32
DREAMING

John Sutton

Introduction

As a topic in the philosophy of psychology, dreaming is a fascinating, diverse, and severely underdeveloped area of study. The topic excites intense public interest in its own right, while also challenging our confidence that we know what the words "conscious" and "consciousness" mean. So dreaming should be at the forefront of our interdisciplinary investigations: theories of mind which fail to address the topic are incomplete. Students can be motivated to think hard about dreaming, so the subject has definite pedagogical utility as entry into a surprising range of philosophical topics. Learning even a little about the sciences of sleep and dreaming, and about the many ingenious experiments designed by dream psychologists, is an excellent way into thinking about relations between phenomenology and physiology, and between empirical and conceptual strands in the study of mind. Students and researchers seeking complex and multifaceted intellectual challenges will increasingly be drawn to explore resources for the study of dreams.

But despite the fascination of dreams for modern Western culture, the story of the discovery of REM (rapid eye movement) sleep and the subsequent exploration of the psychophysiology of dreaming, which was among the great adventures of twentieth-century science (Hobson 1988: Ch. 6; Aserinsky 1996; Foulkes 1996; Kroker 2007), has barely influenced the active self-image of mainstream philosophy of mind. Although epistemologists still use dreaming to focus concerns about scepticism, the *psychology* of dreams remained until recently a marginal subject in philosophy and the cognitive sciences alike. There are no references to sleep or dreams in Blackwell's 1998 *Companion to Cognitive Science;* only short single entries in the substantial encyclopaedias of cognitive science published by MIT and by the Nature Publishing Group, and both by the same author (Hobson 1999a, 2003); and at the time of writing no entry on dreaming is listed in the projected contents of the online *Stanford Encyclopedia of Philosophy*. Yet this chapter can now draw on a small but increasing wave of recent work on dreams which takes a naturalistic and integrative attitude to philosophy of psychology, foreshadowed by Daniel Dennett (1976) and Patricia Churchland (1988), and exemplified by Owen Flanagan's *Dreaming Souls* (2000).

The previous significant philosophical monograph on the subject, written in a very different intellectual climate, was Norman Malcolm's controversial *Dreaming* (1959), which dramatically amplified some scattered and cryptic remarks of Wittgenstein's. Malcolm started from what he saw as the analytic claim that no judgements can possibly be made in sleep – whether that I am asleep, or that I am seeing and experiencing various things. Noting that the criterion for ascribing a dream is the dreamer's later report, Malcolm argued that there can be no other criteria – such as physiological criteria – because they could only be established and maintained by reference to the primary criterion of waking testimony. Malcolm claimed that reports of mental phenomena in dreams do not report reasoning, remembering, or imagining in the same sense as while waking: "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" (1959: 51–2; see also McGinn 2004: 96–112; Sosa 2005). Malcolm did not *identify* dreams with waking reports or impressions (1959: 59), but he has consistently been read as simply denying that dreams are experiences we have during sleep. This bewildering view, which seems to fly in the face of subjective, conceptual, and scientific evidence alike, has prompted in response some of the best philosophical work on dreams (Putnam 1975 [1962]; Dennett 1976; Revonsuo 1995, 2005; Windt and Metzinger 2007), but may also have had a more generally "dispiriting" effect on the field (Dreisbach 2000: 37).

There are other plausible and compatible explanations for the longstanding neglect of dreaming in philosophy of psychology: widespread suspicion of Freud, ongoing obsessions with Cartesian doubt, the fragmentation and swift professionalization of the sciences of sleep physiology, which encouraged their divorce from the psychology of dreaming (Foulkes 1996), and the uneasiness about consciousness which long characterized the cognitive sciences (Foulkes 1990: 46). But perhaps behind all these diagnoses lies the sheer difficulty of the enterprise. Integrated, multilevel theories of dreaming are unusually hard to develop because our access to the phenomena is unusually indirect, so that it is unusually difficult to manipulate postulated mechanisms and identify the causally relevant components of the dreaming mind/brain system.

While researchers seek both conceptual and empirical ways to address these difficulties, it is unsurprising that theories of dreams lag behind work on memory, imagery, colour vision, or emotion (say) in the identification of robust, independent but converging lines of evidence for the entities and activities postulated in any inchoate model. Higher level synthetic and conceptual work is vital, especially given recent signs of new momentum in the field. Alongside the sudden emergence of "consciousness studies" in the last 15 years, we can point to the strength of the pluralistic organization IASD (the International Association for the Study of Dreams) and its excellent journal *Dreaming*, published since 1991; to a remarkably rich special issue of *Behavioral and Brain Sciences* in 2000, with six target articles and 76 commentaries (republished in book form as Pace-Schott et al. 2003); and to the promise of improved neurocognitive techniques, such as the better temporal resolution in newer neuroimaging technologies. Naturalistically oriented philosophers can realistically hope to

help when, as now, rapid increase in experimental data has not been matched by new maturity in theories.

This chapter illustrates the tight links between conceptual and empirical issues by highlighting surprisingly deep disagreements among leading dream scientists over what might seem basic aspects of their topic. Philosophers who discuss dream science have in the main taken their picture of the field from the impressive and ambitious work of J. Allan Hobson and his team at Harvard Medical School (Hobson 1988, 2002; Flanagan 2000; Metzinger 2004; Clark 2005; but see Kitcher [1992: 141–9] for a more cautious approach), so we start by sketching his account. Hobson is the pre-eminent dream scientist of the last 30 years, but his views are far from uncontroversial. We then analyse the conceptual significance of some important but (as yet) less influential alternatives, focusing on research by Mark Solms, David Foulkes, and G. William Domhoff, which remains unjustly neglected by philosophers: it's surprising, for example, that all three authors are omitted from Windt and Metzinger's impressive survey of the philosophy of dreaming and self-consciousness (2007).

In focusing closely in on the sciences of dreaming in this way, this chapter omits discussion of dreaming in the history of philosophy (see Hacking 2002; Holowchak 2002), history of science (Lavie and Hobson 1986; Ford 1998; Dacome 2004), philosophy of psychoanalysis (Kitcher 1992; Blechner 2001), and the social sciences (D'Andrade 1961; Burke 1997; Stansell 2006). This is emphatically not to see such enquiries as entirely disconnected from psychology, which as we'll see could benefit greatly from closer integration with historical and cultural investigations of practical attitudes to dreaming. Among the intriguing live questions in the psychology of dreaming which we also don't discuss are issues about the relation between dreaming and attitude to dreams (Wolcott and Strapp 2002; Beaulieu-Prévost and Zadra 2005), and about the methods for and results of systematic content analysis of dream reports (van de Castle 1994: 291–358; Strauch and Meier 1996; Domhoff 2003: 67–134). However, the best initial view of the fertile philosophical territory can perhaps be gained from within the rich core scientific debates about how to overcome the difficulty of access to the mind in sleep.

Phenomenology and physiology: the cognitive neuroscience of dreaming

David Foulkes, a cognitive psychologist whose positive views on dreaming we examine below, offers a relatively neutral characterization of the phenomena in question: dreaming is "the awareness of being in an imagined world in which things happen" (Foulkes 1999: 9). This contrasts dramatically with the description of dreaming preferred by Hobson's team. For them, it is

> [m]ental activity occurring in sleep characterized by vivid sensorimotor imagery that is experienced as waking reality despite such distinctive cognitive features as impossibility or improbability of time, place, person and actions; emotions, especially fear, elation, and anger predominate over sadness, shame and guilt and sometimes reach sufficient strength to cause awakening; memory

> for even very vivid dreams is evanescent and tends to fade quickly upon awakening unless special steps are taken to retain it. (Hobson, Pace-Schott, and Stickgold 2000a: 795)

Although Hobson suggests that this "highly specified definition" serves folk psychology well by capturing "what most people mean when they talk about dreams," it is also clearly intended to build in some substantial assumptions, and to encapsulate the key *explananda* of a particular neurocognitive theory. The theory in question has evolved from an "activation-synthesis model" (Hobson and McCarley 1977) to the current activation-input-modulation (AIM) model (Hobson, Pace-Schott, and Stickgold 2000a; Hobson and Pace-Schott 2002), through the incorporation of vast arrays of additional data (especially in neurochemistry) in an admirably ambitious multileveled research program. The common thread has been to emphasise "such aspects of the form of dreams which might be expected to have their roots traced to isomorphic forms of brain activity" (Hobson, Pace-Schott, and Stickgold 2000a: 823). We can examine the ensuing picture of dream phenomenology and physiology in turn.

While Hobson acknowledges a range of other kinds of mentation in sleep, he takes the following features to be paradigmatic of core cases of dreaming. Expanding on the above definition in ways which (as he notes) match widely shared assumptions, Hobson argues that consistently in dreaming we experience "hallucinatory perceptions," especially visual and motoric; our imagery "can change rapidly, and is often bizarre"; the content lacks "orientational stability," in that persons, times, and places are "plastic, incongruous and discontinuous"; story-lines emerge to "explain and integrate all the dream elements in a single confabulatory narrative"; we have "increased and intensified emotions" in dreams, but usually our volitional control is severely diminished and our reflective and metacognitive capacities reduced (Hobson, Pace-Schott, and Stickgold 2000a: 799); we have little access in dreaming to coherent narrative units of our episodic memories (Fosse, Fosse, Hobson, and Stickgold 2003), and in turn have very poor recall for dream content. Most of us recognize this description of dreaming, for Hobson, not because these are features of a few, atypically memorable dreams, but because this kind of intense "dreaminess" is indeed typical of mentation in key forms of sleep.

After the discovery of REM sleep, the initial hope was that, not only such general formal features of dreaming, but also specific dream contents could be mapped on to and explained by reference to particular features of the unique neurophysiology of this stage of sleep. In sharp contrast to the various "deeper" stages of sleep (collectively labelled non-REM, or NREM), in REM sleep (in addition to the unusual clusters of eye movements) muscle tone is exceptionally low, and brain activity is wake-like, though heavily influenced by phasic activation from the brainstem in the form of irregular PGO (ponto-geniculo-occipital) waves. From the start of the experimental studies of REM-dream correlations, people woken from REM sleep reported dreams much more frequently than when woken from NREM. Although by the early 1960s it was clear that NREM sleep can also produce dream reports, NREM dreams are in general less intense and more "thought-like." There are ongoing controversies about relations

between REM sleep and dreaming, to which we return in the third section, below, but Hobson's assessment of this substantial body of research is that it has established "clear-cut and major" differences in phenomenology between "the states of waking, sleeping (NREM), and dreaming (REM)," and that all of the peculiar phenomenological features of REM dreams, as listed above, "will eventually be explainable in terms of the distinctive physiology of REM sleep" (Hobson, Pace-Schott, and Stickgold 2000a: 799).

The AIM (activation-input-modulation) model offers a three-dimensional-state space, which allows for intermediate states and for gradual, as well as discontinuous, transitions between states. The three factors together should explain the loss of volition and executive control in dreams as we swing from directed waking thought to hallucinatory activity (Fosse et al. 2001). While general brain-activation levels in REM sleep show significant similarities with waking, imaging and other recent studies identify a range of finer grained differences, notably in the deactivation of the prefrontal cortex in REM. The information sources for waking cognition are often dominated by external inputs from the world, as our perceptual systems register our surroundings and we in turn act on our environment: in normal REM, the dreamer is cut off from the world, with sensory input all but eliminated and motor output inhibited, so that only internal information sources are available. Finally, the neurochemical modulation characterizing REM is, roughly, a switch in the neurotransmitter balance, from aminergic predominance (noradrenaline and serotonin) in waking to significant cholinergic influence (acetylcholine) in REM, with intermediate chemical modulation in deep NREM. These three neurobiological dimensions are intended also to have psychological referents, to be established empirically (Hobson, Pace-Schott, and Stickgold 2000a: 794). This is a tough long-term project, in which much of the burden of explaining the unique features of REM dreaming will fall to correlations between altered neuromodulation and alterations in "the way in which the information in the system is processed (mode)" (794).

Hobson's reductionism is admirably forthright, and as an integrative ideal is clearly and correctly distinguished from eliminative materialism (Hobson, Pace-Schott, and Stickgold 2000b: 1030). The positive metaphysics of his "brain-mind isomorphism" are harder to pin down. Sometimes the view is expressed oddly, as if the brain is itself the object of dreaming cognition – "dreaming is the conscious experience of hyperassociative brain activation that is maximal in REM sleep" (Hobson and Pace-Schott 2002: 691) – but usually the kind of "isomorphism" in question seems to be some kind of identity, in which subcortical stimuli are themselves informational. So, for example, dreams of flying are a "logical, direct, and unsymbolic way of synthesizing information generated endogenously by the vestibular system" (Hobson and McCarley 1977: 1339). In this earlier work, the picture was that strong, irregular, and unstable input from the brainstem is synthesized into bizarre narrative form by forebrain systems (Hobson 1988): "in dream bizarreness we see a mental readout of the chaotic brainstem activity of REM sleep" (Hobson and Stickgold 1994: 10-11). There was no particular theory of mental representation, or of the nature of computation, invoked to support this direct mapping between physiological chaos and cognitive chaos. Even

Michel Jouvet, on whose pioneering studies of this brainstem activity Hobson relies, could see the difficulty in interpreting PGO waves in informational terms: "the almost random volleys of PGO activity are hardly compatible with any attempt at semantics" (Jouvet 1999: 87).

Hobson's more recent model offers much more fineness of detail on both physiological and psychological dimensions, with rich extensions into many related areas of sleep science, learning and memory, and neurochemistry: it must remain the starting point for any empirically informed philosophy of dreams. But the model has not obviously yet incorporated the requisite conceptual advances to explain the implications for dream science of the broad claim that "every form of mental activity has a similar form of brain activity" (Hobson 2002: 33). Hobson intends this to be much more than correlation, and to amount to something more specific than the general materialist commitment that features of dreaming are in some general way "brain-based" (Hobson and Pace-Schott 2002: 686): we should interpet talk of phenomenology "reflecting" changes in the brain (Hobson, Pace-Schott, and Stickgold 2000a: 812) as a quite specific "readout," as particular "formal psychological features of dreaming are determined by the specific regional activation patterns and neurochemistry of sleep" (Hobson and Stickgold 2002: 691). In other words, there are direct isomorphisms between *particular* properties represented in dream content and *particular* properties of the representing vehicles of that content.

A challenge for Hobson-style theories, then, is to defend such direct isomorphisms for the case of dreaming against the general charge that they unnecessarily conflate properties of representings with properties of representeds (Dennett 1991; Hurley 1998). Just as "there are gigantic pictures of microscopic objects," so any candidate neural code can in principle represent any perceptual dimension (Dennett 1991: 147), and so the representing vehicle of dream bizarreness need not itself be particularly bizarre or chaotic. Of course, a case may be made for the significance of more complex forms of resemblance or isomorphism between vehicle and content (O'Brien and Opie 2004). But Hobson sees no need to make this case, because he allows no theoretical space for any materialist theory which distinguishes vehicles from contents in the ways Dennett and Hurley recommend. This is apparent in the charge that psychologists like Foulkes who reject such direct isomorphisms are treating cognitive activation as entirely "independent of brain activation," or reaching "the absurd and unacceptable conclusion that brain and mind have nothing to do with each other" (Hobson, Pace-Schott, and Stickgold 2000a: 804). In examining some alternative views below, I'll suggest that this charge does not stick, and that there is room for genuinely cognitive or representational levels of analysis between phenomenology and physiology, through which claims of isomorphism need to be mediated.

Neuropsychology and dream bizarreness

Some philosophical attention has focused on recent debates between Hobson and the "neuropsychoanalytic" views of clinical neuroanatomist Mark Solms, including their "dream debate" at the 2006 Tucson consciousness conference (Faw 2006: 87–9;

Hobson 1999b, 2005, 2006; Solms 1995, 1999, 2006). This section describes the basis of their disagreements over dream science, bypassing for present purposes the radically different attitudes to Freud which animate their work, but then (following Domhoff [2005]) argues that these real disagreements coexist with, and tend to mask, substantial shared assumptions on some other key issues.

Hobson, as we've seen, ascribes the neural origins of dreaming to noisy, disordered PGO waves from the brainstem, or to the cholinergic neuromodulation which, in dominating aminergic influence during REM, "underlies the similar modal shifts in information processing" (Hobson, Pace-Schott, and Stickgold 2000a: 833). In other words, the same processes underlie both REM sleep and dreaming: indeed, Hobson approves of the idea that dreamlike mentation in NREM sleep too could be ascribed to ongoing stimulation from the brainstem in "covert REM sleep" (Nielsen 2000), arguing that "all sleep is REM sleep (more or less)" (Hobson 2000: 952). For Solms, in contrast, the complex mechanisms driving REM sleep are in principle entirely independent of the mechanisms of dreaming. Even if there is a well-defined cholinergic "REM-on" brainstem system, he argues that the chemistry of the "dream-on" system is "controlled by dopaminergic forebrain mechanisms," those which in waking support goal-seeking behaviour and appetitive interaction with the world (Solms 2000: 843–6).

Solms makes these claims on the basis of groundbreaking detective work, both "clinico-anatomical" and historical, into the neuropsychology of dreams (Solms 1997). Firstly, although evidence is sketchy, large-scale lesions of the pontine brainstem which eliminate REM do not seem necessarily to eliminate dreaming. More significantly, Solms found a large range of cases in which dreaming is eliminated or dramatically altered by forebrain lesions which completely spare the brain stem. Solms reanalysed nineteenth-century case studies by Charcot and others, and psychosurgical reports of the prefrontal leukotomies carried out on many human subjects in the mid-twentieth century, and gathered information on the dreaming of 361 neurological and neurosurgical patients and controls of his own. Most of these patients reported no changes in dreaming, indicating that their lesions were in brain areas which do not have substantial roles to play in dreaming. But the key results included two large groups of patients who reported global cessation of dreaming after their lesion, despite the absence of damage to the brainstem and despite the continuation of ordinary REM sleep. In one group, lesions were in the region of the parieto-temporal-occipital junction, which supports various cognitive functions related to mental imagery and spatial representation; in the other group, which included the leukotomised subjects, lesions were in the ventromesial quadrant of the frontal lobes, in the dopaminergic appetitive circuit mentioned above (Solms 1997, 2000). Other notable results concern the bases of sensory imagery in dreaming: visual imagery in dreams was intact after lesions to primary visual cortex (as it is in people who go blind after the age of 5–7 or so [Kerr and Domhoff 2004]), but significantly affected in two patients with damage to the occipito-temporal region of their visual association cortex, to the extent that their dreams became "nonvisual" (Solms 1997: 93–106). These last points, and related evidence for other sensory modalities, are important because they

show that "perceptual and motor dream imagery does not isomorphically reflect the simple activation of perceptual and motor cortex during sleep," but that such imagery is "actively constructed through complex cognitive processes" as in waking imagery (Solms 2000: 848).

On the one hand, Solms takes these results to demonstrate a double dissociation between dreaming and REM sleep. There are dreams with no REM, as well as genuine and distinctive NREM dreams; and there is cessation of dreaming with REM preserved. On the other hand, in constructive mode Solms suggests that a complex, highly specific network of forebrain mechanisms acts as the generator of dreams, in the wider cerebral context of a basic level of arousal or activation which is usually (but not essentially) provided by the REM state through a quite distinct mechanism (Solms 2000; Domhoff 2001, 2003: 9–18). This network, which must take some time to emerge over the course of neurocognitive development, includes a "seeking" system which taps our interests and goals: this leaves room for Solms to build both cognitive and motivational factors into the heart of the model of dreaming, thus driving a broader defence of certain aspects of psychoanalytic theory (Solms 2006), and the resulting standoff with the Hobson camp.

Yet Solms's defence of the "meaningfulness" and symbolic nature of dreams is still conducted wholly at a neurobiological level: he invokes neither a particular cognitive or representational theory, nor any detailed and systematic analysis of dream contents. Like Hobson, he sees questions of dream psychology as needing to be settled only by the neurobiology of dreaming. The concern here, again, is not about reductionism *per se*, but about over-hasty versions, which jump levels too fast in bypassing representation and content. Better forms of reductionism for dream science, one might think, would not only "be compatible with great explanatory pluralism" (Murphy 2006), but in suggesting multilevel experimental strategies would also look for evidence directly at the cognitive level.

The appropriate use of imaging studies is also at stake here: because some imaging studies have simply identified dream sleep with REM sleep (thus always finding that the pontine brain stem is involved in dream sleep), they do not independently compare dreaming with nondreaming NREM epochs, to try to discover just what's in common across all episodes of dreaming (Solms 2000: 848). Ideas about better imaging methods have been suggested recently by Sophie Schwartz and colleagues. They suggest, firstly, comparing bizarre but common features of dreams with similar but independently verified neuropsychological syndromes: for example, the common mismatch in dreams between a character's appearance and identity ("she looked like X, but I knew she was really Y") is compared with the related waking delusional misidentification condition called Frégoli syndrome (Schwartz et al. 2005: 434–5). The point is that such comparisons should generate predictions about the underlying transient neuropsychology of dreaming, which could then in principle be tested in neuroimaging studies (see also Dang-Vu et al. 2005).

A further point of contact between Hobson and Solms is that, despite their very different explanations, Solms's view of the formal characteristics of dreams – "hallucination, delusion, disorientation, negative affect, attenuated volition, and

confabulatory paramnesia" (Solms 2000: 848) – is close to Hobson's account of dreams as essentially bizarre, and dream narratives as paradigmatically implausible. Where for Solms dreams are bizarre because they are disguised wishes, dreaming for Hobson is a form of psychosis or delirium: "the mind becomes formally psychotic. Wild and bizarre delusions are fed by visual and auditory hallucinations … The mind becomes hyper-emotional, alternately terrified and ecstatic. Profound anxiety alternates with a sense of omnipotent grandiosity" (Stickgold and Hobson 1994: 141–2). Hobson's team has sought to discover just how bizarre dreams really are, working from a classification of types of bizarreness into incongruity, uncertainty, and discontinuity: but casual readers of their work or that of philosophers reliant on it (Flanagan 2000: 147–8) would not realize just how difficult it is to find agreement on methods and results concerning dream bizarreness (Colace 2003).

One early sleep lab study of 635 REM dream reports assessed bizarreness as "the extent to which the described events were outside the conceivable expectations of everyday life; to put it bluntly: the craziness of the dream" (Snyder 1970: 146). Fewer than 10 percent were scored as highly bizarre, while 75 percent contained little or no drama. Subsequent studies both in sleep labs and in home settings use many different measures of both bizarreness and emotion. In general, studies find that many dreams have no emotional content at all, and only 20–30 percent are highly emotional: most emotions in dreams are appropriate to the dream context, save for the occasional absence of emotions which would be normal in waking life. Part of the difficulty with measuring dream bizarreness is that in many studies (like Snyder's) it is judged by comparison with waking real-life events, whereas there is some reason to think it would be more accurate to compare dreaming to waking mental life. A sequence of events might be implausible in external reality, but as easy and natural to imagine as to dream. The suspicion is that only a broadly perceptual or hallucinatory model of dreaming makes this comparison of the dream world to the (perceived) external world, rather than to an imagined world, seem obvious. But systematic comparisons of dreaming with imagination, narrative, and fantasy, rather than with "everyday life," might reveal, as Domhoff suggests, that "there is far more discontinuity, drift, and inattention in waking thought than is implied by the claim that changes in dream scenes or settings are inherently bizarre" (Domhoff 2003: 153; see also Flanagan 2000: 58–61).

Having noted these points of contact between Hobson and Solms in relation both to the relation between levels of explanation, and to the characterization of the phenomenological data, we can now examine an alternative theoretical perspective in which dreams are a more sophisticated cognitive achievement, and are typically not so bizarre or fraught with emotion. The best way into this is through a discussion of children's dreams.

Children's dreams and dreaming as a cognitive achievement

In remarkable longitudinal and cross-sectional studies from the late 1960s to the 1980s, David Foulkes and his co-workers investigated the frequency of dream recall

and the content of dream reports in children from age 3 to age 15. The results were surprising, and conflict with assumptions about dreaming in both folk and scientific psychology: but even after Foulkes presented them in more accessible form in *Children's Dreaming and the Development of Consciousness* (1999; see also the more technical account in Foulkes 1982), they remain strangely little known outside the dream-research community (see Domhoff 2003: 18–25).

The first, longitudinal, study began in Laramie, Wyoming in June 1968. Foulkes tracked two groups of children over 5 years: one group from age 3 or 4 to age 8 or 9, the other from age 9 or 10 to age 14 or 15. In each group, 7 or 8 boys and 7 or 8 girls slept in the lab for nine nights each in the first, third, and fifth years of the study. More children joined the study in the third and fifth years, to check on any effect of participation. Only four of the older children, whose families left town, did not participate through the full study. Foulkes himself woke each child three times a night from either REM or NREM sleep, a total of 2711 awakenings. In the second and fourth years, children had their dream reports collected after uninterrupted nights of sleep at home, and took part in a range of other cognitive and personality tests. Core results of this longitudinal study from a small town were later replicated in a cross-sectional study of 80 children between the ages of 5 and 8 in metropolitan Atlanta.

Before sketching some of Foulkes's specific results, we can highlight the common assumptions about children's dreaming which he thinks they challenge. On the basis of his studies, Foulkes rejects the idea that dreaming "has always been there, even in infancy, in pretty much the form that we know it now" (1999: 6). He suggests, plausibly, that many people – including scientists – interpreted the discoveries that infants have more REM than adults as suggesting "a rich infantile dream life"; and that in the broader Western culture at least, "there is an expectation that children's dreams will be dripping with feelings, mostly unpleasant ones at that" (1999: 7, 68). He links these assumptions, plausibly, to "an implicit equation of dreaming with perception" (1999: 11), by which the dreamer, whether adult, child, or nonhuman animal, is quasi-perceptually registering what happens in the absent or virtual dreamed world when they have vivid, hallucinatory, self-involving, emotional oneiric experiences.

But in Foulkes's studies, the younger children (ages 3–5) dreamed very little: no NREM awakenings, and only around 15 percent of REM awakenings elicited dream reports, and those reports were "very brief and insubstantial" – one boy's only two dream reports from 15 REM awakenings in the year from 4 years 8 months were "I was asleep and in the bathtub" and "I was sleeping at a co-co stand, where you get Coke from" (1999: 56, 159). Right up to ages 9–11, only about 30 percent of REM awakenings produced dream reports; but from that age, frequency increased substantially and swiftly to typical adult rates of around 80 percent.

A natural response is that Foulkes has only measured children's verbal skills, or their memory: isn't it just that such young children are unable to report their rich and vivid dream life? This is certainly the view of the Hobson team, who "specifically suggest that the human neonate, spending as it does more than 50% of its time in REM sleep, is having indescribable but nevertheless real oneiric experiences" (Hobson et al 2000a, p. 803). But although Foulkes acknowledges that the results with

very young children are harder to interpret, he defends confidently his claim of the paucity of dreams from ages 5 to 9: what's striking here is that there are no correlations between dream frequency and richness, on the one hand, and verbal skills or memory development on the other hand, right through the age groups. Children whose general verbal skills were relatively poor were just as likely to report more vivid dreams, and those who had the best linguistic abilities were just as likely to report few and bland dreams. The variable from waking cognitive life which correlated most with dreaming was the child's visual-spatial skill, as tested on tasks involving visual imagery and spatial imagination. Significantly, two children who joined the study at ages 11 and 12 had typical verbal, memory, and general cognitive skills for their age, but visual-spatial skills comparable only to those of 5–7 year olds: they also had extremely low dream recall, also like the younger age group. So, Foulkes argues, it's not likely that either these two or the younger children were having rich dreams but failing to remember or describe them well. Instead, along with the development of narrative memory and theory-of-mind capacities, the gradual development of a rich visual-spatial imagination may be among the key cognitive prerequisites for a fuller dream life.

Since early dreams are thus (in general) relatively static and bland, they have weak narratives: further, before the age of 7 or so the self is rarely an active participant, and there are few complex social situations. And in the relatively rare case in which dream reports are emotional or stressful, they still show lower levels than older children and adults of aggression, misfortune, and negative emotion. No significant gender or personality differences emerge in the content of typical dreams until adolescence. Dreaming, Foulkes concludes, is an organizing, constructive process which requires cognitive sophistication, and is continuous with waking cognitive and emotional life. It is less like perceiving than other forms of thinking about or imagining what is absent (see also McGinn 2004: 74–95; Sosa 2005), so is much harder before the development of fuller representational and narrative capacities.

The prevailing view that even very young infants must have vivid dreams, suggests Foulkes, is supported primarily by the pervasive assumption of identity or correlation between dreaming and REM sleep, by adults' memories of a few atypical bizarre dreams in their childhood, and by the striking nature of their own children's reactions to rare powerful dreams or night terrors (which in fact are not part of ongoing dreams, but arise in deep and dreamless sleep). A distinct account of the nature of adult dreaming also emerges: instead of the stress on bizarre hallucination, Foulkes argues that dreaming is at heart an organizing process, a high-level symbolic skill, and a form of intelligent behaviour with cognitive prerequisites (Foulkes 1990, 1999). The virtual world we inhabit in dreams is one which we have constructed, though usually without either voluntary control or current sensory input.

There are, of course, a host of further methodological questions about these studies. There are difficult issues about differences between dream reports collected in the sleep lab and the home environment, and by experimenter and parent. Critics have not always accepted Foulkes's claims that the children's home dreams in his study did not differ significantly from those collected in controlled conditions, or that any of the dreams collected by an experimenter is representative. It's also worth noting that

one study by Hobson's team, in which parents asked about their children's dreams on waking at home in the morning, did find children giving "long, detailed reports of their dreams which share many formal characteristics with adult dream reports" (Resnick et al. [1994], followed by Flanagan [2000: 146–7]). While parents were asked not to pressure their children, on some of the nights the children had to repeat "I will remember my dreams" three times out loud before going to sleep, and parents were "explicitly instructed to elicit as much detail as possible by guiding their children." Rather than addressing further details of the consequent disputes about method (see Foulkes 1999: 18–39; Domhoff 2003: 39–66), here we can focus the difference between Hobson's and Foulkes's picture in one last way which also returns us to the philosophical literature.

> In Part II of the *Philosophical Investigations*, Wittgenstein described People who on waking tell us certain incidents (that they have been in such-and-such places, etc.). Then we teach them the expression "I dreamt," which precedes the narrative. Afterwards I sometimes ask them "did you dream anything last night?" and am answered yes or no, sometimes with an account of a dream, sometimes not. That is the language game. (Wittgenstein 1953: 184)

Foulkes is not quite suggesting that children have to learn to dream, but the idea is at least thinkable in the context of his theory, whereas for Hobson it is absurd, because the hallucinosis and emotionality of dreaming is a basic neurobiological given. Despite his notorious reluctance to ask what dreaming really is (Malcolm 1959: 59, 83), Norman Malcolm, in Wittgenstein's wake, offers a rather careful discussion of the senses in which this language game is and isn't learned. In my own case, Malcolm acknowledges, I don't rely on my own waking report to know that I have dreamt: rather, I wake with certain impressions and infer that "I dreamt so and so" (1959: 64–5). This "raw material," these "impressions" which form the basis for the language game of telling dreams, are not learned but are given, "a part of the natural history of man" (1959: 87–9). What we *do* learn is not just the inessential language of telling dreams, but most importantly, how "to *take* an after-sleep narration in a certain way," distinguishing it from a true or false recollection of events that occurred before or during sleep, and "not questioning the accuracy of the impression but accepting the narrative on the speaker's say-so" (1959: 88). The practical meaning of the dream impressions, in contrast to other impressions, lies in the practical significance we learn to attribute to them (Schroeder 1997: 32; Child 2007). Even in cultural contexts in which enormous significance is attributed to dreams, in the diverse ways anthropologists have shown (von Grunebaum and Caillois 1966; Tedlock 1991), they are not connected to the rest of experience or owned *in the same way* as autobiographical memories, thoughts, and so on. Our norms for remembering, for example, are quite differently connected to many diverse practical activities and negotiations.

But Foulkes's account of dreaming as a cognitive achievement suggests a compatible and stronger role for learning and development. As well as learning the peculiar relation of dreams to the rest of practical life, children have to learn quite complex

understandings of what dreams are, and of their relation to imagination, pretence, memory, and so on. On top of learning basic differences between the real and the imaginary, this involves acquiring more sophisticated beliefs about the origins and controllability of dreams, beliefs which remain open to some individual and cultural variation into later life (Woolley and Boerger 2002).

For Foulkes, the offline visual-spatial imagining of worlds in which a represented self can act in complex social contexts amidst rich kinaesthetic and sensory imagery requires a whole raft of complex cognitive capacities, as the putative neural network for dreaming comes into operation. One further example of the lines of research this suggests is the following. If early visual-spatial skills, rather than verbal skills, drive frequent and richer early dreaming, then autistic children (who score relatively highly on tests of visual-spatial capacity) should have relatively early and rich dreams; but then, if the fuller temporal organization of narrative thought is required to build richer dreams from early adolescence onwards, autistic children might be left with more disconnected or fragmentary imagistic dream experience. Foulkes (1999: 153–5) notes the paucity of evidence about such aspects of autistic experience, but there is just a little work on both episodic memory and dreaming (Godbout et al. 1998; Boucher 2001; Boucher and Bowler 2008) which might suggest more about the relative roles of narrative and spatial thinking at different stages of development.

The phenomenology of dreaming

Sticking close to the sciences of dreaming, as we've seen, immediately raises questions of obvious philosophical interest. What are the best metaphysical and methodological approaches to understanding relations between the phenomenology and the neurophysiology of dreams? What room is there for an integrated cognitive level of analysis through which accounts of representation and computation can interlock with more general theories in cognitive science? What are the theoretically and empirically plausible roles of motivation, emotion, imagination, and memory in dreaming? Are there conceptual suggestions that might help clarify or resolve the scientific disagreements over the extent and nature of bizarre mentation in dreaming, and over children's dreaming? Do individually and culturally variable beliefs about dreaming only influence dream reports, or is the form of dreams themselves in certain respects also malleable? Most broadly, is dreaming a quasi-perceptual hallucination or an imaginative construct?

One natural reaction to this plethora of unresolved questions is bewilderment. Can't we just solve – or dissolve – at least some of these debates by combining the psychological results with some better, careful introspective reflection on our own dream experience? This is certainly a common reaction to the antirealism about dreaming commonly ascribed to Wittgenstein and Malcolm. For example, Windt and Metzinger (2007: 194) answer Malcolm with a detailed phenomenological account of "the subjective quality of the dream experience," as "the appearance of an integrated, global model of reality within a virtual window of presence." But how clear a consensus

can we obtain about the details of the phenomenology of dreaming? How good is our access to our own experience?

This chapter concludes by examining one pessimistic answer to these questions from the recent work of philosopher Eric Schwitzgebel. But first, in a spirit of further proliferation of paths for interdisciplinary research, we sketch two more distinct aspects of the phenomenology of dreaming, which can both be used as test cases in assessing those general issues, and which both intersect in their own right with broader questions in philosophy and psychology. In turn we briefly examine perspective and vantage-point in dreams, and the nature and implications of lucid dreaming.

In his work on children's dreams, Foulkes suggested a connection between dreaming and skills in the mental imagining and manipulation of figures or patterns. One thought is that perhaps visual-spatial capacities somehow help to generate the continuous kinematic imagery typical of richer dreams: very young children's dreams are relatively static. But Foulkes also links "the sustained production of involuntary kinematic imagery" with another aspect of imagery. In a further sleep lab study with young adults, Foulkes and Kerr (1994) asked subjects who reported preawakening visual imagery, whether they could see themselves the way another person might, or whether they were seeing through their own eyes. They found that only a small number of dreams were experienced in what they called "the see-oneself mode," and that in the "see-oneself" reports there was a dramatically smaller amount of kinematic imagery: in contrast, in the larger number of "own-eyes" reports, most experience is kinematic.

These ideas about point of view, perspective, or vantage point in dreaming are connected to related work on autobiographical memory. Sometimes I remember events in my personal past from the inside, experiencing the scene from my own past perspective; sometimes, in contrast, I see myself in the remembered scene. Psychologists call the former "field memories" and the latter "observer memories" (Nigro and Neisser 1983), and have found that field memories are more common and generally contain more information on emotional and other subjective states than observer memories (Berntsen and Rubin 2006). The field-observer distinction also has under-explored philosophical implications (but see Debus [2007]). Although it might seem that the "own-eyes" or "field" perspective is the default vantage point, Foulkes and Kerr make the bold case that young children find it relatively more difficult "to adopt the own-eyes perspective as an actively participating character in their own dream scenarios," and thus don't so easily engage in the involuntary elaborations associated with dreaming (1994: 360).

Studies which explicitly ask subjects to specify one of two possible perspectives of their dream or memory experience are not the ideal option in this fascinating domain: many people spontaneously flip or switch between the perspectives, and confidence in retrospective judgements of dream or memory perspective is not always high. It should be possible to examine dream reports collected without such explicit enquiry, to look for references to the self as an observed character, and to assess the speculation offered by Foulkes and Kerr that observer perspectives may be linked with reduced movement and kinematic imagery in dreams, and with less active self-participation. Such a

project might add detail to our understanding of complexity of self-representation and emotion in dreams.

So far, more work has focused on links between perspective and lucid dreaming: there is some evidence, for example, that those who report more lucid dreaming are also more easily able to switch between viewpoints in waking mental life (Blackmore 1988: 385–6). A lucid dream is one in which I become aware that I am dreaming. As Metzinger puts it, "the lucid dreamer is fully aware of the fact that her current phenomenal world does not, in its content, covary with external physical reality": in the extreme, the lucid dreamer also recovers full access to memory, and regains at least aspects of the phenomenology of agency (Metzinger 2004: 530–1). There is good psychophysiological evidence for lucid dreaming through indications from experienced lucid dreamers in the form of agreed eye movement signals while clearly in REM sleep (LaBerge 1988), in a striking form of "trans-reality communication" (Metzinger 2004: 536). We also have careful delineations of "the variety of lucid dreaming experience" (LaBerge and DeGracia 2000). It's clear that certain forms of training can enhance the capacity for lucid dreaming: recent social movements in which people seek new forms of consciousness have promoted the urge to achieve control and awareness within what is otherwise an involuntary and entirely immersed part of our mental life.

The philosophical significance of lucid dreaming is only beginning to be explored. Revonsuo (1995, 2005) and Metzinger (2004; Windt and Metzinger 2007) highlight lucid dreaming as a distinctive and instructive form of consciousness, in which a full phenomenal world is inhabited without "the all-pervading naïve realism – which also characterizes ordinary waking states" (Metzinger 2004: 537). The virtual nature of the world created by the lucid dreamer's consciousness is available as such to the dreamer, who understands (and acts on the basis of) the simulational or misrepresentational character of the experiential process. This may drive a particularly strong form of indirect realism: the idea is that in lucid dreaming the brain, so to speak, *realizes* that it's in a vat. For Revonsuo, for example, our understanding of ordinary experience should be modelled on dreams, because dreaming and especially lucid dreaming show us that "we are not *really* out of our brains in our experiences" (1995: 51): waking experience too is experience of a brain-generated model or a virtual world which just happens to be more constrained, a dream guided by the senses (Revonsuo 1995: 47, quoting Llinás and Paré 1991: 525).

Such views offer a challenge to theories of mind which stress the extended or situated nature of cognitive processes and states. The immediate line of enquiry required before returning to the classic epistemological issue is to investigate whether even lucid dream experience is indeed as realistic as ordinary perceptual experience, and in relevant similar ways. On a contrary view, based for example on privileging the analogy between dreaming and imagining over the analogy between dreaming and perceiving, it is even more gappy and fragmentary than perceptual experience: just because the mind can draw neither on sensorimotor access to the world nor the usual interpersonal support, the thought is, "consciousness appears severely reduced and in a shrunken state in nocturnal life" (Halbwachs 1992 [1925]: 42). The fact that the

experiential world of the lucid dream *seems* to be rich, full, and detailed does not of itself demonstrate that it is so. At present, this is a standoff, so systematic work with experienced lucid dreamers needs significant conceptual development to inform the philosophical debate.

This, then, is another instance of the line of thought with which this section began, that consensus about the phenomenology of dreaming is hard to find. We conclude by examining one further argument for caution. Eric Schwitzgebel (2002, 2003, 2006) has examined the case of dreaming as part of a general argument "that we are pervasively and grossly mistaken about our own conscious experience" (2002: 658). Combining historical, psychological, and philosophical analysis, Schwitzgebel examines references to colour in dreams over a long historical period. While writers on dreams had previously often referred to colour in dreams, suddenly in the 1940s and 1950s psychologists, and the people they surveyed, came to "the opinion that dreaming is predominantly a black and white phenomenon," with (in a typical study) 40 percent of people claiming never to see colour in dreams; and 31 percent, that they do so only rarely (Schwitzgebel 2002: 650). More recent popular and scientific opinion, though, as confirmed by Schwitzgebel's own (2003) attempt to replicate that particular study, has entirely reverted to the view that in general there are colours in most dreams.

What could explain the sudden rise and fall of the opinion that dreams are a black-and-white phenomenon? Schwitzgebel considers four options. Least likely, in his view, is the possibility – intriguing speculation though it is – that the rapid spread of black and white media technology actually caused our dreams to change. If, instead, it was the reporting of dreams that changed (rather than their content), then in at least one period the majority of scientists and people "must have seriously misdescribed the experience of dreaming" (2002: 654), even though most show considerable confidence in their own answers to such questions. Either the mid-twentieth-century view was correct and everyone else has been wrong, or – more likely – dreams really are predominantly in colour and the 1950s view was wrong, with the reports of that time being tainted by the media with which subjects then compared their dreams. This last view seems plausible: but Schwitzgebel is equally attracted to a fourth possibility – "that dreams are *neither* coloured nor black and white, that applying either of these categories is misleading" (2002: 655). Novels are neither in colour nor in black and white, although particular fictional objects can be coloured: perhaps the same holds for dreams, with most elements in dreams being of indeterminate colour.

How then should we decide between these last two possibilities – are dreams really in colour, or do most objects in dreams have no determinate colour? Surely, Schwitzgebel suggests, the subjective experience would be quite different in the two cases, so that we should be able simply to reflect on the phenomenology of dreaming to decide the question. Yet here he finds himself "quite thick," as "incompetent," as at least some of the historical respondents must have been: so he concludes by suggesting "that people's self-confidence in this matter is misplaced. We don't know the phenomenology of dreaming nearly as well as we think we do" (Schwitzgebel 2002: 657).

This may seem a pessimistic way in which to wind up a survey of the current state of the interdisciplinary study of dreaming. It does underline the point that we are far less advanced in drawing convincing connections between phenomenology, psychology, and physiology in the case of dreams than for memory, colour, or emotion. But this pre-paradigmatic situation offers many opportunities, not only to watch the relevant scientific communities in the heat of action, but to contribute directly to the required interdisciplinary projects. Perhaps the gulf between dreaming and the evidence which we can access for it can be gradually overcome. This will involve – among other things – improved methods of collecting and analysing dream reports, more subtle interlevel experiments linking neural processes with experience, systematic attempts to identify those aspects of dreaming which are influenced by beliefs and attitudes and those which are not, and neurocognitive theories which are more thoroughly integrated with our best accounts of other psychological domains. The future of dreaming in both science and culture is at present intriguingly unpredictable.

Acknowledgements

Thanks to Tim Bayne, John Buckmaster, Claudio Colace, Caroline Horton, Doris McIlwain, Richard Menary, Gerry Nolan, Gerard O'Brien, Jon Opie, Perminder Sachdev, Mike Salzberg, Maria Trochatos, to the audience at the joint meeting of the Society for Philosophy and Psychology and the European Society for Philosophy and Psychology in Barcelona in 2004, to my students in Phil 363 at Macquarie University, and to the editors.

References

Aserinsky, Eugene (1996) "The Discovery of REM Sleep," *Journal of the History of the Neurosciences* 5: 213–27.

Barrett, Deirdre, and McNamara, Patrick (eds) (2007) *The New Science of Dreaming*, 3 vols, Westport, CT: Praeger-Greenwood.

Beaulieu-Prévost, Dominic, and Zadra, Antonio (2005) "Dream Recall Frequency and Attitude towards Dreams: A Reinterpretation of the Relation," *Personality and Individual Differences* 38: 919–27.

Berntsen, Dorthe, and Rubin, David C. (2006) "Emotion and Vantage Point in Autobiographical Memory," *Cognition and Emotion* 20: 1193–1215.

Blackmore, Sue (1988) "A Theory of Lucid Dreams and OBEs," J. Gackenbach and S. LaBerge (eds), *Conscious Mind, Sleeping Brain: Perspectives on Lucid Dreaming*, New York: Plenum Press, pp. 373–87.

Blechner, Mark J. (2001) *The Dream Frontier*, Hillsdale, NJ: Analytic Press.

Boucher, Jill (2001) "'Lost in a Sea of Time': Time-Parsing and Autism," in C. Hoerl and T. McCormack (eds), *Time and Memory: Philosophical and Psychological Perspectives*, Oxford: Oxford University Press, pp. 111–35.

Boucher, Jill and Bowler, Dermot (eds) (2008) *Memory in Autism: Theory and Evidence*. Cambridge: Cambridge University Press.

Burke, Peter (1997) "The Cultural History of Dreams," in *Varieties of Cultural History*, Ithaca, NY: Cornell University Press, pp. 23–42.

Child, William (2007) "Dreaming, Calculating, Thinking: Wittgenstein and Anti-Realism about the Past," *Philosophical Quarterly* 57: 252–72.

Churchland, Patricia Smith (1988) "Reduction and the Neurobiological Basis of Consciousness," in A. J. Marcel and E. J. Bisiach (eds), *Consciousness in Contemporary Science*, Oxford: Oxford University Press, pp. 273–304.
Clark, Andy (2005) "The Twisted Matrix: Dream, Simulation, or Hybrid?" in C. Grau (ed.), *Philosophers Explore* The Matrix. Oxford: Oxford University Press, pp. 177–97.
Coe, Jonathan (1998) *The House of Sleep*, London: Penguin.
Colace, Claudio (2003) "Dream Bizarreness Reconsidered" (editorial), *Sleep and Hypnosis* 5: 105–27.
Crick, Francis, and Mitchison, Graeme (1986) "REM Sleep and Neural Nets," *Journal of Mind and Behavior* 7: 229–50.
D'Andrade, Roy (1961) "Anthropological Studies of Dreams," in F. K. Hsu (ed.), *Psychological Anthropology*, Homewood, IL: Dorsey Press.
Dacome, Lucia (2004) "'To what purpose does it think?': Dreams, Sick Bodies, And Confused Minds in the Age of Reason," *History of Psychiatry* 15: 395–416.
Dang-Vu, T. T., Desseilles, M., Albouy, G., Darsaud, A., Gais, S., Rauchs, G., Schabus, M., Sterpenich, V., Vandewalle, G., Schwartz, S., and Maquet, P. (2005) "Dreaming: A Neuroimaging View," *Schweizer Archiv für Neurologie und Psychiatrie* 156: 415–25.
Debus, Dorothea (2007) "Perspectives on the Past: A Study of the Spatial Perspectival Characteristics of Recollective Memories," *Mind and Language* 22, 173–206.
Dennett, Daniel C. (1976) "Are Dreams Experiences?" *Philosophical Review* 73: 151–71.
—— (1991) *Consciousness Explained*, New York: Little, Brown.
Domhoff, G. William (2001) "A New Neurocognitive Theory of Dreams," *Dreaming* 11: 13–33.
—— (2003) *The Scientific Study of Dreams: Neural Networks, Cognitive Development, and Content Analysis*, Washington, DC: American Psychological Association.
—— (2005) "Refocusing the Neurocognitive Approach to Dreams: A Critique of the Hobson versus Solms Debate," *Dreaming* 15: 3–20.
Dreisbach, Christopher (2000) "Dreams in the History of Philosophy," *Dreaming* 10: 31–41.
Faw, Bill (2006) "Are We Studying Consciousness Yet?" (Towards a Science of Consciousness, Tucson Conference, April 4–5), *Journal of Consciousness Studies* 13: 81–99.
Flanagan, Owen (2000) *Dreaming Souls: Sleep, Dreams, and the Evolution of the Conscious Mind*, Oxford: Oxford University Press.
Ford, Jennifer (1998) *Coleridge on Dreaming: Romanticism, Dreams, and the Medical Imagination*, Cambridge: Cambridge University Press.
Fosse, Magdalena J., Fosse, Roar, Hobson, J. Allan, and Stickgold, Robert J. (2003) "Dreaming and Episodic Memory: A Functional Dissociation?" *Journal of Cognitive Neuroscience* 15: 1–9.
Fosse, Roar, Stickgold, Robert, and Hobson, J. Allan (2001) "Brain-Mind States: Reciprocal Variation in Thoughts and Hallucinations," *Psychological Science* 12: 30–6.
Foulkes, David (1982) *Children's Dreams: Longitudinal Studies*, New York: Wiley.
—— (1990) "Dreaming and Consciousness," *European Journal of Cognitive Psychology* 2: 39–55.
—— (1996) "Dream Research: 1953–1993," *Sleep* 19: 609–24.
—— (1999) *Children's Dreaming and the Development of Consciousness*, Cambridge, MA: Harvard University Press.
Foulkes, David, and Kerr, Nancy H. (1994) "Point of View in Nocturnal Dreaming," *Perceptual and Motor Skills* 78: 690.
Godbout, Roger, Bergeron, Cybèle, Stip, Emmanuel, and Mottron, Laurent (1998) "A Laboratory Study of Sleep and Dreaming in a Case of Asperger's Syndrome," *Dreaming* 8: 75–88.
Hacking, Ian (2002) "Dreams in place," in *Historical Ontology*, Cambridge, MA: Harvard University Press, pp. 227–54.
Halbwachs, Maurice (1992 [1925]) "The Social Frameworks of Memory," in L. Coser (ed.), *On Collective Memory*, Chicago: University of Chicago Press.
Hobson, J. Allan (1988) *The Dreaming Brain*, New York: Basic Books.
—— (1999a) "Dreaming," in R. A. Wilson and F. C. Keil (eds), *The MIT Encyclopedia of the Cognitive Sciences*, Cambridge, MA: MIT Press, pp. 242–4.
—— (1999b) "The New Neuropsychology of Sleep: Implications for Psychoanalysis," *Neuro-Psychoanalysis* 1: 157–83.

—— (2000) "The Ghost of Sigmund Freud Haunts Mark Solms's Dream Theory," *Behavioral and Brain Sciences* 23: 951–2.
—— (2002) *Dreaming: An Introduction to the Science of Sleep*, Oxford: Oxford University Press.
—— (2003) "Sleep and Dreaming," in L. Nadel (ed.), *Encyclopedia of Cognitive Science*, London: Nature Publishing Group, vol. 4, pp. 46–52.
—— (2005) "In Bed with Mark Solms? What a Nightmare! Reply to Domhoff (2005)," *Dreaming* 15: 21–9.
—— (2006) "Freud Returns? Like a Bad Dream," *Scientific American Mind* 17, no. 2: 35.
Hobson, J. Allan, and McCarley, R. (1977) "The Brain as a Dream-State Generator: An Activation-Synthesis Hypothesis of the Dream Process," *American Journal of Psychiatry* 134: 1335–48.
Hobson, J. Allan, and Stickgold, Robert (1994) "Dreaming: A Neurocognitive Approach," *Consciousness and Cognition* 3: 1–15.
Hobson, J. Allan, and Pace-Schott, Edward F. (2002) "The Cognitive Neuroscience of Sleep: Neuronal Systems, Consciousness and Learning," *Nature Reviews Neuroscience* 3: 679–93.
Hobson, J. Allan, Pace-Schott, Edward F., and Stickgold, Robert (2000a) "Dreaming and the Brain: Toward a Cognitive Neuroscience of Conscious States," *Behavioral and Brain Sciences* 23: 793–842.
—— (2000b) "Dream Science 2000: A Response to Commentaries on 'Dreaming and the Brain'," *Behavioral and Brain Sciences* 23: 1019–35.
Holowchak, M. Andrew (2002) *Ancient Science and Dreams: Oneirology in Greco-Roman Antiquity*, Lanham, MD: University Press of America.
Hurley, Susan (1998) Vehicles, Contents, Conceptual Structure, and Externalism," *Analysis* 58: 1–6.
Jouvet, Michel (1999) *The Paradox of Sleep: The Story of Dreaming*, Cambridge, MA: MIT Press.
Kerr, Nancy H., and Domhoff, G. William (2004) "Do the Blind Literally 'See' in Their Dreams? A Critique of a Recent Claim That They Do," *Dreaming* 14: 230–3.
Kitcher, Patricia (1992) *Freud's Dream: A Complete Interdisciplinary Science of Mind*, Cambridge, MA: MIT Press.
Kroker, Kenton (2007) *The Sleep of Others and the Transformations of Sleep Research*, Toronto: University of Toronto Press.
LaBerge, Stephen (1988) "The Psychophysiology of Lucid Dreaming," in J. Gackenbach and S. LaBerge (eds), *Conscious Mind, Sleeping Brain: Perspectives on Lucid Dreaming*, New York: Plenum Press, pp. 135–53.
LaBerge, Stephen, and DeGracia, Donald J. (2000) "Varieties of Lucid Dreaming Experience," in R. G. Kunzendorf and B. Wallace (eds), *Individual Differences in Conscious Experience*, Amsterdam: John Benjamins, pp. 269–307.
Lavie, Peretz, and Hobson, J. Allan (1986) "Origin of Dreams: Anticipation of Modern Theories in the Philosophy and Physiology of the 18th and 19th Centuries," *Psychological Bulletin* 100: 229–40.
Llinás, Rodolfo R., and Paré, D. (1991) "Of Dreaming and Wakefulness," *Neuroscience* 44: 521–35.
Malcolm, Norman (1959) *Dreaming*, London: Routledge & Kegan Paul.
McGinn, Colin (2004) *Mindsight: Image, Dream, Meaning*, Cambridge, MA: Harvard University Press.
Metzinger, Thomas (2004) *Being No-one: The Self-Model Theory of Subjectivity*, Cambridge, MA: MIT Press.
Murphy, Dominic (2006) *Psychiatry in the Scientific Image*, Cambridge, MA: MIT Press.
Nielsen, Tore A. (2000) "A Review of Mentation in REM and NREM Sleep: 'Covert' REM Sleep as a Possible Reconciliation of Two Opposing Models," *Behavioral and Brain Sciences* 23: 851–66.
Nigro, Georgia, and Neisser, Ulric (1983) "Point of View in Personal Memories," *Cognitive Psychology* 15: 467–82.
O'Brien, Gerard, and Opie, Jon (2004) "Notes Towards a Structuralist Theory of Mental Representation," in H. Clapin, P. Staines, and P. Slezak (eds), *Representation in Mind*, Amsterdam: Elsevier, pp. 1–20.
O'Shaughnessy, Brian (2002) "Dreaming," *Inquiry* 45: 399–432.
Pace-Schott, Edward F., Solms, Mark, Blagrove, Mark, and Harnad, Stevan (2003) *Sleep and Dreaming: Scientific Advances and Reconsiderations*, Cambridge: Cambridge University Press; updated repr. of a special issue of *Behavioral and Brain Sciences*.
Putnam, Hilary (1975 [1962]) "Dreaming and 'Depth Grammar'," in *Mind, Language, and Reality: Philosophical Papers*, vol. 2, Cambridge: Cambridge University Press, pp. 304–24.

Resnick, Jody, Stickgold, Robert, Rittenhouse, Cynthia D., and Hobson, J. Allan (1994) "Self-representation and Bizarreness in Children's Dream Reports Collected in the Home Setting," *Consciousness and Cognition* 3: 30–45.

Revonsuo, Antti (1995) "Consciousness, Dreams, and Virtual Realities," *Philosophical Psychology* 8: 35–58.

—— (2005) *Inner Presence: Consciousness as a Biological Phenomenon*, Cambridge, MA: MIT Press.

Schönhammer, Rainer (2005) "'Typical Dreams': Reflections of Arousal," *Journal of Consciousness Studies* 12: 18–37.

Schroeder, Severin (1997) "The Concept of Dreaming: On Three Theses by Malcolm," *Philosophical Investigations* 20: 15–38.

Schwartz, S., Dang-Vu, T.T., Ponz, A., Duhoux, S., and Maquet, P. (2005) "Dreaming: A Neuropsychological View," *Schweizer Archiv für Neurologie und Psychiatrie* 156: 426–39.

Schwitzgebel, Eric (2002) "Why Did We Think We Dreamed in Black and White?" *Studies in History and Philosophy of Science* 33: 649–60.

—— (2003) "Do People Still Report Dreaming in Black and White? An Attempt to Replicate a Question from 1942," *Perceptual and Motor Skills* 96: 25–9.

—— (2006) "Do We Dream in Color? Cultural Variations and Scepticism," *Dreaming* 16: 36–42.

Snyder, Frederick (1970) "The Phenomenology of Dreaming," in L. Madow and L. H. Snow (eds), *The Psychodynamic Implications of the Physiological Studies on Dreams*, Springfield, IL: Charles C. Thomas, pp. 124–51.

Solms, Mark (1995) "New Findings on the Neurological Organization of Dreams: Implications for Psychoanalysis," *Psychoanalytic Quarterly* 44: 45–67.

—— (1997) *The Neuropsychology of Dreams: A Clinico-Anatomical Study*, Hillsdale, NJ: Erlbaum.

—— (1999) "The New Neuropsychology of Sleep: Commentary by Mark Solms," *Neuro-Psychoanalysis* 1: 183–95.

—— (2000) "Dreaming and REM Sleep Are Controlled by Different Brain Mechanisms," *Behavioral and Brain Sciences* 23: 843–50.

—— (2006) "Freud Returns," *Scientific American Mind* 17, no. 2: 28–35.

Sosa, Ernest (2005) "Dreams and Philosophy," *Proceedings and Addresses of the American Philosophical Association* 79, no. 2: 7–18.

Stansell, Christine (2006) "Dreams," *History Workshop Journal* 61, no. 1: 241–52.

Stickgold, Robert, and Hobson, J. Allan (1994) "Home Monitoring of Sleep Onset and Sleep-Onset Mentation Using the Nightcap," in R. D. Ogilvie and J. R. Harsh (eds), *Sleep Onset: Normal and Abnormal Processes*, Washington, DC: American Psychological Association, pp. 141–60.

Strauch, Inge, and Meier, Barbara (1996) *In Search of Dreams: Results of Experimental Dream Research*, New York: State University of New York Press.

Tedlock, Barbara (1991) "The New Anthropology of Dreaming," *Dreaming* 1: 161–78.

van de Castle, Robert L. (1994) *Our Dreaming Mind*, New York: Ballantine.

von Grunebaum, Gustav, and Caillois, Roger (eds) (1966) *The Dream and Human Societies*, Berkeley, CA: University of California Press.

Windt, Jennifer M., and Metzinger, Thomas (2007) "The Philosophy of Dreaming and Self-Consciousness: What Happens to the Experiential Subject During the Dream State?" in D. Barrett and P. McNamara (eds), *The New Science of Dreaming*, vol. 3: *Cultural and Theoretical Perspectives*, Westport, CT: Praeger-Greenwood, pp. 193–247.

Wittgenstein, Ludwig (1953) *Philosophical Investigations*, Oxford: Blackwell.

Wolcott, Sommer, and Strapp, Chehalis M. (2002) "Dream Recall Frequency and Dream Detail as Mediated by Personality, Behaviour, and Attitude," *Dreaming* 12: 27–44.

Woolley, Jacqueline D., and Boerger, Elizabeth A. (2002) "Development of Beliefs about the Origins and Controllability of Dreams," *Developmental Psychology* 38: 24–41.

Further reading

An excellent and philosophically rich entry into the field is Owen Flanagan, *Dreaming Souls: Sleep, Dreams, and the Evolution of the Conscious Mind* (Oxford: Oxford University Press, 2000). For a more popular and a more technical first read, try A. Alvarez, *Night: Night Life, Night Language, Sleep, and Dream* (New York: W. W. Norton, 1994) and William G. Domhoff, *The Scientific Study of Dreams: Neural Networks, Cognitive Development, and Content Analysis* (Washington, DC: American Psychological Association, 2003), respectively. Other accessible introductions to the field as a whole are Robert L. van de Castle, *Our Dreaming Mind* (New York: Ballantine, 1994) and Kelly Bulkeley, *An Introduction to the Psychology of Dreaming* (Westport, CT: Praeger, 1997). Among the great philosophers, Aristotle (David Gallop, *Aristotle on Sleep and Dreams* [Peterborough, Canada: Broadview Press, 1990]) and David Hartley, *Observations on Man, His Frame, His Duty, and His Expectations* (New York: Garland, 1971 [1749], Bk I, pt 3, sec. 5), offered particularly impressive theories of dreaming. For modern theories, the work of J. Allan Hobson is essential: *The Dreaming Brain* (New York: Basic Books, 1988) is an extraordinarily detailed historico-scientific *tour de force*, while *Dreaming: An Introduction to the Science of Sleep* (Oxford: Oxford University Press, 2002) offers a shorter but unreferenced update. Norman Malcolm, *Dreaming* (London: Routledge & Kegan Paul, 1959) remains a worthwhile provocation, while the more recent interdisciplinary philosophy books by Thomas Metzinger, *Being No-one: The Self-Model Theory of Subjectivity* (Cambridge, MA: MIT Press, 2004) and Antti Revonsuo, *Inner Presence: Consciousness as a Biological Phenomenon* (Cambridge, MA: MIT Press, 2005) include substantial self-contained sections on dreams. For other scientists discussed in this chapter, start with Mark Solms, *The Neuropsychology of Dreams: A Clinico-Anatomical Study* (Hillsdale, NJ: Erlbaum, 1997) and David Foulkes, *Children's Dreaming and the Development of Consciousness* (Cambridge, MA: Harvard University Press, 1999), respectively. Favourite philosophical papers on dreams include Daniel C. Dennett, "Are Dreams Experiences?" *Philosophical Review* 73 (1976): 151–71; Antti Revonsuo, "Consciousness, Dreams, and Virtual Realities," *Philosophical Psychology* 8 (1995): 35–58; Ian Hacking, "Dreams in Place," in *Historical Ontology* (Cambridge, MA: Harvard University Press, 2002), pp. 227–54; Brian O'Shaughnessy, "Dreaming," *Inquiry* 45 (2002): 399–432; and Eric Schwitzgebel, "Why Did We Think We Dreamed in Black and White? *Studies in History and Philosophy of Science* 33 (2002): 649–60. A major three-volume collection *The New Science of Dreaming* edited by Deirdre Barrett and Patrick McNamara appeared in 2007 (Westport, CT: Praeger-Greenwood), with new papers by many of the leading researchers across the disciplines of dreaming. Membership of the International Association for the Study of Dreams (http://www.asdreams.org/) is open to all, and includes a subscription to the journal *Dreaming*. Finally, Jonathan Coe's *The House of Sleep* (London: Penguin, 1998) is a glorious serio-comic novel substantially inspired by the sciences of sleep and dreams.