

which were of five-tenths of one and two per cent., and of complete saturation. The test stimuli regularly employed were graduated series of aqueous solutions of sulphate of quinine, cane sugar, common salt and tartaric acid. Three drops at a time of the material at a temperature of  $15^{\circ}$ – $18^{\circ}$  C. were applied to the tongue with a pipette.

Signor Fontana's results are as follows: Eucaïne B, like cocaine, tends to raise the intensive limen for all four of the taste-qualities. Its effect, like that of cocaine, is far more marked upon bitter and sweet than upon salt and sour, and is most marked upon bitter. The degree of effect of eucaïne B upon the three qualities less implicated can be stated in each individual case. Fontana does not compare eucaïne B with gymnemic acid. In this connection, however, one may recall the showing of Dr. Kiesow that gymnemic acid, like cocaine, affects sweet and bitter much more than salt and sour, that, unlike cocaine, it affects sweet more than bitter, and that its influence upon bitter is much less intensive than the effect of cocaine upon sweet. Thus in eucaïne B and gymnemic acid we have two substances which may eliminate one quality and yet at the same time may produce slighter and mutually comparable effects upon the other three.

Fontana tested his sensibility for the different qualities three minutes and five minutes after the application of the anæsthetic and again at intervals of five minutes until the normal limen was restored. From these trials it appears that the effect of eucaïne B is less lasting than that of cocaine.

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## EXPERIMENTAL.

*Ueber den Einfluss der Farbe auf die Grösse der Zöllnerschen Täuschung.* VITTORIO BENUSSI. Zeitschrift f. Psychologie u. Physiologie d. Sinnesorgane, Bd. XXIX., Heft 4 u. 5, S. 264–341; Heft 6, S. 385–433.

As is indicated by the title, the purpose of the experiments was to determine the effect of color (and brightness) upon the Zöllner illusion. The apparatus consisted of a perpendicular frame, covered, usually, with white cardboard, and having the figure drawn upon this as a background. The single main-line was fourteen centimeters long, with transversals five and one-half centimeters long, and crossing at an angle of twenty degrees. At the upper end of the main-line a thread was attached, which ran over the top of the background, and was weighted behind in order to keep it drawn tightly. The test consisted in adjusting the position of the thread so as to appear to be

in line with the main-line of the figure. The amount of deflection necessary to produce this appearance was read off from a millimeter scale at the top of the frame over which the thread passed. Seven one-colored figures were used (red, yellow, green, blue, violet, gray, and black), and forty-two combinations of these into two-colored figures, in which the transversals and main-lines were colored differently.

In one-colored figures the illusion varies with the brightness difference between the figure and background, being weakest for the light gray and strongest for the black. The other one-colored figures come in between the black and white in the order yellow, red, green, violet, and blue. In the two-colored figures a darkening of the transversals and an increase in the brightness of the main-line result in a greater illusion. The illusion also varies directly with the brightness difference between the figure and background, decreasing with decreasing brightness difference. The illusion was also found to be reduced to a minimum in those two-colored figures which have a maximal brightness difference between main-line and ground and a minimal brightness difference between transversals and ground. In colored figures, then, the force of the illusion depends upon the brightness difference between the figure and background and the color quality of the components of the figures. The equations and laws for this brightness difference between the figure and background are worked out to a very considerable length.

It was found that, in order to produce a maximal illusion, the transversals must cross at an angle of from twenty to thirty degrees; they must be relatively long and close together; there must be a maximal brightness difference between the transversals and background and a minimal brightness difference between the main-line and background.

In determining whether or not the illusion depends upon eye-movement, it was found that there was practically no difference in the results when the eyes were fixated upon the point of junction of the thread with the main line and when they moved freely. Eye-movement alone was regarded as insufficient to account for the illusion. (The author assumes that steady fixation eliminates eye-movement; it would seem that this assumption is not entirely accurate.)

With reference to the nature of the illusion, the hypothesis that it is an illusion of judgment is dismissed as unsatisfactory. In support of this statement experiments were made with the two parts of the regular figure united by means of the haploscope. If the illusion

were really one of judgment, it would not be affected by this method. The results of over fifty-five hundred separate determinations demonstrated that the illusion is decreased when the two parts of the figure, the main-line and the transversals, are united by the haploscope, the illusion, however, still varying with the brightness difference between the figure and background.

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*Untersuchungen über die sogenannten Aufmerksamkeitsschwankungen.* E. WIERSMA. Zeitschr. f. Psy. u. Phys. d. Sinn. Bd. 28, H. 3-4. Pp. 179-198.

In this article Dr. Wiersma continues his researches upon the attention waves and extends them to include the effects of changing conditions upon the capacity for perception as measured by the time of visibility of a faint stimulus. Again the three senses, sight, touch and hearing, were investigated, and each with respect to the effect of the time of day, of mental and physical fatigue, and of the use of alcohol and sodium bromide.

The change during the course of the day was found to be dependent upon whether the individual was a morning or evening worker. For a morning worker the period of greatest perceptive capacity was at noon, and the early morning hour was considerably better than the evening hour. For the evening worker, on the contrary, there was a gradual increase in capacity from morning to evening. The experiments were taken three times a day only, between nine and ten in the morning, two and three in the afternoon, and seven and eight in the evening, so that the exact point of change between increasing and decreasing efficiency could not be established. It is suggested that the difference in type is rather a matter of habit than inheritance, for experiments upon nurses who had no fixed periods of mental work showed no such marked influence of the time of day as did the experiments upon the academic men.

Bettmann's results were confirmed in the experiments upon the influence of mental and bodily fatigue. The period of visibility of the minimal stimulus was decreased by both mental and physical work, adding or walking for two and a half hours, although the decrease was more marked for the mental than for the physical work.

Ten c.c. of alcohol had from the beginning a marked effect in decreasing ability of perception, while three grams of sodium bromide had just as marked an effect in increasing it. The effect of the bromide was also found to persist for three days after the drug had been taken.