

From the great complexity of the conditions, the same exactness will not of course, be expected here as in the inorganic field, but this is one of the necessary limitations of all physiological and psychological inquiry, thus qualified the proofs of the correlation of the nervous and mental forces with the physical, are as clear and decisive as those for the physical forces alone.

The physical agencies acting upon inanimate objects in the external world change their form and state, and we regard these changes as transformed manifestations of the forces in action. A body is heated by hammering; the heat is but transmuted mechanical force; or a body is put in motion by heat, a certain portion being transformed into mechanical effect or motion of the mass. And so it is held that no force can arise except by the expenditure of a pre-existing force. Now, the living system is acted upon by the same agencies and under the same law. Impressions made upon the organs of sense give rise to sensations, and we have the same warrant in this, as in the former case, for regarding the effects as transformations of the force in action. If the change of molecular state in a melted body represents the heat transformed in fusing it, so the sensation of warmth in the living body must represent the heat transformed in producing it. The impression on the retina, as well as that on the photographic tablet, results from the transmuted impulses of light. And thus impressions made from moment to moment, on all our organs of sense, are directly correlated with external physical forces. This correlation, furthermore, is quantitative as well as qualitative. Not only does the light-force produce its peculiar sensations, but the intensity of these sensations corresponds with the intensity of the force; not only is atmospheric vibration transmuted into the sense of sound, but the energy of the vibration determines its loudness. And so in all other cases; the quantity of sensation depends upon the quantity of the force acting to produce it.

Moreover, sensations do not terminate in themselves, or come to nothing; they produce certain correlated and equivalent effects.

The feelings of light, heat, sound, odor, taste, pressure, are immediately followed by physiological effects, as secretion, muscular action, etc. Sensations increase the contractions of the heart, and it has been lately maintained that every sensation contracts the muscular fibres throughout the whole vascular system. The respiratory muscles also respond to sensations, the rate of breathing being increased by both pleasurable and painful nerve-impressions. The quantity of sensation, moreover, controls the quantity of emotion. Loud sounds produce violent starts, disagreeable tastes cause wry faces, and sharp pains give rise to violent struggles. Even when groans and cries are suppressed, the clenched hands and set teeth show that the muscular excitement is only taking another direction.

Between the emotions and bodily actions the correlation and equivalence are also equally clear. Moderate actions, like moderate sensations,

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