This is interesting, as it is 'flatly opposed' to the results of Exner in all his seven subjects. Exner's data being false, his explanation that the F.-C. requires a longer interval, because of 'the slower rise and greater duration of the visual sensation,' is, of course, invalid. The author favors the explanation of the differences in the intervals by the movements of the attention (Wundt) rather than by 'sensory inertia.'

In the second series, with forced attention, it was found, contrary to expectation, that voluntarily attending to a specific stimulus has no appreciable tendency to make it appear to precede the other. The best results were obtained, not when the attention was preadjusted, but when the subject was in a state of 'alert indifference.' An explanation of this preadjusted attention is suggested. We decide upon the order of the occurrence of stimuli, not by the order of the sensations resulting thereby, but by the order of the sensations from the reflex movements in the adjustment of the organs in response to the stimuli. If the attention be preadjusted, the sense-organs are more or less adapted, and consequently the reflex movements being more obscure, the judgment is correspondingly uncertain.

XI. Four new pieces of apparatus are here described. The Binocular Stroboscope is an instrument devised by Prof. Sanford for demonstrating a 'little-known' phenomenon of binocular vision—viz., the definite localization of a moving object due to an instantaneous glimpse by each eye in succession. There are also described, 'A Model of the Field of Regard;' 'A Simple Adjustable Stand,' which can be put to a variety of uses; and 'The Pendulum Circuit Breaker,' an instrument "designed to break electrical currents at known and regulable intervals of time from one another." This last instrument was used in the experiments of Study X to obtain an exact interval between the application of the different stimuli.

W. J. SHAW.

Minor Studies from the Psychological Laboratory of Cornell University.

Communicated by E. B. TITCHENER. VI. *Taste Dreams.* E. B. TITCHENER. VII. *On the Quantitative Determination of an Optical Illusion.* R. WATANABE. VIII. *The Cutaneous Estimation of Open and Filled Space.* C. S. PARRISH. Amer. Jour. of Psy., VI, 505-523. Jan., 1895.

VI. This study aims to show that the explanation of dreams, adduced in connection with the other sensations, is adequate for gustatory dreams also. Dreams are of two kinds: presentative

(occasioned by a peripheral stimulus) and representative (due to central excitation). The tendency of psychology is to emphasize more and more the relative importance of the peripheral stimulus; thus the *Eigenlicht* of the retina explains the great predominance of visual dreams.

The number of taste dreams is relatively small. Miss Calkins (A. J. of Ps., V) reports only two in a total of 335 dreams, and none in a total of 298. While without doubt the majority of dreams of the gustatory type are representative, we have no right to assume that they are all presentative any more than we have to assume that all visual dreams are presentative, because the retina is in continuous excitation. In conclusive support of this, five taste dreams were collected, all representative. Two of these are described—one a case of auto-suggestion, being experienced by the author himself.

VII. This article is a continuation of an investigation of the illusion of point and dotted line distance begun by Mr. Knox (A. J. of P., VI, 3). The apparatus consisted of a set of cards, on each of which was placed a line, made up of a dotted line, and a point distance, the centre of the line coinciding with the centre of the card. Knox, by keeping the point-distance constant, and varying the dotted line until the subject judged them equal, found, besides confirming the illusion itself, that the mean variation of the vertical differences is not greater than that of the horizontal. This result was unexpected, because "binocular bisection of horizontal distances is not subject to any constant error," while of vertical lines we constantly over-estimate the upper part.

Dr. Watanabe, 'in the hope of elucidating this difficulty,' conducted a similar series, except that for him the dotted line is the constant. His results on three subjects confirm those of Knox, in showing not only that the illusion itself prevails in all cases, but also that the vertical differences have not a greater mean variation than those of the horizontal. In regard to this latter, he says: "The fact itself holds, [but] we are not at present prepared to suggest any explanation."

VIII. It has been amply proven by experiment that, to the eye, filled space invariably appears greater than empty space, objectively equal. This has been explained by the fact that the movements of the eye are more retarded in the case of filled space. Dresslar (A. J. of Ps.) maintains that the same illusion holds in the case of touch, and the same explanation—viz., movement plus touch—is adequate. Prof. Parrish maintains that, so far from Dresslar's explanation

being adequate, the alleged facts on which it is based are not true—*i. e.*, filled space is not judged by touch as greater than empty space. On the contrary, he shows by two series of experiments upon seven reagents that filled space is judged actually shorter.

In the first series, nine pieces of wood were used, to each of which was attached a number (varying from two to nine) of small rubber projections, the distance between the extremes being constant—64 mm. These were applied to wrist and forearm. The result shows “that for a resting skin a filled distance is, on the average, shorter than an empty distance objectively equal to it.”

In the second series, the apparatus consisted of a strip of rubber .01 in. in thickness (for filled space) and an æsthesiometer (for empty space). The results here confirm the first; filled space is invariably judged shorter than open space—*e. g.*, “an open space of 24 mm. is judged equal to a filled line of 28 mm., and one of 15 to a filled line of 20.” The author concludes that these experiments upon resting skin, showing an illusion opposite to that of sight, clearly support the explanation of the latter in terms of movement.

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Ueber den Einfluss der Geschwindigkeit des Pulses auf die Zeitdauer der Reactionszeit bei Schalleindrücken. Ueber den Einfluss der Geschwindigkeit des Pulses auf die Zeitdauer der Reactionszeit bei Licht und Tasteindrücken.—J. J. VAN BIERVLIET, (Phil. Stud., X, pp. 160 ff; XI, 1, pp. 125-135.

In these two papers are communicated the results of the first part of an investigation undertaken by Professor van Biervliet in the psychological laboratory at Ghent to determine the influence of the circulation of the blood upon the length of the reaction time. The present communications report upon modifications in the duration of the simple reaction to stimuli of sound, light and touch, accompanying varying rates of pulse beat. Further investigation will concern itself with the effects of changes in blood pressure.

In all, 17 different observers took part and the results of 6800 experiments are reported. The subjects were given preliminary practice. The experiments were made in series of 20; before each series, the pulse rate at the wrist was determined by two independent observations. The ordinary set of apparatus was employed, including the Hipp chronoscope, a hammer to give the sound stimulus, the Leipzig pendulum for the light stimulus, and for touch a hammer, which was allowed to drop upon the first joint of the middle finger. The subject sat in a dark room apart. In the