DALTONIANA

NEWSLETTER
OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES

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LITERATURE SURVEY

Photopic spectral sensitivity of the peripheral retina, by B.R. WOOTEN (Brown University, Providence, Rhode Island 02912), K. FULD (Dartmouth College, Hanover, New Hampshire 03755) and L. SPILLMANN (University of Freiburg, Germany), J. opt. Soc. Amer. 65/3, 334-342, 1975.

Photopic spectral sensitivity was determined in the mid- and far periphery of the retina in its horizontal nasal meridian using a 1° monochromatic test flash. For the 30° and 70° excentricities the test flashes ranged from 410 to 670 nm in 20 nm steps. In order to test the generality of the findings, 450 nm and 550 nm flashes were employed at three additional excentricities, 6°, 50° and 80°. Two methods were used. After about 10 min of dark adaptation the subject viewed for 4 min a 12° adaptation field which was similar in spectral composition to CIE source A. During the first 2 min the increment thresholds were measured. The resulting spectral sensitivity functions displayed a maximum at about 440 nm and a secondary maximum at 550 nm in agreement with previous work (R.A. Weale, J. Physiol. 119, 170, 1953). Following termination of the adaptation field, absolute thresholds were measured for the same test-field condition and for a period of 12 min. A single wavelength was used in each dark adaptation curve. From these curves spectral sensitivity functions were derived for various times in the dark. The results showed that the 440 nm maximum quickly diminished after termination of the background. When photopic thresholds were estimated from the cone plateau of the dark adaptation curves, the spectral sensitivity functions peaked at about 550 nm and had much the same shape from the parafovea to the far periphery. The authors suggest that previous findings of maximum photopic sensitivity in the short-wave regions of the spectrum resulted from chromatic adaptation induced by the background (such as source A) that were weighted towards middle and long waves and selectively depressed the corresponding cone systems. - Ingeborg Schmidt.

Color induction : dependence on luminance, purity and dominant or complementary wavelength of inducing stimuli, by A. VALBERG (Institute of Physics, Univ. of Oslo 3, Norway), J. opt. Soc. Amer. 64/11, 1531-1540, 1974.

The inducing color stimuli were presented to the right eye in a 6.1°x6.2° test field surround, the induced color appearing to the right eye in a semicircular and initially achromatic central test field, of 1°x2° substense of a constant lower luminance. The central semicircular reference field projected by a color matching instrument is seen by the left eye in an achromatic surround. Due to a haploscopic method the observer viewed the two central fields adjacent to each other. Increasing luminance yielded induced colors of lower lightness but of constant chromaticity. For 21 dominant and complementary wavelengths of the inducing stimuli the induced colors have been measured as functions of the purity of the surround. The results can be described in terms of the opponent color metrics. Graphical presentation allows to predict the equivalent color-matching coordinates of an induced color for any combination of dominant wavelength and purity of the inducing color stimulus. A quantitative formulation of color induction that considers photic adaptation level, subtense of the inducing stimulus and time of fixation is suggested. - Ingeborg Schmidt.

Identification of cone mechanims in graded responses of foveal striate cortex, by P. GOURAS and P. PADMOS (Inst. for Perception TNO, Soesterberg, The Netherlands), J. Physiol. 238, 569-581, 1974.

1. The earliest electrical response detectable in foveal striate cortex of anaesthetized Rhesus monkeys following light stimulation is a graded potential which is positive at the cortical surface and negative in the grey matter and has a peak latency of about 60 msec. The response is similar at both the on- and the off-phase of a light stimulus.

2. The relationship of this graded potential to the depth of the recording electrode, to the latency of extracellular impulses and to post-synaptic potentials suggest that it is generated by the depolarization of cortical cells.

3. Action spectra obtained in the presence of strong selective chromatic adaptation indicate the participation of all three cone mechanisms in this response.

4. Each cone mechanism contributes a similar potential to the response but antagonism between cone mechanisms is apparent. The proportion in which a cone mechanism contributes to the response varies from one area to another implying topographical differences in the representation of cone mechanisms in striate cortex. - The Authors.

Axial chromatic aberration of eye with achromatizing lens, by J.G. SIVAK (School of Optometry, Univ. of Waterloo, Ontario, Canada N 21 3G1) and M. MILLODOT (Laboratory of Experimental Optometry, University of Montreal, P.Q. Canada) J. opt. Soc. Amer. 64/12, 1724-1725, 1974.

Using an achromatizing lens described by R.E. Bedford and G. Wyszecki (J. opt. Soc. Amer. 47, 564, 1957), retinal focal conditions were established subjectively with trial lenses for the wavelengths 466, 518, 589, 620 and 656 nm, on four subjects. The results indicated a residual aberration of 0.37 to 0.50 $ at 1.54 m distance. This may be due to individual variation but could be partly due to difference of procedures. - Ingeborg Schmidt.

Rod origin of prolonged afterimages, by I.A. MacLEOD and M. HAYHOE (Inst. Molecular Biophysics, Florida State Univ. Tallahassee) Science 185, 1171-1172, 1974.

Method : 30 seconds exposure to a white light of 2.2 million trolands subtending 10° and centered 10° above the line of sight. Conditioning background a 21° red (620 nm) circular field with a small red fixation spot near its bottom. The afterimage appeared as a dark disk in the center of the field. If fixation was maintained, the afterimage gradually faded in a few seconds. If the red conditioning background was abruptly replaced with light of a different wavelength, the afterimage was usually revived. But after the lapse of 7 to 8 minutes a range of intensities could be established within which a change of background color fails to revive a faded afterimage; above this range the observer saw a negative afterimage, below it a positive afterimage. Three rod monochromats were asked to make each of the variously colored substituted background lights indistinguisheable from the red by suitably adjusting their intensities. The average radiances chosen were close to those chosen by the normal observer as interchangeable with the red standard. Explanation : During the first phase of recovery both rods ands cones are locally insensitive and can generate an afterimage. After 7 min cones have recovered to the same fully dark adapted intensity in the bleached area as in the rest of the retina and cannot signal a distinction between bleached and unbleached area. Under these conditions the afterimage is generated by the rods and they cannot revive it unless they detect the change of background. - Ingeborg Schmidt.

Relation between Munsell and Swedish Natural Color System scales, by D.B. JUDD and D. NICKERSON (National Bureau of Standards, Washington, D.C. 20234), J. opt. Soc. Amer. 65/1, 85-90, 1975.

The degree to which Munsell hue, value, chroma and the Swedish Natural Color System (NCS) variables describe the same color space is shown by simple formulas. There is little difference ultimately, whether a description of color space is

arrived at experimentally in terms of color differences (as for the Munsell parameters) or in terms of color resemblances or characters in terms of 6 elementary color sensations (as reported for the NCS 1969 sampling). - Ingeborg Schmidt.

Objective analysis of the Lüscher Colour Test, by R. LAKOWSKI and P.W. MELHUISCH (Dept. Psychol., Univ. Brit. Col., Vancouver, Canada), Die Farbe 22, 239-250, 1973.

Objective analysis of three versions of the Lüscher color test shows significant colorimetric differences between versions, particularly between the blue-green samples. Luminance measurements by red-green color defectives are compared to those of normal subjects. The implications of these findings in terms of structure and interpretation of the Lüscher test are discussed. - The Authors.

Some temporal aspects of colour vision and a pilot study with a new interference filter anomaloscope, by W. Bruce YOUNG (143 Kent St. W., Lindsay, Ontario, Canada), Submitted in partial fulfillment of the requirements for the Master of Science degree in Physiological Optics in the Graduate School, University of Waterloo, May 9, 1974.

Some of the characteristics of normal and defective colour vision are described in so far as they relate to the interpretation of matches made on an anomaloscope.

Measurements made on the Nagel anomaloscope confirm
(i) that no substantial change in the Rayleigh equation occurs until the sixth decade of life,
(ii) that significant seasonal changes occur in the Rayleigh equation,
(iii) that diurnal variations in the Rayleigh equation are smaller than 0.001 in log G/R.

An anomaloscope employing interference filters was built. This instrument was used in a pilot study to find a pair of primaries which, when used in a "blue" + "green" = "blue-green" type of equation, shows only a small variation in the blue/green (B/G) ratio of subjects with a wide range of macular pigment. The optimal pair, found in the pilot population of 16 normals, showed a variation of 0.2 in log B/G. One subject was found, outside this population range, who seemed to be marginally tritanomalous.

A significant diurnal variation in log B/G for the optimal primaries is reported. - The Author.

Examination of anomalous colour vision on base of double equation (in czech) by K. JANOUSKOVA and J. JUREK, Ceskoslovenska oftalmologie 29/5, 343-346, 1973.

Colour campimetry on green plane (in russian), by M. MATEV, Oftalmologitscheski Journal (Odessa) Nr. 3, 216-218, 1973.

Pigment rulers for examination of colour thresholds (in russian), by Y.P. BAZILEVICH, Oftalmologitscheski Journal (Odessa), Nr. 4, 308, 1973.

Graphic method of depicting the colour perception rate (in russian), by L.B. SUKHININA, Westnik Oftalmologie Nr. 1, 67-69, 1974.

Test of color-defective vision using the visual evoked response, by J.A.S. KINNEY and Ch.L. McKAY (Naval Submarine Medical Res. Labor., Groton, Conn. 06340), J. opt. Soc. Amer. 64/9, 1244-1250, 1974.

16 color normals, 8 deuteranopes, 8 protanopes and 1 tritanope have been tested for a pattern response in the visual evoked cortical potential by use of targets formed of hue differences and of luminance differences. An add/sub computer technique allowed to isolate the response for a patterned field from the response for a blank field. Patterns were formed of different hues that lie on the confusion lines of the 3 types of dichromats. For deuteranopes and tritanopes the two hues used were of same luminance, for protanopes they were equated according to their luminosity. For patterns formed of luminance differences three different degrees of gray contrast were choosen so that a dichromat could be tested with a luminance pattern that should give a response comparable to that for a hue pattern. Although color normals give pattern responses for both stimulus parameters, color defectives shows responses only to luminance and have no pattern response to contrasts that consist of hues that they confuse. The results clearly indicate that the technique can be used to detect color vision defects, including adult malingerers, children and animals. A possible error is confusion pattern response elicited by luminance contrast with one elicited by hue contrast. Solutions to avoid this error are shown. An interesting finding in color normals is that the latency of the pattern response to hue contrast is longer than the pattern response to luminance contrast, both of equal amplitude, which seems to indicate a longer processing time for hue information than for brightness. - Ingeborg Schmidt.

A closer look at the tritanopic convergence point, by P.L. WALRAVEN (Institute for Perception TNO, Soesterberg), Vision Res. 14, 1339-1343, 1974.

On the basis of new experimental data of tritanopic vision the convergence centre for tritanopia has been redetermined, and has turned out to be x = 0.1747, y = 0.0060 in the Judd 1951 chromaticity diagram. A consequence of this determination is that the blue system is more sensitive than was concluded from

the Thomson-Wright (1953) study. The spectral sensitivities of the three colour mediating systems are derived. The ratio of the number of red, green, bleu receptors in normal trichromatic eyes is derived to be 32 : 16 : 1. - The Author.

What is it that confines in a world without color? by M. ALPERN (Dept. Ophthal. Univ. Hosp. Ann Arbor, Mich. 48104) Invest. Ophth. 13/9, 648-674, 1974.

Making use mainly of own observations on monochromats, A. tries to analyse whether a world without color is a result of the dearth of cone visual pigment or a defect in neural connections or both. Psychophysical experiments (dark adaptation, increment thresholds, anomaloscope) and densitometry measurements demonstrate that the color blindness of the typical R. monochromat (misleadingly called rod monochromat) is a consequence of the defect that all photoreceptors in his retina including the cones contain a visual pigment with a rhodopsin action spectrum. In the atypical R. monochromat (blue-cone monochromat, deuteranopic protanope) the results of all psychophysical experiments lead to the expectation that only rhodopsin should be found in the retina. Nevertheless, retinal densitometry revealed the presence in normal amounts of at least two cone pigments which resemble in all respect the normal foveal cone pigments erythrolabe and chlorolabe. In a red-cone monochromat (A. has seen only one case) psychophysical tests and densitometry pointed to the existence of a single pigment in the fovea similar to erythrolabe. Increment thresholds revealed a presumably normal concentration also of cyanolabe. In cone monochromatism the lack of color vision must be the result of a reduced number of cone pigments and some abnormal post-receptor neural connections. - Ingeborg Schmidt.

Age effect in the Burnham-Clark-Munsell Color Memory Test, by R. LAKOWSKI and J.A. DE BECK (Dept. Psychol., Univ. Brit. Col., Vancouver, Canada), Die Farbe 22, 231-238, 1973.

105 subjects, divided into groups by decades, were tested on the Burnham-Clark Color Memory Test and the Farnsworth-Munsell 100-Hue Test. Results of the statistical analysis of the data indicate that BCMT scores are curvilinearly related to age. The dependence of BCMT scores upon color discrimination ability is discussed. - The Authors.

Color vision-marked improvement. Age 10 to 14, by O.W. RICHARDS (College of Optometry, Pacific University) Opt. Journ. Review of Optometry 112/2, 7-12, 1975.

A 10 year old boy was brought to the clinic because he did not see colors. A color vision examination suggested that he was either an excellent malingerer or an atypical achromat. Visual acuity was 20/20 (6/6) and no photophobia was reported.

Color vision testing at the age of 14 years revealed a deuteranomaly with poor discrimination. Careful questioning indicated that the possible alternative of malingering was likely correct. His color vision deficiency may have complicated the returning to color seeing. - Ingeborg Schmidt.

Foveal spectral threshold in tobacco amblyopia, by S.K. BHARGAVA and C.I. PHILLIPS (Manchester Royal Eye Hosp. and Dept. Ophthal. Univ. Manchester, England), Acta ophthal. (Kbh.) 52/1, 67-72, 1974.

The achromatic foveal threshold to red, green and blue was studied in twelve subjects with tobacco amblyopia and twelve matched controls. The amblyopic subject all showed reduced visual acuity, centro-caecal scotoma and acquired red-green dyschromatopsia. The Tübingen perimeter was used. The results show highly significant differences between patients and controls for red and just significant differences (5% level) for green. Threshold differences were significantly greater for red than for green and blue. On the basis of these findings, the possible retinal location of the tobacco lesion is discussed. - Anders Hedin.

Studies on the color vision in the patients with Behcet's disease by the Panel D-15, by K. AOKI, S. OHNO and M. OHGUCHI (Dept. Ophthal., Hokkaido Univ. School Med., Sapporo-shi, Japan), Folia ophthal. jap. 243, 1186-1189, 1973.

84 eyes of patients with Behcet's disease were submitted to the Panel D-15 with the following results : Pass 38 (no errors 22, minor errors 14, one error 2) Fail 46 (tritan 28, border line 4, irregular 14). The problem of rehabilitation in the patients with Behcet's disease is important, because the treatment is still not very effective. - Yasuo Ohta.

Genetic studies of colour blindness on the school children in the perfect isolated tribe Yami (Formosa), by ICHIKAWA (Dept. Ophthal. Centr. Hosp. of the Japanese National Railways, Shibuya-ku, Tokyo), Acta Soc. ophthal. jap. 77, 1908-1915, 1973.

Orchid island is 49 miles from the southern tip of Formosa in the Pacific Ocean. The smallest tribe in Formosa, the Yami, lives only on this island. The present population of tribe Yami is approximately 2,070. They became to "perfect" isolate because of no chance to marry outsiders. Each of the 6 villages has primary school built by compulsory education system. 76 males and 80 females among the total number of 388 students were examined (Ishihara, screening series of the AO-HRR, anomaloscope, Panel D-15). The frequency of defectives in the males was 14.47 $\pm$ 4.03%; no defective females were found. As the result of a survey on 8 pedigrees, one family with a repulsion mixed heterozygous mother with normal colour vision was found. The frequency of cousin marriage (21.2%) obtained among the

colour defective families may show the average percentage of consanguinity among the population of the Yami tribe. This frequency is quite high. - Yasuo Ohta.

Colour vision deficiencies in French Canadian school children, by M. MILLODOT and A. LAMONT (Lab. exp. Optom., Univ. Montreal, C.P. 6128, Montreal, P.Q., Canada), Can. J. publ. Health 65, 461-462, 1974.

Colour vision was examined in 1537 French Canadian school children (758 boys and 779 girls). 6% of the boys and 0.9% of the girls were found to be colour deficients. This value for boys is slightly less than the expected average and the value for girls is also slightly higher than the generally expected average. It is suggested that there might be more colour deficient boys in the next generation as girls transmit the condition and are found in this study to be slightly more affected than expected. Neither case of tritan nor total colour blindness were discovered in this sample. - The Authors.

Colour, colour vision and colour vision deficiencies. Testing colour sense (Färg, färgseende och färgsinnesdefekter. Färgsianesprövning), by A. HEDIN (Dept. Ophthal. Univ. Göteborg, Sweden), Läkartidningen 70/43, 3831-3837, 1973.

A review in Swedish on the topics of the title. - Anders Hedin.

A method of colour contrast for treatment of spasm accomodation (in russian), by L.N. KOLESNIKOVA, Oftalmologitschecski Journal (Odessa) Nr. 5, 370, 1973.

The effect of memory color on form identification, by R.P. MIAL, P.C. SMITH, M.E. DOHERTY and O.W. SMITH (Bowling Green State Univ., Bowling-Green, Ohio 43403) Perception and Psychophysics 16/1, 1-3, 1974.

The task was one of form identification of stimulus forms representing familiar objects lightly associated with a natural color. The forms were cut from Munsell papers in 3 colors including the natural color, moreover adding 2 alternate "nonsens forms" of the same colors. The results show that memory color, rather than interacting with the object in such a manner as to aid identification, induces a bias toward identification of an object of the memory color. - Ingeborg Schmidt.

CORRESPONDANCE

Leverkusen, April 16, 1975.

Dear Dr. Verriest!

I have the pleasure to inform you that the Executive Committee of the AIC accepted the membership of the International Research Group on Colour Vision Deficiencies as an Associate Member of the AIC.

A. Brockes,

Secretary-Treasurer of the AIC
(Association Internationale de la Couleur
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(continued - please check and inform the general secretary if uncorrect - a list of corrections and of new members will be printed later)

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(To be continued).