Fechner’s Elusive Parallel Law

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Abstract
Weber’s Law states that the differential threshold or just-noticeable-difference (jnd) is proportional to the physical intensity of the stimulus. Fechner built up his logarithmic law of sensation intensity from Weber’s Law and the assumption that all jnds are subjectively equal. He thought it important that the Parallel Law should also hold. The Parallel Law states that, when perceived stimulus intensity is changed by something other than physical intensity (such as adaptation), Weber’s Law continues to hold: discrimination should be unchanged provided the perceived values of the two stimuli change in the same ratio. Fechner claimed that weight discrimination was unaffected by weight adaptation; he was unsure about light adaptation; and he claimed that tactile length discrimination was unaffected by perceived changes caused by the bodily location of the stimulus. Modern research on adaptation for weights and other sensory stimuli shows that changes occur both in perceived intensity and in discrimination. Discrimination between stimuli is usually finest when the adaptation level is appropriate to the test level. There is insufficient evidence concerning the discrimination of tactile length and visual length when perceived length is changed. However, the Parallel Law may be untestable because of the difficulty of obtaining measures in the same experiment both for changes in discrimination and for the ratios of the perceived changes of the stimuli.

Keywords
Weber’s law, Fechner’s law, parallel law, discrimination, adaptation, weight, light, length

1. Introduction
One hundred and fifty years ago, Fechner (1860) published Elemente der Psychophysik. In this book he sought to establish Weber’s Law for several sense modalities, because he believed that the logarithmic law of sensation magnitude was dependent on the validity of Weber’s Law. Weber’s Law states that the jnd (just-noticeable-difference) or DL (difference limen or threshold) is proportional to the

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Figure 1. Fechner’s Parallel Law by Nicholas Wade. Fechner can be seen at a slightly different brightness in the text from p. 300 of the first volume of *Elemente der Psychophysik* (Fechner, 1860).

physical intensity of the stimulus. Fechner wanted to build a relationship between a physical dimension of a stimulus (such as its weight) and its psychological attribute (heaviness). He assumed that all jnds are subjectively equal, and that this would produce a logarithmic relation between the stimulus intensity and the sensation — assumptions that have both been questioned (see Heidelberger, 2004; Masin et al., 2009). Most researchers nowadays accept that a power function is a more likely relationship, or that a logarithmic function is one of a family of possible functions (see review by Murray, 1993, and commentaries). Nevertheless Fechner is still respected for his pioneering work in psychophysics and for his other wide-ranging interests (Heidelberger, 2004).

One of Fechner’s lesser known statements was the Parallel Law, the assumption that Weber’s Law applies to changes in perceived stimulus intensity in the same way as to changes in physical intensity: if the perceived intensity is altered by some factor other than physical intensity (such as adaptation), discrimination should remain unchanged. He added the proviso that this would be true only if the two stimuli appear to change in the same ratio. In Fig. 1, Fechner is shown in the text from his *Elemente* in which the Parallel Law was introduced.

Fechner discussed the Parallel Law in Chapter 12 of *The Elements of Psychophysics* (1966, p. 250). He wrote: