

## WHAT'S NEW? NOT US

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### Abstract

*In twelve current History of Psychology texts, psychophysics gets no discussion for the years since about 1880. Signal Detection Theory appears in just one book (and is identified only as what APA gave John Swets an award for). Stevens' Law appears in only two books, one of those including it as a "refinement" of Fechner's Law. For comparison, five books mention two-point thresholds, five mention Weber's Law, all twelve mention Fechner's Law (often without a formula), seven mention Fechner's psychophysical "methods" (apparently methods for accomplishing something of little or no subsequent importance) and three provide Fechner's interesting biography. Have we accomplished nothing since then? Have our successes become so commonplace and familiar that they don't merit discussion? What became of us? What have we done for them lately and why don't they notice?*

Many schools offer a course on the history of psychology (sometimes called History and Systems) and some require their students to take it. I inspected twelve of the recent textbooks (some that a friend who teaches the course had, and some more hurriedly at publishers' booths at conferences). In essence, as these textbooks present it, psychophysics did not contribute to the development of psychology as a science after about 1880. (I also looked at a few books from the 1990s; they look quite like the more recent ones in these respects.)

It is quite obvious by inspecting the books' topical coverage that people write books based in part on reading what the competition looks like. They all say something or other about thresholds, occasionally (Benjamin, 2007) distinguishing the Ascending and Descending Methods of Limits. Many of the 12 discuss the 2-point threshold in particular as an example of a difference threshold, before discussing Weber's Law in general. Most credit Fechner with developing "methods" for determining thresholds. Several mention Fechner's law, some mention that it's "logarithmic" and some provide a formula. So the textbooks do properly put some of psychophysics into the early history of scientific psychology. In addition, several provide some interesting biographical information on Fechner (who is, indeed, a good story) and one mentions that Fechner influenced Freud's ideas about the unconscious. None of those latter things are psychophysics, but at least they're Fechner.

But once Wundt's laboratory is established, things change. Consider the treatment of S. S. Stevens, for example. Four books mention him in connection with the rise of operationism in psychology. One mentions him in passing and only because George Miller was a research fellow in Stevens's lab. Two mention Stevens's power function and both do so where they're discussing Fechner; one of those provides a formula and the other merely says that it's a mathematical refinement of Fechner's original psychological principle. One (Chung & Hyland, 2012) says that "Fechner's work forms the basis for modern psychophysical measurement" and cites two Stevens references – "On the Psychophysical Law" and "To Honor Fechner and Repeal His Law". In no books do the discussions of Fechner's and Stevens's laws have any experimental results accompanying them – those two formulations appear to be simply theoretical exercises.

Signal Detection Theory fares even worse than does psychophysical scaling. It gets a mention in only one book, there in connection with John Swets's receiving the APA

Distinguished Scientific Contribution Award for his “extension” of SDT “as an alternative to the magnitude estimations of Fechner and Stevens”. Sadly, “magnitude estimations” appear nowhere else in the book. Happily, SDT is said to treat the experimental subject as an active decision maker operating under uncertainty.

So what’s our problem?

First, psychophysics suffers from having been famously characterized as boring by William James (1890), in part due to its focus on methodology. At one point (p.192) he complained that “psychology is passing into a less simple phase. Within a few years what one may call a microscopic psychology has arisen in Germany, carried on by experimental methods, asking of course every moment for introspective data, but eliminating their uncertainty by operating on a large scale and taking statistical means. This method taxes patience to the utmost, and could hardly have arisen in a country whose natives could be *bored*. Such Germans as Weber, Fechner, Vierordt, and Wundt obviously cannot”. He was not alone in this diagnosis; one of psychophysics’s supporters thought so too. L. L. Thurstone (1931) told the Midwestern Psychological Association that several years earlier “it seemed to me that psychophysics was really a very dull subject in spite of the fact that it did offer the satisfaction of clean and quantitative logic.....There is a great deal of hairsplitting about just how a limen should be determined with the greatest possible precision...And then you can find shortcuts for these methods by which you can determine somebody’s limen very quickly when you are in a hurry for a limen...[But] I venture the guess that not more than perhaps half a dozen psychologists in this room have ever needed or wanted somebody’s limen for anything with a high degree of precision” (pp. 249 - 250). And, indeed, the history books do reliably discuss the “methods” for determining limens. We have continued to find more efficient schemes for finding limens and discrimination functions and the like (see Kingdom & Prins, 2010, Chapter 5 for several). We are right to regard psychophysics’s triumphs in this regard as important but the broad range of psychology is not so methodologically careful, nor is it interested that we are.

Second, psychophysics suffers from its primary association with the study of the senses. Sensory topics arise only little in history texts. One book discussed color vision in an early chapter (indeed, the book’s first chapter not entirely about the history of philosophy) called “Physiological Influences on the Development of Psychology”. That chapter discussed Galvani, Phineas Gage and Hodgkin & Huxley; the different views of Hering and of Young & Helmholtz and those of Christine Ladd-Franklin and Hurvich & Jameson. It also included the material on psychophysics, and the work of von Bekesy modernizing Helmholtz’s view of pitch perception. None of those topics reappeared later. Gestalt psychology, however, does get extended coverage (sometimes entire chapters) considerably later in several books. So by and large, the history books do not take up the study of sensory and perceptual processes (though James Gibson’s “ecological” approach to perception gets a few pages in a few books, mostly because it’s “ecological”). The history books’ inattention to sensory and perceptual topics in the 20<sup>th</sup> century surely contributes to their lack of interest in psychophysics.

If psychophysics shows up in introductory psychology textbooks it is in the introduction to the chapter(s) on sensory function where students learn about thresholds and occasionally SDT. That’s where it appears in the popular introductory text by Schacter, Gilbert and Wegner (2011). That book’s chapter on the senses, unfortunately, never mentions or displays any thresholds other than Galanter’s (1962) list of limens specified in “familiar” physical terms.

Thurstone (1931) declared that psychophysics would be no less logical but far more interesting if its subject matter expanded from the measurement of sensory experience to matters of “more psychological significance than the sensory limen” (p.250) – in particular,

attitudes. And so he proposed taking up matters of more psychological significance, e.g., asking people “Which of these two offenses do you consider in general the more serious?” rather than “Which of these two little cylinders is the heavier?” (p.250). He and Chave (1929) had already declared their system for attitude measurement to be “psychophysical” in the title of their monograph. And, indeed, there has been work along these lines on what we might call social psychophysics (see, e.g., Stevens, 1975, chapter 8; Wegener, 1982).

We in ISP often have an interest in the notion of measurement. None of the history texts mention Stevens’s classification of measurement scales nor any subsequent development of what we think of as measurement theory. Although I did not take proper notes on this topic, I know that some of the history books do discuss the psychometricians’ concepts of reliability and validity as important considerations in measurement associated with mental testing. All this is quite consistent with the treatment of measurement issues in textbooks of introductory psychology. For instance, consider the treatment of measurement in Schacter, Gilbert and Wegner (2011). The authors say that measurement requires “operational definitions” (and so they propose that we can define “happiness” by the frequency with which a person smiles or by the answer to the question, “How happy are you?”) Scale type of course goes unmentioned because in this approach there is no actual thing properly called “happiness” other than the measurement adopted in the “operational definition”. And so by metaphysical sleight-of-hand, the measurement becomes the thing it measures. Despite that, the book pulls back from that position to discuss validity as “the extent to which a measurement and a property are conceptually related”. It then discusses reliability and power (“the ability of a measure to detect the concrete conditions specified in the operational definition”). All this is accomplished in approximately three-quarters of a page. It is followed by a page-and-a-half on Demand Characteristics and another half-page on Observer Bias. What we in ISP think are the important characteristics of measurement are not major concerns in this introductory textbook nor in any others that I know of.

One important thing that unites psychophysics with many other areas of psychology is the underlying belief that subjective experience is measurable, that stimuli can be thought to have locations along some psychological dimension. As Marks (1982, p.43) put it, “The modern enterprise that Fechner may be said to have begun is the quantification of mental events.” (William James, on the other hand, thought of Fechner’s enterprise as one whose “proper psychological outcome is just nothing” [p.534]). Of course, people before Fechner thought that sort of quantification possible in one setting or another (Marks mentions Plato), but Fechner provided the first program for trying to accomplish it. And it is so intuitively appealing that it seems altogether reasonable that we can try to measure people’s impressions of occupational prestige, or seriousness of crimes, or the locations of politicians or voters along a dimension extending from “Very Conservative” to “Very Liberal”. (This discussion ignores some important differences between psychophysics and psychometrics, and it will not be clarified here.) This sort of idea has motivated a great deal of psychophysical work and much of it (at least much of the sensory and perceptual work) tells a coherent story (for a good recent summary, see Teghtsoonian, 2012).

The notion of subjective experience is what motivates much of social psychologists’ interest in such “context effects” as assimilation and contrast. Two recent social psychology books (Biernat, 2005; Stapel & Suls, 2007) take explicit note of the psychophysics ancestry of the social psychology investigations. And it is an idea for which we should receive more credit.

Psychophysics needs something of a public relations campaign. It needs to reduce the textbook emphasis on psychophysical methods for learning things and enhance attention to what we’ve learned using them. If we can do it with intrinsically interesting subject matters,

so much the better. We need to speak not only of measurement accomplishments but answer the question, “Why does humanity want to know this?” Applied work using SDT or the sort of work that Howard Moskowitz (2012) does with food might help reawaken general interest in our field. So might a wider appreciation of that fact that SDT has provided informative new views of such varied phenomena as “depressive realism” (Allan, Siegel, & Hannah, 2007), and the influence on memory of “levels of processing” (Sheridan & Reingold, 2012).

This leads to what may be the largest part of our problem. Fechner thought of psychophysics as the study of the relations of body and mind, of the material and the mental. He distinguished between outer and inner psychophysics. To a considerable extent, psychophysics has been essentially subsumed into cognitive science (outer psychophysics) and behavioral neuroscience (inner psychophysics). And so even if some of our interests continue to get mentioned in the history books, our name has disappeared. For example, it is rare (I think) to see mentions of psychophysical ideas and their contributions to the ideas of the now-popular behavioral economics including the attempts to determine the “utility function”. (Poundstone [2010] is not a psychologist but his trade book on the topic makes our role in all that clear. Sadly, the psychologists and economists who think of themselves as behavioral economists seem not to.)

Fifty years ago, Gene Galanter (1962) described psychophysics as the interconnected studies of detection, recognition, discrimination, and scaling. That was a sensible way to present psychophysics as a science with a subject matter – processes that occur widely in a great variety of circumstances. Now, all that remains of that chapter is a list of catchy values for human sensory thresholds. Perhaps it’s time for a new try.

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