COMMUNICATIONS

AN HISTORICAL NOTE

TO THE EDITOR OF THE PSYCHOLOGICAL BULLETIN:

There was at one time a very lively discussion whether or not psychical states, especially sensations, are quantities. The discussion arose about Fechner's assertion that sensations are measurable magnitudes, or quantities, *i. e.*, the sums of certain numbers or sensation-units, a proposition which is fundamental for his doctrine. At present the consensus of opinion seems to be that the negative side, represented by Delboeuf, Tannery and J. v. Kries, carries the day and that Fechner is wrong. A very interesting and exhaustive presentation of this controversy is given in Titchener's *Manual*, Vol. II., Pt. II., pp. 48-68 of the Introduction. It may be remarked that the quest on is mainly one of historical interest, since psychophysics of the present day does not make any such assumption.

It is a curious and interesting fact that the whole controversy was anticipated several years before the *Elemente* appeared in print. The following lines contain a translation from A.-A. Cournot, *Essai sur les fondements de nos connaissances et sur les caractères de la critique philosophique*, which was published in 1851. Cournot says that writing this book took him ten years and that the first plan was made twenty years before its completion. He, therefore, was some thirty years prior to Delboeuf and Tannery, and Fechner could have found a complete refutation of his system, had he but known the *Essai sur les fondements de nos connaissances*. However, considering the stubborn fight which Fechner put up, it is not at all likely that he would have surrendered to the arguments of Cournot. Neither may we blame him for not knowing the writings of the French philosopher, whose high position in the government service militated against the success of his ideas, for there is no sign that Delboeuf and Tannery appreciated the argument of their fellow countryman. This is a sign of the unmerited oblivion which was the lot of the ideas of this deep thinker.

(P. 396) "According to the popular definition everything capable of increase and decrease is called a quantity. There are, however,

many things which may be increased and diminished, and even increased and diminished continuously, that, nevertheless, are not magnitudes and, therefore, not quantities. A painful or a pleasant sensation may increase or diminish or go through different stages of intensity without a sudden transition from one phase to the other, so that one can not fix the precise moment when it comes into consciousness or disappears therefrom. This is the way in which things doubtlessly take place in a great number of cases. When in other cases a pain seems to begin or end abruptly, to increase or diminish in jumps, we may reasonably believe that this discontinuity is apparent only (as in the case of an impact which suddenly changes the motion of a body), and that the phenomena are always continuous, although we identify different phases, their succession escaping us owing to the imperfections of the inner sense which we call psychological consciousness. *The sensations of pleasure and pain, however, and the mathematical notions of magnitude have nothing in common. One can not say that a more intense pain is the sum of several fainter ones.* Although a sensation frequently goes in continuous steps from pleasure to pain, or inversely from pain to pleasure, thereby passing through a neutral state (what in several respects may be called the vanishing of certain magnitudes when passing from positive to negative values) (p. 397) *one can not regard such a neutral state as resulting from the summation of pains and pleasures which balance.*

“By the study of anatomy and physiology we succeed in understanding how a continuous variation in the intensity of a pleasant or a painful sensation may be related to the continuous variation of certain measurable magnitudes and depend on the inherent continuity of time and space. For we understand that the bigger a tract of nervous fibres is (taking into account for the determination of the cross-section the sections of elementary nerve-fibres only, disregarding the tissues which surround and protect them), the more painful is the sensation produced by straining the tract. Other conditions remaining constant, there is for every size of the area of the cross-section a certain corresponding painful sensation, *but this correspondence has not the character of a mathematical relation for although the area of the cross-section is a measurable magnitude, sensation is not.*

“If you put your hand in water of forty degrees and leave it there a sufficient length of time, although the temperature of the water does not change, your first sudden sensation of heat gradually and without leaps grows fainter so that one can not assign any particular moment when it disappears. Other conditions being equal, the

intensity of the sensation depends on the time elapsing since the immersion of the hand, and (p. 398) the continuity of time explains sufficiently the continuity of the variations in the sensation produced. This sensation, however, is not a measurable magnitude which by reference to a unit could be expressed numerically.

"Since the vibration-rate of a sounding body or of the ether is a measurable and continuous magnitude, we understand that passing from one tune to another, or from one color to another color should be continuous, but this is no reason for the existence of assignable numerical relations between the sensations of sound and of color, such as exist between the corresponding vibration-rates. *The sensation of the note SOL is not equivalent to one and a half times the sensation of UT, merely because the vibration-rate of SOL is one and one-half that of UT. Nor is the sensation of orange five-sevenths or any other fraction of the sensation of violet, because the vibration-rate of ether for orange light is about five-sevenths of that for violet rays.*

"Continuity in the variations of the intensity of attention or of sexual desire may be explained by continuity in the variations of certain physical quantities, as for instance the velocity or oversupply of blood, the electrical charges or the temperature of certain organs which have, or may have, an immediate influence on other vital forces. From this one must not conclude, however, that the attribute of being a measurable quantity belongs to these vital forces or to the phenomena determined by them."

The circumstance that Cournot uses the term "sensation of pain," where most writers of his period would have said feeling of pain, makes this passage sound quite modern. As a matter of fact there is very little that could be added to his argument, which is as precise as one could wish.

F. M. URBAN

UNIVERSITY OF PENNSYLVANIA