The contribution GUSTAV THEODOR FECHNER

Gustav Theodor Fechner ; 19 April 1801 – 18 November 1887) was a German experimental [psychologist](https://en.wikipedia.org/wiki/Psychologist), [philosopher](https://en.wikipedia.org/wiki/Philosopher), and [physicist](https://en.wikipedia.org/wiki/Physicist). An early pioneer in [experimental psychology](https://en.wikipedia.org/wiki/Experimental_psychology) and founder of [psychophysics](https://en.wikipedia.org/wiki/Psychophysics), he inspired many 20th-century scientists and philosophers. He is also credited with demonstrating the non-linear relationship between psychological sensation and the physical intensity of a stimulus via the formula: {\displaystyle S=K\ln I}, which became known as the [Weber–Fechner law](https://en.wikipedia.org/wiki/Weber%E2%80%93Fechner_law). Present topic describes the fact how G T Fechner established Psychology as Experimental Psychology first time in the history of Psychology by his several experiments.

Most of the groundbreaking works of Gustav Theodor Fechner (1801–1887), who paved the way for modern experimental psychology, psychophysics, and empirical aesthetics, are so far only available in German. We want to fill in one of the blank spots in the reception of his Aesthetics from Below (Aesthetik von Unten). In his 1866 article, Fechner devises a fundamental principle that accounts for the role of associations in the formation of aesthetic preferences. Based on concrete everyday examples and thought experiments, he demonstrates how aesthetic choices are largely shaped by the observer’s learning history (associative factors) rather than by an object’s formal properties (direct factors). Fechner’s Aesthetic Association Principle has lost nothing of its initial relevance as the role of content and personal meaning is still grossly underrated in theory and practice of empirical aesthetics today.

Philosopher and physicist Gustav Theodor Fechner (1801–1887) is famous for pioneering psychophysics and experimental aesthetics, although much of his influential work is still untranslated and therefore inaccessible to many scholars from both disciplines. On occasion of the Fechner Year 1987, Scheerer showed that this lack of English translations has led to some serious misconceptions and blind spots in the reception of Fechner’s psychophysics. While the Elements of Psychophysics  is at least partly available in English, none of Fechner’s equally groundbreaking works on aesthetics have so far been translated into English.[1](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7264472/#fn1-2041669520920309) This is perhaps one of the reasons why his Aesthetics from Below is still widely mistaken for an application of psychophysics, rather than a full-fledged research programme in its own right. It, of course, entails the application of certain psychophysical elements like the threshold concept (Aesthetische Schwelle), the method of choice (Methode der Wahl), the method of production (Methode der Herstellung), and the method of use (Methode der Verwendung) to aesthetic problems such as Zeising’s golden ratio hypothesis. Yet already in Fechner’s early writings on aesthetics, one encounters a principle which has no direct counterpart among the elements of psychophysics: The Aesthetic Association Principle. By providing the first English translation of Fechner’s) article on The Aesthetic Association Principle , we hope to raise awareness for an essential aspect of his Aesthetics from Below that has been overlooked: namely, the eminent role of personal recollection, Zeitgeist, and cultural background in the formation of aesthetic experiences

## Contributions

Fechner published chemical and physical papers, and translated chemical works by [Jean-Baptiste Biot](https://en.wikipedia.org/wiki/Jean-Baptiste_Biot) and [Louis Jacques Thénard](https://en.wikipedia.org/wiki/Louis_Jacques_Th%C3%A9nard) from the [French](https://en.wikipedia.org/wiki/French_language). A different but essential side of his character is seen in his [poems](https://en.wikipedia.org/wiki/Poetry) and humorous pieces, such as the *Vergleichende Anatomie der Engel* , written under the pseudonym of "Dr. Mises."

### Elemente der Psychophysik

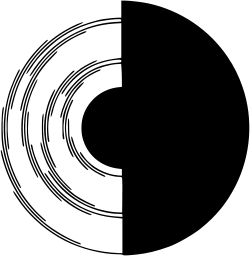
Fechner's epoch-making work was his *Elemente der Psychophysik* (1860). He started from the [monistic](https://en.wikipedia.org/wiki/Monism) thought that bodily facts and conscious facts, though not reducible one to the other, are different sides of one reality. His originality lies in trying to discover an exact mathematical relation between them. The most famous outcome of his inquiries is the law known as the [Weber–Fechner law](https://en.wikipedia.org/wiki/Weber%E2%80%93Fechner_law) which may be expressed as follows:

"In order that the intensity of a sensation may increase in arithmetical progression, the stimulus must increase in geometrical progression."

The law has been found to be immensely useful, but to fail for very faint and for very strong sensations. Within its useful range, Fechner's law is that sensation is a logarithmic function of physical intensity. [S. S. Stevens](https://en.wikipedia.org/wiki/Stanley_Smith_Stevens) pointed out that such a law does not account for the fact that perceived relationships among stimuli (e.g., papers coloured black, dark grey, grey, light grey, and white) are unchanged with changes in overall intensity (i.e., in the level of illumination of the papers). He proposed, in his famous [1961 paper](https://en.wikipedia.org/wiki/Stevens%27_power_law) entitled "To Honor Fechner and Repeal His Law", that intensity of stimulation is related to perception via a power-law.

Fechner's general formula for getting at the number of units in any sensation is *S* = *c* log *R*, where *S* stands for the sensation, *R* for the stimulus numerically estimated, and *c* for a constant that must be separately determined by experiment in each particular order of sensibility. Fechner's reasoning has been criticized on the grounds that although stimuli are composite, sensations are not. "Every sensation," says [William James](https://en.wikipedia.org/wiki/William_James), "presents itself as an indivisible unit; and it is quite impossible to read any clear meaning into the notion that they are masses of units combined."

### **The Fechner color effect**

**[](https://en.wikipedia.org/wiki/File:Benham%27s_Disc.svg)**

**A sample of a Benham's disk**

**In 1838, he also studied the still-mysterious perceptual illusion of what is still called the**[**Fechner color effect**](https://en.wikipedia.org/wiki/Fechner_color)**, whereby colors are seen in a moving pattern of black and white. The English journalist and amateur scientist**[**Charles Benham**](https://en.wikipedia.org/wiki/Charles_Benham)**, in 1894, enabled English-speakers to learn of the effect through the invention of**[**the spinning top that bears his name**](https://en.wikipedia.org/wiki/Benham%27s_top)**. Whether Fechner and Benham ever actually met face to face for any reason is not known.**

### **The median**

**In 1878 Fechner published a paper in which he developed the notion of the median. He later delved into**[**experimental aesthetics**](https://en.wikipedia.org/wiki/Experimental_aesthetics)**and thought to determine the shapes and dimensions of aesthetically pleasing objects. He mainly used the sizes of paintings as his data base. In his 1876 *Vorschule der Aesthetik* he used the method of extreme ranks for subjective judgements**

**Fechner is generally credited with introducing the**[**median**](https://en.wikipedia.org/wiki/Median)**into the formal analysis of data.**

### **Synesthesia**

**In 1871 Fechner reported the first empirical survey of coloured letter photisms among 73**[**synesthetes**](https://en.wikipedia.org/wiki/Synesthesia)**. His work was followed in the 1880s by that of**[**Francis Galton**](https://en.wikipedia.org/wiki/Francis_Galton)**.**

### **Corpus callosum split**

**One of Fechner's speculations about consciousness dealt with brain. During his time, it was known that the brain is bilaterally symmetrical and that there is a deep division between the two halves that are linked by a connecting band of fibers called the**[**corpus callosum**](https://en.wikipedia.org/wiki/Corpus_callosum)**. Fechner speculated that if the**[**corpus callosum were split**](https://en.wikipedia.org/wiki/Corpus_callosotomy)**, two separate streams of consciousness would result - the mind would become two. Yet, Fechner believed that his theory would never be tested; he was incorrect. During the mid-twentieth century, Roger Sperry and Michael Gazzaniga worked on epileptic patients with sectioned corpus callosum and observed that Fechner's idea was correct.**[**[14]**](https://en.wikipedia.org/wiki/Gustav_Fechner#cite_note-14)

### **Golden section hypothesis**

**Fechner constructed ten rectangles with different ratios of width to length and asked numerous observers to choose the "best" and "worst" rectangle shape. He was concerned with the visual appeal of rectangles with different proportions. Participants were explicitly instructed to disregard any associations that they have with the rectangles, e.g. with objects of similar ratios. The rectangles chosen as "best" by the largest number of participants and as "worst" by the least number of participants had a ratio of 0.62 This ratio is known as the "golden section" (or**[**golden ratio**](https://en.wikipedia.org/wiki/Golden_ratio)**) and referred to the ratio of a rectangle's width to length that is most appealing to the eye.**[**Carl Stumpf**](https://en.wikipedia.org/wiki/Carl_Stumpf)**was a participant in this study.**

**However, there has been some ongoing dispute on the experiment itself, as the fact that Fechner deliberately discarded results of the study ill-fitting to his needs became known, with many mathematicians including**[**Mario Livio**](https://en.wikipedia.org/wiki/Mario_Livio)**refuting the result of the experiment.**

### **The two-piece normal distribution**

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## Influence

**Fechner, along with**[**Wilhelm Wundt**](https://en.wikipedia.org/wiki/Wilhelm_Wundt)**and**[**Hermann von Helmholtz**](https://en.wikipedia.org/wiki/Hermann_von_Helmholtz)**, is recognized as one of the founders of modern experimental**[**psychology**](https://en.wikipedia.org/wiki/Psychology)**. His clearest contribution was the demonstration that because the mind was susceptible to measurement and mathematical treatment, psychology had the potential to become a quantified science. Theorists such as**[**Immanuel Kant**](https://en.wikipedia.org/wiki/Immanuel_Kant)**had long stated that this was impossible, and that therefore, a science of psychology was also impossible.**

**Though he had a vast influence on**[**psychophysics**](https://en.wikipedia.org/wiki/Psychophysics)**, the actual disciples of his general philosophy were few.**[**Ernst Mach**](https://en.wikipedia.org/wiki/Ernst_Mach)**was inspired by his work on psychophysics.**[**[20]**](https://en.wikipedia.org/wiki/Gustav_Fechner#cite_note-20)[**William James**](https://en.wikipedia.org/wiki/William_James)**also admired his work: in 1904, he wrote an admiring introduction to the English translation of Fechner's *Büchlein vom Leben nach dem Tode* (*Little Book of Life After Death*). Furthermore, he influenced**[**Sigmund Freud**](https://en.wikipedia.org/wiki/Sigmund_Freud)**, who refers to Fechner when introducing the concept of psychic locality in his *The Interpretation of Dreams* that he illustrates with the microscope-metaphor.**

**Fechner's world concept was highly**[**animistic**](https://en.wikipedia.org/wiki/Animism)**. He felt the thrill of life everywhere, in plants, earth, stars, the total universe. Man stands midway between the souls of plants and the souls of stars, who are angels. God, the soul of the universe, must be conceived as having an existence analogous to men. Natural laws are just the modes of the unfolding of God's perfection. In his last work Fechner, aged but full of hope, contrasts this joyous "daylight view" of the world with the dead, dreary "night view" of**[**materialism**](https://en.wikipedia.org/wiki/Materialism)**. Fechner's work in**[**aesthetics**](https://en.wikipedia.org/wiki/Aesthetics)**is also important. He conducted experiments to show that certain abstract forms and proportions are naturally pleasing to our senses, and gave some new illustrations of the working of aesthetic association.**[**Charles Hartshorne**](https://en.wikipedia.org/wiki/Charles_Hartshorne)**saw him as a predecessor on his and**[**Alfred North Whitehead**](https://en.wikipedia.org/wiki/Alfred_North_Whitehead)**'s philosophy and regretted that Fechner's philosophical work had been neglected for so long.**[**[25]**](https://en.wikipedia.org/wiki/Gustav_Fechner#cite_note-25)

**Fechner's position in reference to predecessors and contemporaries is not very sharply defined. He was remotely a disciple of**[**Schelling**](https://en.wikipedia.org/wiki/Friedrich_Wilhelm_Joseph_Schelling)**, learnt much from**[**Baruch Spinoza**](https://en.wikipedia.org/wiki/Baruch_Spinoza)**,**[**G. W. Leibniz**](https://en.wikipedia.org/wiki/Gottfried_Wilhelm_Leibniz)**,**[**Johann Friedrich Herbart**](https://en.wikipedia.org/wiki/Johann_Friedrich_Herbart)**,**[**Arthur Schopenhauer**](https://en.wikipedia.org/wiki/Arthur_Schopenhauer)**, and**[**Christian Hermann Weisse**](https://en.wikipedia.org/wiki/Christian_Hermann_Weisse)**, and decidedly rejected**[**G. W. F. Hegel**](https://en.wikipedia.org/wiki/Georg_Wilhelm_Friedrich_Hegel)**and the**[**monadism**](https://en.wikipedia.org/wiki/Monad_(philosophy))**of**[**Rudolf Hermann Lotze**](https://en.wikipedia.org/wiki/Rudolf_Hermann_Lotze)**.**

**Fechner's work continues to have an influence on modern science, inspiring continued exploration of human perceptual abilities by researchers such as**[**Jan Koenderink**](https://en.wikipedia.org/wiki/Jan_Koenderink)**,**[**Farley Norman**](https://en.wikipedia.org/wiki/Farley_Norman)**,**[**David Heeger**](https://en.wikipedia.org/wiki/David_Heeger)**, and others.**

**Why do people prefer the sight of an orange—after all, an unevenly surfaced and imperfectly shaped object—to that of a perfectly round varnished wooden ball of the same size and colour? Why are red cheeks and lips more attractive than red noses and hands? If the aesthetic appeal of an artwork lies mainly in its formal aspects, should we not value an equally colourful but perfectly symmetrical carpet pattern over Rafael’s Sistine Madonna? It takes but a few casual examples and simple thought experiments for Fechner to demonstrate that aesthetic choices are largely shaped by the observer’s learning history (associative factors) rather than by an object’s size, shape and colour (direct factors). Moreover, since formal properties, such as the colour red, may themselves be evocative of strong associations, both direct and associative factors must be regarded as inextricably intertwined. According to Fechner, it takes an inductive approach to fully grasp the importance of the association principle for aesthetics, which is easily overlooked by the Aesthetics from Above with its “more or less fleeting or floating concepts, that do not capture the individual with the appropriate precision due to their generality” Nevertheless, 150 years after these ideas were first published, they seem to have lost nothing of their relevance as the role of content is still underestimated by today’s paramount theories of empirical aesthetics. Apart from being highly topical, Fechner’s piercing and evocative line of thoughts impresses with its unsurpassed Prägnanz**

**Thus we can say that it is the Fechner who established the Experimental Psychology as a main branch of Psychology and developed the idea of several experiments for the study of Psychological compnents first time in the history of Psychology.**