

Fechner: The Man in the Mask

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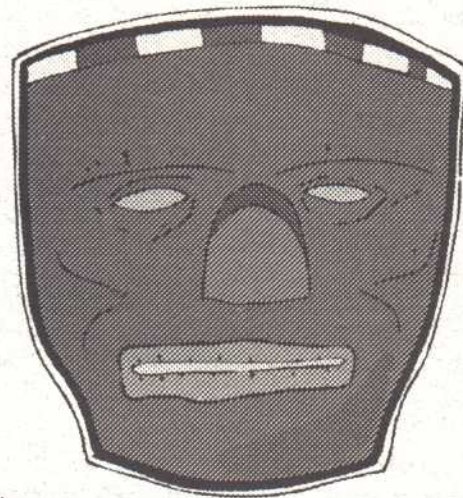
Emaciated, nearly blind, alone by choice in rooms with blackened walls. Communicating through funnels doors while wearing a metal mask. Despondent and wishful of death yet persisting in volitional exercises to channel mental forces to subject his involuntary physical functions to voluntary control. Although dismissed by some as a mental patient, he gained renown as “the father of experimental psychology.” So, who was this man in the mask?

Gustav Theodor Fechner is well known to us through “Fechner’s Law.” This law was one consequence of a lifelong interest in the potentialities of the mind, particularly in the relationship between the mind and body. This interest led him to argue that the mind (sensation) and body (stimulus) had to be regarded as two separate entities in order that each could be measured and the relation between the two determined (separation of parameters?).

He encountered a problem. While the magnitude of a stimulus can be directly measured, the magnitude of a sensation can not. But since we can physically measure the stimulus values that give rise to a sensation, we can indirectly measure sensation by taking differences between two stimuli. To determine the magnitude of a sensation, we then take the just noticeable difference (jnd) between two stimuli as the unit of sensation and count up jnd’s from zero sensation at the absolute threshold to the sensation that is being measured. This reasoning led to: $S = k \log R$, where S (the magnitude of sensation) is the number of jnd that the sensation is above zero, R is the magnitude of the stimulus, and k is a proportionality constant. (Interestingly, the law requires the existence of negative sensations.)

With this formula, Fechner believed that the dualism between mind and body had disappeared and the nature of psychophysics as “an exact science of the functional relations or the relation of dependency between mind and body” had been established. For us, the significance of his work was that it took measurement beyond solely material phenomena to what Fechner referred to as the immaterial mind and the spiritual world.

So then, what drew Fechner to the study of the mind? Why, in particular, did he seem to have a fixation on measuring magnitudes of sensations? Was his interest purely academic and suited to the times (Zeitgeist) or



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Professional interests: developing interesting graphical representations of multivariate data (visualizing an eigenvector), and applying psychometric models in situations where the results have an obvious practical utility (scaling flute performance).

Personal interests: woodcarving, sketching, and motorcycling.

Last book read: Arthur Koestler, *The Sleepwalkers*.

Personal goal: Actually catch something fly-fishing.

Favorite drink: Diet Dr. Pepper.

Favorite quote: “If it exists, it can be measured. If it can’t be measured, it doesn’t exist.” (mine)

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was there a personal interest in his quest? These questions prompted this article.

First, there were his spiritual, philosophical beliefs.

His father was the village pastor and his uncle, too, was a preacher. Both men contributed to his lifelong philosophical stance against materialism through their examples of independence of thought and receptivity of new ideas. His support of spiritualism as opposed to materialism is seen in his *The Little Book on Life after Death* (1836). His spiritualism even took him so far as to argue for the mental life of plants (Nanna, 1848).

Second, there were his medical studies.

At the age of 16, he went to Leipzig to study physiology, which meant studying for a doctorate in medicine. This was a time when medical thinking and practice were characterized by philosophical considerations and systems. There was an absence of an empirical basis in medical doctrine. It was a time of experimenting and waiting for chance hits. The practice of medicine was so chancy that Fechner adopted the pen name Dr. Mises and wrote numerous satires on current medical practices (seen in his *Proof that the Moon is Made of Iodine*, 1821).

His medical studies were, however, purposeful in another direction. He studied the brain and was intrigued by its duplex structure. He came to regard consciousness as an attribute of the cerebral hemispheres and he placed great stress on the equipotentiality of the cerebral cortex. In fact he argued that if it were possible to split the brain longitudinally it would achieve something like the duplication of a human being, in effect dividing the stream of consciousness.

Third, there was his professional career.

After medicine he studied physics and mathematics and was made professor of physics at Leipzig. During this period, he became acquainted with the work of Bernoulli and Laplace. From Bernoulli's probabilistic work linking fortune morale and fortune physique, he saw a mathematical relationship that corresponded exactly with his goal of connecting mind and body. From Laplace, he saw the value of applying the normal law of error in experimentation. Combined with these mathematical interests, he had a growing interest in sense-physiology, especially on complementary and subjective colors and subjective after-images. His experimental enthusiasm for gazing at the sun through colored glasses, however, permanently injured his eyesight. In 1839 he resigned his position due to poor health partly because of this injury.

Finally, there was his "life-crisis."

Fechner spent 1839 to 1851 in retirement. These were not pleasant years. He lost his health, his sight, his income, his friends, and even his wife at times. He suffered intense physical pain and mental anguish. He was profoundly despondent and obsessively brooding. He physically isolated himself and refused to eat for extended periods. But he would not give in to his suicidal wishes. His perspective was "If I put an end to my life here, I must make atonement and undergo all my sufferings in my future life". This attitude led to a system of experiments designed to mitigate his suffering and facilitate his healing.

First, he regarded the medical advice of the day as "fruitless" and began his own series of treatments. These consisted of stimulants, infusions, draining remedies, electrical applications, steam baths, opium, and even animal magnetism. These were all without success.

Second, he truly believed that mind and soul are the ultimate of reality, a philosophical position he called the "day view". Starting from this position allowed him to consider that the brain possessed powers not fully realized or explored. He was particularly concerned with establishing psychophysical functional connections that would guide him to personal psychotherapeutical procedures. For example, he suffered from an intense digestive disorder that transmitted sensation (pain) to his brain. He reasoned that if the digestive organs could transmit signals to the brain, "why not conversely, by the exercise of volition, bring about a conduction from the brain to those organs and thus remedy them?"

This reasoning led to a system of exercises to not only increase his mental effort at reducing pain but to turn back and heal the disorder in the first place. Here we see the stimulus (the volitional exercise of mental effort) and the sensation (the pain). What was their relation-was it one-to-one? How could he control the relation-could he simply concentrate harder and through auto-suggestion heal his condition?

On the morning of October 22, 1850 he had the insight that led to this date being honored as Fechner Day. While lying in bed puzzling over how to mathematically link body and mind (or stimulus and sensation, or mental effort and pain) he proposed that a geometric series in the intensity of a stimulus might correspond to an arithmetic series in the sensation. This idea (a direct consequence of his painful experiences?) established the program of research that Fechner called psychophysics.

Rather than succumbing to his condition and disappearing from history, he took advantage of his personal philosophy and professional training to extract meaning from his illness. His drive to model the world he lived in left us with methods of measurement we employ on a daily basis. In fact, the next time you use the remote on your television and adjust the red color back and forth until it's just right for you (but maybe not for your partner), you are applying the principles he established 150 years ago.

(To this day there is no definitive explanation of what his illness was nor how he was able to recover from it.)

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