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SYNESTHESIA

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In 1920, Wheeler (9) published a detailed description of the synesthesia of a blind subject. This paper was followed by a series of papers under the joint authorship of Wheeler and the synesthetic subject Cutsforth, which deal especially with the function of synesthesia in consciousness. In the first paper a description is given of the various forms of synesthesia possessed by the subject, who had lost his sight at the age of eleven. He had an extensive laboratory training and was a proficient introspector. Some of the forms of synesthesia were colored tones, music, alphabet, voices, proper names, names of the days, the months, the digits, the directions of the compass, colored number form, and colored forms for the week, month, century, and alphabet, colored odors, and cutaneous sensations, and colors for affective states, and for some of the emotional complexes. He also experienced colors for the imagery of tones, tastes, etc., which were the same as the colors for the respective sensations. Detailed description is given of the colors and their degree of permanence. The author ventures the hypothesis that synesthesia is "an immediate and permanent 'conditioned' reflex." The paper contains a good historical survey of the subject and an extensive bibliography.

Two years later Wheeler and Cutsforth (12) published an elaborate comparative study of the latter's (A) synesthesia with the experience of an asynesthetic blind subject (B). A is not totally blind, but his vision is confined to a form of entopic phenomenon. He describes his field of vision as filled with shifting colors and brightnesses. The color distribution corresponds to the retinal zones. The entopic phenomenon is probably due to inherent retinal light. He can distinguish these entopic colors, which are sensations, from the imaginal synesthetic colors. The authors discuss at length the process by which subject A is conscious of meaning. From a comparison of A's experience with that of B, it seems "that synesthetic imagery in A's case functions as an essential component in the

development of meaning. Synesthetic phenomena are themselves the development of meaning: they are acts of cognizing." For B, non-visual images come into the focus of consciousness upon a dominantly kinesthetic background, and as they then develop they become meaning. The functioning of the content of consciousness for the two subjects is the same; the mental contents, however, are different. The authors conclude that synesthesia is not due to an organic condition of the brain such as "tangling of fibers," but rather it is a normal and essential mental function for the subject, a cognitive process differing in no respect from any other process of meaning.

In a further paper (13) the authors develop more fully the rôle which synesthesia plays as a cognitive function in the life of the subject. They also describe the function of synesthesia in perception and in learning (11). In perception, the primary process is indescribable; it is merely a "something." Without the secondary process the observer cannot perceive. In the learning process, synesthetic phenomena appear in connection with the perception of the stimulus, and in retention, anticipation, immediate and delayed recall. In a short paper (10) the authors give a description of the subject's form and color imagery for numbers, dates, days of the week, and the months. In their latest paper (14) the authors have described the development of the concept on the part of the synesthetic subject. They performed experiments similar to those of Fisher (*Psych. Monog.*, 21, 1916) and found that the synesthesia is not confined to perceiving, but is also characteristic of conception. They confirmed Fisher's results, but desire to lay more emphasis than does Fisher upon the rôle of kinesthesis in the formation of the concept.

Cutsforth (2) reports an experiment upon the rôle of synesthesia in reasoning. The material used consisted of analogies, absurdities, simple and difficult abstract problems. The introspection of the synesthetic blind subject was checked against that of an asynesthetic, normal subject. Neither subject had imageless or non-sensory contents of consciousness. The results confirm those of the previous experiment described above. The subject's synesthesia is not an extraneous association. It is an essential factor of the process of comprehending meaning, and is both conceptual and perceptual in character.

English (4) has given a brief account of the experience of a child of three years, eleven months, who called soft music yellow, loud music black, and medium-loud music blue. The reason given was that one cannot see yellow crayon marks on paper so well as black. The author suggests that from such reports it may be possible to discover the origin and development of color-hearing.

Azoulay (1) has described the case of an artist, who saw a white light every time she heard a sudden voice, if she happened to be in a dark place at the time. She did not, however, have color-hearing in the usual sense of the term.

Mudge (7) asked fifty students, most of whom were school teachers, to "report the colors, or brightnesses which they associate with certain tones, musical keys, instruments, and familiar musical compositions." Only eight persons reported lack of such associations. The author concludes that much of the visual imagery is due to particular experiences. High tones and high-pitched instruments are associated with bright colors, and low tones, and low-pitched instruments are associated with dark colors. There also seems to be a relation between timbre and richness of color and between purity of tone and the black-white series.

Wells (8) describes the nature and function of symbolisms, principally according to the views of Bleuler. He compares synesthesia with symbolisms, induced hallucinations, and autistic thinking. He also gives a number of examples from the literature of synesthetic experiences.

Winkler (15) has attempted a physiological explanation of synesthesia. He accepts the general theory of nerve conduction of Stöhr, which states that sensations occur in the periphery and that the impulse goes from there to the central neurones and thence to the various peripheral organs, both receptors and effectors. An acoustical stimulus can go to the central system and from there to the retina, causing a sensation of light. In this way he believes that synesthesia can be explained. The paper, which contains many references, supposedly in support of the theory, does not deserve further description.

Lundborg (6) has investigated the question of inheritance of colored hearing in three generations of a certain Swedish family. The father of the first generation, six children of the second and three of the first had colored hearing. The author concludes from these cases that colored hearing is probably a dominant Mendelian factor. It is not related to sex. The inheritance of other mental characteristics was also investigated.

Ginsberg (5) describes a case of synesthesia, where the stimulation of each of the sense organs produces secondary color sensations.

The subject also has photisms for digits and days of the week. Primary sensation blends often give corresponding secondary color blends. The author thinks that the association theory explains such phenomena as number forms, associations of colors with abstract terms, etc., but that we must seek a physiological explanation for "pure" synesthesia, such as colored hearing, colored tastes and odors, etc. He also believes that everyone has synesthesia in some form or other.

Donath (3) gives a complete description of a case of colored smelling. The associated colors, however, were not very constant. The subject also had colored hearing. The author describes the various theories and concludes that synesthesia is probably due to irradiation.

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SPECIAL REVIEWS

HENRY J. WATT. *The Sensory Basis and Structure of Knowledge.* London: 1925. Pp. xi+243.

This book may count in the history of psychology as the "swan song" of structural psychology. The author—the late Dr. Watt, Lecturer on Psychology in the University of Glasgow—made systematic psychology his major interest. Over a period of nearly twenty-five years, until his recent untimely death, Watt's numerous experimental and theoretical papers, including his two major contributions, *The Psychology of Sound* (1917) and *The Foundations of Music* (1919), were directed chiefly upon the systematization of mental contents. The incentive and the careful methodology of Külpe and Stumpf, his two teachers, are evident in all his work, yet his own contribution was much more than a re-phrasing of what he had learned from them.

In brief, the system of psychology which is set forth in the volume under review is based upon sensation with its variable attributes. These attributes are: *quality, intensity, systemic position* and *extent, temporal position* and *extent.* While as a general rule each sense has its own unique quality, the other attributes are, with certain exceptions, common to all the senses, and serve as a means of integration. "We find," writes Watt, "good reason to believe that mind, like nature, is built on a coherent plan, and works in an orderly way. Or, being founded upon, or consisting of, certain elements, the integrations it shows flow from the nature and properties of these elements, and are therefore as systematic as the latter. The plans of mind are not those of the material system, to be sure. Nor can its actions be said to be merely mechanical. But they seem to share in that systematic coherence and rationality that in nature so gratifies our love of knowledge" (p. 74).

Given the elementary sensations of varying modality, the attributes, the capacity to fuse, and "the resulting conformations by summative overlapping are all that we need" in order to explain every integrative result. "It is evident that the whole nature of every figure is fully determined by the elementary sensations of which it consists, along with the distances that emerge from their more distant positions. This is the total *conformation* of the figure,