

in leaving the house would conceal two statuettes near the door under his mantle; after two days N. would regret his theft and return the pieces of art. Dr. X. repeated to N.: "and you will steal, do you hear? You will steal!" Later Herr F. related the event as having been carried out in every particular. Later still, N. was imprisoned for stealing an overcoat. On his person was found a note-book recording many small thefts, such as visiting cards. The author felt himself possibly to blame. Much later when N., who was at the time of the theft 17 or 18, had grown (N.'s father forbade it sooner) the author again hypnotized N., and learned that at the same time when the boy committed the theft which ended in imprisonment, Dr. X. had met him on the street, lead him into a café, hypnotized and commanded him to steal 'little things,' such as watches, gloves, money cases and probably visiting cards.

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LEIPZIG.

VISION.

Note on the Analysis of Contrast-Colors by Viewing, through a reflecting tube, a Series of grey disks or rings, on colored surfaces. A. M. MAYER. Am. Jour. of Science. (4) I., 38-40. 1895.

Article (Vision) in Johnson's Universal Cyclopædia. W. LE CONTE STEVENS.

Untersuchungen zur Lehre vom Farbensinn. W. KOSTER. Arch. f. Ophth. 41 (4) 1-20.

Théorie de la Couleur. W. NICATI. Arch. d'Ophthal. XI., 1-44. 1895.

From the fact that a dark grey background is most effective when yellow contrast-color is to be produced, and a light grey when the color to be produced is green, Professor Mayer argued that a yellow-green contrast-color would change its tone with a change in the intensity of the background. He found this to be the case. Bits of violet paper were placed on thirteen different shades of grey; on the four lightest, the contrast-color was a greenish yellow; on the fifth, it was equally yellow and green; and on the darker papers it became greener and greener until at last it was a green almost devoid of yellow. But Professor Mayer considers that this *may* be due to the fact, noticed by Professor Rood, that some colors regularly change their tone on being mixed with larger and larger amounts of black.

Professor Stevens has given what must be considered as an admirably clear account of the principal phenomena of vision, when regard is had to the small space into which it had to be condensed. He makes short work of the bugbear of the inverted image, and he shows that the contest between the empirical and the nativistic school loses its importance in the light of evolution. Attention is given to some of the new facts of color-vision; but it is an inadvertence to say that the cones are sensitive to variations of color chiefly. The correct statement would be that *only the cones* are sensitive to variations of color; they must be extremely sensitive to variations of intensity in white light as well,—otherwise the fovea would not be the place with which we make out the minutest variations of line and shade in an intricate drawing. If the *cones only* give color, they do not give *color only*. Every new and adequate theory of vision must make provision for this fact; but, strange to say, it has been overlooked by no mean authorities.

I must protest also against saying that the physicists are satisfied with Helmholtz's theory of vision, with the implication that that is a fact of critical importance. The physicists have nothing to do with a theory as to what goes on in the retina and in the brain—that is beyond their province. It would be as much to the point if the chemists were to announce that they were perfectly satisfied with the corpuscular theory of light. As matter of fact, the objections to the theory of Helmholtz are exclusively objections from the side of sensation; as far as the physics of the question is concerned, there is nothing in the theory that anyone could take exception to. And when it is a matter of discussing light as a *sensation*, we do not so much say that the physicists are not in the habit of thinking about their sensations, pure and simple, as that they are not in the habit of reading up the discussion that is going on regarding sensation. Professor Cattell has said he best word that has been said about the Helmholtz theory when he said that it is both pre-evolutionary and pre-psychological; the arguments that hold good against it are not only arguments that appeal with especial force to the physiologist and the psychologist, but they are arguments that have been debated in Pflüger's *Archiv* and the *Zeitschrift für Psychologie u. Physiologie der Sinnesorgane* and other journals of that kind, which the physicists, overwhelmed as they are by their own journals, have no time to read. Even the critical facts, of late discovery, do not always reach them. Captain Abney, in his last book on *Color Vision*, says of a certain man, who had no variation of sensation throughout the entire spectrum, that it has been

'proved' that he sees green only. Now if a man has no other light sensation with which to compare his one sensation, it is absolutely impossible for us ever to find out what that one sensation is, unless by way of deduction from a theory which is taken as proved. But, fortunately for such cases as this, there have been instances of monocular total color-blindness, and from them it is known that the single sensation is a colorless sensation. Moreover, we have ourselves this monotone sensation in the periphery and throughout the retina in a faint light, and one must have a very strong preconceived affection for a theory to regard this sensation as green, though this, too, is a feat that has been accomplished. I have been told that there is one important university in this country in which the theories of Helmholtz and Hering have both been definitely given up, and particularly in the physical department.

Koster explains the fact that the fovea lags behind the periphery in sensitiveness to faint light by the fact that it is generally, on account of its position with respect to pupil and lens, more brightly lighted up, and hence, if I understand him, in a condition of greater exhaustion. He forgets that in a faint light also the fovea has the same advantage of position, and that the superiority of the periphery is on this account greater than a simple measurement gives evidence of. For Koster's eyes the difference would seem to be very slight; if this is so his eyes differ most remarkably from those of other observers who have measured the phenomenon. He uses the term periphery without any indication as to what part of it he is comparing with the fovea. The maximum sensitiveness is about 35° away from the fovea, and it is true that at distances remote from this the superiority is not extremely great, but at this distance it is, for most eyes, as four to one, which is hardly to be called slight. He seems to have made no measurements.

Koster finds the Pürkinje phenomenon to persist, under certain conditions, in the fovea itself; this does not, however, disprove the belief that the visual purple is the principal factor in the adaptation which the rods undergo. The cones have a means of adaptation of their own in the varying length of their myoids under light and shade (Angelucci, van Genderen Stort), and also in the moving out and in of the pigment grains. This might also account for a superiority of the edge of the fovea over its centre, which Koster detects. That the adapted eye sees colors less well than the unadapted, Koster finds not to be the case. This agrees with my own observations; I found, in fact, that there is a distinct adaptation for color, though nothing like so much as for light, in the middle periphery.

Nicati uses the term color for the entire sensation produced by light, as painters speak of the color, sometimes, of a picture in black and white. By protochroism he means grey vision; by metachroism, partial color blindness; and by pleochroism, normal vision. He gives a theory which, he says, will seem at once to be plausible, and which will be confirmed by all the considerations which he will have mentioned at the end. In the rods and cones, he says, there is no differentiation such as could give rise to *three* colors, but in the central terminations of the bipolar cells, as described by Ramon Y. Cajal, we have just the separation into *three* layers, which we are in search of as a basis for a three-color theory. The chemical effect of light on the photopsine (the visual purple) is to disengage electricity; the different threads of the bi-polar cells have different electric resistance, and thus the electricity is conducted, according to its varying degrees of strength, by one or another of the sets of threads to the several layers of their terminal expansions. (But is not this a little like making a big door for a cat and a little door for a kitten? What prevents the strong current from going also through the path which is fitted to conduct the weak current?) The synoptoblasts are the large ganglia below the bi-polar cells, and their function is to restore equilibrium, after red has been seen, by sending down a discharge which results in green.

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EXPERIMENTAL.

Ueber den Einfluss von Gesichts-Associationen auf die Raumwahrnehmungen der Haut. MISS M. F. WASHBURN. Philosophische Studien. Bd. XI. (1895), pp. 190-225.

The development of tactual space is undoubtedly influenced by vision and, though the assertion of this article that the fact has entirely escaped the notice of previous investigators, with the one exception of Weber, who mentions it only in a negative way, called for a correction in a note by the editor, yet a series of experiments such as Miss Washburn has made serves to emphasize an important truth. Results obtained from subjects who visualized but little, from others who are able at will to abstract from their otherwise vivid visual images, and finally from one blind subject are compared with normal results in which the images immediately arising when the skin is touched are allowed to play their usual part. In this way it is shown that Camerer's subjects in his experiments on the method of equivalents