

the peripheral stimuli of the senses inward to the nervous centres (sensory or afferent nerves).

19.  
Müller's  
"specific  
energies."

About the same time Johannes Müller, under the influence of Goethe's observations on the subjective colour-sensations and of Kant's doctrine of the innate forms of perception,<sup>1</sup> introduced another important distinction into the theory of the action of the sensory nervous apparatus. This doctrine is known by the name of the "specific energies." It has for a long time governed all physiological reasoning on the subject of our sense perceptions. In the words of Helmholtz, who more than any other has lent the great weight of his authority to an elucidation of this theory, "physiological experience has found that by the stimulus of any single sensible nerve-fibre, only such sensations can be pro-

<sup>1</sup> The doctrine of the "specific energies" of the sensory nerves, one of Joh. Müller's earliest speculations, which has governed a large section of psycho-physical research, at least in Germany, has grown out of the philosophical discussions in the 'Kritik der reinen Vernunft,' and the æsthetic treatment in Goethe's 'Farbenlehre,' both of which deal with the subjective element in our sense-perceptions. In this regard the reform of physiology in Germany contrasts with the contemporaneous reform by Magendie in France, whose extreme experimentalism Müller even ridiculed. See on the historical origin of Müller's psychophysics, Du Bois-Reymond's excellent "Eloge of Müller" ('Reden,' vol. ii. p. 159), also Helmholtz's lecture on "Goethe's Naturwissenschaftliche Arbeiten" ('Vorträge und Reden,' vol. i. No. 1, 1853), and his address before the Goethe Society in 1892. Helmholtz finds the cause which

misled Goethe in his optical experiments to be the same which misled Brewster—viz., the difficulty of obtaining really pure homogeneous light of any special tint. He worked with impure light and dull media. Helmholtz experienced great difficulties in obtaining the necessary purity in his own labours. Goethe, however, was not alone in studying with predilection the subjective colour-sensations. Du Bois-Reymond mentions Erasmus and Robert W. Darwin in England, and Purkinje in Germany, as working in the same field (*loc. cit.*, p. 160). Müller's work is contained principally in the treatise, 'Zur vergleichenden Physiologie des Gesichtsinnes des Menschen und der Thiere nebst einem Versuche über die Bewegungen der Augen und über den menschlichen Blick' (1826), and in his larger work on Physiology. See also on Goethe's merits Helmholtz, 'Physiologische Optik,' p. 249.