REVIEW ARTICLE

Fechner (1801-1887) For and In Psychology: Part I

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Introduction and overview

A rich interdisciplinary literature on Fechner emerged with the bicentennial of his 1801 birth in 2001. Within such a context, it seems a shame for psychologists to limit themselves to remembering Fechner's psychophysics to the exclusion of his many other facets. Since the Fechner corpus, including so much secondary literature or Fechneriana, has become so large, I have resolved to provide an overview of Fechner in two parts. Here I will cover "Fechner For and In Psychology" on Mind-Body, Psychophysical Parallelism, Psychophysics, Experimental Aesthetics, and Ethics. This comprises what we might call the Psychological Fechner, though its breadth reminds us of how psychology has dissolved today into specialty journals of philosophy, vision research, experimental psychology, history of psychology, etc.

Elsewhere I will review "Fechner beyond Psychology" on Humor, Scientific Translations, Indeterminism and Freedom, Nonreductive Materialism, Atomism, and Panentheistic Philosophy of Religion. Taken together, this two-part project will portray Fechner in his theoretical positions. His holism is surely what he stood for; he referred to his holism as a Day View triumphing over the Night View. This did not excite followers in his time, though his Leipzig colleagues wisely gave him a lifetime stipend after he resigned his chair in physics in the 1840s. From this freedom to write and experiment emanated many projects circling around not only psychophysics but an indeterminism that led to probability theory. Contemporary with Fechner's death in 1887, the age of generalism (the *Universalgelehrter*) had largely passed. Scholars rarely spanned so many disciplines. Psychologists by and large no longer probe philosophical foundations or neighbor disciplines. We live in an age of specialism. Viewing Fechner in this way gives us an opportunity to see what has been lost and to ask ourselves whether a science that is *not* holistic deserves the name of science (*Wissenschaft*, scientific worldview).

1. Pleasure and a Eudemonistic Ethics

1.1. Ethical Theory Quantifies Pleasure

Fechner's proposals for an empirical theory of pleasure actually entered into a lively discussion in nineteenth-century thought, psychoanalysis, and the New Psychology,

while they were largely ignored in philosophical ethics (Woodward, 2010). The themes are by now familiar: immediacy, identity, summation, and stability. He was too original in starting with an ethics from below.

The idea of a natural science of ethics had appeared prominently in two other German sources, Friedrich Schleiermacher and Friedrich Beneke. However, Fechner's biographer, Hans-Jürgen Arendt (1999, p. 106), admits that we have no direct evidence of Fechner's reading or discussion of these predecessors. In his journal for June 6, 1846, Fechner observed that during his loss of sight in the early 1840's, "since it was not allowed me to regard external nature in a fruitful way, I was driven to the inner world… I set down the main views of these lectures recently in a small treatise under the title "On the Highest Good" (1846, pp. 286-287). He was 45 years old.

It was his initial quantification of pleasure, and his later assumption about the relation of pleasure and pain to overall stability or constancy in mental energy that inspired subsequent scientific theories of pleasure. In 1846 Fechner viewed pleasure somewhat as a physicist might be expected to do. It had quantity and it could be not only measured but used to compute consequences of action.

> No measure can be more linked to action than what lies immediately in feelings. … The principle of pleasure is a computational principle… When have people ever acted other than with reference to the assumed consequences of their actions upon their happiness and unhappiness? (1846, pp. 15-16)

Befitting an empirical theory, the quantitative pleasure principle has corollaries; among them, that we can make mistakes about pleasures, we can sum them, and we can calculate consequences of our actions in regard to future happiness (Fechner, 1848b).

Hermann Lotze gave Fechner the closest reading. He reviewed Fechner's essay (1847), and he developed a scientific theory of feelings in his *Medical Psychology* in 1852 (Woodward, 2015).

> we will be everywhere inclined to derive pleasure from *agreement* and displeasure from *conflict* that occurs between the effects of a stimulus and any of those conditions in which the lawful expression of the bodily or mental life is bound (Lotze, 1852, pp. 233-234).

Let us call this the principle of agreement and conflict: pleasure is harmony and displeasure is conflict in the nervous system.

Years later, Fechner (1873) enunciated a version of Lotze's agreement and conflict principle. The mind tries to keep the quantity of excitation low, or stable:

> According to this hypothesis, every psychophysical motion rising above the threshold of consciousness is attended by pleasure in proportion as, beyond a certain limit, it approximates to complete stability; while between the two limits, which may be described as qualitative thresholds of pleasure and displeasure, there is a certain margin of aesthetic indifference (Fechner, 1873, p. 94, in Freud, 1961 [1920], p. 2).

Coming long after the psychophysics, Freud introduced the concept of threshold as well as stability and psychophysical relation, all of which were lacking in 1846. Freud acknowledged that "G. T. Fechner held a view on the subject of pleasure and displeasure (*Lust und Unlust*) which coincides in all essentials with the one that has been forced upon us by psycho-analytic work" (1961 [1920], p. 2). Psychoanalysis borrowed concepts of pleasure and displeasure, constancy and strangulation of affect, and catharsis, from the Fechner-Lotze tradition rather than the Helmholtz School of physiological reductionism (Sulloway, 1979, p. 67).

1.2. Ethical theory

Fechner's book *On the Greatest Good* (1846) is an ethical theory with a hedonistic and religious core. He aimed at a larger good than mere individual pleasure: namely, how ought we to act according to the will of God? To act for God is to act in accordance with nature. His moral imperative became "humans ought to seek to bring the greatest pleasure, the greatest happiness into the world in general, into the whole of time and space" (1846, p. 4). Höffding remarked (1900) that "Fechner had arrived…at a theo-physic before he began to develop a psycho-physic" (p. 529). He believed that God informs our actions, so long as we act in accord with nature. The philosopher Lotze answered:

> We are not against the concept of a maximum of pleasure but only against the claim that this is the pinnacle of an additive scale. A true magnitude will depend upon an object (*Gegenstand*) or content (*Inhalt*). A circle of conditions must be developed in which the events of the world could develop (Lotze, 1847, *KS*, *2*, 282-283).

For Fechner, by contrast, feelings are immediately given, whether in consciousness or in the bodily unconscious: "All of a person's subjective and objective motives for action "... include an aspect of pleasure, either openly or covertly, consciously or unconsciously" (1846, p. 10, in Heidelberger, 2004, p. 52). Feelings are identical to bodily processes in the senses developed above in Section 2 "Mind-Body Theory" and Section 3 "Psychophysical Parallelism."

By qualitative content or object, I think Lotze means judgment in the sense of Brentano when he wrote that intentionality is directedness of a mental act at an object or content. "Consciousness is always consciousness of something." If we know that we are angry, it is an objectification of a psychological act. We become aware of ourselves as angry.

Unwilling to accept the critique of Lotze and later Brentano, Fechner simply reaffirmed that he meant his hedonism or eudemonism as an empirical law:

> Kant calls it a mistake of all principles of pleasure that they make morality into something empirical; since what pleasure and pain offer can only be recognized from experience. I find it an advantage of all pleasure principles that they not only allow us to use all experiences in life for the theory… but that they require us to enter into the empirical nature of humans and things. How could a theory of action, which has to move in the

> empirical realm, be itself independent of the empirical? (1846, p. 20)

Pleasure and displeasure constitute an empirical *fact*. In Fechner's words,

> [Pleasure] is not like a house, but like the indestructible stone building material … pleasure is something unanalyzable, unexplainable to the understanding, but at the same time the best means of dividing and binding because nothing can be divided from it (1846, p. 9).

In a sense, his insight about the fundamental nature of pleasure in human experience is shared by clinical psychologists today. "God lets what is harmful be devoured by its consequences, and what is good is multiplied by its seeds" (1846, p. 13). Granted that hell on earth also exists, he ascribes that to states that the individual creates. "Why is there pain and evil in the world? We do not know and no one knows; it is there, it is there with God, and we cannot have God without it…Therefore, painful beginnings and detours may be as justified in His world as pleasurable ones. They only redouble His pleasurable way" (1846, pp. 6-7).

In the idiom of the preacher's son that he was, Fechner asserted that God's fear-inspiring punishment inspired us to greater blessedness. In some Lutheran sense, he believed that God heals evil deeds. Yet Fechner did not invoke a New Testament concept of sin, forgiveness, or redemption. Fechner's boldly pragmatic ethical theory may be succinctly summarized as a mental apparatus that maintains (1) a measure of agreement between stimulation and function, (2) an awareness of its effect on us, be it conflict or pleasure, and (3) a striving for conditions of stability, perceived as pleasurable. Every psychophysical event rising about the threshold of consciousness confers feelings of pleasure or pain. These feelings evoke associations with signs that convey meaning in the world (cf. Fechner, 1873).

Psychoanalysis borrowed from the "Fechner school" the economic assumption that the mind keeps the level of activity low, that sometimes strong affects cannot be discharged, and that there is a topography of unconscious and conscious whereby affects made conscious can diminish or disappear (Sulloway, 1979). But Fechner, and Freud as well, offered much more than a "biology of the mind." His theory of pleasure as goal oriented, quantifiable, and conveyed in signs, constituted the seeds of an ethics of therapy that came to be embedded in interpretations of meaning in twentieth-century psychological practice.

2. Mind-Body Theory and the Identity View

2.1. Phenomenalistic Theory

The Zeitgeist in philosophy had shifted away from Kant's noumena or substance to Kantian phenomena or experience. Fechner's phenomenalistic theory is conveniently found in his book on atomism in 1855: "This orange that I see: I can also touch it, smell it, taste it, peel it, hear a sound by striking it; I can do this not only now, I can repeat it; not only I can do it but numerous others can also" (Fechner, 1855, p. 96; Heidelberger, 2004, p. 91). Note the similarity to J. S. Mill's "permanent possibilities of sensation," which affirmed objects as collocations of sensation. Fechner denied any *noumenon* behind this phenomenon (Kant),

he rejected any hidden substance (Spinoza), or "real being" (Herbart). In what follows, I am borrowing from Michael Heidelberger's novel interpretation, in that he compares Fechner with J. S Mill, William James, and Bertrand Russell. "For what then do we need a solid thing lurking behind the phenomena?" (Fechner, 1863, p. 205). The concept of a thing does, however, assume a regularity behind the phenomena (Fechner, 1861, p. 214). Laws link phenomena into physical objects, and similarly, they link "sensations, thoughts, and so on" (1861, p. 207). Both mind and body consist of interconnection.

What is the relation then between these two classes of phenomena that we have come to call "body" and "soul"? Soul is nothing mysterious in this empirical sense of a regular series of phenomena appearing together. "Self phenomena can only be interconnected, if they can be perceived by others as connected phenomena…This view is wholly an identity view, in that it holds both, the body and the soul, to be merely two different manners in which one and the same being appears" (1861, p. 210f; Heidelberger, 2004, p. 97). Fechner gives the example of a coin in which the body is one side and the soul the other. A change in one yields a change in the other. This is a mutual relationship in that psychological changes have physical correlates.

Yet Heidelberger (2004) urges that this is an asymmetric relationship in that for every mental event, there is a physical change, but not vice versa. "Nothing can exist, develop, or move within the mind, without there being something in the body that exists, develops, or moves" (Fechner, 1861, 211). Fechner calls this claim "the basic law of psychophysics." To understand this delicate and surprising distinction, Heidelberger invokes the contemporary term "supervenience." He argues that supervenience makes possible a non-reductive materialism in that mental properties depend upon physical properties (2004, p. 98). Supervenience also means "An object cannot alter in some mental respect without altering in some physical respect" (Davidson, 1970, p. 214). Reviewer Laurence Shapiro (2004) goes along with Heidelberger in conceding that mind and body "do not differ ontologically, but perspectivally" (p. 741). However, if mind and body are simply two ways a thing appears, then why posit asymmetry? In the examples Heidelberger gives, the bent coin, and even the billiard ball with a dot on it (see below), seem to be symmetric and not asymmetric relations

2.2. Double-Aspect Theory

Reviewer Alex Rueger remarked about Michael Heidelberger's *Nature from Within* (2004 [1993]) that "Although one may sometimes have slight doubts about whether the conceptual tools from contemporary analytic metaphysics which Heidelberger uses ('non-reductive materialism', 'scientific realism', 'functionalism', ...) are indeed suitable to capture Fechner's thoughts, such doubts are clearly far outweighed by the insights gained into virtually forgotten debates" (p. 265). For example, Heidelberger points us to Fechner's novel interpretation of double-aspect theory. He argues that the psychical and the physical are law cluster concepts, using a term from Putnam (1962). Fechner's basic law relates these two clusters (Putnam, 1962, Heidelberger, 2004, p. 99). Otherwise, in the customary dualistic view, mental and physical would be properties of objects. But Fechner has defined

both the mental and the physical by the clusters of phenomena that make them up.

The dualist would claim that the subjective is accessible to only one person. But if we require potential phenomena for physical objects, so for Fechner we also require them to infer the internal phenomena of other persons (Heidelberger, 2004, p. 100). Fechner here adopts the double-aspect theory to make the inner phenomena empirically acceptable. This is explained in two ways. "Mental and physical are strictly parallel" (1851, *2*, 330), or "generally we call the mental a function of the physical" (1860, *1*, 8). But how can a functional relation obtain between two aspects of the same object? If a causal relationship exists, we could infer from one to the other. "Fechner's mind body theory stands and falls on the issue of the criterion": functional relation or causal relation? (Heidelberger, 2004, p. 102).

Heidelberger admits that Fechner "neglected this question," so he suggests the analogy of a billiard ball with a spot on each of its halves. As the ball rolls, each spot is functionally dependent upon the other. If, however, the ball was to strike another ball, and the impact made a spot on the other ball, this becomes a causal relation. The difference is the contingent relation of the collision. Now apply this to the mind, where a change in mind is accompanied by a change in the body. This implies functional dependence. The parts of the body that produce the unity of consciousness, however, would comprise a causal relationship. "Why… should the soul - a unified being that bundles diversity within itself - not be tied to a physical system that itself is a network of diversity?" (1860, *2*, 415, in Heidelberger, 2004, p. 102). Shapiro (2004) suggests that Davidson's Principle of Causal Interaction, which states that some mental events interact causally with physical events, seems in direct contradiction with Fechner's view here" (p. 743).

Heidelberger subsequently clarified this point in his essay "Functional Relations and Causality in Fechner and Mach" (2010). Heidelberger referred to *Elements of Psychophysics* (Fechner, 1860, *1*, 8.), where Fechner defines a functional dependency as a relation between a psychical and a physical variable, just as a mathematical dependency between $y = f(x)$. This could be a functional relation in terms of measurement, or in terms of the mind body problem, or as a law of nature. "In all three cases, it is important to explain the difference between a functional dependency of a variable upon another and a causal relationship between two (or more) variables" (Heidelberger, 2010, p. 163). Heidelberger reiterates that a functional dependence does not imply causality, and that the relationship of mental to physical is asymmetric: psychological dependent on physical, but not vice versa**.**

2.3. Implications of the Identity View: 1845-1848

Fechner contrasted his position with that of Leibniz: "Leibniz says: …two clocks mounted on the same board adjust their movement to each other by means of their common attachment…; this is the usual dualistic notion of the mind-body relation…Leibniz has left out one point of view – the most simple possible. They can keep time harmoniously – indeed never differ – because they are not really two different clocks" (1860, p. 4; Heidelberger, 2004, p. 103). Fechner dismisses pre-established harmony because the clocks are identical.

His double-aspect view reinterprets pre-established harmony: from the inner aspect, the clock has unity; from the outer aspect, it comprises gears and chains; "their essence is identical" (Fechner, 1851, *2,* 347; Fechner, 1860, *1,* 5). He writes that we do not know why this is the case. He uses the terms "synechological principle" and "resultants" to describe the emergent properties of the system. He argues that the identity view has the least metaphysical baggage. If there is no empirical refutation -- no instances that would require us to split the identity of body and mind -- then the identity view seems to contain no more metaphysics than any law of physics.

Anticipations of Fechner's identity view are found in his humorous writings. His playful philosophy of science reflects an early exposure to *Naturphilosophie*. Marilyn Marshall characterized his proclivity for analogical thinking as psychological acrobatics or cognitive inversion (1988). In "The Shadow is Alive" (1845) Fechner humorously questioned the identity of original object (*Urbild*) and its reflection (*Abbild*), claiming that just as the body has a soul, so does the shadow. I once argued that analogies such as this convey functional relations (1975), a kind of prelude to the functional relations discussed under "double aspect theory" above. In yet another speculative leap, Fechner claimed that God's immanence in art and humans is analogous to sentience as a function of bodily activities in plants as in animals.

In Fechner's popular book, *Nanna or the Soul Life of Plants*, plants are active, they communicate with one another, they obey a principle of economy, and they are receptive to light; they possess senses, they are ancient, and they sleep in the winter (Fechner, 1848a). Stubbe (2016) places Fechner's views on plants in the context of communication in and between plants, and between animals and plants (Mancuso & Viola, 2015). Fechner's ironic respect for plants is echoed by modern research on plant communication (Buffie, 2013). Here is a good example of the cash value of a concept of consciousness marked by functional relations. Might plants function as instruments for psychophysical measurement? However, Fechner felt very much alone in this quest:

> The transition from a general [external psychophysics] to inner psychophysics and to the quantitative basic relation between body and soul is still in dispute, and the question whether the entire world beyond humans is a psychophysical system, upon which the laws for humans find application, has been taken up by no one besides me, and my efforts and striving in this direction have been in vain…and they will remain so until the Day View comes to light, and psychophysics [moves] from itself to one of its foundations (Fechner, quoted in Kuntze, 1882, p. 305, quoted in Lennig, 1994, p. 174, translation mine).

Lothar and Helga Sprung recognized that the measure of sensitivity and measure of sensation were connected to Fechner's metaphysical world view (1978). To Petra Lennig (1994), psychophysics was an integral part of a panpsychistic world view in which geometric and arithmetic series were related to one another.

A step in this direction came from Jiri Wackermann (2010), who proposed "integral psychophysics as a systematic study, that is, description and mathematical

modeling of structures of primary experience" (p. 200). This description occurs *prior to* physics and psychology. Wackermann wanted to abandon "measurement of sensation" and "neural entities." He explained that "measurements are performed on the apparatus, that is, on a worldly object, and not on S's mind." The equivalence of weights in a pan and the subject's recognition of that equivalence comprise a functional relation (p. 198). Is this in tune with Heidelberger's interpretation? "For Fechner, however," wrote Heidelberger (2010), "the paradigm of a natural law is precisely such a functional equation, and not an "if…then" clause" ; not a causal dependency, but a function, such that "the more functional equations we can find for a certain object realm, the closer we will come to a causal understanding" (p. 168).

3. Psychophysical Parallelism and its Vicissitudes

Fechner also set in motion a century-long discussion of parallelism (though he did not use the term). He believed in separate causality in his youth: physical causality and mental causality. Then, at the height of his career, he seemed to bracket causality to the realm of reality beneath both sides or aspects. Finally, at the end of his life, he tended to ascribe causality to the mind. These important nuances can be understood as one if we distinguish between his epistemological and his metaphysical stance. We can know only phenomena and generalize or analogize from them. As explained above, a substance or an event becomes a lawfully connected whole through its relations. Commentators since Heidelberger generally recognize that lawfulness was meant in a functional sense for Fechner.

Fechner embraced the multifaceted "identity view" of psychopsychical parallelism. The twentieth-century view seems to be that Herbert Feigl and the Vienna Circle demolished Cartesian dualism with a "brain-state theory" anchored in neutral monism (Kim, 1998; Heidelberger, 2004, p. 166). Feigl is known as the founder of modern identity theory, with U. T. Place and J. J. C. Smart. But this ignores the fact that psychophysical parallelism was the dominant paradigm of the nineteenth century, and that Fechner's *Elements of Psychophysics* (1860) was its *locus classicus* – originating in his 1823 "Premises toward a General Theory of Organisms" (Marshall, 1974; Wegener, 2009). Wegener attributes the discursive meme of "parallelism" of mind and body to Fechner's books. She finds this meme in his successors Ernst Mach, Ewald Hering, and du Bois Reymond in Germany, in Alexander Bain and J. S. Mill in Great Britain, and in Hippolyte Taine and Theodule Ribot in France. "Thereby Taine took up the dualism of the English to turn it into a double-aspect theory and like Fechner underpinned it with an ontological monism" (Wegener, 2009, p. 291, citing Taine, 1880, 259, my translation).

Three kinds of psychophysical parallelism can be found in Heidelberger's Fechner (Heidelberger, 2004, pp. 169-171): (1) an empirical postulate that mental and physical processes lawfully accompany one another, a so-called functional dependence, close to today's supervenience; (2) a metaphysical privileging of body or mind such as nonreductive materialism (emergentism), based on inductive generalization that can anticipate future experience; and (3) a cosmological thesis that the mental does not even need a nervous system but is found as the flip side of material system or plants (panp-

sychism). Fechner's panpsychism was later criticized by others such as Ernst Mach, Richard Avenarius, Carl Stumpf, and Moritz Schlick.

If psychophysical parallelism was the dominant paradigm, what implications did it have for mind and body identity theory? In Denmark, Harald Höffding (1891) wrote about Fechner's "identity hypothesis" as follows:

> Every phenomenon of consciousness gives occasion for a twofold inquiry. Now the psychical, now the physical, side of the phenomena is most accessible to us; but this does not affect the principle of the relation of the two sides to one another (pp. 69-70).

Höffding also used the metaphor of the concave and convex side of a mirror. But his nineteenth-century perspective did not acknowledge the asymmetric relation discussed above. His simpler view did have resonance at the time but it overlooked functional relations. Fechner's scientific philosophy permeated the late nineteenth century, in part due to the many editions of Paulsen's *Introduction to Philosophy* (German, 1893ff, English 1895ff): "He sees that the assumed inner world cannot serve as an explanation for the physical world" (p. 120). "Why not, therefore, attach mental properties to this higher complexity? That, however, the plurality of the world is grouped, comprehended, and organized into a unity does not contradict the thought that it is also comprehended into a corresponding mental unity" (p. 264).

Friedrich Paulsen noted in his introduction to Fechner's "On the Soul Question" that Fechner's works were "experiencing new editions in quick succession, were bought, read, studied, and beginning to penetrate with their views as an ever-present element of philosophy, science, and literature" (1928, p. vii). Geoff Bunn (2010) wrote that

> To confuse the analysis of subjective experience with that of objective reality is to commit what William James called 'the psychologist's fallacy' (Leary, 1990). Fechner's great achievement was to show how psychology could inaugurate a programme of systematic empirical inquiry without possessing either any standard units of measurement on the one hand, or without committing the psychologist's fallacy on the other. 'The task did not at all originally present itself as one of finding a unit of mental measurement;' Fechner wrote, 'but rather as one of searching for a functional relationship between the physical and the psychical that would accurately express their general interdependence.'

Evidently, contrary to Fechner's disappointment with the reception of his worldview, Fechner's manifold writings did gain adherents over time. With Paulsen's and James's rising tide of appreciation in early twentieth century, and again in early twenty first century, we turn to Fechner's psychophysics.

In our time, Eckart Scheerer (1987a) noted

> The basic defect in the contemporary "Fechner image"
>
> Fechner (1860, I, p. 8) defined psychophysics as the "exact science of the functional, or dependency, relations between body and mind and, more generally, between bodily and

> mental, physical and psychical world". The second part of this definition is usually suppressed in secondary sources (e.g., Boring, 1950, p. 286). It refers to Fechner's belief in universal psychophysical relations not restricted to living organisms; thus, it belongs to his philosophy of nature…(p. 198).

Once again, we are reminded of the myopia in the present-day view of psychophysics, who view psychophysics narrowly as a measurement theory. Fechner's philosophy of nature was premised on psychophysical relations in the world at large. I shall return to this point in another article (Woodward, in preparation).

4. Psychophysics

Against the claim of Kant that psychology will never become a science because it cannot be treated mathematically, Fechner claimed that sensation could be measured as a just-noticeable-difference. The claim had two parts. (1) Inner psychophysics measured inner (brain) activity in relation to sensitivity, extending from unconscious to conscious. But in Fechner's time, brain activity could not yet be measured. (2) Conventionally, the importance of psychophysics rested on outer psychophysics, a measure of sensory intensity as a function of physical stimulus magnitude.

However, consider the example of sensing the just noticeable difference (j.n.d.) in a weight on one's hand. According to Gundlach (2010, cf. 1993), this is actually a measure of "sensitivity" (*Empfindlichkeit*), although Fechner claimed that the j.n.d. was a unit of sensation. Fechner's contention that the sensation can be summed into a scale of sensation has not received general acceptance by the psychological community. The claim entailed two kinds of sensitivity: absolute and relative. Fechner (1860) asserted that sensitivity is the unit of measurement, and that the absolute threshold is the null point, such that sensation magnitude = k log (stimulus magnitude/absolute threshold for a person). For contemporary assessment of the history of outer psychophysics, see David Murray (1993) and the extensive commentary following his target article

In his *Zend-Avesta*, Fechner had posited a logarithmic relation between psychological and physiological activity (1851, pp. 373-386, in Scheerer, 1987b, pp. 203-207): "in brief, that mental intensity is a logarithm of the corresponding physical intensity and progresses in arithmetical proportion when the latter progresses in geometrical proportion." Scheerer pointed out that Fechner was mainly concerned here with inner psychophysics, arguing that the mind-brain functional relation was governed by nonlinear laws that connect simultaneous events. By contrast, the mind-stimulus relation is governed by linear causal laws. In the inner psychophysics, long ignored by psychologists, Fechner argued that psychophysical oscillation, what we call neural excitation, underlies mental processes. Oscillation also rests on the conservation of energy, a new concept at the time from Helmholtz (1847), whereby a system with opposing forces tends to oscillate. The alternation of sleep and wake bears this out, depending on wave of endogenous brain activity.

Freud admired Fechner's inner psychophysical model and viewed it in terms of pain and pleasure in the libido, anchored in

combinations of oscillations -- if not of corpuscles then of nervous excitations. Fechner later explained memory as oscillatory patterns in the brain (Fechner, 1882; Scheerer, 1987c, p. 210). "From these premises it is easy to understand, first of all, why we do not retain memories, or distinct memories, of childhood; while in old age we retain very distinct memories of certain events in later childhood, but at the same time, more recent events easily escape our memory."

In their time, before the discovery of nerves, the oscillatory theory competed with electrical and chemical theories of nervous system activity. The inner psychophysics also found a reception in Mach's radical empiricism, Bohr's principle of complementarity, and signal detection theory (Robinson, 2010; Murray, 1993). A compelling view for psychologists at the time was Wundt's critique of (1) the inner psychophysics (a physiological version of Weber's law) and (2) his criticism of the outer psychophysics of the measurement of sensory intensity; Wundt proposed instead (3) a psychological interpretation involving apperception (A. Kim, 2016, 4.1).

Antonelli (2015) analyzed the Brentano-Fechner correspondence on psychophysics. He explained that Brentano reinterpreted the psychophysical relations as occurring within the mind: "the noticing of a difference in intensity of two sensations consists of a mental act of comparison supported by memory. This comparison is conducted by a judgment in the realm of inner experience" (2015, p. 50). Although Fechner resisted Brentano's arguments, his own view is not so very different, since he includes associative memories and signs in his ethics and aesthetics.

5. Experimental Aesthetics

5.1. Pioneering Psychological Aesthetics

Fechner founded a second experimental field after psychophysics, variously called psychological aesthetics, empirical aesthetics, or experimental aesthetics**.** In the eighteenth century Baumgarten and Kant founded aesthetics alongside logic and ethics, to study what rational disciplines left out: imagination, phantasy, taste, and pleasure. Fechner's younger contemporaries Windelband, Rickert, and Dilthey distinguished human from natural sciences, but Fechner himself made no such distinction. With aesthetics from above and below, he and his protégé Lotze set in motion a method that brought these into relation. Kant framed the conditions of aesthetic judgment, but Fechner wanted to actually measure "which features of an object release a beautiful sensation, a sense of pleasure in the subject" (Köser, 2007, p. 118). The arguments he made for an aesthetics "from below" represent a challenge to the philosophical aesthetics of its day. This experimental discipline has continued today in the journal *Empirical Studies of the Arts* (Jacobsen, 2010).

Whereas philosophical aesthetics asks for a concept of beauty (Kant, Schelling), Fechner posed the empirical question what is beautiful and in this respect pleases? Using sampling procedures, "one can measure… the most votes for one preference or another under controlled conditions, …for a given subject class" (Fechner, 1871, p. 598, in Sprung & Sprung, 1988, p. 224). Fechner wanted to find empirical laws that allow the measurement of an aesthetic object (Kösser, 2007, p. 118). Which features of an object release a beautiful sensation? Fechner noted

that "If aesthetics were only about sense perception, then Goethe's Faust and Sixtini's Madonna and everything that stirs a meaning would not come into consideration" (Fechner, 1897, 1: 33). Meaning is important and it must ask what underlies pleasure and displeasure, while allowing aesthetic judgments to be measurable. Aesthetics and ethics come together because of eudemonism, "solidarity in which the well-being of the individual is realized with that of the whole," hence the public good (Fechner, 1897, 1: 40, Kösser, 2007, pp. 120-121).

Fechner's influential former student Hermann Lotze had proposed that association of past pleasures and memories yields aesthetic pleasure (1868, p. 74ff., p. 232ff.). Fechner objected that current pleasing relationships and harmonies constitute the proximate cause of pleasure (1871, p. 13n). He adopted the term "auxiliary conditions" (*Nebenwirkungen, Mitbestimmungen*) from Lotze, however he added the term "chance conditions" (*zufälligen Mitbestimmungen*) and depicted the subjects' responses in a frequency distribution. He gave a fourfold mathematical definition of central tendency: D = most pleasing value; C = central value, G = geometric mean, and M= arithmetic mean (1871, pp. 61-66). When these four measures of central tendency coincide, it shows insufficient resolution of chance factors. This is the case with observations of stars.

In cases of "collective objects" with dimensions varying by chance, however, a coincidence does *not* generally obtain. We can apply Gauss's law of probability for symmetric and asymmetric deviations around the most pleasing value. "One can imagine that the most pleasing value is that which combines the most advantageous conditions of pleasing, or as we say, an excess of pleasure above all others, if chance subjective or objective auxiliary conditions obtain in the individual experimental subjects" (1871, p. 66/618). Thus, Fechner related subjective pleasure to objects in general, and to art in particular: "One of the most striking examples among artistic objects are the dimensions of height and depth in gallery paintings, in genre pictures, landscapes, and still lives" (1871, p. 68/620). In his posthumous *Theory of Measuring Collectives* (1897) he extended this insight into a general theory of probability.

An exhibition of two Holbein madonnas occurred in Dresden in 1871. It offered Fechner an opportunity to launch an empirical study of the sense of beauty. Over centuries the Holbein dispute stemmed from an original Madonna by Hans Holbein the Younger (1497-1593) in 1526-1528 and a later copy from the 1600s. Notably, the Madonna and infant are flanked by the Basel mayor's family - three women, a boy, and a toddler, illustrating the realism of the Italian Renaissance; one Holbein Madonna sold recently for over $70 million dollars (Dobrzynski, 2011). After both paintings had changed hands many times, Darmstadt and Dresden vied for the authentic version., where Fechner obtained permission to put out a notebook asking which Madonna people felt was more beautiful.

In his "method of choice," he asked museum visitors to vote for their preference of the Dresden versus the Darmstadt Holbein Madonna. The results can vary with the attributes of the experimental subjects: gender ("one only learns what is relatively pleasing among men or women"), race, class, educational level, climate (?), and age

(Fechner, 1871, p. 53-54/605-606). But the attributes of the object could also be varied experimentally: "the greater the pleasure of a certain proportion, the more difficult will it be for chance conditions to influence the effect of this pleasure" (1871, p. 45/597).

Fechner summarized the Holbein results in a series of papers, culminating in *Vorschule der Aesthetik* (1876): less than one percent of the 11, 842 visitors – 113 – registered an impression and the results were inconclusive. This negative result pales in comparison to the introduction of chance variation into experimental aesthetics (Niemann et al, 1997). Statistics of experimental design today consists in testing conditions that will produce an effect greater than chance.

5.2. Controversial Reception

Gordana Jovanovic (in press) noted that

> Aesthetics from below stands also for democratization of aesthetic experience, which has also social and political implications in view of the fact that pleasure in art works served for a long time as a marker of a privileged social position. The same point was, however, used by some critics of Fechner to discredit his project of psychological aesthetics.

Professional scholars of art were almost unanimous in rejecting experimentation with the public opinion of beauty. Yet today we have become accustomed to the scientific study of samples of naïve subjects. In 1871 art historian Alfred Woltmann wrote that Fechner "is trying to decide between the paintings by universal suffrage" (Knopf, p. 174). Berlin art historian Carl von Lützow wrote that it opens up the way to "dilettantism and subjectivism in a question that should belong exclusively to professionals" (Knopf, p. 177; Lützow to Fechner, 1871).

German philosophers were no kinder. Aesthetics begins, wrote Eduard von Hartmann, "where one steps beyond the foundations of mere experience and advances to an explanation of it" (1886, p. 329, cited in Allesch, 2010, p. 112). He was dismissive of psychological aesthetics: "The same thing in itself in all normally-endowed persons releases the same subjective experience, so that the normal unconscious reaction of subjects who produce subjective phenomena need not be attended by aesthetics and can be left to psychology" (Hartmann, 1924, p. 3, cited in Allesch, 2010, p. 113). Philosopher Fritz Medicus also made fun of empirical aesthetics for using the aesthetic feelings "of little children, Senegalese Negros, and similar culture-bearers" to achieve laws of aesthetics (Allesch, *ibid*.). Benedetto Croce (1930) referred to the "chaos" of Fechner: "this pseudoscientific effort was a waste of time akin to…stamp collecting" (p. 411ff).

One magnanimous British philosopher, Bernard Bosanquet, praised Fechner's contribution to method (1892, p. 387). This is not surprising, inasmuch as Bosanquet formulated a theory of aesthetic experience. While Bosanquet (1915) recognized that some forms of beauty require aesthetic insight, beauty goes beyond what is aesthetically pleasing and it is accessible to all (Sweet, 2015).

Notwithstanding the objections of art critics and philosophers, psychologists soon began to pursue empirical studies of aesthetics (Külpe, 1906). Max Dessoir's *Zeitschrift für Aesthetik und allgemeine Kunstwissenschaft* became an interdisciplinary outlet

during 1906 to 1937, succeeded by the *Journal of Aesthetics and Art Criticism* in 1942, with sister journals in France and Italy. The opening chapter of Dessoir's programmatic book *Ästhetik und allgemeine Kunstwissenschaft* (1906) reviewed Lotze, Fechner, and von Hartmann.

> Today's philosophers of aesthetics have weighed in much more favorably. The rehabilitation of Fechner began with literary critic Gert Mattenklott's reissue of texts of Fechner and Da Vinci with a postscript referring "to the presence of Fechner in the thought of our century" (1984, p. 189). Fechner had written:

In fact, does one who looks at an orange see merely a round yellow patch? With the sensory eye, yes; intellectually however one sees a thing with a stimulating smell, startling taste, on a pretty tree, in a beautiful land, growing under a warm sky. One sees, so to speak, "entirely Italian" the country toward which a romantic yearning draws us (Fechner, 1978 [1876], p. 89, cited in Fix, 2003, p. 169).

Ulla Fix noted here the significance of accompanying ideas, or connotations that give signs their meaning. She finds a similar distinction in Umberto Eco's writings on semiotics.

Ingo Warnke (2003) argued that Fechner's theory was pragmatic, with the goal of happiness (*Glück*) and pleasure (*Lust*). The center of the subjective process is the associations of pleasure and concepts of intensification, clarity, and threshold. Warnke observed that "deductive aesthetics allows no importance to the associations of the subject" (p. 159), witness Kant's pure and dependent beauty. Thus, the orange in Fechner's quotation above has a different associative potential than the wooden ball. Warnke added another quote from Fechner:

> A woman who loved her husband said to him: how glad I am that you have such a pretty name. The name was not pretty but she loved the husband. That is why the name pleased her (Fechner, 1876, 1: 91).

Connotation includes contextual meanings for the sign user, hence the contextual associated signs in this example and in the orange example. Warnke (2003) compares Fechner's association principle with Charles Peirce, in that the perceptible object bears signs to a referent, which activates meaning as interpretation (Peirce, 1991). Fechner's association principle would correspond to Peirce's interpretant, which steers the meaning. This is Peirce's term, referring to thoughts and feelings a sign evokes in a subject interpreting it (Jovanovic, in press). Affective evaluation belongs to contemporary theories of interpreting signs. Since the connotations refer to the sign and sign user, Fechner's theory is essentially pragmatic.

Conclusion

I have presented a broader review of Fechner "in and for psychology" than that with which psychologists are generally familiar. Fechner wrote in a time before the emergence of psychology as a discipline and a profession. (1) He offered a quantitative theory of pleasure as a computational principle in action, directed toward the goal of stability or equilibrium. (2) Bodies and minds are collections of phenomena in Fechner's phenomenalism. Mental changes are a function of bodily changes, but not

vice versa, an asymmetric relationship. Double-aspect theory can be seen as relating clusters of body phenomena and mental phenomena. Is their relation functional or causal? (3) Fechner's psychological parallelism contributed a widely-accepted meme to nineteenth-century philosophical and psychological thought. (4) Scholars have anchored his psychophysics in sensitivity, expanded it to a psychophysical worldview, and drawn lessons for memory from the inner psychophysics. (5) Fechner's experimental aesthetics drew on judgments of beautiful objects by naïve subjects, taking into consideration the proportions of the object as well as the feelings of the subject. Part II will address Fechner "beyond psychology": his physics and chemistry, indeterminism, atomism, non-reductive materialism, satirical writings, and philosophy of religion.

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