

The inorganic compounds of those elements that are in the middle of the periodic or natural system and that have neither strongly pronounced positive nor negative characteristics are sweet, and compounds of the elements of the other groups are bitter.

The paper contains no data of special experiments. The author bases his theory—if it may be so termed—upon a collection of facts largely well known. Many of the additional allusions, etymological explanations, etc., that the article contains may be interesting, but they are hardly to the point and do not serve to strengthen the author's theory.

As far as the 'double nature' is concerned upon which, according to the author, saporific power depends, it may with propriety be held that all chemical compounds (except the molecules of the elements themselves) have a dual nature, since, speaking in general terms, it is *unlike* elements that combine to form chemical compounds. Again the author explains only in a vague, indefinite way what he means by the 'harmony' in the compound upon the existence of which sweet taste depends. By his arbitrary assumption that there are only two taste sensations, he eludes the insurmountable difficulties of explaining the taste of salty, sour and alkaline substances by means of his theory.

Though the article under consideration is interesting to read, the reviewer must confess that in his humble judgment it has not answered in any satisfactory manner the three important questions that it has raised.

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TOUCH.

Ueber die Function der Tastkörperschen. M. VON FREY and F. KIESOW. *Zeitsch. f. Psych. u. Phys.*, XX., p. 126.

This is a very careful investigation of the stimulus to touch sensation. The following facts "necessitate the assumption that, as in the field of the other senses, so also for the sense of touch, the external stimulus acts only as a liberator of energy (auslösend); that the energy in the nerve-fibers peculiar to the excitation-process arises, not from the activity of the stimulant, but from chemical transformations in the end-organ, of which the stimulant is merely the occasion."

1. The depression-energy necessary to excite the peripheral nerves is several hundred times greater than that of the weakest touch-

stimulus. 2. Continuous pressure stimulates the touch-organs but not the peripheral nerves. 3. After a heavy and not too brief weight upon the skin, the sensation continues after the outer stimulus has been removed.

The authors investigate this process of liberating energy (*auslösungsvorgang*), the factors involved being: (1) the locus of the stimulation, (2) its quantitative aspect, (3) the depth of the depression and (4) its time-aspect. They eliminate the last factor, wherever the surface stimulated remains constant, by keeping the time of the depression-process constant. Where the surface stimulated varied, the time was varied according to a rule resulting from experiments previously carried out by Dr. Kiesow. The rule is as follows: with constant pressure, increase in the surface area stimulated necessitated a slow proportional increase in the rapidity of the depression: decrease of the surface-area necessitated a rapid proportional increase in rapidity of depression.

As to the locus of stimulation. Areas differ: (1) in the sensitiveness of their end-organs, and (2) in the number of their end-organs. Places free from hair must be sought out, as using the razor does not remove the difficulties which the hair-cells involve. The problem demanded that the experiments be carried out by stimulating single touch-organs, and this is possible only on such portions of skin as do not contain too many touch-organs. Tendons and blood-vessels, concave and convex surfaces had to be avoided. The place chosen was the volar side of the wrist. After carefully searching out the loci of the touch-organs, the area experimented upon was drawn upon a chart, each point being carefully marked and described.

After the time and loci of stimulation had thus been arranged for, the author's simplified problem related to the significance: (1) of the surface area, and (2) of the depth of the impression in the stimulation of single anatomical elements. As, however, the depth of the depression was empirically adjusted to the varying anatomical characteristics of the skin (the authors find an empirical adjustment the only possible one), the main question investigated was the significance of the quantity of stimulated surface to touch-sensation.

The apparatus for applying stimuli was but slightly different from the hydrostatic threshold-scales described by Dr. Kiesow in a previous report. Metal pieces were carefully cut to correspond to the size of single elements or touch-organs beneath the surface of the skin, and to various combinations of single elements. For single end-organs the optimum demanded was 0.4 mm.² or a circle of 0.5 mm. diameter.

Stimulations covering 0.05 mm.²—0.005 mm.² were affected by the use of hairs. The disturbing effects of weariness, varying conceptions of the nature of the experiments in the mind of the subject, variations of temperature in the room, etc., were carefully eliminated. The two authors experimented upon each other as subjects.

The main results of the investigation are as follows: for the stimulation of any particular touch-organ the production of a certain depression with constant time and depth characteristics at the point of skin beneath which the organ is located is the necessary condition. The excitation of a touch-organ is a function of the depression necessary at its locus. The barely noticeable depression increases slowly but clearly when the surface area is increased; and this generalization holds for large as well as for small stimulated surfaces. Where the time is constant, such stimuli as produce a like depression possess equivalent stimulation-values.

One wishes that these careful and elaborate experiments had been carried out on a larger number of subjects, and that central influences such as attention, preconception and suggestion had been investigated. The question arises whether the Druckgefälle of a particular touch-organ, here treated as a constant, does not vary with central influences which the authors do not take into account.

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FEELING.

Zur Kritik der Wundt'schen Gefühlslehre. E. B. TITCHENER. *Zeitschrift für Psych. u. Phys. d. Sinnesorgane*, Bd. XIX. Pp. 321-326. 1899.

Bemerkungen zur Theorie der Gefühle. W. WUNDT. *Philosophische Studien*, Bd. XV., Hft. 2. Pp. 149-182. 1899.

The more often an expert opinion is expressed, the more liable is it to suffer variation and possible inconsistency. This danger is more pronounced when the expressions are offered in independence of one another. Variations are sometimes due, no doubt, to a progress in the views of the expert, as well as to the modifying influence of newly discovered facts. Inconsistencies may arise through forgetfulness or simple logical weakness. The literature under consideration is of interest because such tendencies are more or less apparent in it. Wundt has given three definite expressions of his psychological views¹

¹ *Grundzüge*, etc., 4th ed., 1893, I.: 555-600; *Lectures on H. and A. Psych.* (Eng. tr. based on 2d German ed.), 1896, pp. 210-222, 247f.; *Outlines of Psych.* (Eng. tr.), 1897, pp. v-vi, 74-89. Cf., also Titchener, *An Outline of Psych.*, 1896, Ch. V., especially sec. 34, pp. 105-108.