

**Introspective Training Apprehensively Defended:  
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

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### Abstract

To study conscious experience we must, to some extent, trust introspective reports; yet introspective reports often do not merit our trust. A century ago, E.B. Titchener advocated extensive introspective training as a means to resolve this difficulty. He describes many of his training techniques in his four volume laboratory manual of 1901-1905. This paper explores Titchener's laboratory manual with an eye to general questions about the prospects of introspective training for contemporary consciousness studies, with a focus on the following examples: introspective knowledge of the combination tones that arise when a musical interval is played; the "flight of colors" in the afterimage of a field of bright, broad spectrum light; and the possibility of non-obvious visual illusions. Introspection is characterized as attention to experience. Introspective training appears to have some merit, but also to involve significant hazards.

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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?

As you will have guessed from the title, I recommend that we consider introspective training as a potential response to this difficulty. Even if introspective reports collected from the general population are often undependable, perhaps subjects can be trained reliably to generate trustworthy reports, with sufficient discipline and practice. The prominent American psychologist Edward B. Titchener emphasized this approach a century ago, and his work will serve as the focus of this essay.

Although the principal aim of this essay is to suggest a resuscitation of the practice of introspective training, introspective training is beset with substantial difficulties and perils. Considerable space is devoted to the articulation of concerns that promise no straightforward resolution and which might thus be taken to count against the central thesis. On balance, I think, the promise of introspective training recommends its pursuit despite the concerns.

## I. Consciousness and Introspection.

Before delving into Titchener, let me clarify what I mean by two crucial terms: ‘conscious experience’ and ‘introspection’. Conscious experience or consciousness is that aspect of our lives responsible for their 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 this paper, all experiences are conscious. There are facts about what it is like to be you at any particular moment, 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 and Gordon 2000 and Schwitzgebel 2002a).

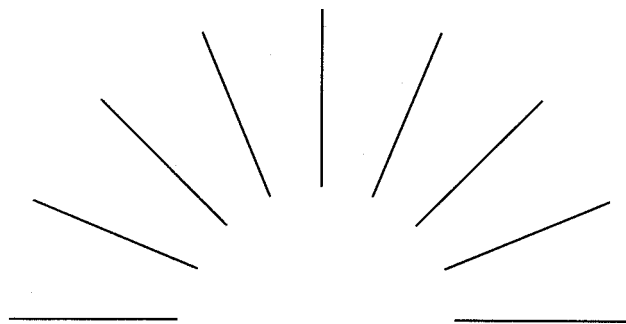
I have never seen what I take to be an adequate account of introspection, nor can I provide one. But since it is the central topic of this essay and people have differing impressions about it, something must be said. William James famously commented that

“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 Anglicize the metaphor already obvious in the Latin etymology and add an element of reporting. He may have been wise to leave it at that. If so, I will now display somewhat less wisdom.

I take introspection to be the process of attending to one’s own experience. Consequently, we can introspect mental states and processes only insofar as they are experiential, that is possess a “phenomenal” or “qualitative” character.<sup>2</sup> For the purposes of this essay, I will assume that the product of introspective attention is a conscious judgment regarding the properties of the experience introspected. Non-conscious judgments about experience, if they exist, are incidental to introspective method. So is any acquaintance with experience that cannot be captured in any form of judgment.

But what is it to attend to one’s own experience? I’m afraid I can’t do better here than to offer a couple of borrowed examples and hope the reader finds them sufficient. First, consider the display often used in ophthalmology, consisting of an array of lines of different orientations, as shown in figure 1 (the example and the figure are from Haack 1993, p. 40; the figure as printed here is of course not a valid ophthalmological test).

fig. 1



If you have the misfortune to be in an ophthalmologist's office looking at such a display, the doctor will ask whether some of the lines look thicker than others. You may know antecedently that the lines on the display are equally thick and that they would be seen as such by someone with normal vision – but that, of course, is not the question. You are being asked not for your judgment about whether the lines are actually of equal thickness but for a judgment about your visual experience of the lines. To reach the latter judgment, you must attend, perhaps partly to the world, but at least partly, also, to your current visual experience – that is to say, you must introspect. You introspect in the same way when you take your glasses off and notice how much blurrier everything appears.

Some authors (such as Lyons 1986; cf. Comte 1830<sup>3</sup>) have argued that such a characterization of introspection is misleading because it requires an impossible division of attention between the process introspected and the introspective process (e.g., between the process of looking at the lines and the process of introspecting the consequent visual experience). The issue is a difficult one, as indeed is the characterization of attention in general (see Pashler 1998 and Luck and Vecera 2002 for reviews), but recent psychological research appears to favor the possibility of division of attention with respect to at least some tasks. Another objection arises from the suggestion that, when asked to attend to sensory experience, people appear to focus not on an inner state but rather just, perhaps more carefully, on the objects they already sense (e.g., Ryle 1949; Lyons 1986; Dretske 1995; Tye 2000; Rowlands 2001). Surely there is some truth to this observation. Nonetheless, some differences of attention and attitude, or cognitive set, exist between normal, non-introspective, sensory perception (even if careful) and processes more properly called introspective.

A second example comes from Titchener's student, the historian of psychology, E.G. Boring (1950, p. 418; but see Boring 1921 for a more complicated treatment of this same example). When one's skin is simultaneously touched by two needles very near to each other, it sometimes feels as though one is being touched by only one needle. When the needles are sufficiently distant, of course, the two needles are experienced as contacting the skin separately. According to Boring, two needles pressed against the skin may also be experienced as producing one oval-shaped region of pressure, if they are too far apart to be experienced as a single point and too near to be experienced as completely distinct. A sufficiently practiced observer in the right context, then, might be able to tell in such a case that he is being stimulated by two needles. If his focus is on the task of determining the number of needles contacting his skin, he is engaged in standard perceptual judgment, and he will report feeling two needles. However, he may instead adopt a different attitude, the introspective one, and attend primarily to the sensory experience the needles produce in him, in which case he will report a single region of pressure.<sup>4</sup>

Despite the intuitive appeal of James' perceptual analogy, introspection differs from sensory perception in a number of important respects (some of which are discussed in Shoemaker 1994a-c). One does not attend to experience in the same way one attends to events in the environment – by means of sensation. Yet introspective attention, like sensory attention, is in some way inherently immediate and local in its objects, in contrast to more purely cognitive attention, which may range over matters far and near, such as abstract puzzles, plans for future action, or yesterday's experiences. (We should probably not draw too sharply the contrast between sensory and cognitive attention,

however.) Another crucial point of difference between introspection and sensory perception is that introspective attention to an experience generally modifies the experience toward which it is directed, perhaps in some sense becoming part of the experience, or even creating it, while sensory perception of an object does not generally modify that object (though again, this contrast may be drawn too sharply – touching an object does modify the object to an extent, all sensory perception changes at least an object's relational properties, and there are abstruse considerations from quantum mechanics).

Perhaps this discussion has raised more questions about the nature of introspection than it has settled. (Hence my earlier comment about James' wisdom.) Be that as it may, this section will conclude now with a couple of general concerns about introspective method that will (largely) be set aside in the remainder of the essay.

The first concern arises from the second above-mentioned point of disanalogy between introspection and sensory perception. If introspection generally modifies the experiences introspected, it would be a mistake simply to assume that our experiences as introspected closely resemble our experiences independent of introspection. Why should we think that introspection can tell us anything general about experience, which is for the most part not introspected? In response to this worry, it is sometimes suggested that introspection should be replaced by immediate retrospection, which involves reporting an unattended experience immediately after it occurs.<sup>5</sup> (One of the earliest discussions is Mill 1866/1961; more recent discussions include Lyons 1986 and Farthing 1992). However, Titchener believes that for the well-trained introspector, the results of introspection and immediate retrospection are similar, in part because introspection



becomes almost effortless and automatic (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). This question has not been sufficiently explored, but I believe that we will profit from yielding the point to Titchener and seeing what more specific thoughts emerge from an examination of his techniques.

The second concern regards the integrity and separability of the introspective process. There may be no single or distinct faculty of introspection. Indeed, it seems likely that many of our apparently introspective judgments arise from a plurality of introspective and non-introspective sources.<sup>6</sup> When you say that you are feeling blue, your judgment may be based in part on knowledge of your recent behavior and your facial and bodily posture, your assessment of your circumstances as apt to produce negative feelings, your awareness of the content of your recent and current thoughts (perhaps partly introspective), introspective recognition of some kind of conscious phenomenology characteristic of that particular mood or emotion – and potentially many other things, in who knows what proportion. Furthermore, you may be quite incapable of determining what the sources are of any apparently introspective judgment. For example, I am inclined, with Titchener, to suspect that people often ground their judgments about the nature of their sensory experiences in part on their knowledge of the objects producing those experiences and their (implicit) expectations about the sorts of experience those objects should produce.<sup>7</sup> (Thus, for example, someone might regard her visual experience of a surface as stable and uniformly colored because she knows the surface itself to be stable and uniformly colored.) Titchener, again, felt that training (and

exhortation) could reduce the influence of non-introspective factors on “introspective” reports. This issue also has been insufficiently explored.

## II. Historical Background, and Titchener’s General Position on Introspective Training.

A rough history of psychology will help put Titchener in context and display his relevance to contemporary consciousness studies (detailed histories include Boring 1950 and Danziger 1990). As is generally known, experimental psychology as a distinct academic discipline arose in the second half of the nineteenth century. It did so partly through the labor of Wilhelm Wundt in founding a productive laboratory and training a generation of students and partly through the model of Gustav Fechner’s and Hermann von Helmholtz’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. Among the more permanent accomplishments of early introspection were the construction of the color pyramid or color cone, with its characterization of color experience in terms of hue, saturation, and lightness or brightness, and the measurement of relations between stimulus quality or intensity and sense experience for each of the various sensory modalities (including measurement of the stimulus changes required to produce a “just noticeable difference”). Much of what we know about the structure of sensory experience traces back to the careful reports of relatively few trained introspectors from this period.

By the 1910’s, however, behaviorism had declared war on introspective psychology, portraying it as bogged down in irresolvable debates between differing

introspective “experts” (which was partly true), and offering, in place of the introspectionists’ passive taxonomizing of experience, the beginnings of a socially usable paradigm for the modification of behavior. 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. Gestalt psychology, though it gave an important role to introspection, regarded classical introspective training as harmful, leading to reports in which the whole sensory “Gestalt”, which is primary in ordinary experience, is disregarded in favor of particular sensory elements (a criticism which, like the behaviorists’, has some merit). 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 insights 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 describes both the pitfalls of introspective laboratory work and the conditions of its success with an explicitness one rarely sees in textbooks or journal articles.

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. 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 who had performed fewer than 10,000 laboratory introspections (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>8</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 brightness 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).

Experienced introspectors are also more likely than untrained introspectors to maintain a consistent standard of judgment and accurately to report lapses of attention and interfering influences.<sup>9</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 generally approach psychology neutral between theses, even when those theses are dry psychophysical ones – and when people do start out relatively open-minded, after a few introspections they are apt 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>10</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; cf. 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. (Some of the reasons for the overthrow were briefly mentioned above. It is probably also worth mentioning that introspective training is quite tedious.) Even among psychologists interested in introspection today, the idea that a 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>11</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 the 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.

At one point, Titchener suggests 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 [observers], 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. Such broad pluralism seems not to have been characteristic of Titchener – he was generally inclined to privilege the judgments of his own trained observers – but it would appear nonetheless to be sound advice. Consciousness studies is presently well supplied with naive introspective observers, but it is sorely lacking in trained observers who might bring a different perspective.

### III. Examples of Introspective Training.

The remainder of this essay will examine three particular exercises from Titchener's manual. Doing so will put some flesh on the concept of introspective training and help the reader gain a sense of Titchener's techniques in general. It will allow us to see more clearly both the promise and challenges of introspective training. No single, organizing thesis will emerge, but rather a smattering of reflections, questions, and descents into confusion that I hope will spur further thought and inquiry.

III.A. 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, lower (and generally quieter) tone, called a difference tone. The pitch of this difference tone will resemble that of a tone of frequency  $U - L$ .<sup>12</sup> For example, when two flutes simultaneously play the notes  $F_6$  (fundamental frequency 1396.9 hertz) and  $C_6$  (1046.5 hertz), listeners may also report hearing a note at about the pitch of  $F_4$  (349.23 hertz) (Stickney and Englert 1975). Similar effects may be produced by combining sine waves in a sound editor program and listening to them through headphones. The

standard view, and Titchener's, is that difference tones so generated do not exist in the environment but rather are a consequence of "non-linearities" in the human ear – i.e., that they result 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>13</sup> In addition to the (first) difference tone at  $U - L$ , a second difference tone (also called a cubic difference tone) may sometimes be heard at  $2L - U$ , and more rarely other tones, including a third difference tone at  $3L - U$ , and disputably a summation tone at  $L + U$ . 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 with fundamental frequencies of approximately 1584 hertz and 1980 hertz. (Quincke's tubes consist of a glass whistle connected to a resonator. Drawings 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 this difference tone until the observer "is entirely satisfied with his introspections" (*ibid.*). Titchener next recommends the student listen for the difference tone of two Quincke's tubes of 1584 and 2376 hertz, which he describes as particularly loud and one octave below the lower generator. After these two hopefully easy introspections are each rehearsed several times, the student is instructed to proceed up and down the musical intervals, then to practice hearing difference tones when one or



both of the generating tones is quiet and when the duration of the tones is short. Finally, the student is instructed in similar procedures for the second and third difference tones and the summation tone. Titchener expects students to have only limited success in hearing the more difficult of these tones. Still, by the end of the experiment series – 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.

On my website, 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 an hour or two, to obtain a more vivid sense of the nature of Titchenerian introspective training.

Several features of this training procedure bear comment. First, the training does not proceed by mere repetition of a stimulus or presentation of stimuli in random order. Rather, it begins with comparatively easy introspections and proceeds to more difficult ones only after the easier are mastered. Also, since there is good theoretical reason to expect each difference tone to be heard at a particular pitch – reasons having to do with acoustics and the ear and confirmed by accomplished introspectors – the students’ introspective reports can be verified. Titchener suggests that several tones be produced and the students be required to say which tone is closest in pitch to the difference tone they purport to hear (I.2.70). Many (but not all) of Titchener’s exercises share these features of scaled difficulty and corrective feedback. Indeed, so do many ordinary non-

introspective training procedures. However, it is worth noting that on certain infallibilist or incorribilist approaches to introspection – approaches I have been assuming the reader of this essay does not share – it is hard to see how training of this sort could be possible.<sup>14</sup>

Let's back up a bit, though, and ask: Are students in this experiment really introspecting? In my experience, attempting to discern a combination tone feels 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.

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 outside world. Since it sounds odd to say that one is attending to one's ear, it is easy to suppose 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 similar to double images, color adaptation effects, or the floating black spots experienced by people with a certain type of eye damage – that is, as a kind of illusion, 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. (By the way, did the double image exist before you attended to it?) But surely you needn't be introspecting if, with yellow-adapted eyes, you mistakenly judge a white object to be blue. The blue is, in some sense, only in your own mind – but you do not introspect it. 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, for example, 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, deficiencies in her ear, 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. 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 such 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.

When an untrained observer at first cannot discern a combination tone, and 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, at least when one is deliberately listening for them. 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 by the person adopting the introspective attitude, 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 position that all mathematically simple combination tones contribute to any auditory experience of a musical interval, despite in many cases their never being reported even by the most sophisticated observers. (Besides the combination tones described, combination tones of  $2U - L$ ,  $3L - 2U$ ,  $4L - 3U$ ,  $2U - 2L$ , and others are sometimes reported for various stimulus intensities and frequency ranges, 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, consequently, 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 simple 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. Tellingly, 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.B. The “Flight of Colors”. At the end of the fourth experiment series, after the students have already conducted fourteen other introspective experiments on afterimages, some rather complex, and so have 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 [observers] now see



training to even a greater degree than does Titchener, indicating the necessity of several months of extensive practice in observing afterimages. Homuth divides his images (which do not include a vertical bar) into four parts, the center, border, outer frame, and extreme periphery, which undergo different color shifts. In his primary condition with bright white light, Homuth reports the center of the afterimage to be mainly blue alternating with reddish-violet, magenta, or pinkish-violet, although the sequence concludes with a brownish-yellow. The resemblance to Titchener's description is minimal at best.

William Berry (1922) offers a broad review of the literature on the flight of colors, dating back to Aristotle, and finds great variability of this sort among researchers. His conclusion is that there is no consistent sequence in the flight of colors, a point he supports with a study using his own observers (1927). (All Berry's (1927) observers were graduate students in psychology at Rochester, but he doesn't otherwise indicate their level of training.) On the other hand, Robertson and Fry (1937) point out that earlier observations were conducted under a wide variety of conditions and thus might be expected to produce variable results even if there is consistency in the flight of colors given any one condition. They report consistency among their observers, with results fairly similar to Titchener's (as do Weve 1925 and Barry and Bousfield 1934). The very sparse more recent research that I have been able to find does nothing to resolve the issue. The matter was less settled than dropped.<sup>16</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. Titchener seemed satisfied in this



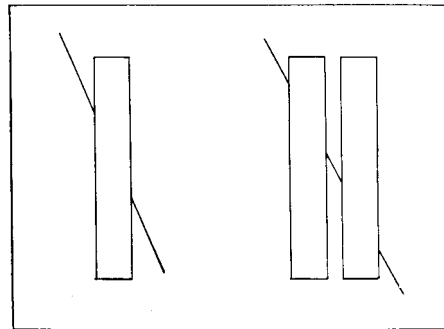
instance that observers with little general practice in introspective reporting but some practice in reporting afterimages – the undergraduates who had proceeded to the thirtieth page of his laboratory course (I.1.29-30) – would eventually settle on a common description of the flight of colors (presumably without feedback other than the explicit expectation that a consistent flight of colors will be found). We can duplicate these conditions.

Suppose it turns out that unpracticed observers report very different color sequences, while observers with both general experience reporting afterimages and specific experience reporting the flight of colors converge on Titchener's B – G – Y – R – B – G sequence; and suppose further that the observers have no special expectations about the sequence to be found. It would be possible that the trained and untrained observers had both accurately described their experiences – that somehow the training procedure had tamed the flight of colors. However, it is hard to see why this should be so. I would rather suspect, if the suppositions hold, that the pandemonium of colors in the naive introspectors' reports reflected some sort of introspective incompetence on their part and that the flight of colors is really as Titchener claims. We would then have learned something interesting about the evolution of afterimages, something that might have a general impact on our understanding of the visual system. And introspective training would appear to be vindicated, at least in this one particular research domain.

Of course, there is no guarantee that things would turn out that way. Even the best-trained introspective “experts” on the flight of colors might continue to give divergent reports. That would reflect rather badly on Titchener. Here, then, is an opportunity to assess the merits of introspective training.

III.C. Non-obvious Visual Illusions. The more powerful illusions that one generally sees in textbooks and at colloquia mask the introspective difficulties that arise for weak or non-obvious illusions. Confronted with Poggendorf's illusion (fig. 2 below, from I.1.165), most people feel unambivalently comfortable in reporting that, in some sense, the partly occluded line which we may know to be straight nonetheless "looks" crooked.

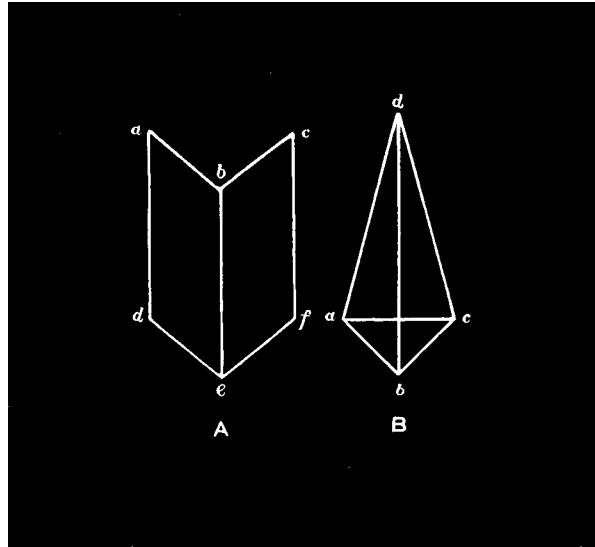
fig. 2



If we accustom ourselves only to such easy cases, the "best" illusions, we are not apt to reflect that one might have to look hard to find an illusion, that one might be talented or inept in the introspection of illusions, and that the criteria of illusoriness and visual appearance are evasive.

Examine the figure below, from page I.1.154:

fig. 3



Titchener invites his students to consider the following 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 the 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.

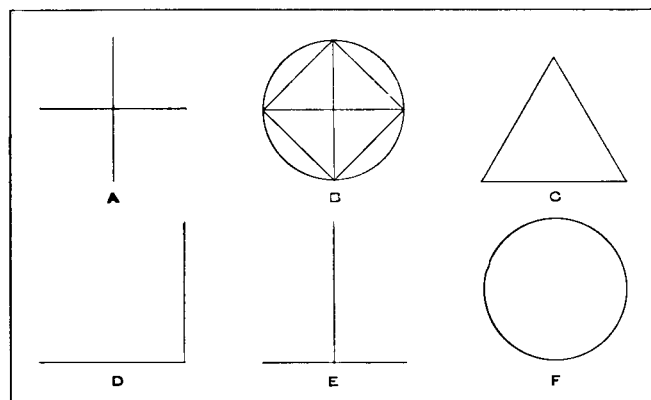
The difficulty lies partly in controlling one's attention and the movement of one's eyes, resisting the temptation, for example, to glance at point c as one is supposed to be moving

one's fixation slowly along ab. Since control of attention is crucial to many introspective tasks, this point is worth noting. It seems likely that attentional control varies considerably between people and that it may be improved by both general training in introspection and specific training with particular stimuli.

In the instructor's manual, Titchener comments that in both figures, the central line is generally seen as convex (i.e., closer to the observer) but that fixation on any point on a line tends to bring that line forward (I.2.310-311).<sup>17</sup> Although my introspections of the experiences produced by fig. 3 were initially quite disorganized, I find them now mostly to conform to the pattern described. But I am unsure whether I am now judging my experience of the figures more accurately or whether acceptance of Titchener's generalization has altered my experience. Perhaps a bit of both.

The introspective difficulties in fig. 3 do not stop there. To gain a more acute sense of them, it is helpful to consider another figure (from I.1.160; apologies for the imperfect reproduction, especially of B):

fig. 4



Titchener has his students view the objects in fig. 4 first with both eyes, then with one eye at a time. 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” (ibid.).

I find, in looking at these figures, as well as at those in fig. 3, that I feel considerable uncertainty about how they presently look to me. Perhaps the reader will feel the same way. In fig. 4A, does the vertical line look taller, shorter, or the same length as the horizontal? With one eye closed, does the inner horizontal limb (on the side of the nose) look longer, shorter, or the same length as the outer? Of course, you can carelessly toss out a response, confident that no one will prove you wrong (if such proof is even possible); but approaching these questions conscientiously, I at least feel unsure of myself, hesitant, or perplexed.

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 appear to you? Your task is not to report how things stand in the world – a task that might understandably require difficult discernment. To a reasonable degree of precision, the horizontal and vertical dimensions of the objects in fig. 4 are the same, the central lines of 4A, 4B, and 4E bisect each other, the circles are perfect, and the triangle is equilateral. Likely you guessed all this; my telling you does not spoil the task. The point is not to examine the lines in 4A, for instance, to guess which is longer, but rather to examine them carefully to determine which looks longer. Although judgments about how things are understandably carry some risk, judgments about how things look to you right now are insulated in a particular way. Could you really go wrong in such a judgment? And if you couldn’t go wrong, where does the difficulty lie?

Some readers will not feel any difficulty or have any sense that they could be mistaken. Those readers for whom such a feeling arises out of general temperament or philosophical conviction will probably not be much in sympathy with the themes of this essay. Others, however, may have approached the task too casually, since, after all, no Titchener is standing over your shoulder forcing you to write a detailed lab report. Consider, then, in more detail, figure 4A. Look at it both monocularly and binocularly. On first glance, in my experience, most viewers report no illusion: The two lines look to be equal length and to bisect each other perfectly at right angles. Nevertheless, figures of this sort are standardly presented as examples of the “horizontal-vertical” illusion (e.g., Robinson 1972, p. 97; Coren and Girgus 1978, p. 29).<sup>18</sup> Experts in visual illusion appear to agree that in some sense, the vertical line does look longer for normal perceivers. Perhaps something about the arrangement of this particular figure, with other figures and a frame nearby, compromises this illusion, but Titchener appears not to think so (I.2.309, I.2.315). Bearing this in mind, return to the figure. Are you still confident that the lines look the same length? With one eye closed, the horizontal-vertical illusion purportedly is reduced or vanishes (I.2.315; also Prinzmetal and Gettleman 1993). Titchener also claims that in monocular vision the inner horizontal limb looks longer than the outer, and that in binocular vision the upper vertical limb looks longer than the lower (*ibid.*).<sup>19</sup> Some people, myself included, do not find it obvious, on reflection, which of these illusions is present or absent in their own experience. But that would appear to entail uncertainty about how long the lines look.

Part of the difficulty here may be that it is not clear what it is for two lines to “look” the same length. Clearly, it cannot be a matter of one’s overall judgment about the length

of the lines, since one can judge that two lines look different lengths even when one knows them actually to be the same length. Is it a judgment about what one's assessment of the lines would be, if one were to depend only on visual cues? I doubt visual cues operate separately from general knowledge in the way that would seem to be presupposed by such an approach. And in any case, the necessary judgment would be a difficult hypothetical one, requiring us to ascertain the bases of and influences on our assessments – which we seem to be rather poor at, generally speaking, for reasons famously reviewed in Nisbett and Ross (1980). Do two lines look the same length if they extend equal lengths across the “television screen of visual experience”? Many psychologists and philosophers now think that there is no one locus of visual experience, where everything comes together as on a screen, but rather a sequence of processes, some in parallel, that may yield differing results.<sup>20</sup> Even if there is something like a television screen of visual experience, it is unclear whether how things look should be judged by their projection upon it. Does a penny viewed at an angle “look” elliptical or round? Does an oar half in water “look” straight or bent?<sup>21</sup> Presumably, there is an illusion in fig. 4A just in case the lines look different lengths. But now I am puzzled as to what this means or how we are to come to a dependable judgment about it.

To add a different sort of difficulty: 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 as the horizontal, but you recall the vertical line to have looked longer 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 were tempted to judge that the vertical line looks

longer but that temptation has passed and you are uncertain how far to trust your memory. Or... If visual experience is a complicated flux, there may be no stable experience of the lengths of the lines to underwrite a stable judgment about which looks longer.

One way to approach the question of whether there are illusions in fig. 4, even for people who claim to see none, would be to construct a variety of figures like fig. 4 but in which the relevant lines differ in length. The subject might then be required to choose which lines are longer, and the researcher could check for a tendency toward error in one direction or the other (as Künnapas 1955 did for figures like those in 4D and 4E). Alternatively, the subject might be given the opportunity to adjust the lines until they are judged to be equal length (as Gardner and Long 1960a&b did for the same types of figures). Such experiments either replace judgments about how long the lines look with judgments about how long the lines are, or blur the two judgments together. Perhaps this is acceptable if the subjects are sufficiently naive, but a subject aware of the possibility of illusion might treat the two questions rather differently. Furthermore, the presentation of multiple figures in sequence, or the ability to control the length of the 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 adjustable or vice versa can have a pronounced effect on the magnitude of error. It is therefore conceivable that someone may consistently err on such tests and yet experience no corresponding illusions in fig. 4.

So, if someone reports no horizontal-vertical illusion in fig. 4A, should we conclude that she genuinely does not experience such an illusion? Or might one line look longer than the other despite the observer's being an insufficiently capable introspector to



discover that fact about her visual experience? I can't see how we might easily go about deciding which is the case. To insist on the former seems unrealistically to deny the possibility of inaccuracy in assessing the complex stream of visual experience. To insist on the latter risks opening the door to a world of illusions that no one reports and that never deceive us.

Perhaps we can imagine an observer who, when presented with a variety of figures such as those in fig. 4, reports experiencing several small illusions in one direction or other for each of the figures, though most observers report no such illusions; and, further, that it turns out that both this observer and those who report no illusions err, on tests like those described in the last paragraph but one, in the directions predicted from the illusions reported by the first observer. Perhaps it would be plausible to suggest in such a case that all the observers experienced illusions in the original figures, that the lines actually looked to them, in some relevant sense of 'looked', to be different lengths despite their contrary report – and thus that we had on hand one introspector talented at reporting illusions and a mass of others misreporting their own visual experiences. But I doubt things will turn out so cleanly.

#### IV. Conclusion.

It is reasonable 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 can easily be provided to a subject in fifteen minutes. Since the scientific study of conscious experience depends on introspective report, trained observers ought in some cases to be desirable. Close examination of cases

from Titchener, however, reveals that the process of training may raise a tangle of epistemic and methodological issues that promise no easy resolution. Until we grapple with those issues and discover adequate means of distinguishing trustworthy introspective reports from undependable ones, the basic data of consciousness studies will remain muddy and inconsistent, and we will have no firm scientific footing.<sup>22</sup>

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<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 experience. However, higher order theories of consciousness need not be read as having these implications.

<sup>2</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 commonly accepted opinion. A variety of mechanisms for non-introspective knowledge of belief are explored by Ryle 1949; Bem 1972; Nisbett and Ross 1980; Evans 1982; Brandom 1994; McGeer 1996; and Moran 2001. We may also introspect experience associated with beliefs or other attitudes, such as verbal imagery and the phenomenal aspects of confusion, confidence, surprise, etc.

<sup>3</sup> The widely available English edition of Comte’s Positive Philosophy, “freely translated and condensed” by Harriet Martineau (1830/1896 and other editions) is too loosely translated. James provides a better translation of the relevant passage in his Principles of Psychology (1890/1981), p. 187-188.

<sup>4</sup> To adopt the standard perceptual attitude rather than the introspective attitude in the course of an introspective task is a form of what Titchener calls the “stimulus error”. For discussions and examples of the stimulus error (also called ‘R-error’), see Titchener

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1901-1905, vol. I, part 2, p. 90-91; vol. II, part 1, p. xxvi-xxvii; vol. II, part 2, p. lxiii-lxiv, 198, 203-205, 251-253; 1910/1915, p. 202-203; 1912b, p. 488-489; also Boring 1921.

<sup>5</sup> 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 and having them record an immediate retrospective report.

<sup>6</sup> Among the more interesting discussions of this issue are Ryle 1949; Bem 1972; Nisbett and Ross 1980; Gopnik, Goldman, et. al 1993; Nichols and Stich forthcoming.

<sup>7</sup> This may also involve the “stimulus error”. See note 4 for references.

<sup>8</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. The 1971 reprint of Experimental Psychology omits the second part of the first volume, and each part of the first volume is itself misleadingly divided into two “parts”.

<sup>9</sup> For more specific discussions and examples of the benefit of practice in focusing on stimuli, steadyng 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

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and interfering influences, see I.1.167; I.2.220-222; I.2.341-345; II.2.402, and, in conjunction with each other, II.1.104-106; II.2-3; II.2.260.

<sup>10</sup> However, E.G. Boring claims that later in his career Titchener put “considerable faith” in the method of naive phenomenological report that he here criticizes, though he never published on the subject (1950, p. 416; also 1927, p. 502; R. Evans 1972). It is unclear how much Titchener actually shifted his position or what his motivations for doing so would have been.

<sup>11</sup> Psychophysicists sometimes train subjects perceptually – e.g., in “analytic listening”, which involves distinguishing particular tones in a complex auditory stimulus – but such training is not generally regarded as introspective or approached with Titchenerian introspective standards in mind.

<sup>12</sup> For readers unfamiliar with these terms: Frequency is a physical measurement of the rate of vibration, in this case of a sound wave, in hertz or cycles per second. Pitch is a subjective phenomenon pertaining to how high or low a tone sounds on the musical scale. Generally speaking, higher frequency tones sound higher in pitch (doubling the frequency increases the pitch by one octave), though as with most psychophysical phenomena the relationship between stimulus and experience is complex when examined in detail.

<sup>13</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 in this issue, as should become evident later in this subsection.

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<sup>14</sup> Descartes is generally viewed as the historical source of infallibilism and incorrigibilism regarding judgments about current conscious experience. More recent examples include Lewis 1946; Ewing 1951; Ayer 1963; Shoemaker 1963; Rorty 1970; and, in restricted forms, Dennett 1991, 2000; Gertler 2001; Chalmers 2002. Criticisms include Armstrong 1963; Churchland 1988; Hill 1991; Audi 1993; Kornblith 1998. In Schwitzgebel 2002a, I argue that these criticisms do not go far enough.

<sup>15</sup> Blue and yellow are generally treated as opposing colors in visual perception, as are red and green.

<sup>16</sup> Wallace (1979) takes individual variability in the flight of colors for granted, while Feldman, Todman, and Bender (1974) assume the contrary. In his influential general review of the literature on afterimages, Brown (1965) seems at one point to agree roughly with Titchener's description 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). A related issue is whether people experience a similar or variable evolution of colored afterimages following exposure to colored light. The evidence on this question is also divided (see, e.g., Homuth 1913; Weve 1925; Judd 1927; Brown 1965; Stamper, Lund, Molchany, and Stuck 2000; Taya and Ohinata 2002). Other papers of interest include Fröhlich (1921) and Shuey (1924).

<sup>17</sup> Many people have discussed ambiguous figures that appear to reverse perspective, the most famous example being the Necker cube. The view that attention to a particular vertex tends 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 (Köhler and Wallach 1944; Hochberg 1950; Pritchard 1958; Gregory

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1970; Girgus, Rock, and Egatz 1977; Peterson and Hochberg 1983; Long and Olszweski 1999).

<sup>18</sup> Classical sources for the horizontal-vertical illusion include Oppel (1854-1855) and Künnapas (1955). Titchener claims that every object in fig. 4 shows this illusion, except the last, which he says shows no illusion.

<sup>19</sup> I have been unable to find contemporary verification of these illusions (the first of which is supposed also to be present in fig. 4E, the second in 4B). Titchener attributes to Kundt (1863) the view that in monocular vision the outer limb appears longer than the inner. I'm not sure this is unambiguously implied by Kundt; but Kundt does clearly claim that in bisecting a horizontal line, subjects will show bias toward one side. I informally tested this claim by having subjects monocularly bisect, with a pen stroke, lines of varying length, but I found no consistent trends. Titchener attributes the view that the upper limb looks longer than the lower to Delboeuf (1865; see also Nicolas 1995). I also informally tested Delboeuf's claim, parallel to Kundt's, that subjects bisecting a vertical line will tend to cut it too high. My subjects actually showed a weak tendency in the opposite direction.

<sup>20</sup> Such a perspective is engagingly explored in Dennett (1991).

<sup>21</sup> Differing views on these questions are taken in the philosophical debate on the "argument from illusion" (e.g., Ayer 1940; Austin 1962).

<sup>22</sup> For helpful comments and discussion, I'd like to thank Dillon Emerick, Kirk Gable, Felipe Leon, Mike Gordon, Tori McGeer, Pauline Price, Bill Prinzmetal, Erich Reck, Josh Rust, Colleen Ryan, Gideon Yaffe, and Jeff Yim.

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