



Why did we think we dreamed in black and white?

Eric Schwitzgebel

Department of Philosophy, University of California, Riverside, CA 92521-0201, USA

Received 15 November 2001; received in revised form 16 April 2002

Abstract

In the 1950s, dream researchers commonly thought that dreams were predominantly a black and white phenomenon, although both earlier and later treatments of dreaming assume or assert that dreams have color. The first half of the twentieth century saw the rise of black and white film media, and it is likely that the emergence of the view that dreams are black and white was connected to this change in film technology. If our opinions about basic features of our dreams can change with changes in technology, it seems to follow that our knowledge of the experience of dreaming is much less secure than we might at first have thought it to be. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Dreams; Color; Black and white; Media; Consciousness; Subjective report

1. Introduction

This paper will trace the rise and fall of the view, once dominant among research psychologists as well as the general population of the United States, that people dream primarily in black and white. It will then attempt to evoke perplexity in the reader about whether we actually do dream in color and an admission that our knowledge of the phenomenology of dreaming is much shakier than we ordinarily take it to be. I write in service of the broader thesis that people generally have only poor knowledge of their own conscious lives, contrary to what many philosophers have supposed.

E-mail address: eschwitz@citrus.ucr.edu (E. Schwitzgebel).

2. The history of psychological opinion about color in dreams

In 1951, Calvin S. Hall announced in *Scientific American* that 29% of dreams are either entirely colored or have some little bit of color in them (Hall, 1951). He called such dreams ‘technicolored’, thereby explicitly comparing them to the colored movies that were becoming increasingly prevalent in the 1940s and ’50s, and implicitly contrasting them with lower-tech black and white movies and dreams.

Some of Hall’s contemporaries might have thought him too generous in his estimation of the proportion of colored to black and white dreams. Tapia, Werboff and Winokur (1958) found that only about 9% of a sample of people reporting to the hospital at Washington University in St. Louis for non-psychiatric medical problems reported having colored dreams, compared with 12% of neurotic men and 21% of neurotic women. Middleton (1942) found that 40% of his college sophomores claimed never to see colors in their dreams, 31% claimed rarely to do so, and only 10% claimed to do so frequently or very frequently. Interestingly, Middleton found a similar percentage of his respondents to report *hearing* in color, 11% claiming they frequently or very frequently experienced colored hearing, 68% claiming they rarely or never did.¹ De Martino (1953) found that only 17% of his undergraduate respondents claimed to see colors in their dreams at least once a month.

One might imagine a researcher in this period doubting the very existence of colored dreaming on the basis of these data: if one were disposed to think of ‘colored hearing’ as very rare, or even nonsensical, and thus overreported by Middleton’s respondents, one could read Middleton’s data as showing that colored dreaming is on an equal footing. Tapia’s finding that psychiatric patients reported colored dreaming more frequently than a control group might seem to bolster this interpretation. Nevertheless, most prominent dream researchers at the time accepted the veracity of reports of color in dreams. A widely shared opinion was that dreams were predominantly black and white phenomena, comparable to black and white movies, with an occasional splash of color here or there (see, for example, Knapp, 1956; Garma, 1961; Calef, 1954; for retrospective assessments see Yazmajian, 1968; Suinn, 1966; Blum, 1964; for a dissenting view, see Rapport, 1949).

Scientific opinion on this matter changed in the 1960s, beginning with a report by Kahn, Dement, Fisher and Barmack (1962) asserting that when subjects were awakened during REM sleep and questioned about the incidence of color in their dreams, 83% of dreams were described as having some color. Herman, Roffwarg

¹ Middleton (1942, p. 222) offers a description of colored hearing that he attributes to C. M. Diserens (1926), *The Influence of Music on Behavior*:

Colored hearing is a condition in which sounds (vowels or musical tones) produce a simultaneous sensation of a definite color. For example, in nine cases studied by Claparede, colors were attributed to all or almost all of the notes of the scale. A number of persons ascribed colors to musical intervals and represented sharps or flats by slight changes in tint. Entire musical selections or the work of particular composers may induce particular colors, which may also vary with the mood of the music, or the type of instruments played upon.

and Tauber (1968), using a similar method, found that colored dreaming was reported after 69% of REM awakenings of their subjects. Berger (1963) found between 40% and 71% of dreams to contain color; Padgham (1975) found about 50%. Snyder (1970) even suggests that all dreams may contain color. (See also Jankowski, Dee & Cartwright, 1977; Roffwarg, Herman, Bowe-Anders, & Tauber, 1978; Gackenbach & Schillig, 1983; Rechtschaffen & Buchignani, 1983; López, Sánchez, Arriaga, & Saldivar, 1986.)

Today, few researchers are interested in the incidence of color in dreams: for the most part they seem to take the presence of color for granted. From anecdotal reports and some recent surveys, it appears that popular opinion about the presence of color in dreams has undergone a corresponding change. In an informal poll conducted by America On-Line in 1999, 56% of respondents said they dreamed in color, 4% said they dreamed in black and white, 27% said they dreamed in both, and 13% said they did not know.² In a similar survey I recently administered to undergraduates in the United States, I found very similar results: out of 67 respondents, 62% said they dreamed in color, none said they dreamed in black and white, 27% said they dreamed in both, none said they dreamed neither in black and white nor in color, and 15% said they did not know. I also attempted to replicate Middleton's 1942 questionnaire, with very different results: whereas Middleton found 71% of college sophomores to say they 'rarely' or 'never' see colors in their dreams, I found only 18% to do so.^{3,4}

² Thanks to Bryan Lee for alerting me to the survey and forwarding the results.

³ The methodology and results of these surveys are described in more detail in Schwitzgebel (forthcoming). See also Frayn (1991), who finds 74% of non-anorexic respondents to report dreaming in color, although it is unclear exactly when his survey was conducted since some of his anorexic data go back to 1978. Stepansky et al. (1998) report rather different results: 47% of respondents in a 1993 survey of a representative sample of the adult Austrian population still claimed not to dream in color. Perhaps the age and nationality of the respondents account for this difference.

⁴ While researchers' and questionnaire respondents' opinions have changed substantially, the rate of color term use in dream reports appears not to have changed substantially since 1950. I surveyed dream reports from four recent sources: Cynthia Richmond's columns on dream interpretation in the *Los Angeles Times* in 1999; a website featuring monthly dream reports from a variety of subjects (<http://www.lifetreks.com>), January 1997 to January 2000 (accessed February, 2000); a sample of 81 dreams collected from women at University of California at Santa Cruz in 1996, made available by Adam Schneider and G. William Domhoff at <http://psych.ucsc.edu/dreams> (accessed October, 2001); and a sample of 4th–9th-grade San Francisco Bay Area girls in 1996–1997, also from Schneider and Domhoff's site. Colors other than black, white and gray are mentioned approximately 153 times (depending on what counts as a color term use) in 72,886 words from these four sources: 0.21% of all words in the dream reports were color words. (There was remarkable consistency in the rates from these four sources: 0.20%, 0.19%, 0.23% and 0.22%, respectively.) Most of the dream reports summarized in Hall and Van de Castle (1966), a sample collected from 1947–1950, were also made available on Schneider's and Domhoff's website, and the color term rate is very similar: approximately 228 words out of 122,280, or 0.19%. Although these may seem like low rates of color term use, they might be interpreted as suggesting a prevalence of colors in dreams, since they compare with rates of approximately 0.02% – 0.14% in samples of English drawn from various other sources: Carroll, Davies and Richman (1967); Dahl (1979); Johansson and Hofland (1989); Kučera and Francis (1967), and in a search, at the request of the author, of his HAL database of internet newsgroup text by Curt Burgess (on HAL, see Burgess & Lund, 2000). Of course,

Prior to the rise of scientific psychology, scholars interested in dreaming generally stated or assumed that dreams have color. For example, Aristotle specifically includes colors among the remnants that sense-impressions may leave in the sense-organs and which thus appear to us in sleep (459a23–462a31, in Gallop, 1996). Epicurus describes the impressions we have in dreams as having color and shape (15A, in Long & Sedley, 1987). Descartes in his Second Meditation (Descartes, 1984; originally published 1641) describes a bit of wax as seeming to change color and wants to grant that such an appearance could come to him in sleep; and, indeed, the skeptical idea that our ordinary waking experience is not qualitatively different from the kinds of experiences we have in sleep requires that our dreams have color, since our ordinary waking experience usually involves color. More explicitly, in *The Passions of the Soul* (Descartes, 1985; originally published 1649), Descartes asserts that ‘everything the soul perceives by means of the nerves [i.e. sensations] may also be represented to it through the fortuitous course of the spirits [i.e. in dreaming]’ (Section 26). In general, I have not observed in my (admittedly desultory) wanderings through the pre-scientific literature on dreaming any mention of dreams as lacking color.⁵ Commonly, dreams were compared to paintings or tapestries—typically colored media.

Early scientific psychologists working at the end of the nineteenth century still implicitly treated dreams as colored. For example, by my count, 50% of the long dream reports (that is, reports over 15 lines of text) in Freud’s *Interpretation of Dreams* explicitly mention colors other than black, white and gray (Freud, 1931; originally published 1900).⁶ Presumably, that percentage would be even higher had Freud been inclined to ask whether there was color in dreams in which it was not spontaneously reported, but unlike mid-twentieth-century clinical psychologists he did not attach any special significance to the presence of color in dreams (Yazmajian, 1964). Among Freud’s contemporaries, Monroe (1898) finds color to be a ‘pronounced feature’ of 21% of dreams in one sample; Calkins (1893) describes dreams as composed of reproduced and recombined images, never mentioning, in her detailed phenomenological study of dreams, any lack of color in those images; and Titchener (1900) mentions ‘flashes of color’ as a primary cause of dreams. The shift appears to occur in the early twentieth century, in some cases among the very same researchers who previously assumed that dreams were colored: by 1900, a research assistant of Calkins reports that although 81% of a sample of her dreams involved

this comparison is only suggestive, since it could plausibly be argued that the samples of English used in those sources are not the appropriate comparison class.

⁵ It would be interesting also to look at color in dream reports of people in cultures without motion pictures or television. Bolton (1978) reports on color in the dreams of the Quechua Indians in Peru, who at the time had little exposure to Western media, and finds it infrequently mentioned (white, black and gray in 32 of 498 dream reports; other colors in 19 of 498). However, without knowing how long the dream reports were or the frequency of color term use in reports of everyday occurrences, the results are difficult to interpret (cf. n. 4).

⁶ Knapp (1956) also counts the frequency of color reports in *Interpretation of Dreams*, and finds that over half the dreams mention color. However, Knapp treats black, white and gray as colors for his analysis, and presumably he includes a number of dreams described in fewer than 15 lines.

visual experiences, fewer than half involved color sensations (Calkins and Andrews, 1900); and Titchener (1912) grants that some people see only shades of gray in their dreams. Bentley (1915) reports four times as many grays as colors in his sample of dreams. Twenty years later, Husband (1935) finds 40% of respondents to deny having color in their dreams.

What might explain the rise of the opinion that dreaming is predominantly a black and white phenomenon? It will likely have occurred to the reader that the first half of the twentieth century was the pinnacle of black and white media. Black and white photography was first made public in the 1830s, and became increasingly popular through the early twentieth century. Although color photography was invented in the 1860s, color photos did not become easily attainable to the public until the 1940s. Motion pictures, invented around the turn of the century, were, from very early on, occasionally hand-painted with colors, and two-color filming was sometimes used in the 1920s (for example in *Ben Hur*). Nonetheless, motion pictures were overwhelmingly black and white until the late 1930s when a few ‘technicolored’ movies such as *Gone with the Wind* and *The Wizard of Oz* drew huge crowds. It was not until the 1950s that colored movies became commonplace, and even as late as 1960 a black and white film, *The Apartment*, was mainstream enough to win an Academy Award for best picture. Black and white television became widespread after World War II; color television did not become popular until the late 1960s.

It is surely not chance that this flourishing of black and white media coincided with the flourishing of the opinion that dreams are a black and white phenomenon. The question is what to make of this fact. The remainder of this paper is devoted to rather free-ranging speculation on this topic.

3. Speculation on the phenomena underlying this history

One possibility is that the ubiquity of black and white images in technologically advanced countries in the first half of the twentieth century actually caused our dreams to change—that although Aristotle, Epicurus, Freud and their contemporaries dreamed in color, the average American in 1950 dreamed mostly in black and white—and now that our media are largely color again, our dreams are returning for the most part to color. It does seem plausible to regard the presence of black and white media as potentially affecting people’s dreams in various ways. After seeing a black and white film about Frankenstein’s monster, one might have a nightmare in which his black and white figure appears as one’s tormentor. Since most romantic movies seen by people living in 1950 were black and white, perhaps some of those people dreaming of themselves as romantic heroes would paint their dream world in black and white. However, most of our dreams are not modeled on motion pictures in this way. Every day a person sees her house and family in full color. It would be odd to suppose that whether she dreamed about them in color would depend on what she sees in the cinema or on the television screen. Despite their cultural importance, photography, film and television seem unlikely to have so profound an effect as to transform the dreams we have of the colored world around us into dreams of black and white.

It seems reasonable to assume, then, that it is largely the reporting of dreams that changed rather than their content. If so, the scientists and general population of at least one period must have seriously misdescribed the experience of dreaming. The two most obvious possibilities are that our dreams really are predominantly in color (or at least that they are for a majority of people) and consequently the mid-twentieth-century claim that they are mostly black and white is mistaken, or that our dreams are predominantly black and white and the view that they are colored is the mistake.

One might attempt to defend the view that dreams are predominantly black and white as follows. The failure to notice this feature of dreams by Aristotle, Descartes and company was due to the lack of black and white film media in their time. Absent these media, the idea that something colored might be represented as a black and white image may be unfamiliar, making it natural to assume that since the things dreamed about (family, locations, etc.) are colored in real life, they are colored in dreams. Once black and white media gained prominence in the early twentieth century, people came to recognize that their dream images resembled the images in these media. Now that black and white media are losing importance, most people have returned to mistakenly assuming that their dreams are thoroughly colored, though an observant minority maintain that their dreams are mostly black and white. People may even mistakenly attribute color to black and white dream objects in the course of a dream, just as in a dream I might judge something to have the layout of my house when in fact it does not resemble my house at all. Somewhat differently, one might simply ‘know’ that an object is red without experiencing a red dream image, just as one might know in a dream that someone is one’s sister even if she looks nothing like her.

One weakness of this argument is that it is not clear that pre-twentieth-century media were generally colored. Black and white ink sketches and prints were common in some periods, as were monochromatic representations of people and animals on pottery and furniture and as sculpture. If dreams were black and white, they could as easily have been compared to these media as to colored paintings and tapestries.⁷

The perhaps more appealing claim is that dreams really are either predominantly or entirely in color and that the 1950s view that they were not was due to an infelicitous but natural comparison between dreams and the flourishing black and white media of the time. As paintings and tapestries yielded to photographs and motion pictures, people naturally updated the media to which dreams were compared; and

⁷ One might be tempted to counter with the analogous argument that if dreams were colored, they could, in 1950, have easily been compared to the colored media—paintings and tapestries did not cease to exist. However, black and white movies had other advantages over the competing media of the time that may have compelled comparison to dreams. They integrated visual imagery with movement and narrative as no other medium previously had been able (except perhaps theater, if that is a medium—why was it not more common to describe dreams as like plays on the mind’s stage?). Thus, the defender of colored dreaming could argue that the comparison to black and white film was comprehensible despite the media’s lack of color, while the defender of black and white dreaming may find it difficult to mount a similar argument explaining the pre-twentieth-century comparison of dreams to colored paintings and tapestries.

since these media were black and white, so also, it came to seem, were dreams.^{8,9} In the twenty-first century, the media may change again to integrate not just visual and auditory but also haptic elements, coming closer to giving us a full fictional sensory experience. A number of people have told me that haptic elements in their dreams are either weak or non-existent—that they do not feel the impact of their feet on the sidewalk or the breeze against their arms as they dream of walking, nor even, in a nightmare, do they feel the pain of a knife in the belly. (Perhaps this is why feeling a pinch is sometimes thought to indicate wakefulness.) I wonder if, as the media change, our opinions about the presence of such elements in dreams will also change.¹⁰

Although the view that our dreams have color may be more appealing than the view that they are black and white, a third possibility is also worth considering—the possibility that dreams are *neither* colored nor black and white, that applying either of these categories is misleading.

Consider, as an analogy, a novel. While novels surely are not in black and white, it also seems a little strange to say that they are ‘in color’. Certainly novels make fictional attributions of color (‘she strode into the room in a dazzling red dress’) and refer to objects that normally have a particular color (‘she promptly chopped a carrot’). Maybe it makes sense to describe such fictional claims as ‘in color’ or partly

⁸ One of Middleton’s respondents even claims that nearly all his dreams appear in sepia, a common tint of black and white photographs. His explanation? ‘Maybe it’s because I’m partial to brown’ (Middleton, 1942, p. 224).

⁹ Since paintings and tapestries don’t represent motion well (despite some attempts), I am inclined to wonder whether there were, prior to the twentieth century, debates about whether images in dreams moved, analogous to the black and white vs. color debate in the twentieth century. A related issue: radio was a lively and pervasive medium for fiction in the first part of twentieth century. However, as far as I know, dreams were not compared to radio broadcasts. On the contrary, Knapp (1953) and Garma (1961) describe dreams as mostly soundless, more like silent motion pictures than like ‘talkies’ (although admittedly these references are rather late if the media comparison is to silent film).

¹⁰ Bill Domhoff and Maggie Friend have emphasized to me that the media can also influence popular opinion about dreams by disseminating information about scientific research on dreams. As an example, Domhoff cites William Dement’s view, which seems to have gained popular acceptance in the early 1960s, that people will go insane if deprived of dreams. Since techniques of dream research improved in the 1960s (including a new emphasis on REM awakening), one could argue that researchers of this period discovered a fact that had eluded previous researchers with clumsier techniques—i.e., that we dream in color—and then spread this view through the popular press. As a rough test of this view, I looked up ‘dreams’ in the *Reader’s Guide to Periodical Literature* and read every article under that heading published in *The New York Times Magazine*, *Newsweek*, *Reader’s Digest*, *The Saturday Evening Post* and *Time Magazine* between 1955 and 1975 (21 articles total). (These magazines were chosen for their wide circulation throughout the period and their general interest news content.) Although I found seven articles giving substantial play to Dement’s theory that dreams preserve one’s sanity (including one titled ‘Dream and Stay Sane’), I found only a few passing mentions of the issues discussed in this paper: two early articles (1959 and 1961) mentioning that most dreams are monochrome; a 1965 article on psychic dreams that describes the colors of two dream objects but makes no general comments about the coloration of dreams; a 1967 article briefly stating that dreams can be either colored or black and white but not saying which is more common; and a 1971 article claiming that people who dream in color have more satisfying emotional lives. If this sample is representative, it does not appear that popular science reporting is responsible for the spread of the opinion that we dream in color.

in color. However, most elements of most scenes in novels do not have determinate colors in that way. When our character slides into her 1966 Mustang and rumbles away, the scene could be imagined to have any of a variety of colors; her skin might be dark brown or light; the Mustang might be red or black or green; the sky might be blue or gray or dusky or star-spangled. And even though we know her dress is red, it actually could be any of a variety of shades, as long as they are suitably dazzling. It is a bit odd to say that this part of the novel—the sentence describing her departure—is ‘in color’ when the color of so much of it is underdetermined. It is correspondingly a bit odd to say that the novel as a whole is in color, though maybe one could get away with saying such a thing if one were careful enough in circumscribing what one meant to imply by the phrase ‘in color’.

One might more naturally say that the *images* that the novel evokes in (most of) its readers are in color (I imagine the Mustang as green and the sky as dusky), but even that may not be quite right. Can’t one just imagine her driving away without imagining the colors of the car, road and sky? If one is reading the novel quickly, one may not have time to piece together a completely colored scene in one’s imagination.¹¹ It does not seem that my imagination, at least, is that rich, that novels play before my mind with all the details of a color movie.

If you find yourself disinclined to think that novels, or the images evoked by novels, are properly described as being either in black and white or in full color, then you might likewise find yourself hesitant to apply the terms ‘black and white’ or ‘colored’ to dreams. Perhaps dream-objects and dream-events are similar to fictional objects and events, or to the images evoked by fiction, in having, typically, a certain indeterminacy of color, neither cerise nor taupe nor burnt umber, nor gray either.

One could go in a variety of directions with this thought. One might argue, for example, that the objects portrayed in black and white movies are of similarly indeterminate color, though they appear on the screen to be gray. Although our heroine is eating a bell pepper the screen image of which is gray, it does not follow that she is eating a gray bell pepper. Perhaps, then, the color of the bell pepper is indeterminate. Black and white movies, novels and dreams may be alike in somehow leaving indeterminate the colors of most of their objects—and that is something that color film cannot (or at least cannot easily) do. Perhaps this is a respect in which dreams are more felicitously compared to black and white than to color movies.

Which approach to color in dreams is the correct one? I have laid out a few quite distinct possibilities, and I find myself tempted both by the view that dreams are in color and by the view that most objects in dreams have no determinate color. Now it would seem that the phenomenology, that is to say the subjective experience, of dreaming would be quite different in the two cases. If dreams are in color, then the objects in our dreams to whose color we are not attending generally have determinate

¹¹ Although I am not aware of research on the speed at which color imagery in particular is generated, research does suggest that, in general, complex images are more slowly generated than simple ones. See Kosslyn (1980).

colors; otherwise, they generally do not. Shouldn't we then be able to reflect on the phenomenology of dreaming to decide the question? The experiential difference between these two cases is so vast that it seems a moment's reflection should make it obvious which hypothesis is correct.

Here is where I find myself quite thick. Though I remember a dream or two many mornings—and sometimes they have seemed quite vivid—I cannot tell you whether those dreams are in color. I doubt that my difficulty here stems from any exceptional ineptitude at the task: the historical swings in opinion about dreaming in black and white suggest that incompetence of the sort I feel is quite widespread, despite the considerable self-confidence people usually exhibit when questioned along these lines. My suggestion is 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.

One might object that the mistakes I say people make, or have historically made, about their dreams are not so terribly large. After all, it is sometimes difficult to remember which classic movies are in color and which are black and white, and such amnesia doesn't seem to constitute a serious epistemic failure. However, confusion about the coloration of dreams is substantially deeper than the relatively innocuous confusion one might have about a particular Jimmy Stewart film. It is rather more like the confusion of not being able to tell—or, worse, of confidently persisting in the wrong opinion about—whether *all* the movies one sees are in color or *all* are in black and white, or whether there is some mix, despite seeing movies every night.

I will conclude by raising the question of whether the phenomenology of dreaming is uniquely elusive or whether our knowledge of other aspects of our conscious experience is equally poor. I am inclined to think the latter, that we are much worse phenomenologists than common sense and philosophy typically allow. Surely we have a powerful tendency to forget dreams. We do not generally forget emotionally powerful events with equal alacrity. Dream reports would thus appear to be particularly good candidates for theory-guided reconstruction. But we probably forget with approximately equal haste most of our phenomenology—our emotional experiences, our bouts of inner speech, our shifting sensory impressions—if we do not, as with dreams, make special note of it shortly after it occurs. What we remember best is the world outside our minds; our stream of experience, I suspect, is mostly unattended, quickly forgotten, and patchily reconstructed.

Even the reporting of current conscious experience, without the distortions of memory, may be problematic. Imagery, in particular, raises issues and difficulties similar to those I have been discussing with respect to dreams.¹² Form a visual image of your house and then consider these questions: can you keep the image of both the chimney and the front door vividly in mind at once, or does one part of the image fade as your attention shifts to another part? Is your image colored throughout as soon as you form it, or do some parts remain uncolored until, perhaps, your attention alights upon them? I see little reason to invest much confidence in the

¹² In Schwitzgebel (2002), I explore in detail our knowledge of our own imagery experiences.

(divergent) answers ordinary people give to such questions. It is also tempting to read the debate about the ‘picture theory’ of imagery as a debate partially about the phenomenology of imagination (see Kosslyn, 1980, 1994; Pylyshyn, 1973; Block, 1981; Tye, 1991; Thomas, 1999).

Of course, the argument that we are pervasively and grossly mistaken about our own conscious experience is best established by the detailed examination of a wide range of cases in which our phenomenological reports are seriously ill-informed. This paper can be thought of as one piece of such a broader project.

Acknowledgements

For helpful discussion of these ideas, thanks to Curt Burgess, Josh Dever, Bill Domhoff, Dillon Emerick, Maggie Friend, Michael Gordon, Tony Jack, Bryan Lee, Tori McGeer, Pauline Price, Richard Reis, Josh Rust, Carol Slater, Nigel Thomas, Penny Vinden, Gary Watson (who was the first to suggest the novel analogy to me), Chuck Young and audiences from the Society for Philosophy and Psychology, and the Southern California Philosophy Conference, Washington University in St. Louis and U.C. Riverside, as well as to the numerous others with whom I have chatted about color in their dreams.

References

- Bentley, M. (1915). The study of dreams. *American Journal of Psychology*, 26, 196–210.
- Berger, R. J. (1963). Experimental modification of dream content by meaningful verbal stimuli. *British Journal of Psychiatry*, 109, 722–740.
- Block, N. (Ed.). (1981). *Imagery*. Cambridge MA: MIT Press.
- Blum, H. P. (1964). Colour in dreams. *International Journal of Psychoanalysis*, 45, 519–529.
- Bolton, R. (1978). Saliency of color terms in the dreams of Peruvian mestizos and Qolla Indians. *Journal of Social Psychology*, 105, 299–300.
- Burgess, C., & Lund, K. (2000). The dynamics of meaning in memory. In E. Dietrich, & A. B. Markman (Eds.), *Cognitive dynamics: Conceptual and representational change in humans and machines* (pp. 117–156). Mahwah, NJ: Lawrence Erlbaum.
- Calef, V. (1954). Color in dreams. *Journal of the American Psychoanalytic Association*, 2, 453–461.
- Calkins, M. W. (1893). Statistics of dreams. *American Journal of Psychology*, 5, 311–343.
- Calkins, M. W., & Andrews, G. A. (1900). IV. Studies of the dream consciousness. *American Journal of Psychology*, 12, 131–134.
- Carroll, J. B., Davies, P., & Richman, B. (1967). *The American Heritage word frequency book*. Boston: Houghton Mifflin.
- Dahl, H. (1979). *Word frequencies in spoken American English*. Detroit: Gale Research.
- de Martino, M. F. (1953). Sex differences in the dreams of Southern college students. *Journal of Clinical Psychology*, 9, 199–201.
- Descartes, R. (1984). *Meditations on first philosophy*. In *The philosophical writings of Descartes, Vol. II* (J. Cottingham, R. Stoothoff, & D. Murdoch, Trans.). Cambridge: Cambridge University Press. Originally published 1641.
- Descartes, R. (1985). *The passions of the soul*. In *The philosophical writings of Descartes, Vol. I* (J. Cottingham, R. Stoothoff, & D. Murdoch, Trans.). Cambridge: Cambridge University Press. Originally published 1649.

- Diserens, C. M. (1926). *The influence of music on behavior*. Princeton: Princeton University Press.
- Frayn, D. H. (1991). The incidence and significance of perceptual qualities in the reported dreams of patients with anorexia nervosa. *Canadian Journal of Psychiatry*, 36, 517–520.
- Freud, S. (1931). *The interpretation of dreams* (A. A. Brill, Trans.). New York: Carlton House. Originally published 1900.
- Gackenbach, J., & Schillig, B. (1983). Lucid dreams: The content of conscious awareness of dreaming during the dream. *Journal of Mental Imagery*, 7, 1–14.
- Gallop, D. (1996). *Aristotle on sleep and dreams: A text and translation with introduction, notes, and glossary*. Warminster: Aris & Phillips.
- Garma, A. (1961). Colour in dreams. *International Journal of Psychoanalysis*, 42, 556–559.
- Hall, C. S. (1951). What people dream about. *Scientific American*, 184(5), 60–63.
- Hall, C. S., & Van de Castle, R. L. (1966). *The content analysis of dreams*. New York: Appleton-Century-Crofts.
- Herman, J., Roffwarg, H., & Tauber, E. S. (1968). Color and other perceptual qualities of REM and NREM sleep. *Psychophysiology*, 5, 223.
- Husband, R. W. (1935). Sex differences in dream contents. *Journal of Abnormal and Social Psychology*, 30, 513–521.
- Jankowski, W. L., Dee, S. C., & Cartwright, R. D. (1977). A distribution of colorimetric imagery in REM sleep. *Sleep Research*, 6, 123.
- Johansson, S., & Hoffman, K. (1989). *Frequency analysis of English vocabulary and grammar*. Oxford: Clarendon Press.
- Kahn, E., Dement, W., Fisher, C., & Barmack, J. E. (1962). Incidence of color in immediately recalled dreams. *Science*, 137, 1054–1055.
- Kosslyn, S. M. (1980). *Image and mind*. Cambridge, MA: Harvard University Press.
- Kosslyn, S. M. (1994). *Image and brain*. Cambridge, MA: MIT Press.
- Knapp, P. H. (1953). The ear, listening, and hearing. *Journal of the American Psychiatric Association*, 1, 672–689.
- Knapp, P. H. (1956). Sensory impressions in dreams. *Psychoanalytic Quarterly*, 25, 325–347.
- Kučera, H., & Francis, W. N. (1967). *Computational analysis of present-day American English*. Providence: Brown University Press.
- Long, A. A., & Sedley, D. N. (1987). *The Hellenistic philosophers, Vol. 1*. Cambridge: Cambridge University Press.
- López, A. T., Sánchez, T. J., Arriaga, A. E., & Saldivar, R. E. (1986). El rol de la memoria visual y el color onírico en la frecuencia del recuerdo de sueños. *Revista mexicana de psicología*, 3, 143–149.
- Middleton, W. C. (1942). The frequency with which a group of unselected college students experience colored dreaming and colored hearing. *The Journal of General Psychology*, 27, 221–229.
- Monroe, W. S. (1898). Einige Experimente über Gesichtsbilder in Traum. *American Journal of Psychology*, 9, 413–414.
- Padgham, C. A. (1975). Colours experienced in dreams. *British Journal of Psychology*, 66, 25–28.
- Pylyshyn, Z. W. (1973). What the mind's eye tells the mind's brain: A critique of mental imagery. *Psychological Bulletin*, 80, 1–24.
- Rapport, N. (1949). Overture to dreams. *Psychiatric Quarterly*, 23, 266–276.
- Rechtschaffen, A., & Buchignani, C. (1983). Visual dimensions and correlates of dream images. *Sleep Research*, 12, 189.
- Roffwarg, H. P., Herman, J. H., Bowe-Anders, C., & Tauber, E. S. (1978). The effects of sustained alterations of waking visual input on dream content. In A. M. Arkin, J. S. Antrobus, & S. J. Ellman (Eds.), *The mind in sleep* (pp. 295–349). Lawrence Erlbaum: Hillsdale, NJ.
- Schwitzgebel, E. (forthcoming). Do people still report dreaming in black and white? An attempt to replicate a questionnaire from 1942. *Perceptual & Motor Skills*.
- Schwitzgebel, E. (2002). How well do we know our own conscious experience? The case of visual imagery. *Journal of Consciousness Studies*, 9, 35–53.
- Snyder, F. (1970). The phenomenology of dreaming. In L. Madow, & L. H. Snow (Eds.), *The psychodynamic implications of the physiological studies on dreams* (pp. 124–151). Charles C. Thomas: Springfield, IL.

- Stepansky, R., Holzinger, B., Schmeiser-Rieder, A., Saletu, B., Kunze, M., & Zeitlhofer, J. (1998). Austrian dream behavior: Results of a representative population survey. *Dreaming*, 8, 23–30.
- Suinn, R. M. (1966). Jungian personality typology and color dreaming. *New York (State) Mental Hygiene Department Psychiatric Quarterly*, 40, 659–666.
- Tapia, F., Werboff, J., & Winokur, G. (1958). Recall of some phenomena of sleep. *Journal of Nervous and Mental Disease*, 127, 119–123.
- Thomas, N. (1999). Are theories of imagery theories of imagination? An active perception approach to conscious mental content. *Cognitive Science*, 23, 207–245.
- Titchener, E. B. (1900). *A primer of psychology*. New York: MacMillan.
- Titchener, E. B. (1912). Prolegomena to a study of introspection. *American Journal of Psychology*, 23, 427–448.
- Tye, M. (1991). *The imagery debate*. Cambridge, MA: MIT Press.
- Yazmajian, R. V. (1964). Color in dreams. *Psychoanalytic Quarterly*, 33, 176–193.
- Yazmajian, R. V. (1968). Dreams completely in color. *Journal of the American Psychoanalytic Association*, 16, 32–47.