, 2015, chap.s 11 and 12), but also the relationship between dreaming and waking experience. In this view, the common denominator underlying different types of dreams, such as lucid and nonlucid dreams, but also nightmares and false awakenings is their immersive quality. Even in simple forms of dreaming, there is still a sense of presence, a phenomenal *here*, or the sense of being located at a specific point in space, as well as a sense of duration centered on a phenomenal *now*. This basic structure is preserved even when the features that characterize a majority of dreams, such as interaction with non-self dream characters, objects, emotions, or even visual imagery are lost. In such minimal dreams, phenomenal selfhood takes the form of pure spatiotemporal self-location, arising independently of more complex forms of phenomenal selfhood that involve the experience of being a thinking self and embodied agent. There may even be the experience of phenomenal disembodiment, or of lacking a body, and the dream self may be experienced (and later described) as an abstract, undefined volume of indeterminate extension or even as an unextended point in space. Even though this sense of identification with a phenomenal *here* and *now* involves a drastically reduced form of phenomenal selfhood, it is still sufficient to ground retrospective claims of having had a self in dream reports. The basic structural feature of a self that is experienced as distinct from and located at a precise point within the world is preserved. To be sure, the locus of self-location and self-identification is more fluid in dreams than in wakefulness—the phenomenal *here* is subject to sudden shifts, and sometimes, we identify with a dream character or even a series of dream characters that are quite distinct from our waking self (Rosen & Sutton 2013). Yet, as long as there still is a world experienced as distinct from the self, at least a basic form of the self-other distinction continues to exist.

Within this framework, immersive spatiotemporal hallucination, or self-location with respect to a largely nonveridical, spatiotemporal reference frame, marks the cutoff line between dreaming and nondreaming. It also helps isolate and empirically ground minimal phenomenal selfhood (Blanke & Metzinger 2009), or the simplest conditions under which the experience of being or having a self arises. Here, I would like to suggest that this framework can be extended to dreamless sleep experience as well. A very basic point is that we can now sharpen the claim that dreamless sleep experience is a selfless state. Within the present framework, in order for dreamless sleep experience to count as selfless, even the basic form of self-other distinction that underlies spatiotemporal self-location must be lost. The next step is to consider the spatial and the temporal characteristics of self-location independently of each other and ask whether either of them, considered on their own, would be sufficient to give rise to phenomenal selfhood. An affirmative answer would mean that we had not yet identified the phenomenal signature of dreamless sleep experience; an even more simplified account would be needed.

Considering the spatial and temporal aspects of self-location separately, there seems to be a strong conceptual link between the phenomenal *here* and the sense of being located in and relative to a larger spatial expanse. A spatial reference frame, according to the present

theory, turns into an experienced world when it is centered on a phenomenal *here*, which in turn is identified as the self. The spatial variant of presence thus seems to have the self, or some rudimentary form of self-other distinction, written into it. Moreover, the attempt to conceive of an experience characterized by a phenomenal *here* but lacking any temporal characteristics whatsoever strains the limits of conceivability. Speaking of an experience that is both instantaneous, lacking any temporal extension, and fails to have temporal location seems to be a contradiction. It is not clear how this could count as an experience at all, and even less how it could count as a reportable one.

By contrast, the phenomenal *now* does not appear to carry the same conceptual commitments. At least intuitively, the notion of a form of temporal experience that is independent of and perhaps more basic than the experience of being or having a self seems more acceptable than that of an immersive but nonetheless selfless form of spatial experience. Moreover, we can at least conceive, it would seem, of a phenomenal *now* that fails to be differentiated from or clearly located relative to a larger temporal reference frame.[14] And we can also, it would seem, conceive of an experience characterized only by temporal but not by spatial characteristics. Thinking, for instance, is not always experienced as having spatial location (as in thoughts occurring in one's head), but it certainly has temporal dynamics.[15] Spatiality does not seem to be essential to phenomenality in quite the same way as temporality.

Note that I do not intend these conceptual considerations to carry too much weight. In the framework I am working towards, conceptual distinctions are informed by differences in the structure of phenomenal experience and such differences should at least in principle be memorable and describable, for instance in dream reports or reports of dreamless sleep experience.[16] I also think that the most empirically plausible view will allow for gradual transitions between states involving a phenomenal self and those retrospectively described as selfless; and the same may also be true for the emergence of the simplest forms of phenomenal experience. If this is correct, then we should expect there to be a certain amount of uncertainty when dealing with borderline cases. Where exactly to draw the cutoff line for minimal phenomenal selfhood in a given case may well be hard (if not impossible) to determine; but even so, it might still be useful to introduce a conventional cutoff line (for instance by saying that minimal phenomenal selfhood involves both the spatial and the temporal aspects of self-location) if this helps pick out a theoretically meaningful transition in the structural features of experience and guides future research in a constructive manner. We will also expect such a theoretical conception to be reasonably well aligned with the way such experiences are described in retrospective reports.[17] I think that both types of considerations support the claim that spatiotemporal self-location can be meaningfully described as a minimal form of phenomenal selfhood, or at least as a theoretically salient point of transition on the trajectory from states described as

14 In fact, if we conceive of temporal experience as involving a specious present, we might say that the phenomenal *now* simply is identical with a rudimentary form of a temporal reference frame. I return to this point later. Alternatively, if we conceive of temporal experience as consisting of a series of unconnected moments that themselves have no temporal extension, then again it would seem that each of these could occur in isolation and without being embedded in a larger temporal reference frame.

15 This phenomenological observation is reflected in the classical idea that the mind cannot be spatially located in the physical world. Mental states persist over time, but they do not have spatial characteristics such as expansion or separable parts. Perhaps, this phenomenological observation lies at the root of metaphysical claims about the relationship between mind and body.

16 This is not to deny that experiences (or qualitative aspects of experiences) could exist that are beneath the cutoff line of memorability and reportability. Certain subtle aspects of phenomenal experience, such as hues of color, do seem to outrun our ability to categorize and reidentify them over time (Raffman 1995). Here, I am only claiming that such subtle aspects of experience are not candidates for the report-based type of scientific investigation I am interested in here.

17 This is a prediction, and different subjects may mean different things when they describe an experience as selfless. For some this may mean an experience characterized by spatiotemporal self-location, but in which they had the experience of being a disembodied entity (cf. Windt 2015, chap. 7); others may describe episodes characterized only by their temporal features as involving a self. There is also the familiar problem that reports of selfless experiences easily slip into a performative self-contradiction, of the type "I had a dream in which I was not present"; such episodes are clearly remembered and reported by someone. But we should not expect the folk-psychological use of terms such as "I" or "self" to align perfectly with a particular technical definition. This is a good example of where specific interview questions might increase the expressive granularity of retrospective reports.

selfless to states involving self-experience in a fuller sense. By contrast, the phenomenal *now*, when it arises independently of spatial self-location, is a candidate for a structural feature of phenomenal experience that provides the conditions of possibility for self-experience but that when occurring on its own is still prior to it. I would like to suggest, then, that pure subjective temporality is a candidate for minimal phenomenal experience; it is a condition for but still more basic than minimal phenomenal selfhood. It can be described as subjective only because it involves phenomenal experience; yet, it does not involve the additional experience of being a self, or a separate entity having the experience.[18]

There is, of course, a rich philosophical debate on the nature of time experience, as well as a large empirical discussion (for an introduction, see Dainton 2010; Arstila 2014; LePoidevin 2015). I cannot begin to do justice to this literature here, but want only to focus on one specific aspect. This is the idea, which we find in William James as well as in Husserlian phenomenology, but also in the neuroscience of time consciousness (see for instance Pöppel 2003), that even the smallest unit of temporal experience, the temporal *now*, is extended rather than instantaneous.[19] Following this conception, a rudimentary form of duration would be intrinsic to the phenomenal *now*; and neuroscientific work seems to suggest that this temporal *now* is itself variable (Wykowska & Arstila 2014). The window of simultaneity, or the maximum time-frame within which two different events are experienced as occurring *now*, is modality-specific. The cutoff line for two stimuli being experienced as simultaneous is, for instance, larger for visual stimuli than for auditory ones. As Wykowska & Arstila (2014, p. 443) note,

> it might be that a relatively broad window of simultaneity is actually beneficial. The human brain needs to exhibit some degree of tolerance to asynchronous stimuli in order to be able to bind different sensory inputs into one event. The window of simultaneity can be seen as an integration window for stimuli and, as such, is a necessary mechanism for binding signals from different pathways into one single object or event.

Human temporal resolution is flexible, it is easily affected by attentional processes as well as by training and expertise (Wykowska & Arstila 2014). Duration perception might be state-dependent as well, showing characteristic changes in altered states of consciousness and psychiatric disorders (Noreika et al. 2014); and perhaps the same is true for the degree to which the experienced *now* itself is stretched in time. There also seems to be a close relationship between changes in time perception and alterations in self-experience. When the self becomes the focus of attention, when we attend to our current mental or emotional state, or to bodily sensations (such as hunger or pain), time seems to slow down; by contrast, when we are thoroughly absorbed in an activity, time contracts and seems to move faster (Wittmann in press). When self-experience is lost, as in selfless states, the loss of a reference point may be associated with feelings of timelessness (Wittmann in press); the phenomenal *now* is stretched indefinitely. There is a sense of duration, but the sense of

18 Note that this is related to a terminological difficulty that is implicit in the Indian debate, as well as in Thompson's reconstruction of it. As noted earlier, both sides in the Indian debate assumed the self to persist throughout sleep; they merely disagreed whether the self is necessarily conscious. My proposal that we redescribe dreamless sleep experience in terms of pure subjective temporality captures this idea that the self persists in a thin sense even when awareness of any intentional contents is lost. At the same time, recall that dreamless sleep experience is thought to be characterized by a collapse of subject-object duality and by an absence of any intentional objects of awareness. In this state, nothing, including the self, is thought to be known or cognized. There is no longer an individual, consciously experienced first-person perspective. It is this thicker and more substantial notion of a self experienced as distinct from other objects or persons that I propose is lost in dreamless sleep experience; the persistence of such a self would mean that there would still be an intentional object of awareness, and thus would indicate a more complex state than that characterized in the Indian debate as dreamless sleep experience.

19 This could, of course, turn out to be false. Even if the underlying neural representations are temporally extended, the same may not be true of conscious states themselves; these may still be conceived of as elementary and momentary events lacking spatial or temporal structure. For a recent defense of such a view, inspired by the Abhidharma doctrine of momentariness, see Chadha (forthcoming). Yet, even if the experience of continuity and persistence over time turned out to be an illusion, this would still be an interesting structural feature of phenomenal experience. For present purposes, the basic phenomenological claim, according to which the phenomenal *now* is temporally stretched rather than momentary and discrete, is enough.

succession, of there being a chain of present moments, has been lost.

Importantly, this way of thinking about subjective temporality and the experienced *now* is one which Thompson (2015) endorses. He explicitly appeals to the Husserlian conception of time experience in his defense of retrospective reports of dreamless sleep experience. Here, he suggests that memories of dreamless sleep experience may be grounded by retentional awareness, "the holding onto the just-past as an intentional content belonging to our consciousness of the passage of time, including our mental lives as flowing in time" (p. 9). Because temporal experience has the retention of the immediate past and protention, or the anticipation of the next moment, written into it, the moment after awakening still carries with it the traces of dreamless sleep experience: "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'" (p. 10).

In *Mind in Life*, Thompson (2010) endorses a version of Husserl's conception of time-consciousness according to which the streaming, flowing character of subjective experience is both the "condition of possibility for every other kind of consciousness, but is not itself made possible by some other, still deeper level of consciousness" (p. 324). This absolute flow of consciousness is self-constituting (p. 324); it is also prior to and essential for phenomenal selfhood. As Thompson (2010) puts it,

> to be aware of phenomena across time, consciousness must be retentionally and protentionally aware of itself across time. Therefore, time-consciousness entails prereflective self-awareness. In other words, our being conscious of external temporal phenomena entails that our temporally enduring experiences of those phenomena are self—aware. Inner time-consciousness is thus nothing other than prereflective self-awareness. (p. 328)

This prereflective awareness that consciousness has of itself (its self-luminousness, reflexivity, or self-acquaintance[20]) is not yet the same has being or having a phenomenal self in the sense used here. Rather, this minimal form of phenomenal experience is the condition for the emergence of minimal phenomenal selfhood.

My suggestion, then, is that we can enrich our theoretical conception of dreamless sleep experience by applying Thompson's account of how we *remember* dreamless sleep experience (namely with the help of retentional awareness) to the description of dreamless sleep experience itself. Dreamless sleep experience involves pure subjective temporality that is not yet structured around intentional objects, including a phenomenal self. As Thompson (2015) puts it, "although deep sleep creates a gap or a rupture in our consciousness, we often feel the gap immediately upon awakening. […] We are aware of the gap from within our consciousness" (p. 4). Just as upon awakening, I am directly aware that it was I who was asleep and unknowing, I am typically aware that a certain (though perhaps indefinite) amount of time has passed. Following Proust's more poetic formulation in the passage quoted by Thompson,

> 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

20 Again, there are subtle terminological differences. For instance, Williford (2015a, pp. 10-11; see also Williford 2015b) writes that reflexivity or self-acquaintance is "an essential structural feature of all consciousness; and I take it to be a phenomenological datum. All streams of consciousness are immediately aware of themselves, and that is the foundation of all other forms of self-representation, autobiographical cognition, and so on. This reflexivity is subjective character (for-me-ness), but it is a mistake to turn this structural feature into a kind of entity or homunculus."
My account is compatible with much of what Williford says here; I agree that we are considering a basic and essential feature of conscious experience, and one that should not lead us to posit an independent entity that is identified as the self. Yet, I think there is room for phenomenal selfhood as a structural feature of experience over and above the reflexivity of even the simplest kinds of phenomenal states. Even readers who disagree with my description of this as a form of phenomenal selfhood might still agree that the target property of spatiotemporal self-location is distinct from the more basic reflexivity of consciousness. Adopting the conceptual convention of describing this as a form of self-experience does not, I take it, require us to reify the self or to slip into a homuncular view, but simply offers a conceptual tool for describing the way we experience ourselves as being or having a self.

> waking; but their ranks can be mixed up, broken. (p. 3)[21]

We might even say that metaphorically speaking, subjective temporality provides a reference frame that is still empty, but poised to integrate and lend temporal structure to intentional contents such as thoughts, objects and events, but also the self, as they arise—for instance by imposing sequential order on them and representing some of them as simultaneous, and others as successive. Yet, this form of temporality is more basic than the events it later integrates; it predates them and provides a space in which they can appear.

Incidentally, this idea fits in nicely with the Vedantan view that, "deep sleep is a kind of 'ground state' of consciousness, a lowest-energy state from which the 'excited states' of dreaming and waking arise" (Thompson 2014, pp. 260-261). Again, deep sleep is the baseline, the causal source from which other conscious states arise; it is also called "seed sleep", because it is thought to contain the seeds of both dreaming and waking consciousness. Perhaps we can begin to make sense of this idea by saying that dreamless sleep experience, understood as pure subjective temporality, is a candidate for minimal phenomenal experience.[22]

How can we make progress on identifying real-world cases of dreamless sleep experience? Importantly, if the account of dreamless sleep experience defended here is even remotely correct, we should not expect dreamless sleep experience to be restricted to experienced meditators. Instead, dreamless sleep experience might be fairly prevalent even in people without any formal training in contemplative traditions. This approach requires disambiguating between at least two variants of the target phenomenon. Note that within the Indian conception of dreamless sleep, we can distinguish between an insight component and a more basic experiential component. The insight component refers to the ability to become aware, during sleep, of the nature of this state. This is not necessarily a conceptually mediated form of knowing *that* you are currently sleeping dreamlessly, but rather consists "in being able to witness the state of dreamless sleep and recall its phenomenal clarity upon awakening" (Thompson 2015, p. 15). Still, even this nonconceptual form of witnessing is not epistemically neutral, but can lead (or fail to lead) to veridical retrospective reports. To be sure, this form of insight or awareness itself can have a particular phenomenal feel—it bears the phenomenal signature of knowing (Metzinger & Windt 2014, 2015), the feeling of just having become aware of the nature of one's ongoing state—but importantly, this type of phenomenal experience carries with it epistemic commitments. My feeling of knowing can be true or false. It also seems plausible, as suggested by Thompson, that meditation facilitates this type of lucid dreamless state, or perhaps could even be a way of inducing it systematically.

But the model of dreamless sleep experience as pure subjective temporality also points to a more basic experiential component that as such bears no obvious connection to an epistemic state of knowing or of being aware of the nature of the state one is currently experiencing. Dreamless sleep experience in this primary phenomenological reading refers to a kind of experience during sleep; but this does not require the ability to conceptualize this *as* a form of sleep experience. In principle, you can have dreamless sleep experience without realizing

21 A prediction that seems implicit in Proust's observation that if we are suddenly overcome by sleep, we no longer know what time it is upon awakening, is that dreamless sleep experience may bear an interesting relation to the ability to estimate how long one has slept. Perhaps, intermittent periods of dreamless sleep experience even ground our awareness that some time has passed or are responsible for the ability, which may be more pronounced in certain subjects, to awaken just before the alarm clock goes off (thanks to Valdas Noreika for pointing this out). By contrast, if we awaken from a state lacking any form of phenomenal experience whatsoever—as in some forms of anesthesia—there may be no sense of a preceding temporal gap and a more profound sense of temporal disorientation. At present, this is, of course, entirely speculative, but it might be a question worth asking.

22 The temporally dynamic nature of experience is also of central importance for understanding the neural correlates of conscious experience. As Melloni (2015) points out, while the mechanisms for updating the contents of consciousness have been investigated by numerous studies, the mechanisms underlying the maintenance or the flow of conscious experience fall outside the scope of most existing paradigms. She also proposes that the temporal flow of consciousness is a fundamental property of experience and an important target—perhaps the most important target—for future research on the neural correlates of consciousness. Similarly, Noreika (2015) suggests that focusing on the analysis of individual contents of consciousness, as is standardly done in mainstream research on the neural correlates of consciousness, misses the temporality of consciousness; instead, to make progress toward understanding this more fundamental property, he proposes contrasting conscious and nonconsciousness states.

that you are asleep: dreamless sleep experience is a form of experience occurring *in* sleep, but it is not necessarily an experience of sleep *as* a state of sleep. It might enable us to estimate how long we have slept, but it can also be misleading, maybe even leading us to misjudge whether we have slept at all. This is particularly obvious if dreamless sleep experience is construed as an answer to the question of how we know, upon awakening, that we slept peacefully (Thompson 2015, p. 4). Thompson's reconstruction of the Indian debate, taken together with my analysis, suggests that because this state is characterized only by its temporal character, we have the sense of there being a gap between two periods of wakefulness; and because this gap is devoid of intentional objects, we describe it as peaceful. Yet, this does not seem to require that we were aware of (or took ourselves to be aware of) the nature of this state while it was occurring, namely during sleep. If any sophisticated epistemological reading of insight were indeed crucial to dreamless sleep experience, the experience of having slept peacefully would have to be reserved for special subject groups, such as experienced meditators —and it would be quite mysterious why clearly, it is not.

Perhaps we can model the relationship between the epistemic and the phenomenological components of dreamless sleep experience on the relationship between lucid and nonlucid dreaming. Thompson (2015, p. 15) himself explicitly contrasts lucid dreaming, or knowing that you are dreaming while you are dreaming, with lucid dreamless sleep. Given this suggestion, a good place to begin the project of broadening the investigation of dreamless sleep experience beyond expert meditators is to consider reports from experienced lucid dreamers.

5 Candidates for pure subjective temporality during sleep

5.1 From lucid dreaming to lucid dreamless sleep?

Lucidity is commonly defined as awareness that one is dreaming while one is dreaming (for excellent reviews, see Voss & Hobson 2015; Dresler et al. in press). Often, this is associated with an ability to control not just one's own actions in the dream, but also the course of the dream, the actions of non-self dream characters, etc. In particular, lucid dreamers can signal that they have now become lucid by making prearranged patterns of eye movements, such as looking right – left – right – left within their dream. These gaze shifts correspond to the movements of their physical eyes and can be identified on the electrooculogram. This technique of signal-verified lucid dreaming enables researchers to identify the precise period of sleep during which certain actions were performed during a lucid dream and potentially to identify their electrophysiological and neural correlates (Dresler et al. 2011, 2012). Lucidity can occur spontaneously, but a number of methods for inducing lucidity are discussed in the literature (Stumbrys et al. 2012). There have even been suggestions and attempts to experimentally induce dream lucidity through electrical stimulation (Noreika et al. 2010a; Voss et al. 2014; Voss & Hobson 2015). While still in its early stages, this work clearly shows that lucidity is a robust phenomenon; and combined with the ability to control the dream as it unfolds, it makes laboratory studies of lucid dreaming compelling.

One reason for being interested in lucid dreams within the present context are reports of lucid dreams describing a loss of phenomenal embodiment, or even a dissolution of the self (see Windt 2015, chap.s 7, 11 for discussion). Some of these appear to fulfill the requirements for minimal phenomenal selfhood described earlier: in so-called imageless lucid dreams (Magallón 1991; Bogzaran 2003; Hurd 2008), self-identification may be relative to a disembodied point in space and can arise independently of bodily sensations and even of visual imagery (see also LaBerge & DeGracia 2000). While most of these reports, so far, are anecdotal, it is tempting to think that lucid dreams could be used to systematically investigate the transition from minimal phenomenal selfhood to more complex forms of self-experience involving the experience of being a thinking self and em-

bodied agent. Importantly, according to some of these reports, even this basic sense of self-identification and location within a larger spatial expanse can be lost. I would like to suggest that such cases may involve a shift from a simple form of lucid dreaming involving minimal phenomenal selfhood to lucid dreamless sleep experience. Here is a single example:

> I am suspended in space—dream space, I think. There is nothing here, just millions of greyish dots and I am one of the dots, there's no dream-body anymore, I'm just a dot [of] pure consciousness suspended. A feeling of great peace comes over me and a sense of gentle, infinite expansion. It's as if everything and nothing are the same thing and there is a sense of effortless belonging. As the sense of expansion increases I am no longer a single dot of consciousness; all the dots are me and I am them. There's no "I" or "them." We are one. There's just a blissful sense of timelessness and oneness and a merging with the light. After an indefinable length of time, I start to feel the weight of my body in bed, and settle back into it, tingling all over. (Clare Johnson, unpublished dream report, March 19, 1995)

If we take the report at face value, it describes a gradual transition from minimal phenomenal selfhood, characterized by phenomenally disembodied spatiotemporal self-location, to selfless experience. This transition is accompanied by a sense of spatial expansion, in the course of which the sense of the self as distinct from the environment is lost. To the extent that there still is a sense of spatial self-location, this no longer involves the experience of being located relative to something else. There is also a change in the temporal structure of experience, almost as if the experiential present, the phenomenal *now*, had been stretched indefinitely. The period following the dissolution of the self is still experienced as having duration, but this duration is indefinable and no longer structured around any events.[23] Following Metzinger (2013), we might want to describe this as involving a transition from a minimal unit of identification, in which an unextended point in space is described as the locus of the self, to a maximal unit of identification. In such cases of "pure consciousness", he suggests, the unit of identification is

> the most general phenomenal property available for identification at all: Philosophers might call it the global "unity of consciousness", or phenomenality per se, or awareness as such, namely the singular, integrated, all-pervading quality of consciousness characterizing the current totality of experiential contents, as it is given in every single moment of experience. (Metzinger 2013, p. 5)

I would like to suggest that we can now be more precise. The moment at which self-location dissolves—or at which minimal phenomenal selfhood is replaced with the maximum unit of identification—involves a transition to the type of pure subjective temporality that earlier, I suggested might be the phenomenal mark of dreamless sleep experience. As lucid dreaming gives way to lucid dreamless sleep experience, minimal phenomenal selfhood shades into pure phenomenality, in which phenomenal experience is characterized only by its temporal structure. I find it telling that according to Johnson's report, this latter part of the episode appears to strain the limits of reportability, and also that despite its indefiniteness, the experience is described as blissful; again, this is exactly what the Indian focus on the experience of having slept peacefully would lead us to expect.

Clearly, this single dream report presents anecdotal evidence at best; still, I would like to suggest that a first step towards extending the investigation of dreamless sleep experience beyond experienced meditators might be to investigate imageless lucid dreams in experienced lucid dreamers. What makes me cautiously optimistic is that lucidity is often described as a very unstable phenomenon, as involving a balancing act

23 A similar link between the dissolution of the self and the experience of timelessness, or of an indefinite duration, may exist in deep meditative states (Berkovich-Ohana et al. 2013), but also, for instance, in drug-induced altered states of consciousness (Wittmann in press).

between maintaining lucid insight (rather than slipping back into a nonlucid dream or awakening) and remaining engaged enough in the ongoing dream to prevent it from dissolving completely (Brooks & Vogelsong 2000). Lucid dreamers often describe that imagery can take on a faded, washed out quality, or that lucidity is followed by a period of darkness or, alternatively, of light; indeed, this may be why such reports often slip into mystical language to describe such experiences. Here, I want only to suggest that in such cases, the unwanted fading of lucid dream imagery may actually be an opportunity for experimentally investigating the transition to dreamless sleep experience.[24]

Before moving on, I want to suggest that the comparison between lucid dreaming and lucid dreamless sleep is also interesting for another reason. This is that as is the case for nonlucid dreams, there continue to be a number of conceptual uncertainties about how to define lucid dreaming and whether to describe it as a genuine sleep phenomenon or as a hybrid state between REM sleep and wakefulness (Voss et al. 2009; for a discussion of lucidity and insight from a philosophical perspective, see Kühle 2015; see Voss 2015 for a criticial reply). Also, while some authors consider any dream involving insight into the fact that one is now dreaming as lucid, others reserve the term lucidity for cases in which there is a marked increase in the overall vividness of multimodal imagery as well as a shift towards wake-like cognitive activity, including the ability to engage in rational thought, full recall of waking life, and insight into the fact that none of the events occurring within the dream have any real-world consequences (for a first attempt to test these different conceptions of lucidity experimentally, see Voss et al. 2013).

On the conception that I favor, lucidity is not necessarily accompanied by an all-pervading change in the phenomenal character of the dream; rather, lucid dreams are gradually distinguished from nonlucid ones along a number of dimensions (Windt & Metzinger 2007; Noreika et al. 2010a; Voss et al. 2013). While laboratory studies, because of their reliance on signal-verified lucid dreams, necessarily focus on lucid dreams involving at least some form of control, the conceptually mediated insight into the fact that one is now dreaming is orthogonal to the other experiential qualities of dreaming. Insight is also necessary to score a given report as describing a lucid dream—but aside from this methodological fact, the ability to conceptualize one's ongoing experience as a dream—to have the thought "I am now dreaming"—can coexist alongside the types of vivid, often bizarre and emotionally charged imagery and erratic reasoning that characterize a majority of nonlucid dreams as well. Lucidity can be the outcome of a conscious inference (of the type "this cannot be happening, so I must be dreaming"), but often appears to be driven by a sudden feeling, sometimes described by saying that the dream suddenly took on a dreamlike feel or a hyperreal character (see Windt 2015, chap. 9 for details and further references). Perhaps, this precursor to full, conceptually mediated lucidity is similar to the type of nonconceptual awareness that is thought to accompany lucid dreamless sleep experience as well. This suggests two further questions. The first is whether nonlucid forms of dreamless sleep experience exist as well. The second is whether in dreamless sleep experience, anything analogous to prelucid dreams exists. I discuss these in turn.

5.2 From white dreams to nonlucid dreamless sleep experience?

Again, we can approach the project of identifying candidates for nonlucid dreamless sleep experience by asking whether instances of minimal phenomenal selfhood exist in nonlucid dreams. If so, we could once more expect these to occur in the vicinity of minimal phenomenal experience during dreamless sleep.

A possible candidate for such a state are so-called white dream reports, in which subjects describe the impression of having experienced a dream but are unable to describe it in any detail. It seems plausible that a subgroup of white

24 Similarly, in the tradition of dream and sleep yoga, dream lucidity is sometimes described as a preliminary stage of becoming aware of sleep; again, realizing that one is dreaming precedes the dissolution of dream imagery while maintaining awareness of dreamless sleep. See for instance Wangyal & Dahlby (1998).

dream reports can be explained by forgetting. Especially where the subject describes the distinct feeling of having had a complex dream but being unable to remember it in any detail, this would seem to be the most plausible interpretation. There is some reason for thinking, however, that this may not be the case for all reports of white dreaming. In at least some cases, the impression of having had some kind of experience prior to awakening, coupled with an inability to describe any particular aspects of the experience, such as any specific forms of imagery or narrative contents, might not be an artifact of forgetting, but might reflect the structure of the experience itself. At least a subset of white dreams might involve a sense of spatiotemporal self-location, or minimal phenomenal selfhood, arising in an otherwise imageless nonlucid dream. And if this were supported by future studies, then it might even make sense to ask whether perhaps, a further subgroup of white dreams could more properly be described as involving nonlucid dreamless sleep experience. In the current framework, these latter types of white dreams would not count as proper dreams at all: they would be instances of pure subjective temporality arising independently of the spatial aspects of self-location and self-identification. They would involve a form of minimal phenomenal experience that could no longer be described as minimal phenomenal selfhood, and thus as a dream. Perhaps, we occasionally really do retain some awareness, after awakening, of phenomenal experience having persisted during sleep. And perhaps, unable to remember any specific details, we then assimilate them to more familiar types of experiences, labeling them as white dreams.

Again, all of this is still extremely speculative and everything I have said so far about white dreams should be read, at best, as a careful prediction of what we might say in light of future findings. In particular, I do not mean to suggest that white dream reports, or a subgroup thereof, can already be regarded as examples of dreamless sleep experience: I only mean to propose that they are an initially promising target for future research on dreamless sleep experience. Still, these considerations fit in nicely with the finding that white dreams are particularly frequent during slow-wave sleep. According to one study, awakenings from stages 2 and 3 NREM sleep were followed by roughly equal rates of dream reports, white dream reports, and reports of nondreaming (Noreika et al. 2009). Their occurrence in the vicinity of reports of dreaming and of nondreaming might indicate that white dream reports describe a transitional state between the two. Moreover, even dream reports obtained following awakenings from these sleep stages were often static, describing experiences lacking narrative progression as well as movement sensations (Noreika et al. 2009, 2010b). Participants sometimes described the sense of being present in a static scene, as in quietly sitting on a bench, with nothing else happening (Valdas Noreika, personal communication; see also Noreika 2014, p. 52). Even in the absence of narrative progression, there was still a sense of duration, and according to subjective estimates, these simple dreams lasted between thirty seconds and one minute.

An interesting possibility could be to investigate the wording of white dream reports in more detail. To my knowledge, this has not yet been done. Maybe there are indeed subtle differences in the wording of such reports, and perhaps these would enable researchers to distinguish cases in which there is the impression of having forgotten a complex dream from ones describing imageless and perhaps even selfless and objectless episodes of phenomenal experience. Again, it might be possible to increase the expressive granularity of reports with the help of training or specific questionnaires, thus rendering subtle phenomenological differences visible that would be otherwise overlooked. A possible finding could be that some of these experiences involve a continued sense of presence and self-location in an abstract, amodally experienced spatial expanse, whereas in others, even this basic sense of self is lost and only the feeling of duration, or of an indefinite temporal expanse, is present.

A particularly promising way to do this would be to use a serial awakenings paradigm, in which participants are awakened multiple

times throughout the night at intervals of 15-30 minutes, thus maximizing the number of reports that can be collected throughout the night (Noreika et al. 2009; Siclari et al. 2014; Siclari et al. 2013). Questions focusing on the temporal aspects of experience could then be used to identify those periods, if any, in which dreamless sleep experience is most likely to occur. For instance, Siclari et al. (2013) asked their participants to estimate how long they had been having continuous experiences before being awakened, but also how long their most recent experience had lasted, how far back in time they could recall any narrative events, and how rich and complex the experience was. They found that during stages N2 and N3, estimates for duration, recall back in time and richness were low. Still, these results could be influenced, in part, by the fact that the interview questions focused on the objects of consciousness and on narrative events. If the questions were reworded in such a way as to cover dreamless sleep experience, the patterns of responses might change. Even so, it is interesting to note that during sleep onset, there was a dissociation between these measures, with participants estimating a long duration of the last conscious experience, but a low richness and ability to recall back in time. At least, this suggests that the estimated duration of conscious sleep states does not always map cleanly onto the ability to recall specific contents. For now, I want only to suggest that a similar strategy could interestingly be applied to the investigation of dreamless sleep experience as well.

This is also attractive in view of the goals of this line of research. Note that Siclari et al. (2014) explicitly use the serial awakenings paradigm to contrast the presence and absence of conscious experience independently of task performance and within the same sleep stage (for a similar suggestion, see Noreika et al. 2009; Noreika 2015), the ultimate aim being to identify the task- and state-independent neural correlates of conscious experience. For this project, dreamless sleep experience, as a candidate for minimal phenomenal experience during sleep, is clearly a relevant target phenomenon.

5.3 From subjective insomnia to unwitting expertise of dreamless sleep experience?

The final example that I wish to discuss is sleep misperception in subjective (or paradoxical, as it is also sometimes called) insomnia. The term objective insomnia, reserved for patients suffering from actual sleep loss as conventionally measured, is sometimes contrasted with subjective insomnia, which refers to subjects who systematically underestimate the time they actually spend asleep (Harvey & Tang 2012; Perlis et al. 1997). This mismatch between subjective sleep perception and objective measures of sleep sometimes leads to a trivialization of subjective insomnia—and the suggestion that their diagnosis as insomniacs is somehow not "real" can be experienced as infuriating by those afflicted by it (Greene 2008). Subjective insomnia is clearly not an imaginary problem, but a cause of real suffering. In fact, patients with subjective insomnia may experience more severe impairments in cognitive functioning than insomnia patients who do not underestimate the amount of sleep they are getting. Furthermore, worrying about getting enough asleep may precede actual sleep loss, and patients who underestimate the time they spend asleep may still be suffering from a real sleep deficit as well (Harvey 2002; Harvey & Tang 2012). The distinction between subjective and objective insomnia has also been questioned, as sleep-state misperception may be prevalent in different subtypes of insomnia. As Harvey & Tang (2012) put it, "many patients with insomnia perceive sleep as wake, systematically overestimate the time they take to get to sleep (SOL) and underestimate the time they sleep in total (TST)." This further highlights the urgency of sleep-state misperception existing alongside actual sleep loss in insomnia.

In the context of the present discussion, the example of sleep-state misperception in subjective insomnia may seem to be a counterexample to, rather than a candidate for, dreamless sleep experience. Thompson (2015, p. 5) considers sleep-state misperception as a possible objection to his view: sleep-state misperception

of the type seen in insomnia challenges the reliability of subjective reports of sleep, thus providing a counterexample to his claim that at other times, reports of dreamless sleep experience and of having slept peacefully are veridical memory reports. He then argues that the mere possibility of there being veridical reports of dreamless sleep experience is enough to disprove the default view. He also proposes that in experienced meditators, "we should observe a stronger correlation between subjective reports of phenomenal qualities of sleep and various objective measures of brain activity" (p. 16). The fact that at other times, subjective evaluations of sleep can go wrong does not contradict this view, but merely shows that the investigation of dreamless sleep experience is best restricted to certain subject groups.

Here, I want to suggest that an alternative interpretation of sleep-state misperception is possible. In this alternative view, patients with subjective insomnia are in fact unwitting experts of various kinds of sleep experience. It is merely in conceptualizing their sleep states as occurring in wakefulness that they go wrong. Yet, this is compatible with saying that during sleep, they maintain prereflective awareness of their ongoing sleep state; in fact, it might be their continued perception of sleep that leads them to mischaracterize it as a state of wakefulness, rather than as sleep. Their expertise, consequently, is of a somewhat paradoxical nature: they have a high-degree of familiarity with their sleep, they observe and perhaps even compulsively attend to it—but they don't recognize or conceptualize it *as* sleep.

Note that this description fits in well with the distinction, introduced at the end of section 5.1, between different readings of the term lucidity. There, I argued that prereflective awareness of the fact that one is now dreaming often precedes the conceptually mediated insight that characterizes full-blown lucidity. Importantly, these two factors may even be dissociable: a fleeting awareness of the dreamlike nature of one's current state can be misinterpreted, on the level of conscious, conceptually mediated thought, as indicating that one is awake. In such prelucid dreams, the erroneous conclusion that one is certainly awake may be prompted by the same type of change in experiential character that in other cases drives the cognitive realization that this is a dream (see also Windt 2015, chap. 9).[25]

Similarly, the idea is that sleep-state misperception arises when patients misinterpret mental activity and phenomenal experience that in fact occurs in sleep as occurring in wakefulness. Indeed, Mercer et al. (2002) found that when they were awakened 5 minutes after the onset of stage 2 sleep or REM sleep, insomnia patients were more likely than good sleepers to say they had been awake. One possibility is that these patients generally have a heightened awareness of sleep-related experiences; another is that increased attention to and concern about the amount of sleep they are getting may increase their sensitivity to such sleep-related experiences, as well as the likelihood of misdescribing them as occurring in wakefulness.

Interestingly, it does not seem that subjective insomnia simply results from a general deficit in the ability to estimate time (Tang & Harvey 2005). Instead, subjective insomnia appears to be associated with selective attention to and increased monitoring of external cues (such as the time of day or the alarm clock), but also of thoughts and bodily sensations that are taken, by the subject, to be inconsistent with sleep. As Mercer et al. (2002, p. 565) put it, "insomniacs' reduced sleep-wake discriminability may be caused by either a greater amount of mentation during sleep, mentation that more

25 This is also why such examples of prelucid dreams or of sleep-state misperception do not threaten the transparency of retrospective reports. In the present framework, reports are transparent with respect to the occurrence and phenomenal character of experience only; but we should not expect them to accurately reflect the sleep state in which the respective experiences occurred (or indeed whether they occurred in sleep at all), just as we should not expect them to accurately identify the underlying changes in neural activation patterns. Perhaps training, as Thompson (2015) suggests, can indeed improve the match between subjective experience reports and objective measures of sleep states or of brain activation; but this is in no way guaranteed. Or perhaps, objective measures of sleep should be informed by the conditions under which different subject groups experience themselves as being asleep. A mismatch between subjective and objective measures need not indicate a flaw in subjective reports; it might also indicate that objective sleep measures are poorly suited to capture what normal, healthy subjects mean when they say they have been asleep. Indeed, this latter suggestion is in keeping with Thompson's proposal of a phenomenologically enriched taxonomy of sleep states.

closely resembles awake mentation, or a misattribution of normal nocturnal mentation as wakeful cognitive activity." Enhanced memory processing may also play a role (Perlis et al. 1997), as might enhanced physiological and cortical arousal. Intriguingly, insomnia patients show heightened beta and gamma EEG activity during sleep onset, but also during NREM sleep; and in one study, this activity was negatively associated with their ability to correctly perceive that they had been asleep (Perlis et al. 2001). Again, this could be an indication of continued awareness during sleep. Subjective insomniacs may be witnessing sleep whilst failing, unlike the expert meditators described by Thompson (2015, see especially p. 16), to realize what it is they are witnessing.

As is the case for white dreams, I am not suggesting that sleep-state misperception in insomnia be equated with dreamless experience, or indeed that any simple explanation is available. Clearly, a wide range of conscious mental activity occurring in sleep might be perceived as occurring in wakefulness, and much of this might be quite different from the specific type of dreamless sleep experience I am interested in here. And equally clearly, sleep-state misperception in insomnia is a far cry from the peaceful type of sleep experience describe in the Indian debate. In her book-length treatment of insomnia, in which she synthesizes research findings with her own personal experience of insomnia, Gayle Greene (2008) describes her reaction to being told, after a sleepless night in the sleep laboratory, that she has in fact been asleep:

> So that's why nobody had come in with a sleeping pill—the EEG said I was asleep. But I was not asleep. I was truly awake. What in the world was it recording? I may have been in a state of deep relaxation, semi-meditative, I usually am when I lie there, and I may have dropped off, but I was aware of all those thoughts, the feel and look of the room, the long drawn-out boredom of lying there without a book to listen to—it felt like consciousness to me. How could I be aware of all that if I hadn't been awake? (Greene 2008, p. 254)

When asked, however, if she had been aware of the technician coming into her room, she was not (Greene 2008, p. 253).

Here, I want only to make room for the idea that a subgroup of instances of sleep-state misperception might be more properly described as resulting from an awareness of what is in fact sleep, but then is erroneously categorized as belonging to wakefulness. And at least a portion of this awareness of sleep might consist of dreamless sleep experience, or the persistence of temporal experience devoid of further intentional content or any specific objects of awareness during sleep. Moreover, this may well be the dreamless-sleep analogue of prelucid dreaming, where heightened awareness of one's ongoing state leads to its erroneous characterization as wakeful activity on the level of conceptually mediated thought.

Finally, sleep-state misperception of this type may not be unique to insomnia, but may be prevalent in the general population. In a paper aptly titled "The perceptual uncertainty of having sleep", Sewitch (1984) describes the outcome of an experiment investigating the ability of healthy subjects to correctly say whether they have been asleep, as determined by objective markers such as EEG measures. She found that out of 210 awakenings from Stage 2 sleep, 116 were judged to be periods of wakefulness; for REM sleep awakenings, the number was lower, with 45 out of 165 awakenings being judged to have been preceded by a period of wakefulness. The surprising conclusion is that even ordinary sleepers quite dramatically underestimate the amount of time they have been asleep (see also Webb 1975). Other studies point in a different direction. There is some evidence that whereas insomnia patients underestimate their total sleep time, healthy subjects overestimate how long they have been asleep (Means et al. 2003; Pinto Jr. et al. 2009). Clearly, more research is needed. But either way, it would seem that our confidence in our ability to tell whether and how long we have been asleep or awake is overrated. And perhaps, at least part of this confusion stems from the fact that the default view is deeply engrained not just in cognitive neuroscience, but also in

folk-psychology: We expect sleep to be a state of unconsciousness, and so when we recall mental activity that is distinct from dreaming, we mistakenly think we must have been awake.

There is, however, an even deeper conceptual point. The mismatch between subjective and objective (behavioral or polysomnographic) markers of sleep should alert us to the fact that conventional definitions of sleep, and attempts to operationalize them scientifically, for instance in the form of sleep-stage scoring systems, may be oversimplified. The borders between sleep and wakefulness themselves may be fluid. This brings us back to Thompson's proposal that a more fine-grained and phenomenologically informed taxonomy of sleep states is needed. This is emphatically illustrated by the following quotation from one of the participants in Sewitch's study. This participant had subjective insomnia and claimed to have been awake following 22 out of 23 Stage 2 NREM sleep awakenings.

> Also, there is for me a state which may be technically sleep to you, but is wakefulness to me and, uhh—it' s an intermediate state—it' s very hard to define, uhh—but I definitely felt that it's there—and uhh—uhh none of the questions precisely examined this situation. (Sewitch 1984, p. 257)

As Thompson suggests, dismantling the default view may be as simple as asking the right kinds of questions.

5.4 Conclusions

I began this commentary by formulating a number of related challenges to Thompson's analysis of dreamless sleep experience. The first two of these centered on the status of reports of dreamless sleep experience. In order to place the scientific investigation of dreamless sleep experience on solid methodological grounding, it is not enough to establish the logical possibility of veridical reports of dreamless sleep experience; rather, some rationale for distinguishing veridical reports from nonveridical ones is needed. Also, in order for such reports to be indicative not just of the occurrence of dreamless sleep experience, but also of its distribution and quantity across sleep, one will have to assume such experiences to be reportable. This means that positive experience reports and reports of an absence of experience, when gathered under the same reporting conditions and unless there is any empirical evidence of disturbing factors, will have to be considered as equally trustworthy. I responded to these dual challenges by pointing out that the methodological background assumptions upon which scientific dream research has long relied, at least implicitly, directly speak to both issues: Dream reports, at least when gathered under (sufficiently) ideal reporting conditions, are indeed assumed to be trustworthy sources of evidence with respect to the occurrence and phenomenal character of experience during sleep (I called this the transparency assumption), and dreams are also assumed to be assumed to be reportable experiences (I called this the reportability assumption). Elsewhere (Windt 2013, 2015), I have argued that both assumptions are theoretically justified because they best explain dream reporting behavior. Here, I only defended the more limited claim that scientific dream research already offers the methodological resources to turn the study of dreamless sleep experience into a scientific research program. This shifts the burden of proof: in order to meaningfully challenge the report-based investigation of dreamless sleep experience, the methodological background assumptions of scientific dream research will have to be challenged as well.

An important upshot was that the default view is inconsistent with scientific dream research. Due to its methodological background assumptions, scientific dream research is committed to the view that if experiences fitting the profile of dreamless sleep experience are, at least occasionally and under sufficiently ideal conditions (for instance immediately after awakening), reported to occur in sleep, then dreamless sleep experience exists. The default view, understood as an *a priori* and conceptually motivated rejection of dreamless sleep experience, is flawed. I then argued that by taking the analogy between contemporary philosoph-

ical and scientific work on dream reports and the Indian debate seriously, valuable lessons can be learned in the other direction as well. In particular, Thompson's reconstruction and critique of the Nyāya syllogism suggests that certain skeptical objections to the trustworthiness of dream reports run into the same problems, resulting either in circularity or an infinite regress.

The second and third parts of my commentary were dedicated to the third challenge to Thompson's view. This was that even if dreamless sleep experience exists, and even if reports of dreamless sleep experience are taken to reflect this fact, its occurrence in experienced meditators is too remote to warrant the large-scale revision of sleep-state taxonomy proposed by Thompson. I attempted to meet this challenge, first, by first sketching the outlines of a conceptual framework for describing dreamless sleep experience. In this framework, dreamless sleep experience is characterized by pure subjective temporality, or the experience of duration and of an extended presence (a stretched phenomenal *now*) arising independently of any further intentional contents, objects of awareness, or modality-specific imagery. This model extends existing work on dreams, where I argue that the simplest forms of dreaming are examples of minimal phenomenal selfhood, or self-location in a spatiotemporal reference frame (Windt 2013, 2015). In dreamless sleep experience, even this minimal form of self-experience is lost; pure subjective temporality during dreamless sleep experience is a candidate for minimal phenomenal experience, or the simplest form of phenomenal consciousness.

In the final part of the commentary, I discussed what I take to be the most plausible candidates for dreamless sleep experience in this sense: these are lucid dreamless sleep, white dreams, and sleep-state misperception as most prominently seen in subjective insomnia. I also proposed that these states can be meaningfully compared to the transition from nonlucid to prelucid and fully lucid dreams. Here, my aim was to show that dreamless sleep experience is not a remote possibility, but might plausibly turn out to be a common characteristic of sleep.[26]

Importantly, I am not claiming that the proposed conceptual model is the final word on dreamless sleep experience; it is only a very first attempt to delineate the borders of the target phenomenon. The model is clearly open to further conceptual refinement, and I would like it understood mainly as an invitation to do so. What I would hope, however, is that the model might facilitate this process by guiding and informing future research. Similarly, the empirical candidates for dreamless sleep experience that I propose should not be taken to be exhaustive, and their plausibility will depend on future research findings. For now, I hope, however, that they lend further support and urgency to Thompson's case for dreamless sleep experience.

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26 Clearly, this is just the very beginning of the conversation on how to refine sleep-state taxonomy. Ultimately, the investigation of dreamless sleep experience, and the addition of dreamless sleep experience to the conceptual tool kit used for the description of sleep and wakefulness, may prove to be no more than a first step in this direction. And while the reconstruction of the Indian debate and its contrast with contemporary views of sleep is a rich and valuable project, important but easily forgotten lessons might be found closer to home as well. The monophasic sleep pattern currently investigated in Western sleep laboratories and taken to be the biological norm may be only a few generations old (cf. Greene 2008, pp. 238-240) and is likely an artifact of a profound change in sleep behavior brought on, to a considerable extent, by electrical lighting. In preindustrial times, sleep was biphasic—two periods of sleep, called the first and the second sleep, were structured around a period of wakefulness that was made up of quiet rest, perhaps even resembling certain meditative states and often involving the contemplation of dreams (Ekirch 2001; Ekirch 2006). Research suggests that under appropriate conditions—in an environment without artificial, electrical lighting and without various nighttime activities that become possible in such an environment, that compete for our attention and increase the pressure for and attraction of staying awake rather than going to bed—we naturally return to this biphasic sleep pattern (Wehr 1992). It does not seem unreasonable to think that the transition to a monophasic sleep pattern, alongside factors such as increased electrical lighting, traffic noise, and time constraints—will have changed not just the structure of sleep, but our experience of sleep as well. With less and less time allotted to sleep, the temptation to simply black out during sleep (or to view sleep as involving such a blackout) may have increased; yet, current sleep behavior in rich, Western societies may be a highly artificial and learned behavior. If we want a taxonomy of sleep states to reflect universal features of sleep, rather than our culturally specific, contemporary sleep habits, we would do well to remember this.

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Steps Toward a Neurophenomenology of Conscious Sleep

A Reply to Jennifer M. Windt

Evan Thompson

Windt's groundbreaking commentary expands and enriches my target article by presenting new considerations against the default neuroscience view that "consciousness is that which disappears in dreamless sleep," by proposing a refined conceptual and phenomenological analysis of dreamless sleep experience, and by offering a refined taxonomy of dreamless sleep experiences. These contributions provide new conceptual and methodological tools for the neurophenomenology of sleep and consciousness.

Keywords
Consciousness | Dreamless sleep | Neurophenomenology | Phenomenal selfhood | Self | Time consciousness | Vedānta | Yoga

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1 Introduction

I would like to begin by thanking Jennifer Windt for her outstanding, constructive commentary (Windt 2015b, this collection) on my target article (Thompson 2015a, this collection), and by expressing my great admiration for her rich discussion, which goes well beyond being a commentary and instead amounts to an original and substantive article in its own right. It is especially gratifying to see the ideas and arguments that I presented be refined and advanced in such a creative and precise way. Indeed, given the wealth of new material that she presents, her paper calls not so much for a reply as for a commentary of its own. Such a task, however, is beyond the scope of this short reply. Instead, I wish to highlight the advances that Windt makes, so that new experimental research can begin in this area.

The main aims of my target article were (i) to use debates about sleep from classical Indian philosophy to call into question the "default view" in cognitive neuroscience that "consciousness is that which disappears in dreamless sleep," (ii) to suggest instead that there may be

states or phases of dreamless sleep in which consciousness is present, (iii) to argue that sleep science accordingly needs a more refined neurophenomenological taxonomy of sleep states, and (iv) to demonstrate how contemplative methods of mind training provide important resources for the neurophenomenology of sleep and consciousness.

Windt's commentary advances each of these four aims in substantive ways, as I will describe in the following sections.

2 Indian philosophy and sleep science

After answering several possible challenges to my arguments against the default view (see Section 1 of her commentary), Windt shows that the Indian philosophical debate (in which the Yoga and Vedānta schools argue that consciousness persists throughout dreamless sleep, whereas the Nyāya school denies this claim) parallels in certain key respects the Western philosophical and scientific debates about the trustworthiness of dream reports. Given that sleep science must assume as a methodological criterion of dream research that retrospective reports of dreaming and nondreaming are trustworthy (given ideal reporting conditions), we must similarly assume that retrospective reports of the presence or the absence of experience in dreamless sleep are also trustworthy (again, given ideal reporting conditions). This requirement in turn implies that we must refine the conceptual typology of retrospective reports upon awakening from sleep. In Windt's (2015b, p. 11) words, "reports of nondreaming should be further qualified: reporting the absence of experience is not the same as reporting dreamless sleep experience. The former is an instance of reporting an absence of experience, the latter is an instance of reporting a form of experience characterized by the absence of intentional objects; but it is still an experience report." I will not review the steps of her analysis of the methodological requirements of sleep and dream science in detail (see Section 2 of her commentary), but the upshot is that the default view turns out to be inconsistent with the methodological background assumptions of scientific sleep and dream research. This conclusion strengthens the case against the default view, for whereas I argue that this view is likely to be empirically false, Windt shows that it is inconsistent with the methodological requirements for scientifically investigating the presence and absence of consciousness in sleep.

3 The phenomenology of dreamless sleep experience

Windt's second contribution is to propose a conceptual and phenomenological model of dreamless sleep experience (see Section 3 of her commentary). Starting from my presentation of the Indian conception of dreamless sleep experience as characterized by a feeling of peacefulness and the dissolution of the subject-object duality, as well as my comparison of this conception with Husserl's conception of pre-reflective and pre-egological retentional time consciousness (see Thompson 2007), Windt proposes that dreamless sleep experience is a candidate for minimal phenomenal experience, one characterized only by the phenomenal "now" and a sense of duration, but having no further intentional content. So described, dreamless sleep experience would qualify as the simplest form in which a state can be phenomenally conscious, namely, as minimal phenomenal temporality.

I find this analysis very promising, though two issues require further analysis. The first concerns whether such a minimal phenomenal experience counts as "selfless." Windt proposes that it does, because minimal phenomenal selfhood requires some sense of spatial self-location, whereas dreamless sleep experience consists only in a minimal sense of temporal self-location—not, of course, in the sense of mental time travel (retrospection and prospection), but rather in the sense of a bare feeling of existing "now," with a minimal feeling of flow or duration. Nevertheless, both Advaita Vedānta and Husserl would take issue with this conception of a phenomenal state as "selfless." As I describe in my target article, Advaita Vedānta describes dreamless sleep experience as a state in which the true nature of the self as non-intentional, re-

flexive consciousness is more apparent than in the ordinary waking and dreaming states. For his part, Husserl also describes the pre-egological retentional time consciousness as a minimal structure of self-experience (see Zahavi 2005; Thompson 2007). It may be that this issue is in part terminological, but there are also likely to be deeper conceptual disagreements about how to analyze the notion of self—whether this notion can be applied to the reflexivity of passive retention (Husserl) or the reflexivity of pure awareness (Vedanta), or whether such states do not meet the criteria for minimal phenomenal selfhood.

Second, and relatedly, I proposed in my target article that, from a Western phenomenological and cognitive scientific perspective, dreamless sleep experience might be describable as a minimal mode of sentience consisting in the feeling of being alive. My point in describing the experience this way was to call attention to the possibly minimal sense of embodiment present in the state. Windt's proposal raises the question of whether even this minimal sense of embodiment may drop away in dreamless sleep, leaving only a bare phenomenal sense of "now." One way to address this question would be to determine whether there can be such a minimal phenomenal temporality in sleep with no affective character, given that one might take the presence of an affective phenomenal character to imply some felt sense of embodiment (assuming that there is a constitutive relation between affect and felt embodiment).

4 The neurophenomenology of sleep states

Windt usefully enlarges the concept of dreamless sleep experience to include a variety of different dreamless sleep states (see Section 4 of her commentary). These states include lucid dreamless sleep (especially the experiential transition from lucid dreaming to lucid dreamless sleep), a possible subclass of white dreams (in which individuals describe the impression of having dreamed but are unable to describe the dream in any detail), subjective insomnia (in which some individuals may maintain pre-reflective awareness of their ongoing sleep state while mistakenly conceptualizing their state as wakefulness), in addition to the contemplative practices of lucid dreamless sleep that I describe. Windt's taxonomy is groundbreaking and opens many new avenues for the experimental neurophenomenology of sleep. This is exactly the kind of work I envisioned when I suggested that we need a more fine-grained and phenomenologically informed taxonomy of sleep states.

5 Contemplative sleep states

In my target article, I called attention to the importance of meditative practices of dream yoga and lucid dreamless sleep, because they are closely connected to the Advaita Vedānta, Yoga, and Indian Buddhist conceptions of dreamless sleep, and have begun to be investigated by cognitive neuroscientists (see Thompson 2015b for further discussion). I agree with Windt that these practices may be too remote from other kinds of sleep experiences in order to justify a wholesale revision of the standard taxonomy of sleep states. For this reason, it is important to place these meditative sleep states within a wider taxonomy that includes other kinds of sleep states, specifically the dreamless sleep states that Windt details. In this way, the meditative practices and their effects on sleep can be integrated into the rest of sleep science. Windt's article provides an excellent framework to this end.

6 Conclusion

Windt's commentary goes far beyond mere commentary in offering new arguments against the default neuroscience view that consciousness is that which disappears in dreamless sleep, by providing a refined conceptual proposal about the phenomenal structure of dreamless sleep experience, and by presenting a new taxonomy of dreamless sleep states and experiences. Thanks to her commentary, sleep science and the neuroscience of consciousness have new conceptual and methodological tools for refining the investigation of consciousness during sleep (see also Windt 2015a).

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