

**Introspective Training: Reflections on Titchener's Lab Manual**

Eric Schwitzgebel  
Department of Philosophy  
University of California  
Riverside, CA 92521-0201  
eschwitz@citrus.ucr.edu  
909 787 4288

January 24, 2003

## **Introspective Training: Reflections on Titchener's Lab Manual**

Introspection must play a central role in the study of the mind; yet introspective reports, even of current conscious experience, are highly unreliable. I have found that philosophers typically accept the first of these propositions and deny the second, while psychologists typically accept the second and deny the first. Indeed, there is some tension between the two claims: If introspection is unreliable, what business does it have playing a central role in the study of the mind? Nonetheless, I expect many of the readers of this special issue find themselves drawn, as I do, toward both of these claims. We must trust introspective reports to make substantial further progress in the study of (at least) conscious experience, yet introspective reports appear not to merit our trust. What is to be done?

From the title, you might begin to guess the direction of my thoughts. I suggest that we take a lesson from the prominent American introspective psychologist of the early twentieth century, Edward B. Titchener, and look toward the possibility of introspective training. However, although that is my thesis, I must confess that I find myself apprehensive about what I take to be substantial obstacles and hazards.

Before proceeding, let me clarify what I mean by two particular items of half-jargon: 'conscious experience' and 'introspection'. Conscious experience or consciousness is that aspect of our lives responsible for there being, in Thomas Nagel's (1974) oft-cited phrase, "something it is like" to be a waking or dreaming human being and (presumably) nothing it is like to be a toy robot or slab of granite. Block (2002) uses the term 'phenomenality' and Chalmers (1996) the term 'qualia' to express the same concept. By 'conscious experience' I emphatically do not mean anything like

‘experience one is conscious of’ in the sense of experience one is aware of having.<sup>1</sup> This latter usage, which blurs the factuality of consciousness with the epistemology of it, promotes a variety of muddles, not least of which is that it can come to seem a mystery how someone could be wrong about her “conscious experience”. We don’t usually describe people as “aware” of things about which they are mistaken. Rather, I suggest that we treat the phrase ‘conscious experience’ as nearly a redundancy – in the primary sense of ‘experience’, the sense I will use throughout the paper, all experiences are conscious. There are facts about what it is like to be you, about what your experiences are, “from the inside” as it were. These facts constitute your stream of conscious experience, and they may, and often do, pass wholly unnoticed or even grossly misapprehended by you (as I have argued in Schwitzgebel & Gordon 2000 and Schwitzgebel 2002a).

I have never seen what I take to be an adequate account of introspection, nor can I provide one. But since it is the central topic of this essay and people have differing impressions about it, something must be said. William James famously commented that “The word introspection need hardly be defined – it means, of course, the looking into our own minds and reporting what we there discover” (1890/1981, p. 185). James’ characterization does little more than Anglify the metaphor already obvious in the Latin etymology and add to it an element of reporting. Perhaps he was wise to leave it at that. If so, I will now display slightly less wisdom.

I take introspection to be the process of attending to one’s own experience.<sup>2</sup> Consequently, we can introspect mental states and processes only insofar as they are experiential, that is, possess a “phenomenal” or “qualitative” character.<sup>3</sup> For the purposes

of this essay, we may assume that the product of introspective attention is a conscious judgment regarding the properties of the experience introspected. Nonconscious judgments about experience, if they exist, are incidental to introspective methods. Also, despite James' perceptual analogy, introspection differs from perception in several important respects. Most notably, introspective attention to an experience generally modifies the experience itself, becoming, in a sense, part of it (a point James himself would not deny).<sup>4</sup> Thus, we should not blithely assume that our experiences as introspected closely resemble our experiences independent of introspection.<sup>5</sup>

There may be no single or separate faculty of introspection. Rather, it seems likely that most of our apparently introspective judgments arise from a plurality of introspective and non-introspective sources. When I say that I am feeling blue, my judgment may be based in part on knowledge of my recent behavior and my facial and bodily posture, my assessment of the circumstances as apt to produce negative feelings, my awareness of the content of my recent and current thoughts, recognition of some kind of conscious phenomenology characteristic of that particular mood or emotion – and potentially many other things, in who knows what proportion. I may regard the statement as a purely introspective report of current conscious experience, yet be quite wrong in that regard.

Thus, my brief account of introspection mires itself, already, in concerns about the integrity of the introspective process. Nonetheless, such general worries will play no further role in this essay. I will assume, not blithely but tentatively and with considerable trepidation, that cases of relatively unadulterated introspection exist, roughly where Titchener thought they did, and that in these cases the addition of an introspective element to the experience distorts it not too badly. I believe we will profit from yielding

Titchener that much and seeing what more specific thoughts emerge from an examination of his techniques.

A cartoon history of psychology will help put Titchener in context and display his potential relevance to contemporary consciousness studies. Experimental psychology as a distinct academic discipline arose in the second half of the nineteenth century, partly through the labor of Wilhelm Wundt in founding a productive laboratory and in training a generation of students, and partly through the model of Gustav Fechner's work in quantifying and experimentalizing sense experience. Early experimental psychologists were committed to employing introspection as a scientific tool, and by the turn of the century, they had made significant strides in introspective method. However, in the 1910's, behaviorism, which placed little or no value on introspective report, had declared war on introspective psychology, and in the 1920's and 1930's, introspective studies were increasingly marginalized. The consequent amnesia for early introspective methodology was compounded by the simultaneous rise, as the chief competitor to behaviorism, of Gestalt psychology, which, though it gave an important role to introspection, took a rather different view of it than did the original introspective psychologists. With behaviorism and subsequently cognitivist functionalism dominating experimental psychology for the remainder of the century, little room existed for serious academic interchange on introspective methods. Although it has now become fashionable again to discuss consciousness, and a rise in the respectability of introspection seems bound to follow, we have not yet recovered the methodological sophistication of the introspectionist school.

Titchener trained with Wundt at the height of Wundt's career and was the principal American representative of classical introspective technique. He stands out as a potential source of insight into introspective method particularly due to his Experimental Psychology (1901-1905), a "manual of laboratory practice" detailing a course of introspective training for students – a manual that runs approximately 1600 pages (with separate parts for student and instructor) and explains both the pitfalls of introspective laboratory work and the conditions of its success with an explicitness one rarely sees in documents meant for advanced practitioners.

This essay, then, is an exploration of Titchener's laboratory manual, with an eye toward what we can learn from it about scientific introspection, especially introspective training.

### I. Titchener's General Position on Introspective Training.

Introspective psychologists of Titchener's era generally accepted, as a condition of sound scientific method, that introspective reports come from subjects – or, as Titchener preferred to say, "observers" – with some significant degree of introspective training. To provide a solid framework for such training at the undergraduate level was the aim of Titchener's manual. In published research, it was standard to depend exclusively on the introspective reports of observers with graduate training in psychology and thus presumably at least several months, often several or many years, of intensive experience with introspective methods. Wundt is reputed not to have admitted data from observers with fewer than 10,000 trials of experience in introspective report (Boring 1953).

In his Primer of Psychology, Titchener compares the development of skill in introspection with the development of skill in physical measurement and chemical analysis (1899b, p. 25). Just as a chemist would never rely on an untrained assistant for any but the simplest measurements, so also the laboratory psychologist cannot rely on untrained introspectors for any but the crudest observations. In fact, precise, “quantitative” introspection is considerably more difficult, in Titchener’s view, than quantitative work in chemistry (1901-1905, vol. II, part 2, p. cliii-clvii).<sup>6</sup> Consequently, “the average student, on entering the laboratory, is simply not competent” to participate as an introspective observer in quantitative experiments (II.2.cliv; cf. I.2.389). Difficulties include maintaining consistent attention, avoiding bias, knowing what to look for, and parsing the complexity of experience as it flows rapidly past (1899b, p. 24-25; cf. 1915, p. 20-22). For example, without introspective training, Titchener asserts, it is difficult to compare the relative brightnesses of two different colors (I.1.13; I.2.31); to discern a very low tone sensation from a sensation of atonal noise (II.1.1, II.1.3); or to make the quantitative assessment that two sensations are each an equal distance, in different directions, from a third (e.g., that one tone sounds as high in pitch above a reference tone as another tone sounds below it) (II.2.201-204; II.1.xxxii-xxxiv).<sup>7</sup>

Titchener turns on its head the standard argument against introspective training, that it introduces bias. Especially regarding our own minds, Titchener believes, everyone is subject to bias and preconceptions. People do not usually approach psychology neutral between theses, and even when they do, in the course of an introspective series they are apt quickly to speculate and form hypotheses. Titchener consequently rejects the ideal of an introspective account “furnished by a naive, common-sense, non-scientific observer,

who has not yet adopted the special attitude of the psychologist” and thus supposedly takes a “neutral standpoint” (1912b, p. 489). Such a neutral standpoint is unattainable. “We can hardly, with the pressure of tradition and linguistic forms upon us, consider mental phenomena in a really naive way, with a truly blank prescientific impartiality” (*ibid.*).<sup>8</sup> In Titchener’s view, the avoidance of bias requires not naiveté but expertise. Introspective practice and an “objective” frame of mind aid the observer in setting aside expectations to report mental phenomena accurately (I.2.xxv-xxvii; I.2.151; II.2.133-134; II.2.202). “The trained observer, psychologist or physicist or what not, can take the suggestion [i.e., the hypothesis toward which he might be biased] for what it’s worth; he does not allow it to affect his observation. But the beginner is exceedingly liable to be led by interest into partiality” (1899a, p. 45; Müller 1904, p. 19-21, 32-35, 175).

Probably no part of classic introspective methodology was more thoroughly and permanently overthrown than the emphasis on extensive introspective training. Even among psychologists interested in introspection today, the idea that the subject would have to be trained in introspection for more than a few minutes – much less hundreds or thousands of hours over the course of months or years – remains alien.<sup>9</sup> But if accurate introspection is difficult, it is plausible to suppose that training could bring substantial benefits. Titchener was surely too optimistic if he felt that a well-trained observer could completely insulate his introspective judgments from the influence of theory and preconception, but given that the naive subject may be similarly prone to bias, it is not clear that innocence is generally preferable to sophistication.<sup>10</sup>

To put some flesh on the concept of introspective training, and to gain a sense of Titchener's techniques in general, let's examine a few examples from Titchener's manual.

## II. Combination Tones.

If two tones of frequency  $U$  (for the upper tone) and  $L$  (for the lower tone) are sounded together, it is sometimes possible simultaneously to hear a third tone, called a difference tone, the pitch of which resembles that of a tone of frequency  $U - L$ . For example, I have noticed on my piano that if I loudly play the C above middle-C (the fundamental frequency of which is 523.3 hertz in standard equal temperament) and the F above that (740.0 hertz), I seem to hear another, much quieter note of approximately the pitch of the A below middle C (220.0 hertz). If Titchener and contemporary acousticians are to be believed, this impression is not due to resonances in the piano. Indeed, I have a similar experience when I combine two sine waves of those frequencies in my computer's sound editor program and listen to them through headphones. The textbook view (and Titchener's) is that the difference tone does not exist in the environment but is a consequence of "non-linearities" in the human ear – i.e., that it results from the ear's failure to respond proportionately to all frequencies and energies of auditory input, distorting the signal it transmits somewhat as an overdriven amplifier does (e.g., Plomp 1976; Hall 2002; Rossing, Moore, and Wheeler, 2002).<sup>11</sup> Similarly, a second difference tone (also called a cubic difference tone) may sometimes be heard at  $2L - U$ , and more rarely a third difference tone at  $3L - U$ , a summation tone at  $L + U$  (maybe), and others. As a class, these are known as combination tones.

Titchener introduces his introspectors-in-training to combination tones in the seventh experiment series in the first volume of his laboratory manual (I.1.39-46). He begins by directing their attention to a particularly salient difference tone produced by two Quincke's tubes of pitch  $g^3$  (three G's above middle C, 1584 hertz in Titchener's just intonation, I.1.32) and  $b^3$  (1980 hertz). (Quincke's tubes consist of a glass whistle connected to a resonator. Pictures appear on I.1.40 and I.1.44.) Titchener remarks that the difference tone's "moderate loudness" combined with its depth (two octaves below the lower of the primary tones) should make it "easily recognisable" to the student (I.1.41). He advises repeated production of the  $g^3$  and  $b^3$  until the observer "is entirely satisfied with his introspections" (*ibid.*). Titchener next recommends the student listen for the difference tone of  $g^3$  and  $d^4$ , which is particularly loud (since the first and second difference tones are identical for the perfect fifth) and one octave below the  $g^3$ . After these two hopefully easy introspections are each rehearsed several times, the student is instructed to proceed up the intervals from the fifth to the octave, then down from the tri-tone to the minor second, then to practice hearing difference tones when the intensity of the primary tones is low or unbalanced and when their duration is short (I.1.42). Finally, the student is instructed in similar procedures for the second and third difference tones and the summation tone.

On the internet, I have posted an adaptation of Titchener's training procedure, using sine wave tones generated by a sound editor (a link is on my homepage, [www.faculty.ucr.edu/~eschwitz](http://www.faculty.ucr.edu/~eschwitz)). I recommend that the reader attempt the procedure, which should take somewhat over an hour, either now or on completion of this essay.

Doing so will provide the reader with a more vivid sense of the nature of Titchenerian introspective training and the methodological difficulties that may arise.

Titchener expects students to have only limited success in hearing difference tones. Their reports of the pitch of the tones requires verification, even for the easiest difference tones, and “it is not probable that many of the difference-tones [between the fifth and the octave] will be heard at all” (I.2.70). Still, by the end of this series of experiments – presumably conducted within one or a few sessions over the course of a week or less – the student should be able to discern combination tones that would previously have eluded her. She has, apparently, become something of an “introspective expert” in this limited domain.

Titchener regards this as a form of introspective training – but is it really introspection? In my experience, attempting to discern a difference tone is no different from attempting to discern a faint tone of the ordinary sort. It feels just like listening for sounds in the external environment. One could presumably develop substantial expertise in discerning combination tones without ever taking oneself to be introspectively reporting one’s own mental states.<sup>12</sup>

One might hope to defend the view that the training is nonetheless introspective on the grounds that combination tones, being (in general opinion) an artifact of the ear, do not exist in the world in the same way that ordinary tones do, and thus that in attending to them one cannot be attending to the world. Since it sounds odd to say that one is attending to one’s ear, it seems that one must be attending to some part of one’s experience, that is to say, introspecting. However, this argument would prove too much. If every sensory or perceptual feature that does not exist outside the observer is

introspectively discovered, then many illusions are discoverable only by introspection. Perhaps, indeed, we should regard combination tones as illusory in the way that double images or color adaptation effects are illusory: that is, as a product of our sensory apparatus not straightforwardly reflecting how things stand in the world beyond. If you hold your finger six inches before your eyes and focus on something in the distance while continuing to attend to the finger, and you consequently notice a double image, are you necessarily introspecting? I'm not certain. But surely you needn't be introspecting if, with yellow adapted eyes, you mistakenly judge a white object to be blue. Introspective attention to one's own mind is no more necessary for the discovery of difference tones than it is for the discovery of other actual or illusory features of the world.

To see how Titchener's procedure qualifies as introspective training we must take a different tack. Consider the naive introspector asked to describe her auditory experience of an interval sounded by a musical instrument. If she has a minimum of musical knowledge, she might be able to describe the interval as a major third, considerably above the middle of the scale, and indicate the instrument upon which it was played if it is a familiar one. But her experience is vastly richer than those words suggest, influenced by harmonics, resonances, echoes, and sundry other acoustic and aural phenomena, including combination tones. Some of these facts are indicated indirectly by her statement that it was a major third played upon, say, a piano; others are not. In any case, auditory experience is far too complex for ordinary people to parse. Thus, a new student entering Titchener's laboratory, asked to describe her auditory experience with care and in detail, would be baffled. To provide introspective reports of any value, she needs concepts and a vocabulary, a sense of what to look for, and practice in discerning these

aspects of her experience as it occurs. Training in the recognition of combination tones is thus introspective training not because reporting difference tones is necessarily an introspective act but because for the person antecedently interested in introspectively attending to her own auditory experience, it provides a way of identifying and labeling one aspect of it.

This is not to say – and I hope Titchener would not have said, despite his persistent emphasis on unchanging sensory “elements” – that the auditory experience of the introspector remains unaffected by the training process, that the Quincke’s tubes (or, if you attempted my internet demonstration, the .wav files) create exactly the same sensory experience prior to the training as after it. When an untrained observer at first cannot discern a difference tone, and then later in an acoustically identical situation can do so, a range of possible interpretations suggest themselves. At one extreme, we might suppose that, while on the second occasion she genuinely experiences the difference tone, on the first occasion the difference tone was in all respects so thoroughly absent from her experience that we couldn’t even say that it contributed in some inarticulable way to its richness. At the other extreme, we might hold that the auditory experience remains in all respects completely identical from one occasion to the other, the only difference consisting in a separable introspective process and judgment. Neither of these extremes is especially inviting. Most philosophers and psychologists now take for granted that general knowledge can influence sensory experience, so that two people with the same peripheral sensory stimulation may nonetheless have different sensory experiences. If so, it seems likely that knowledge of combination tones and practice in discerning them will affect one’s auditory experience. On the other hand, if we grant that sensory experience

is rich, beyond the capacity of most observers fully to parse and articulate, if we grant that combination tone sensations are not wholly created by the training procedure but can in some sense be discovered in experience, then despite the “top down” effect of general knowledge on sensory experience, a gap of ignorance still divides the auditory experience from the introspective judgment about it; and, if Titchener is right, introspective training can help reduce this gap.

One might adopt the radical position that all mathematically possible combination tones contribute to auditory experience, despite in many cases their never being reported even by the most sophisticated observers (and besides the combination tones described, combination tones of  $2U - L$ ,  $2L + U$ ,  $2U + L$ ,  $3U - L$ ,  $3L + U$ ,  $3U + L$ ,  $2U - 2L$ ,  $2U + 2L$ , etc., are sometimes reported, as well as combination tones arising from the interaction of harmonics of the fundamental tones). However, supposing we reject that view, in many cases particular combination tones will be genuinely and in all respects unheard, and the introspective report of their absence will be accurate. When, in that case, should we regard an introspective observer as sufficiently attentive and well-trained that we may take at face value her claim not to hear a difference tone? I see no straightforward resolution. Furthermore, difficulties of this sort will necessarily emerge in any domain in which one admits the possibility of erroneously reporting the absence of particular experiences – potentially creating a major stumbling block for introspective methods. Interestingly, Titchener himself slides, either deliberately or in confusion, between speaking of unreported difference tones as inaudible and speaking of them as merely undetected – most often choosing to say, ambiguously, that the observer does not “hear” them (I.1.39-46; I.2.66-72, passim).

### III. The “Flight of Colors”.

At the end of the fourth experiment series, after the students have already conducted fourteen other introspective experiments on afterimages and so have some significant introspective training in this regard, Titchener describes an experiment that begins with an observer sitting for five minutes in a dark room with a curtained window. When his partner gives a signal, the observer looks toward the window, the curtain is removed, and he stares fixedly for twenty seconds at the vertical bar separating the window panes. He then closes his eyes and reports his visual experience over the next few minutes. This experiment is to be repeated until the observer reports similar visual experiences on every trial (I.1.30).

I quote at length from Titchener’s discussion of this experience in the instructor’s part of the first volume:

This experiment shows, in a striking way, the effects of practice. The report of a wholly unpractised observer is a mere chaos. With attention, the uniformity of the phenomena soon becomes apparent; and presently the observers who at first gave radically different accounts of the after-image will reach agreement upon all essential points.

With an unclouded sky, or a sky thinly covered with clouds and presenting an even white surface, the flight of colors is as follows:

- (a) A momentary positive and same-coloured image.
- (b) Interval of 5 or 6 sec.

(c) Positive image, fluctuating in color; sometimes with patches of red and green. After 1 or 2 sec., the image settles down to a sky blue, the vertical bar remaining dark.

(d) The blue passes, with or without interruption, into a green. The green is at first very vivid; it disappears and reappears five or six times, growing gradually paler; at last it is almost whitish. – These initial changes show a good deal of individual variation. Some O's [i.e., introspective observers] now see

(e) A yellow image. This (or the whitish green preceding) is regularly followed by

(f) A deep red image. The black bar becomes luminous and slightly greenish, the light appearing first as a crack in its length. This is the stage of transition from the positive to the negative image. The red undergoes several fluctuations. Then follows

(g) A deep blue image, with yellowish bright bar, more lasting than any of the preceding phases. The blue darkens, and the image gradually disappears, with or without passing into

(h) A dark green image.... Note the periodicity of stages c to h:

B – G – Y – R – B – G

[Here Titchener draws lines connecting the first blue to the yellow to the second blue and the first green to the red to the second green. Blue and yellow are generally treated as opposing colors in visual perception, as are red and green.]

(I.2.48)

It is by no means clear whether Titchener is right that practiced observers eventually settle on similar descriptions of the “flight of colors”. Titchener cites Helmholtz (1860/1962) and Washburn (1899) in support of his views, but their descriptions deviate in significant ways from his. For example, Washburn reports no yellow stage. Furthermore, William Berry’s (1922) broad review of the literature on the flight of colors seemed to show great variability between researchers, and he himself finds corresponding variability between his own observers (1927). (All Berry’s (1927) subjects were graduate students in psychology at University of Rochester, but he doesn’t otherwise indicate their level of training.) On the other hand, Barry and Bousfield (1934) and Robertson and Fry (1937) find substantial agreement between observers, with results fairly similar to Titchener’s. Robertson and Fry point out that earlier observations were not conducted under similar conditions across experimenters and that minor, fluctuating colors are given the same significance as stable, enduring ones in some of the reports. Barry and Bousfield argue that theoretical bias may affect reports of the color sequence. For example, they assert that observers after Newton but prior to the nineteenth century tended to arrange the colors in (the newly discovered) spectral order, while observers from other periods did not. I would add that a few of the reports compiled by Berry (e.g., Külpe 1895) appear to involve a single introspection, while others depend on what Titchener would likely have regarded as insufficiently trained observers. It’s unclear whether these objections and the agreement among a few late studies should be sufficient to overturn the strikingly broad variability displayed in Berry’s review. One influential general review of the literature on afterimages (Brown 1965) seems at one point to agree roughly with Titchener’s description of the sequence of the flight of colors (p. 480) but at

another point, apparently inconsistently, to endorse Berry's claim that the flight of colors varies greatly from person to person (p. 490). The very sparse more recent research that I have been able to find does little to resolve this issue.<sup>13</sup>

When introspective training was banished from experimental psychology, so also was the possibility of verifying or disproving Titchener's claim. If introspective training is re-instituted, we can put Titchener to the test. Suppose it turns out that unpracticed observers report very different color sequences, while observers with both general experience in reporting afterimages and specific experience in reporting the flight of colors converge on Titchener's B – G – Y – R – B – G sequence; and suppose further that the observers are all theoretically naive and that the experimenter has carefully avoided inducing in them any particular expectations regarding the sequence of colors. One might argue nonetheless that the untrained and the trained observers have both accurately described their experiences – that somehow the training procedure has tamed the flight of colors. However, it is hard to see why that should be so. I would rather suspect, if the suppositions hold, that the pandemonium of colors in the naive introspectors' reports reflects some sort of introspective incompetence on their part, and the flight of colors is really as Titchener claims. This would be an interesting result insofar as it tells us something we wouldn't otherwise have known about the sequence of afterimages, but perhaps more interesting would be the methodological implications: Introspective training would appear to be vindicated, at least in this one particular research domain.

Of course, there is no guarantee that things will turn out that way. Well trained introspective "experts" on the flight of colors might continue to give divergent reports; the agreement for Titchener's (and others') observers might be an artifact of their

expectations. It would not directly follow that introspective training is a sham, but one opportunity to demonstrate its value would have escaped, and my ambivalent effort to resuscitate Titchener's credibility would suffer a serious blow.<sup>14</sup>

#### IV. Unobvious Visual Illusions.

Examine the two figures below, from pages I.1.160 and I.1.154 respectively.

fig. 1

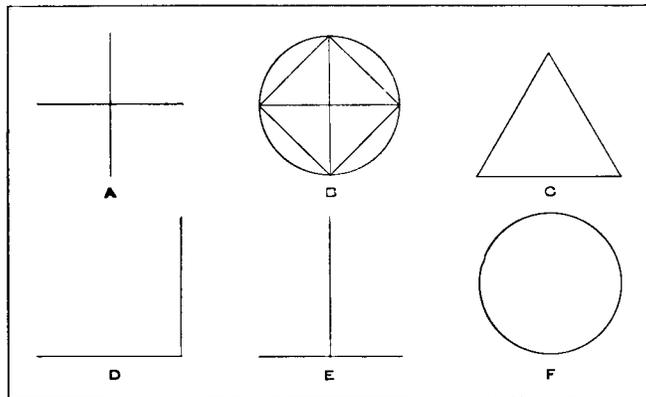
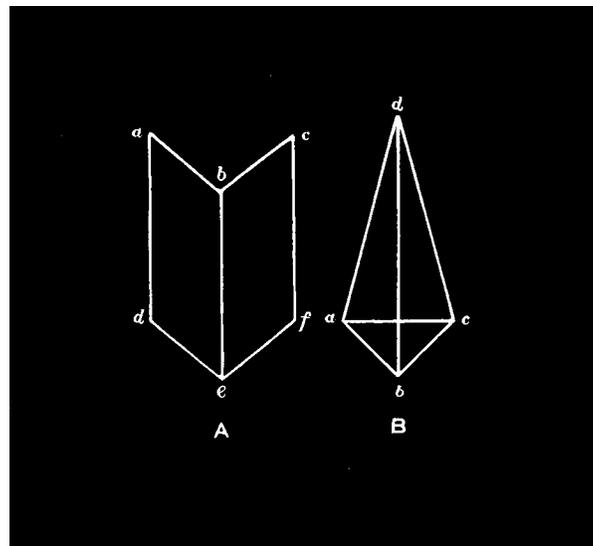


fig. 2



Titchener invites his students to consider the objects in fig. 1 first binocularly, then monocularly. He asks: “Is there any illusion of extent? Is there any other illusion? Look very carefully, in both cases, and do not be satisfied with your first discovery” (I.1.160). With respect to fig. 2 he asks the following series of questions, which I ask the reader also to consider:

How does the figure A strike you at first sight? Fixate on some point on be. What is the appearance of the figure? Move the eye slowly from b to e, and back again. Does the figure change its perspective? Move the eye from b to c, and back again. Is there any change? Is there any uniformity of perspective, according as you move in the directions bc, ba, ef, ed, or in the opposite directions?

How does the figure B strike you at first sight? Fixate, first, a point upon bd, and then a point upon ac, ad or cd. Is there any difference of perspective? Move the eye slowly in the direction ba or bc; and then in direction ab or cb. What happens in the two cases? What secondary modifications of the appearance of the figure are conditioned upon the shift of perspective? (I.1.154)

If you're like me, following these directions is rather difficult – perhaps surprisingly so. The difficulty is partly that of controlling one's attention and the movement of one's eyes, resisting the temptation, for example, to glance at point c as one is supposed to be moving one's fixation slowly along ab. But also, perhaps unintuitively, it can be difficult to judge how things presently seem. In fig. 1A, does the vertical line seem taller, shorter, or the same length as the horizontal? Does fig. 2B seem to reverse perspective as you move, right now, your attention from point a to point b? Of course, you can carelessly

toss out a response, confident that no one is likely to prove you wrong (if such proof is even possible); but approaching these questions conscientiously, I at least sometimes feel unsure of myself, hesitant, or perplexed.<sup>15</sup>

If you share this feeling, I hope you'll also share the sense that to find oneself in such a difficulty is, in a way, peculiar. How could it be hard to reach a judgment about how things seem to you? Your task is not to report how things stand in the world – a task that might understandably instigate confusion or require difficult discernment – but merely to express something like a temptation. If one line appears to you to be longer, say so. Otherwise, don't. Judgments about the world may be right or wrong, depending on the world; but judgments about how the world currently seems to you are insulated in a particular way. Perhaps the sincere, comprehending statement that it seems to you that something is the case is sufficient for its indeed seeming to you that it is the case.<sup>16</sup> How could there be any difficulty here?

On reflection, however, it becomes evident that difficulties abound. Here's one: Titchener asks us to report, not what judgment we are tempted to make with respect to the lines, but whether there is a visual illusion. You may find yourself inclined to say that the lines in fig. 1A are the same length. But, you may wonder, is that inclination the result of their genuinely looking to you to be the same length? That is, does that inclination have a visual basis? Or does it arise in part out of the knowledge that in figures of this sort, presented as examples of visual illusions, the lines for comparison are generally the same length? To answer Titchener's question, one must gain some sense of the basis of one's inclination to judge the lines as equal – and there are good empirical reasons to doubt the reliability of our reports of the bases of our judgments (reasons

famously reviewed in Nisbett and Ross 1980). Suppose you correctly judge that your inclination is based in part on your knowledge of how such figures are generally constructed. Now you have the further challenge of setting that knowledge aside and attempting to decide whether the lines nonetheless look different lengths – attempting to decide, roughly, whether if the visual information were all you had to go on, you would conclude that they were equal. Uncertainty may well be warranted.

And what is it, anyway – to raise, depending on how one individuates difficulties, perhaps a second one – for two lines to “look” the same length? Presumably, there is a visual illusion just in case they don’t; but our experience of the lines is no simple, stable thing. To highlight the problem, suppose, too crudely, that visual experience consists of two parts: a simple sensory experience untainted by judgments about the world and a more sophisticated perceptual judgment derived from this sensory experience in a broader sensory and cognitive context. If the simple sensory experience is of lines of different length but the perceptual judgment is that they are the same, or vice versa, do we have a case of visual illusion? The answer isn’t straightforward, and the difficulty is likely only to be enhanced if sensation and perception blur into each other, or if perceptual processing involves multiple interacting levels, or if there is no single locus of conscious experience. Further, suppose that when you focus on the horizontal line your sense is that the vertical line, as peripherally attended at that moment, is the same length, but you recall the vertical line to have looked longer than the horizontal line presently looks when you focused on it a moment ago. Or suppose that you don’t feel sure whether the vertical line looks longer while you are attending to the horizontal but feel a kind of compulsion to focus upon it to make the judgment. Or suppose you had that fleeting

impression for a moment, or think you may have, but now the two seems the same even when you focus on the vertical. Or .... Some of these confusions may be confusions not about visual experience but about the proper way to classify and describe it, but if our visual experience is a complex flux, it is unlikely that mere confusions about categorization exhaust the matter.

To judge whether there is an “illusion of extent” in fig. 1A, we, of course, have to inspect fig. 1A. In doing so, perhaps some of us slide unaware from introspective reporting of how things look to inspection of how the world is – Titchener calls such a slide the “stimulus error”.<sup>17,18</sup> Instead of attending to one’s experience of the lines in fig. 1A to see which line looks longer, one might attend to the lines themselves in an attempt to determine which is longer. Since often the judgment about which line is longer will coincide with the judgment about which line looks longer (especially if the observer is unaware of the possibility of illusion, which of course is not the case here), and since attending to things outside oneself is much more common and natural than attending to one’s own experience, one might slip fairly easily into the stimulus error. Here, then, is a further potential source of error and perplexity. The observer committing the stimulus error may find herself in the awkward position of trying to reach a difficult judgment about the world, about which line is really longer, while knowing from the context of the task that she must set aside or bracket her antecedent knowledge that the two lines are the same length. Besides the difficulties of the visual comparison of the two lines, then, one must attempt to assess whether the bracketing has been successfully accomplished.

For the record, in fig. 1A-E, the vertical line is supposed to look longer than the horizontal in binocular vision. In A and E viewed monocularly the outer horizontal limb

is supposed to look longer than the inner. In A and B viewed binocularly, the upper vertical limb should look longer than the lower. Figure 1F shows no illusion (I.2.315).<sup>19</sup> Both figures 2A and 2B are generally seen with the central line convex (i.e., closer to the observer than the other lines), but fixation on any point on a line tends to bring that line forward (I.2.310).

I am much more comfortable introspecting these illusions now that I know what I am supposed to see. I would have been embarrassed to report an illusion that isn't there. How strange, though, to think that such mistakes are genuinely likely, or that they are anything to be worried about! The very idea of a talented or inept illusion reporter contains within it the seeds of Titchener's program.

My introspections of fig. 2 now mostly match Titchener's, though they were initially quite disorganized – but I don't know whether I should regard myself as trained or corrupted. Worse, I still cannot see many of the supposed illusions of fig. 1. Am I not experiencing these illusions? Does the vertical line in fig. 1A really not look longer to me? Or does it look longer despite my being an insufficiently capable introspector to discover that fact about myself? Both interpretations seem like real possibilities, but I can't see how to decide which is the case. To insist on the former seems unrealistically to deny the possibility of inaccuracy in assessing the complex stream of experience. To insist on the latter risks opening the door to a world of illusions that no one reports and that never deceive us.<sup>20</sup>

## V. Conclusion.

We are left in an uncomfortable situation. Arguably, conscious experience is the single most important thing in the world, the basis of all value. In a universe of nonconscious zombies, nothing matters. Yet detailed knowledge of consciousness proves to be troublingly elusive.<sup>21</sup> Enough hope remains, however, that we cannot slide into the easy preposterism of asserting the complete impossibility of introspective knowledge.<sup>22</sup> Methodologically, we cannot afford simply to ignore introspective evidence if we wish to learn about conscious experience, nor can we take it at face value, nor is there any presently evident method for distinguishing the trustworthy introspective reports from the undependable ones. (Certainly a strict Titchenerianism will not do.) Perhaps the field awaits an organizing genius.

It seems eminently plausible to suppose, with Titchener, that introspection is a skill, one that not all people possess in equal degree. If so, then it is also natural to suppose that it is a skill that may profit from cultivation beyond what may easily be provided to a subject in fifteen minutes. The argument, then, seems to pull toward a disturbingly elitist conclusion: that we should dismiss the introspective reports of the untutored and reverence a few well-trained introspective talents. Perhaps, however, a certain sort of pessimistic populist comfort can be found in the observation that the determination of what constitutes good training and an introspective talent will surely prove to be marvelously vexatious.<sup>23</sup>

---

<sup>1</sup> According to “higher order” theories of consciousness (e.g., Armstrong 1968; Rosenthal 1986; Lycan 1996, van Gulick 2000), a state is not conscious unless one is in some sense aware of it, or one has an experience of or thought about it. This view conflicts with the one presupposed in this paper, if it is construed to imply that people cannot have conscious experiences of which they are introspectively unaware in the sense of introspection to be articulated below, or if it is construed to imply that people cannot be grossly mistaken about their own current conscious experiences. However, higher order theories of consciousness need not be read as having these implications.

<sup>2</sup> The nature of attention is itself a vexed issue. I will leave the concept intuitive in this essay, while acknowledging with Pashler (1998), Luck and Vecera (2002), and others, that the commonsense notion is in certain respects problematic. More specifically, one might wonder whether experience in particular can be the object of attention. Advocates of “transparency” views of the knowledge of sensory experience, and of “adverbial” accounts of experiential attention, hold that we generally attend to the world to learn about our own sensations. Asked to attend to my visual experience, I focus not on some inner state but rather just, perhaps more carefully, on the objects I am already seeing. While it seems to me that there is some truth to this observation, strong versions of this thesis conflict with the approach to introspection adopted in this essay. (For transparency views, see, e.g., Dretske 1995; Tye 2000; Rowlands 2001. Adverbial views are associated with some remarks in Ryle 1949; e.g., Lyons 1986. Adverbial views of sensory attention should not be confused with adverbial accounts of the nature of sense experience, such as Chisholm 1957; Sellars 1975.)

---

<sup>3</sup> Combining this view with the view that beliefs have no intrinsic phenomenal character, which I endorse elsewhere (Schwitzgebel 2002b), yields the view that we cannot directly introspect beliefs, contrary to widely accepted opinion (recently, for example, Bernecker 2000; Gertler 2000; Rosenthal 2000; Nichols and Stich forthcoming). Generally, when we are right about our beliefs it is because we reflect not on the belief itself but on the facts with which the belief is concerned, and we then express our current judgment about those facts in the linguistic context of a belief report (views along roughly these lines are widely held in philosophy, perhaps most prominently in G. Evans 1982 and Moran 2001). Other factors contributing to the accuracy of belief reports include our tendency to shape ourselves to accord with the beliefs we avow (Brandom 1994; McGeer 1996); our knowledge of associations between of public behavior and belief, combined with observation of our behavior (Ryle 1949; Bem 1972; Nisbett and Ross 1980); and the introspection of experiences associated with belief, such as verbal imagery and the phenomenal aspects of confusion, confidence, surprise, etc.

<sup>4</sup> Shoemaker (1994a-c) contains a useful discussion of a variety of the points of analogy and disanalogy between introspection and perception.

<sup>5</sup> One way to finesse this concern is to rely not on introspection of current experience but rather on immediate retrospection, which involves reporting on an unattended experience immediately after it occurs. (One of the earliest discussions of this problem is Mill 1866/1961; more contemporary discussions include Lyons 1986; Farthing 1992). One obvious difficulty is restraining oneself from attending to the experience until after it is complete. Hurlburt (1990, 1993) advances a methodology that

---

escapes this difficulty by periodically surprising people with a tone as they go about their ordinary day, having them record an immediate retrospective report upon hearing the tone. Titchener believes that for the well-trained introspector, the results of introspection and immediate retrospection are similar (1910/1915, p. 21-23; 1912a, p. 442-444; cf. 1899b, p. 27-29; 1908, p. 176-180; 1912b, p. 490-493; Wundt 1895, vol. II, part 2, p. 174-175), but the question has not been sufficiently explored.

Lyons (reviving Comte 1830, p. 33-36) argues that introspection, as standardly conceived, requires a division of attention between the activity generating the conscious experience to be introspected and the introspective act itself, and that such a division of attention is impossible. Experimental evidence on the division of attention is not univocal (for a review, see Pashler 1998, ch. 3), however it does appear that division of attention is possible at least to a limited extent or over a limited range of cases. It seems premature, then, to rule out the division of attention in introspection without study of particular introspective cases. The reader may wish to consult her own phenomenology in the matter. (I cite the original French edition of Comte above due to the low quality of the English translations of the relevant passage in standard editions. William James provides a good translation of the passage in his Principles of Psychology 1890/1981, p. 187-188.)

<sup>6</sup> Further references to the laboratory manual will list the volume in Roman numerals, followed by the part in Arabic and the page in either Arabic if it is from the body or Roman if it is from an introduction (e.g., II.2.cliii-clvii). The second part of each volume is intended for the instructor's use only. Please note that the 1971 reprint of

---

Experimental Psychology omits the second part of the first volume, and that each part of the first volume is itself misleadingly divided into two “parts”.

<sup>7</sup> For more specific discussions and examples of the benefit of practice in focusing on stimuli, steadying one’s sense organs, and controlling one’s attention, see I.2.30-31; I.2.121; II.2.cliv-clvi; II.2.307; for the benefit of practice in attaining a consistent standard of judgment, see I.2.87; II.1.xxxiii; II.1.1-2; II.1.25-26; II.2.307; regarding knowing what to abstract, attend to, or look for in a complex sensation, see I.1.41-42; I.2.48; I.2.52; I.2.75; I.2.87; I.2.217; I.2.300; regarding the report of lapses of attention or interfering influences, see I.1.167, I.2.220-222; I.2.341-345; II.1.104-160; II.2.2-3; II.2.260; II.2.402.

<sup>8</sup> However, E. G. Boring, a historian of psychology and former student of Titchener’s, claims that later in his career Titchener put “considerable faith” in the method of phenomenology that he here criticizes, though he never published on the subject (1950, p. 416; also 1927, p. 502; R. Evans 1972).

<sup>9</sup> Psychophysicists sometimes train subjects perceptually – e.g., in “analytic listening”, which involves distinguishing particular individual tones in a complex auditory stimulus – but such training is not generally regarded as introspective or approached with Titchenerian introspective standards in mind.

<sup>10</sup> At one point, Titchener suggest that introspective controversies affected by bias may profit from the flourishing of a diversity of perspectives. With respect to the raging debate in his time over Weber’s Law, which holds that the intensity of a sensation is a logarithmic function of the intensity of the stimulus producing it, Titchener writes:

---

We want a large number of O's, we want O's of all types and degrees of training, we want tests of the method by men who are prejudiced or prepossessed both for and against, we want a volume of introspective reports, we want the analysis and critical judgment of those who see the method from within, in the light of their own introspection, and of those who see it merely from without, as a piece of applied logic (II.2.230-231).

In general philosophy of science, Longino (1990) and others have defended similar approaches to dealing with bias. However, such broad pluralism seems not to have been generally characteristic of Titchener.

<sup>11</sup> I am not entirely convinced that there isn't a sense in which difference tones exist in the environment (see also Hall 1981), but the philosophical and acoustic issues are complex. Ultimately, I think no major points in the text hang on this issue.

<sup>12</sup> Titchener himself remarks about a similar case that "there is no difference between introspection and inspection. You are using the same method that you would use for counting the swings of a pendulum, or for taking the readings from a galvanometer scale, in the physical laboratory" (1908, p. 176; see also 1910/1915, p. 19-25; 1912b, p. 487-489). This remark might be read in a variety of ways.

<sup>13</sup> Wallace (1979) takes individual variability in the flight of colors for granted, while Feldman, Todman, and Bender (1974) assume the contrary. A related issue is whether people experience a similar or variable evolution of colored afterimages following a brief flash of colored light. The evidence on this question is also divided (see, e.g., Judd 1927; Brown 1960; Stamper, Lund, Molchany, and Stuck 2000; Taya and

---

Ohinata 2002; more, e.g., Fröhlich?, Germans \*\*\*\*). Other papers of interest include Shuey (1924), \*\*\*\*

<sup>14</sup> Consider this related question. When I close my eyes and *attend to* my visual experience with my eyes closed, I generally notice a variety of vivid afterimages and colors. But most of the time when my eyes are closed, for example, when I'm trying to fall asleep, I notice no such things. Does the attention create the visual experience, or do we generally have a vivid palette of visual experiences with our eyes closed that we completely fail to notice? I incline toward the latter alternative, though I see no easy prospects for a direct test.

<sup>15</sup> Haack (1993) nicely describes a similar commonplace example of uncertainty about visual appearances in the ophthalmologist's office.

<sup>16</sup> One might go farther and suggest that a statement of the form 'it seems to me that P' (where P is some proposition expressed by a complete sentence) is incontestable because it reports no facts, resembling the statement 'P, maybe', which is either trivially true or devoid of truth value. Sometimes, indeed, 'seems' statements are used more or less equivalently to 'maybe' statements; but we cannot conclude that there are no facts about how things seem. Past tense and third-person attributions reveal this. If I say today, 'it seemed to me yesterday that there was no hope of victory', I may be right or wrong. There is some fact of the matter about how things seemed to me then. Thus, if I said yesterday that 'it seems to me that there is no hope of victory', what I said may be true or false, depending on that same fact. Slips of the tongue, at the very least, reveal the possibility of falsehood and thus the existence of a truth value.

---

<sup>17</sup> For discussions and examples of the stimulus error (also called ‘R-error’), see I.2.90-91; II.1.xxvi-xxvii; II.2.lxiii-lxiv; II.2.198; II.2.203-205; II.2.251-253; 1910/1915, p. 202-203; 1912b, p. 488-489; also Boring (1921). It seems quite likely to me that often when we claim to be introspecting, we are drawing conclusions about what our conscious experience must be based on how we know the world is. One may admit the possibility of this sort of error without following Titchener at his most stern in rejecting all introspective reports that mention objects or meanings. Boring (1950, p. 418) presents a helpful simple example of how the stimulus error can distort introspective report (in Boring 1921, however, he gives this case a much more complicated treatment). When one’s skin is simultaneously touched by two needles very near to each other, one sometimes experiences a sensation as though being touched by an object with an elongated shape. In the right experimental context, an observer familiar with this experience would then recognize that he was being stimulated by two needles. To report feeling two needles is to commit the stimulus error; to report feeling a single region of pressure is the correct introspective response per Titchener.

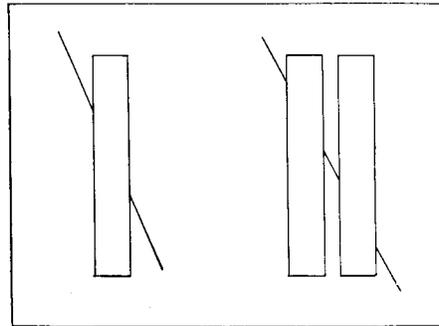
<sup>18</sup> We have a similar tendency, in addressing questions about our beliefs, and perhaps our attitudes more generally, to consider how things stand in the world and report the consequent judgment as the attitude, rather than rummaging through our brains for a freeze-dried belief (see note \*\*\*\*). As long as one’s attitude is aligned (or brought into alignment) with the current judgment, this response strategy is not invalid: One believes what one says one believes. Titchener’s stimulus error is disanalogous in that one’s experience does not reliably align itself with one’s judgments about the stimuli causing the experience, and for this reason it may be called an error.

---

<sup>19</sup> Figures 1A, 1D, and 1E are well-known examples of the “horizontal-vertical illusion”, though 1E (the only case which, for me, is introspectively clear) instantiates another illusion as well that makes the vertical line look longer (and which dominates the horizontal-vertical illusion, as can be seen if the page is rotated 90 degrees). Discussions include Künnapas (1955), Robinson (1972), and Coren and Girgus (1978); Prinzmetal and Gettleman (1993) find, as Titchener suggests, that the illusion is stronger binocularly than monocularly. Many people have also discussed ambiguous figures such as those in Figure 2 that appear to reverse perspective, the most famous example being the Necker cube. The view that attention to a particular vertex has the tendency to bring it forward traces back to Necker himself (Necker 1832). More recent research suggests that this tendency is not perfect and a number of factors may be involved. See, for example, Köhler and Wallach 1944; Hochberg 1950; Pritchard 1958; Gregory 1970; Girgus, Rock, and Egatz 1977; Peterson and Hochberg 1983; Long and Olszweski 1999; Palmer 1999. I have been unable to find contemporary confirmation of the other illusions described.

<sup>20</sup> The more powerful illusions that one generally sees in textbooks and at colloquia mask the introspective difficulties that arise for weak or unobvious illusions. Confronted with Poggendorf’s illusion (fig. 3 below, from I.1.165), most of us feel unambiguously comfortable in reporting that, in some sense, the line which we may know to be straight nonetheless “looks” crooked.

fig. 3



One way to approach the question of whether there is a horizontal-vertical illusion in fig. 1A, even for people who claim that the lines appear to be the same length, would be to construct a variety of figures with vertical and horizontal lines of unequal lengths. The subject might then be required to choose between “horizontal longer” and “vertical longer” (or between “horizontal longer”, “vertical longer”, and “equal”), and the researcher could check for a tendency toward error in one direction or the other (as in Künnapas 1955). Alternatively, the subject might be given the opportunity to adjust the lines until they appeared to be of equal length (as in Gardner and Long 1960a&b). However, it is not clear whether errors in these cases would indicate a genuine visual illusion in fig. 1A as experienced in the context above. Even if the figure was presented in box outline, adjacent to other figures, as in the text here, the presentation of multiple figures in sequence, or the ability to control of the length of lines, significantly alters the cognitive situation. Gardner and Long find that as small a variation as whether the horizontal line is fixed and the vertical changeable or vice versa can have a pronounced effect on the magnitude of error.

<sup>21</sup> For further of my reflections on this topic, see Schwitzgebel and Gordon (2000) and Schwitzgebel (2002a&c).

<sup>22</sup> On “preposterism”, see the delightfully acid eleventh essay of Haack (1998).

---

<sup>23</sup> For helpful comments and discussion, I'd like to thank Kirk Gable, Felipe Leon, Mike Gordon, Tori McGeer, Bill Prinzmetal, Josh Rust, Colleen Ryan, and Jeff Yim.

References:

- Armstrong, D.M. (1968), A Materialist Theory of Mind (London: Routledge).
- Bem, D.J. (1972), 'Self-perception theory', in Advances in Experimental Social Psychology, **6**, ed. L. Berkowitz (New York: Academic), 1-62.
- Barry, H., Jr., and Bousfield, W.A. (1934), 'Implications of the flight of colors', Psychological Review, **41**, 300-305.
- Bernecker, S. (2000), 'Knowing the world by knowing one's mind', Synthese, **123**, 1-34.
- Berry, W. (1922), 'The flight of colors in the after image of a bright light', Psychological Bulletin, **19**, 307-337.
- Berry, W. (1927), 'Color sequences in the after-image of a white light', American Journal of Psychology, **38**, 584-598.
- Block, N. (2002), 'The harder problem of consciousness', Journal of Philosophy, **99**, 391-425. [A fuller version of the same paper is available at <http://www.nyu.edu/gsas/dept/philo/faculty/block/papers/HarderProblem.pdf> .]
- Boring, E.G. (1921), 'The stimulus error', American Journal of Psychology, **32**, 449-471.
- Boring, E.G. (1927), 'Edward Bradford Titchener', American Journal of Psychology, **38**, 489-506.
- Boring, E.G. (1950), A History of Experimental Psychology, 2<sup>nd</sup> Ed. (East Norwalk, CT: Appleton-Century-Crofts).
- Boring, E.G. (1953), 'A history of introspection', Psychological Bulletin, **50**, 169-189.
- Brandom, R.B. (1994), Making It Explicit (Cambridge, MA: Harvard).
- Brown, J.L. (1965), 'Afterimages', in Vision and Visual Perception, ed. C.H. Graham (New York: Wiley).

- Chalmers, D.J. (1996), The Conscious Mind (New York: Oxford).
- Chisholm, R.M. (1957), Perceiving (Ithaca, NY: Cornell).
- Comte, A. (1830), Cours de Philosophie Positive, vol. 1 (Paris: Bachelier).
- Coren, S., and Girgus, J.S. (1978), Seeing Is Deceiving (Hillsdale, NJ: Lawrence Erlbaum).
- Dretske, F. (1995), Naturalizing the Mind (Cambridge, MA: MIT).
- Evans, G. (1982), The Varieties of Reference (Oxford: Clarendon).
- Evans, R.B. (1972), 'Titchener and his lost system', Journal of the History of the Behavioral Sciences, **8**, 168-180.
- Farthing, G.W. (1992), The Psychology of Consciousness (Englewood Cliffs, NJ: Prentice Hall).
- Feldman, M., Todman, L., and Bender, M.B. (1974), "'Flight of colours" in lesions of the visual system', Journal of Neurology, Neurosurgery, and Psychiatry, **37**, 1265-1272.
- Gardner, R.W., and Long, R.I. (1960a), "Errors of the standard and illusion effects with L-shaped figures", Perceptual and Motor Skills, **10**, 107-109.
- Gardner, R.W., and Long, R.I. (1960b), "Errors of the standard and illusion effects with the inverted-T", Perceptual and Motor Skills, **10**, 47-54.
- Gefland, S.A. (1990), Hearing, 2<sup>nd</sup> Ed. (New York: Marcel Dekker).
- Gertler, B. (2000), 'The mechanics of self-knowledge', Philosophical Topics, **28**, 125-146.
- Girgus, J.J., Rock, I., and Egatz, R. (1977), 'The effect of knowledge of reversibility on the reversibility of ambiguous figures', Perception and Psychophysics, **22**, 550-556.

- Gregory, R.L. (1970), The Intelligent Eye (New York: McGraw-Hill).
- Haack, S. (1993), Evidence and Inquiry (Oxford: Blackwell).
- Haack, S. (1998), Manifesto of a Passionate Moderate (Chicago: University of Chicago).
- Hall, D.E. (1981), 'The difference between difference tones and rapid beats', American Journal of Physics, **49**, 632-636.
- Hall, D.E. (2002), Musical Acoustics, 3<sup>rd</sup> Ed. (Pacific Grove, CA: Brooks/Cole Thomson Learning).
- Helmholtz, H. von (1860/1962), Helmholtz's Treatise on Physiological Optics, ed. J.P.C. Southall (New York: Dover).
- Hochberg, J.E. (1950), 'Figure-ground reversal as a function of visual satiation', Journal of Experimental Psychology, **40**, 682-686.
- Hurlburt, R.T. (1990), Sampling Normal and Schizophrenic Inner Experience (New York: Plenum).
- Hurlburt, R.T. (1993), Sampling Inner Experience in Disturbed Affect (New York: Plenum).
- Hurley, S. (1996), Consciousness in Action (Cambridge, MA: Harvard).
- James, W. (1890/1981), Principles of Psychology (Cambridge, MA: Harvard).
- Judd, D.B. (1927), 'A quantitative investigation of the Purkinje after-image', American Journal of Psychology, **38**, 1927.
- Köhler, W., and Wallach, H. (1944), 'Figural aftereffects; an investigation of visual processes', Proceedings of the American Philosophical Society, **88**, 269-357.
- Külpe, O. (1895), Outlines of Psychology (p 131 fn).

- Künnapas, T.M. (1955), 'An analysis of the "horizontal-vertical illusion"', Journal of Experimental Psychology, **49**, 134-140.
- Long, G.M., and Olszweski, A.D. (1999), 'To reverse or not to reverse: When is an ambiguous figure not ambiguous?', American Journal of Psychology, **112**, 41-71.
- Longino, H.E. (1990), Science as Social Knowledge (Princeton, NJ: Princeton).
- Luck, S.J., and Vecera, S.P. (2002), 'Attention', in Stevens' Handbook of Experimental Psychology, 3<sup>rd</sup> Ed., Vol. 1, ed. S. Yantis (New York: Wiley).
- Lycan, W.G. (1996), Consciousness and Experience (Cambridge, MA: MIT).
- Lyons, W. (1986), The Disappearance of Introspection (Cambridge, MA: MIT).
- McGeer, V. (1996), 'Is "self-knowledge" an empirical problem? Renegotiating the space of philosophical explanation', Journal of Philosophy, **93**, 483-515.
- Mill, J.S. (1866/1961), Auguste Comte and Positivism (Ann Arbor: University of Michigan).
- Moran, R. (2001), Authority and Estrangement (Princeton, NJ: Princeton).
- Müller, G.E. (1904), Die Gesichtspunkte und die Tatsachen der Psychophysischen Methodik (Wiesbaden: J.F. Bergmann).
- Nahmias, E.A. (2002), "Verbal reports on the contents of consciousness: Reconsidering introspectionist methodology", Psyche, **8**(21),  
<http://psyche.cs.monash.edu.au/v8/psyche-8-21-nahmias.html> .
- Nichols, S., and Stich, S. (forthcoming), "How to read your own mind: A cognitive theory of self-consciousness," in Consciousness: New Philosophical Essays, ed. Q. Smith and A. Jokic (New York: Oxford. [A fuller version of this paper is available at

<http://rucss.rutgers.edu/ArchiveFolder/Research%20Group/Publications/Room/room.html> .]

Nisbett, R., and Ross, L. (1980), Human Inference (Englewood Cliffs, NJ: Prentice-Hall).

Nagel, T. (1974), 'What is it like to be a bat?', Philosophical Review, **83**, 435-450.

Necker (de Saussure), L.A. (1832), Observations on the Cause of Halos and the Phenomena of Diverging and Converging Beams (Edinburgh: Blackwood).

Palmer, S.E. (1999), Vision Science (Cambridge, MA: MIT).

Pashler, H.E. (1998), The Psychology of Attention (Cambridge, MA: MIT).

Peterson, M.A., and Hochberg, J. (1983), 'Opposed-set measurement procedure: A quantitative analysis of the role of local cues and intention in form perception', Journal of Experimental Psychology: Human Perception and Performance, **9**, 183-193.

Plomp, R. (1976), Aspects of Tone Sensation (London: Academic Press).

Prinzmetal, W., and Gettleman, L. (1993), 'Vertical-horizontal illusion: One eye is better than two', Perception and Psychophysics, **53**, 81-88.

Pritchard, R.M. (1958), 'Visual illusions viewed as stabilized retinal images', Quarterly Journal of Experimental Psychology, **10**, 77-81.

Robertson, V.M., and Fry, G.A. (1937), 'After-images observed in complete darkness', American Journal of Psychology, **49**, 265-276.

Robinson, J.O. (1972), The Psychology of Visual Illusion (London: Hutchinson).

Rosenthal, D.M. (1986), 'Two concepts of consciousness', Philosophical Studies, **49**, 329-359.

- Rosenthal, D.M. (2000), 'Introspection and self-interpretation', Philosophical Topics, **28**, 201-233.
- Rossing, T.D., Moore, F.R., and Wheeler, P.A. (2002), The Science of Sound, 3<sup>rd</sup> Ed. (San Francisco: Addison Wesley).
- Rowlands, M. (2001), The Nature of Consciousness (Cambridge: Cambridge).
- Ryle, G. (1949), The Concept of Mind (New York: Barnes & Noble).
- Schwitzgebel, E. (2002a), 'How well do we know our own conscious experience? The case of visual imagery', Journal of Consciousness Studies, **9**, pp. 35-53.
- Schwitzgebel, E. (2002b), 'A phenomenal, dispositional account of belief', Noûs, **36**, 249-275.
- Schwitzgebel, E. (2002c), 'Why did we think we dreamed in black and white?', Studies in History and Philosophy of Science, **33**, 649-660.
- Schwitzgebel, E., and Gordon, M.S. (2000), 'How well do we know our own conscious experience? The case of human echolocation', Philosophical Topics, **28**, 235-246.
- Sellars, W. (1975), 'The adverbial theory of the objects of sensation', Metaphilosophy, **6**, 144-160.
- Shoemaker, S. (1994a), 'Lecture I: The object perception model – self-knowledge and “inner sense”', Philosophy and Phenomenological Research, **54**, 249-269.
- Shoemaker, S. (1994b), 'Lecture II: The broad perceptual model – self-knowledge and “inner sense”', Philosophy and Phenomenological Research, **54**, 271-290.
- Shoemaker, S. (1994c), 'Lecture III: The phenomenal character of experience – self-knowledge and “inner sense”', Philosophy and Phenomenological Research, **54**, 291-314.

- Shuey, A.M. (1924), 'The flight of colors', American Journal of Psychology, **35**, 559-582.
- Stamper, D.A., Lund, D.J., Mochany, J.W., and Stuck, B.E. (2000), 'Laser-induced afterimages in humans', Perceptual and Motor Skills, **91**, 15-33.
- Taya, R., and Ohinata, S. (2002), 'Afterimage oscillation after a brief light flash', Japanese Psychological Research, **44**, 99-106.
- Titchener, E.B. (1899a), An Outline of Psychology, Rev. Ed. (New York: Macmillan).
- Titchener, E.B. (1899b), A Primer of Psychology, Rev. Ed. (New York: Macmillan).
- Titchener, E.B. (1901-1905), Experimental Psychology: A Manual of Laboratory Practice (New York: Macmillan).
- Titchener, E.B. (1908), Lectures on the Elementary Psychology of Feeling and Attention (New York: Macmillan).
- Titchener, E.B. (1909), Lectures on the Experimental Psychology of the Thought-Processes (New York: Macmillan).
- Titchener, E.B. (1910/1915), A Text-Book of Psychology (New York: Macmillan).
- Titchener, E.B. (1912a), 'Prolegomena to a study of introspection', American Journal of Psychology, **23**, 427-448.
- Titchener, E.B. (1912b), 'The schema of introspection', American Journal of Psychology, **23**, pp. 485-508.
- Titchener, E.B. (1915), A Beginner's Psychology (New York: Macmillan).
- Titchener, E.B. (1929), Systematic Psychology: Prolegomena (Ithaca, NY: Cornell).
- Tye, M. (2000), Consciousness, Color, and Content (Cambridge, MA: MIT).

Van Gulick (2000), 'Inward and upward: Reflection, introspection, and self-awareness',  
Philosophical Topics, **28**, 275-305.

Wallace, B. (1979), 'Hypnotic susceptibility and the perception of afterimages and dot  
stimuli', American Journal of Psychology, **92**, 681-691.

Washburn, M.F. (1899), 'Subjective colors and the afterimage: Their significance for the  
theory of attention', Mind, N.S., **8**, 25-34.

Wundt, W. (1895), Logik (Stuttgart: Enke).