

DALTONIANA

NEWSLETTER

OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES

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LITERATURE SURVEY

Spectrally-opponent responses in Ground-Squirrel optic nerve, by G. JACOBS and R.B.H. TOOTELL, Vision Research 20, 9-13, 1980.

The physiological state of the animal has been shown to influence the response patterns of units in the visual system in various ways, so that accounts in the literature can be confusing. Urethane-anaesthetized and unanaesthetized samples of the California ground squirrel both showed spectrally opponent responses, in particular B/G patterns and BG/G patterns. Both types of fibre were indicated under a variety of experimental conditions; hence the authors do not believe that the two functional classes depend on a physiologically stable preparation indicated by Michael (1968) and Gur and Purple (1978). - Janet Voke.

The basis for a new system of colorimetry, by R. CORTH (Westinghouse Electric Corporation, Bloomfield, N.J., USA), J. Illum. Eng. Society 8/3155-161, 1978/79.

The base for a new system of object color colorimetry is explored. It has been demonstrated that using the Retinex Theory (E.H. Land, Scientific Amer. 237/6, 108, 1977) it is feasible to derive from the physical stimuli underlying color vision a color space which specifies the perception of object colors in our visual environment. This method permits the calculation of the effect of the spectral power distribution of illuminants on the perception of surface colors. The calculation enables the direct comparison of the color rendering properties of lamps of different color temperatures and thus provides for the effect of chromatic adaptation. - Ingeborg Schmidt.

Vector magnitude operation in color vision models : Derivation from signal detection theory, by R.W. MASSOP and St.J. STARR (Wilmer Institute, School of Medicine, The Johns Hopkins University, Baltimore, Maryland 21205, USA), J. opt. Soc. Amer. 70/7, 870-872, 1980.

Using the theory of signal detection, we have derived an expression for the detectability of a visual stimulus in terms of the general zone theory of color and brightness vision. This derived relationship elucidates the theoretic-

tical foundation of the Guth vector model for color vision by showing that the non-linear vector magnitude operation used by Guth may arise from the observer decision-making process. Testable predictions of stimulus detectability are generated by the derived expression. - The Authors.

A color metric from opponent color visual channels, by D.C. RICH (Rensselaer Color Measurement Laboratory, Rensselaer Polytechnic Institute, Troy, New York 12181, USA), Color, Research and Application 5/2, 76-80, 1980.

The Ingling-Tsou opponent-color metric for colorimetric evaluation (C.R. Ingling and B. Tsou, Vision Research 17, 1075-1082, 1977) has been reported to be useful for describing foveal color vision of aperture colors, e.g. for predicting the results of the standard color-discrimination experiment. When applied to surface-color data (Munsell collection, the Morley, Mum and Billmeyer data and the data from the ISCC Committee on Color difference Problems) the model does not appear to perform well. One is thus led to the conjecture, that the perception of aperture colors and the perception of surface colors are controlled by somewhat different mechanisms, and to the implication, that an equation derived from theoretical considerations of aperture-color vision will likely have only limited success in predicting surface-color vision. - Ingeborg Schmidt.

Absolute identification of colors in the Munsell notation. Trainability and systematic shifts, by T. INDOU and M. WATANABE (Keio University, Minato-ku, Tokyo, Japan), Color, Research and Application 5/2, 81-85, 1980.

Subjects were trained to specify colors in the Munsell notation hue, value and chroma without comparing colors with those in the Munsell book of Colors. The problem was to find out (1) to what extent the training is effective (2) what the general level of accuracy of estimation is (3) in what directions the results deviate systematically from the correct Munsell notations. The results are described in detail. - Ingeborg Schmidt.

High level trichromatic colour matching and the pigment-bleaching hypothesis, by G. WYSZECKI and W.S. STILES, Vision Research 20, 23-37, 1980.

A simple hypothesis of bleaching of the visual pigments is shown to predict the change in colour matches (Maxwell type) made at a retinal illuminance of 1000 trolands to that at 100,000 trolands. However a failure in the proportionality law of colour matching does occur at high levels so that some colour matches made at 1000 td do not hold when viewed at 100,000 td. Since it is generally assumed that these differences in colour matches can be attributed to bleaching of the photopigments, particularly the red-receptor mechanism, this aspect has been particularly analysed. The "red" and "green" fundamentals give strong and predictable bleaching

characteristics but the "blue" fundamental appeared to bleach very little under the given experimental conditions. Differences in the densities of the ocular media affect the results and the authors suggest that cyanolabe may already be near-diluted at moderate levels of retinal illuminance so that bleaching at higher levels is difficult to detect. - Janet Voke.

Short-flash Bezold-Brucke hue shifts, by A.L. NAGY, Vision Research 20, 361-368, (1980).

Suggestions that stimulus duration variations could account for the minor difference in results obtained by many researchers on the Bezold-Brucke hue shifts led to this study. The effect is characterised by the tendency for low illuminance stimuli to appear bluer or yellower as illuminance is increased. 17 msec flashes at 10 wavelengths and several illuminance levels were used. The test and standard wavelengths were presented simultaneously once every 10-20 sec. Results were of the same form as found by other investigators.- large positive shifts between 500 and 580 nm and at the extremes of the spectrum. The exact location of the invariant hue (where no effect of stimulus intensity on wavelength is found) varies slightly from other studies and disagrees on whether a zero-shift or minimum shift occurs between 475 nm and 505 nm. The size and direction of hue shift at high intensity was affected by stimulus duration but the direction of hue shift at low intensity was independent of duration. The results are discussed in terms of trichromatic and opponent processes - both indicate some form of non-linearity in coding. - Janet Voke.

Spectral sensitivity in the far peripheral retina, by B. STABELL and U. STABELL (Institute of Psychology, University of Oslo, Norway), J. opt. Soc. Amer. 70/8, 959-963, 1980.

Heterochromatic brightness matching, flicker photometry and threshold measurements were employed to measure relative spectral sensitivity at different intensity levels 45° temporally during the cone-plateau period and in the dark-adapted state. Measurements were obtained at intensity levels between the absolute threshold and 1000 photopic trolands. The measurements were made on the Wright colorimeter. The right eye was tested. The authors, who have normal color vision and acuity, served as subjects. The relative spectral sensitivity curves obtained during the cone-plateau period at 45° temporally are closely related to the photopic luminosity curve obtained at the rod-free fovea in the long and medium regions of the spectrum (520-650), irrespective of method or intensity level employed, whereas the relative spectral sensitivity at 45° in the dark-adapted state is scotopic in form under all experimental conditions, suggesting that it is dominated almost completely by rod activity. Possible explanations of differences in the relative spectral sensitivity between fovea and 45° observed below 520 nm and differences in the results obtained when applying different techniques are discussed. - Ingeborg Schmidt.

Colour vision and age, by A. PINCKERS (Dept. Ophthalmology, University of Nijmegen, The Netherlands), Ophthalmologica (Basel) 181, 23-30, 1980.

A study spanning 12 years of systematic examination of patient's colour vision indicated that about 75% of normal persons perform correctly on the TMC plates, 95% on the HRR but almost 50% of normals make some errors on the Ishihara test. Those under 9 years have particular difficulty with Ishihara. No PIC plates gave indication of age dependency on results. Using the Farnsworth D15 and New Color Test of Lanthony (1977) 70-80% of normals achieved a perfect result, 10-20% made one or more minor errors and 5% showed a blue-yellow confusion. Blue-yellow confusions among normals were found to diminish during adolescence, disappear in the 20's and increase thereafter. Performance with Lanthony's D8/2 desaturated panel showed best scores for age groups 30-39 years and red-green confusion for age groups 40-49 years. Rather higher mean 100 hue scores than found by other authors were noted for the various age groups among colour normals (37.5 for colour normals up to age 30, 67.1 for colour normals between 30 and 50 years of age and 94.4 for normals above 50 years). A green shift on the Rayleigh equation using Nagel's Model II anomaloscope with increasing age was confirmed. Confirmation of other studies that colour discrimination is optimum in the third decade was indicated. - Janet Voke.

Thresholds of perception of colored stimuli, by A.V. BERTULIS and A. GUTANSKAS (Kaunas Medical Institute), Doklady Akademii Nauk SSSR, 240 No. 6, 1480-1492, June 1978.

To test the hypothesis that the functional structures of the individual channels of the visual system differ in the degree of their complexity and that the physiological parameters of these structures may differ, the thresholds of perception were measured of visual objects which differed in shape, size and color. The stimuli were three geometric shapes, a circle, a square and a triangle, of three monochromatic colors : red (656 nm), green (544 nm) and blue (432 nm) and also white. All shapes were presented in five gradations of sizes. Within each gradation they were equal in area. The shapes were presented monocularly in the center of the visual field, in a random order, with equal probability of appearance. The dark adapted subject was instructed to determine the least brightness necessary for detection of the stimulus and to identify the color and shape of the figure presented. The square had the highest threshold of identification of its shape, the triangle the lowest, with the circle in the intermediate position. The circle had the shortest circumference, the triangle the longest of the three shapes. However, the sequence of increase in circumference of the figures did not coincide with the sequence of increase in threshold of identification of their shape. The ratio between the thresholds of identification of the figures re-

mained the same with the change in color or size. The curve (abscissa : area in min. of angle, ordinate : luminance in nits) of the thresholds of red, green, blue and white triangles were always at a lower level than those of the circles of the same color and the thresholds of the circles always lower than those of the squares. With an increase in area of the figures the thresholds of shape decreased accordingly. It can be tentatively suggested that the character of spatial summation of the photic flux does not change in the shape of the stimulus. Achromatic and chromatic thresholds coincided for red stimuli and the threshold energies were much higher for red than for blue, green and white stimuli. The range of luminances between the threshold of detection of a stimulus and the threshold of identification of its shape differs for all three primary colors : red has a range of about 1 log unit, blue 3, green 1.5 log units. At the threshold of identification of the shape the subject sees the color stimuli as different in brightness : the blue shape appears brighter than corresponding red or green shapes. The stimuli also appear different in brightness at the threshold of detection, e.g. blue appears less bright than green or red. Since higher contrast is required in order to distinguish the outline for those color-receptive fields, in which inhibition is weaker, the subject chose higher values of brightness for blue than for green. The experiments suggest that the channel for color identification has a definite functional effect on the channels of brightness sensation and shape perception. - Ingeborg Schmidt.

Spectral characteristics of the a-wave and rapid off-response in protanopia and protanomalia, by D. YONEMURA, K. KAWASAKI, J. TANABE, T. YANAGIDA, H. NAKAZATO and K. WAKABAYASHI (Dept. of Ophthal., School of Med., Kanazawa University, Japan), Jap. J. clin. Ophthal. 33, 683-691, 1979.

The spectral characteristics of the a-wave and the initial rapid positive-going off-response (rapid off-response) of the ERG were studied in normal, protanopic and protanomalous subjects. The light source was a xenon arc lamp (1 kW) with a stabilized power supply. After passing through a heat absorbing filter, the stimulus light was conveyed to the eye through a glass fiber light guide which subtended a visual angle of 20°. A direct coupled amplification was used. The spectral response curves (SRC) (amplitude vs wavelength) were obtained from responses to monochromatic stimuli having equal quanta. The spectral sensitivity curves (SSC) were also presented on a quantized base.

The a-wave has already been reported to be divided into two deflections, which were tentatively designated as the \underline{a}_1 - and \underline{a}_2 -waves reflecting respectively the photopic and scotopic functions. Judging from the actual results, however, the \underline{a}_1 - and \underline{a}_2 -waves were partly photopic and partly scotopic. The amplitude and peak latencies of the \underline{a}_1 - \underline{a}_2 - waves depended on the stimulus frequency as well

as on the stimulus intensity. Since the identification of the a_1 - a_2 -waves was hardly possible at the stimulus frequency of 4 Hz, the deepest trough of the a -wave was measured at this frequency. The SSC of the a -wave measured at 4 Hz stimuli in normal subjects fitted the CIE 10° psychophysical photopic visibility curve from 440 to 640 nm. The SSC of the a -wave greatly deviated from the photopic visibility curve at low stimulus frequencies (1/60, 1/5 Hz). The rapid off-response was too small in amplitude at low stimulus frequencies (1/60, 1/5 Hz) to construct the SSC. The stimulus light of the identical intensity repeated at higher rates (4.0 Hz) evoked a distinct rapid off-response in normal subjects and matched the psychophysical photopic visibility curve.

The SSC of the rapid off-response and the a -wave at the stimulus frequency of 4 Hz were lowered particularly in the long wavelength part of the spectrum in patients with protanopia (14-year-old male) and protanomalia (9-year-old male), and their maximum sensitivities were displaced toward the short wavelength. Their psychophysical sensitivities were also reduced at the long wavelengths and their peaks were deviated toward the short wavelengths as compared with the normal control. Since the rapid off-response mainly originates in the cones, the results indicate the existence of disorders in the cones in protanopia and protanomaly. - Yasuo Ohta.

Electroophthalmoscopy and ophthalmochromoscopy in patients with achromatopsia, by S.L. AVERBUCH, Oftalmologi Schurnal 1974, nr. 5, p. 359.

In 6 children with achromatopsia ophthalmochromoscopy revealed changes in the macular area. One of them showed aplasia, the second hypoplasia, the third ectopia of the macula and focal lesions, the fourth, the fifth and the sixth only focal lesions. By light of various spectral contents the depth of focal localization could be determined. Indirect ophthalmoscopy failed to reveal the described changes, in electroophthalmoscopy in usual light they could not be seen clearly. Because of low vision and nystagmus campimetry failed to reveal the central scotoma, but this was achieved in all patients with the help of polaroidal maculotester and scotometric pictures after Marinchev. The data obtained disagree with statements of many authors who insist that changes on the fundus in patients with achromasia are incidental coincidence and unnecessary for the diagnoses of achromasia. - Marion Marré.

Rod monochromatism associated with strabismus, by Sh. A. BROWN and P.A. CROSBY (Sydney Eye Hospital, Sir John Young Cres., Woolloomooloo 2011, Australia), Australian J. Ophthal. 8, 59-60, 1980.

Description of two female cases with rod monochromatism and convergent strabismus. - Ingeborg Schmidt.

Visual sensitivity, resolution and Rayleigh matches following monocular occlusion for one week, by D.G. BIRCH, E.E. BIRCH and J.M. ENOCH (Center for Sensory Studies and Department of Ophthalmology, University of Florida, College of Medicine, Box J-284-JHMC, Gainesville, Florida 32610, USA), J. opt. Soc. Amer. 70/8, 954-958, 1980.

The data were obtained mainly from three normal observers (ages 20 to 50 years) corrected to visual acuity of 20/20 or better. Light-tight black occluders were worn 24h/day. The pupils were dilated for all tests. A battery of tests was performed before, during and after patching namely : 1) photopic and 2) scotopic Stiles-Crawford (SC) functions, 3) visual thresholds after dark adaptation for at least one hour, 4) visual resolution (interferometric acuity and contrast sensitivity functions), 5) color vision. Following three to four days of monocular light occlusion the photopic and scotopic SC functions revealed changes in the shape. The functions were reduced at all areas tested. The flattening of the SC functions is regarded as the result of increased sensitivity to light entering through the periphery of the eye pupil. Changes in other visual functions were an overall increase in visual sensitivity and a decrease in resolution of low intensity gratings. On the Schmidt & Haensch anomaloscope the subjects required slightly more red for a yellow match. No reliable changes could be detected with the Farnsworth-Munsell 100-hue test, carried out monocularly. - Ingeborg Schmidt.

Organ of vision in hypotensive disease, by A.S. SMELOVSKY, V.N. GOLYCHEV and V.G. PANSHINA, Vestnik Oftalmologii 1974, nr. 2, p. 5.

The authors examined the state of the eyes in 120 patients suffering from hypotensive disease. This is characterized by a concentric narrowing of the visual field for blue targets and by an enlargement of the blind spot. Blood effusions and ampullar dilatation of vessels in the anterior segment of the eyeball were noted; a laminar blood flow in the episcleral veins was encountered more frequently than in normals. The overwhelming majority of subjects with hypotensive disease had more dilated arterial and less dilated venous retinal vessels. Many patients had a slight edema of the optic nerve disc and of the surrounding retina; some hypotonics presented maculodystrophy that tended to affect visual acuity. - Marion Marré.

Functional investigation of the macular region in patients with diabetes mellitus, by G.I. ARKHANGELSKEYA, Vestnik Oftalmologii 1974, nr. 2, p. 13.

In 30 patients with diabetes mellitus (59 eyes) and in 20 healthy subjects (40 eyes) functional investigation of the yellow spot were carried out using three special procedures : (1) determination of colour thresholds with the aid of Rabkin's tables, (2) investigating polarization

properties of the yellow spot (by the assessment of Haidinger's brushes), (3) macular light test (photostress-test). The resulting data made it possible to disclose early alterations in the macular region of patients suffering from diabetes mellitus even in the absence of ophthalmoscopic changes. - Marion Marré.

Hereditary dystrophy of the macula traced in five generations, by T.P. TETERINA, Vestnik Oftalmologii 1970, nr. 1, p. 60.

Macular dystrophy, preceded by achromatopsia and nyctalopia, was traced in 5 generations of one pedigree, this morbid condition occurring in 16 out of 68 members. The transmission of the disease is of the autosomal dominant type, the mono- and dizygotic twins being concordant. In this family the presence of familial strabismus was recorded along with the hereditary dystrophy of the macula. In one of the members strabismus appeared in conjunction with achromatopsia and nyctalopia. The course of the disease was identical in the different members of the pedigree. Changes in the macular region were visible only in the older senile patients. Physiological and ophthalmological investigations indicate that the cones are primarily affected. In a far advanced stage rods are also implicated and the process then ends with blindness. A thorough examination of the organ of vision should be done in close and remote relatives of patients with achromatopsia and nyctalopia to get a correct recognition of the hereditary macular dystrophy and its early detection, this being of prime importance for medico-genetic counselling. - Marion Marré.

Acquired color vision deficiency in open-angle glaucoma, by J.X. KOLIPOULOS (21, Omirou St., Athens - 135, Greece), Glaucoma 1/3, 155-161, 1979.

Reports on acquired color vision deficiency occurring in glaucoma are reviewed as well as the methods of examination. Factors affecting the results are discussed : age, other functional disturbances, illumination level, adaptation; finally the author analyzes whether or not there is a correlation between the clinical feature of glaucoma and color vision disturbances. The author believes that with a more sophisticated and methodological approach color vision examination can be a useful tool in the early diagnosis, follow-up and prognosis of open-angle glaucoma. - Ingeborg Schmidt.

Syndrome of retrobulbar neuritis in edematous exophthalmos, by T.D. STRAZHDINA, Vestnik Oftalmologii 1972, nr. 2, p. 87.

Ophthalmological symptoms of a bilateral syndrome of retrobulbar neuritis in 5 patients with grave edematous exophthalmos, followed up by the author for a space of

1.5 to 2 years, are presented. Visual acuity decreased abruptly and in a relatively short time, while its restoration occurred in 9 of 10 eyes. Central scotomas had a tendency to inferior localization; large scotomas merged together with an enlarged blind spot, creating bitemporal defects. The peripheral fields remained intact. Colour vision suffered, above all, from the loss of green sensitivity. The involvement of dark adaptation was insignificant. In 3 eyes a slight edema of the optic nerve disc was observed and in one female it was followed by paleness. The I.O.P. remained normal. The thyroid function was normal, but in the past all patients had suffered from thyrotoxicosis. - Marion Marré.

Acquired color vision deficiency in people taking digoxin (digitalis extract), by J.M. LESAGE. Ph. D. thesis, Texas Woman's Univ., 1979. 193 pp.

Possibilities of compensation in traffic by protanopic drivers (Kompensationsmöglichkeiten der Rotblinden als Lenker von Kraftfahrzeugen im Strassenverkehr) ed. O. NEUBAUER (Ophthalmological Department of the Hanusch Hospital, Vienna, Austria). Research Commission of the Ministry for Health and Environmental Protection, 2, 79 pages, In the introduction among others the present standards for licensing color defective drivers are reviewed. Of interest is that 12 of 25 countries do not admit protanopes as drivers, four do not admit them as professional drivers and 9 countries do not limit their admittance. The types of color deficiencies and relevant publications and experiments are shortly reviewed. - Since it was not possible up to now to demonstrate unequivocally and conclusively that color defective drivers cause a higher frequency of accidents, O. Neubauer initiated a research project and the Ministry for Health and Environmental Protection in Vienna, Austria commissioned a team of researchers to carry out literature studies and to investigate color defectives, especially protans, from the aspect of ophthalmology and driving, including psychology, praxis and statistics of traffic. - In the Ghent study, G. Verriest reports on field experiments on signal color recognition, confirming the findings of previous authors that the color defectives react significantly slower in designating signals and make significantly more mistakes than color normals. The recognition distances are considerably reduced, especially when the conditions are unfavorable. However, the experiments appreciably helped to increase and to define our knowledge about the poorer performance of color defectives. It could also be shown that deutans frequently perform as bad and sometimes even worse than protans, which is not generally known. Experiments performed at night show that the recognition distances for red position- and warning lights are significantly reduced in protans and slightly reduced in deutans. -

In the Dresden study, M. Marré confirmed most former statistics that protanopia drivers do not cause more traffic accidents than normals or deuterans, considering the total number of accidents. When considering the causes of the accidents protans cause significantly more accidents by driving upon another car and overlooking red warning and stoplights than normals and significantly more than deuterans. They have also slightly more accidents than normals and deuterans in the winter months and appreciably more than normals on wet and slippery driveways. These results confirm statistically that protans perceive red signals too late or not at all because red appears to them darker. Deuterans show increased accident frequency by collision at street crossings when the traffic is regulated by signal lights. - In the Vienna study A, O. Neubauer shortly reports on 226 color defectives examined in the years 1977 and 1978. The results of the ophthalmological investigations and of the color vision examinations were entered on special forms for computer evaluation. - In the Vienna study B, A. Hoseman and G. Welish considered tests for specific driving performance and the personality of drivers. To the question about a possibility of compensation by color deficient drivers they could answer positively only to some extent. Several tests revealed a lower stress tolerance in color defectives, especially in deuterans, also less security and speed in the reaction to color signals. The readiness to adaptation to traffic was slightly more pronounced in color defectives. The latter showed to some extent a tendency to pay more attention to the conditions of the surroundings and to adjust to the latter better than the color normals. In general, the study demonstrated that only a small part of color defectives tested represented a risk group. The results depend less on the degree than on the type of color deficiency insofar as deuterans usually show worse performances than protans and even than protanopes and that the measured deficiencies in performance not necessarily represent a greater danger but can be compensated by corresponding adaptation to traffic and a defensive kind of driving. - All studies agree that deuterans are not fundamentally different in their performance from protans, sometimes their results are even worse. - A leaflet with suggestions and recommendations for color deficient drivers concludes the pamphlet. - Ingeborg Schmidt.

The X-chrom principle; Filter or contact lens? by L.J. PRESS (Pennsylvania Coll. Optom., 1201 Spencer Street, Philadelphia, PA 19141, USA), Rev. Optom. 117, 47-49, 1980.

A 59 year old male with bilateral optic atrophy and visual acuity of 20/70 in either eye wished to eliminate color confusions due to an accompanying acquired color defect. With a monocular red spectacle filter having a spectral transmittance similar to the X-chrom contact lens (0 transmittance at 595 nm) he was able to identify all of

the numbers on the Ishihara pseudo-isochromatic plates. Without the filter none were identified. The filter worked well before either eye. - James E. Bailey.

On the deterioration of color discrimination under high pressure Na-illumination, by A. SERRA, F. SIRIGU and L. PONTI (Cattedra di Ottica Fisiopatologica dell'Università di Cagliari, Italia, and Division II de Medicina, Ospedale Regionale, Cagliari, Italia), Atti Fond. G. Ronchi 35, 93-101, 1980.

Thirty subjects were examined by means of the 100-hue test. They are supposed to be "normal" under every respect; however, they belong to families of which some members are suffering from diabetes juvenilis. The question is set whether colour discrimination of the subjects is normal, or some slight deterioration exists which might be regarded as an early symptom. Under C-illuminant, the total score of the responses recorded from the subjects is found to be abnormal in 43% of the cases. Under high pressure Na-illumination, of matched illuminance, a deterioration of color discrimination is reported, as described in previous papers. However, the entity of this deterioration is not so strong as to alter the course of age dependence (which, on the other hand, resulted to deviate from normality in subjects suffering from diabetes juvenilis). - Lucia Rositani-Ronchi.

The effect of quartz-containing dust on the condition of the eye, by A.I. GMYRYA and A.I. ANTONOVA, Vestnik oftalmologii 1973, nr. 6, p. 65.

The authors examined the eyes of 300 workers engaged in the dinas department of a refractory products plant and of 35 controls. It was found that the quartz-containing dust causes changes in the anterior segment, such as blepharoconjunctivitis, degenerative alterations, and reduced corneal sensitivity. Because of the general toxic action of the dust in workers with a service record of 6 and more years, vision can also be affected, reduced visual acuity and dark adaptation, narrowing of the colour visual field and a rise of the thresholds of colour differentiation. - Marion Marré.

Color discrimination from the ergo-ophthalmological stand point. A preliminary report, by R. PAOLETTI P RINI, Atti Fond. G. Ronchi 35, 658-663, 1980.

Some jobs require a fine color discrimination. From a purely practical stand point it is relevant to detect people fullfilling the required conditions. On the other hand, it is scarcely relevant to know whether a low chromatic discrimination is due to a congenital defect or to a poor ability or low skillness. Therefore, to classify and to select various individuals it is recommendable to consider both typical and non-typical errors, the latters being the outcome of individual's ability in discriminating colors and of the difficulty level of the test. The present paper

deals with the responses recorded from 155 male workmen ranging in age from 21 through 55 y, by the use of both Ishihara charts and of Farnsworth's Tritan Plate. Data are so processed that more information is gathered than that afforded by the traditional distinction between "normal" and "anomalous". - Lucia Rositani-Ronchi.

Sight and profession (Vue et profession), by G. VERRIEST and G. HERMANS. Publ. Editions Scientifiques et Psychologiques, Issy-les-Moulineaux, France. 391 p., 97 fig., 1980.

This book is an extensively completed and updated version of the main chapters of the report "Les Aptitudes Visuelles Professionnelles" presented in 1975 by the same authors to the Belgian Ophthalmological Society.

The first part is devoted to the physio-pathological bases, to the methods of examination and to the ergonomic aspects of the elementary visual functions as static visual acuity, visual field, dark, light, transitory and local adaptation, the various aspects of colour vision, the several kinds of refractive errors and of troubles of accommodation (with special reference to aphakia, presbyopia, nocturnal myopia, wearing of spectacles and of contact lenses), binocular vision and depth perception (with also reference to ocular motility, aniseiconia, Pulfrich phenomenon and chromatic stereoscopy). The last sections of this first part discuss the multiphasic visual screeners, some further visual functions that are relevant for ergonomics as modulation transfer, contrast sensitivity, flicker fusion, electrophysiology, visual performance, attention, long terms effects as fatigue, vision of moving objects and reading, and endly some further factors influencing vision as age, alcohol intake, smoking, medication, hypoxia and physical agents.

The second part discusses the older and newer ideas about the interfaces between visual function and professional requirements, with further sections devoted specifically to road, fluvial, maritime and air traffic, to work on small objects and electronics, and to office work with special reference to the use of visual displays.

The other professions are also included in the general table of visual requirements for more than 1,000 jobs relating to visual acuity for far and for near, visual field, dark adaptation, resistance to glare, colour vision, asthenopia, wearing of spectacles, wearing of contact lenses, monophthalmy, depth perception, chronic infections, and adaptability of the job to low vision and to blind people. - The Authors.

ISCC MACBETH AWARD TO W. DAVID WRIGHT

The 1980 ISCC Macbeth Award was presented to William David Wright at the Annual Meeting Luncheon of the Inter-Society Color Council, April 22, 1980. The Macbeth Award was established by the late Norman Macbeth, Jr., in honor of the memory of his father, Norman Macbeth. The award is presented biennially for one or more outstanding recent contributions to the subject of color.

The Award citation recognized Professor Wright's lifetime achievements but stressed his recent unusual and important contributions to color. This work has taken place in the past ten years, since Dr. Wright's retirement from the Imperial College of Science and Technology in London. Dr. Wright has remained very active in color, particularly in teaching and in the application of principles of color technology to the preservation of paintings. He has lectured and worked at the University of Calcutta, India, the University of British Columbia and Waterloo University, both in Canada, and at the City University of London to promulgate his philosophy that color should be a part of the liberal arts curriculum. Dr. Wright has developed two colorimeters for measuring the chromaticities of paintings, which do not damage them by abrasion or radiation. Under Dr. Wright's guidance, these colorimeters have been used at the Courtauld Institute of Fine Arts and the National Gallery of Arts in London to measure color before and after restoration and for continued monitoring of pigment fading. This effort has convinced a number of artists, art historians, and restorers of the usefulness of applied colorimetry in their work.

David Wright received both his Bachelor of Science degree in physics and his Doctor of Philosophy degree from Imperial College, London University. After two years spent working on television both with the Westinghouse Company in the USA and with the Electrical and Musical Industries Ltd in England, Dr. Wright returned to Imperial College in 1931 as a lecturer in the Technical Optics Section of the Physics Department. He was appointed Professor and Head of the section in 1951, several years after having received the degree of Doctor of Science from London University.

Dr. Wright is the author of five books : "The Perception of Light" in 1938, "The Measurement of Colour" in 1944 (with subsequent editions in 1958, 1964, and 1969), "Researches on Normal and Defective Colour Vision" in 1946, "Photometry and the Eye" in 1950 and "The Rays are Not Coloured" in 1967. He has also authored many papers, stemming from later research work with the colorimeter he first built to conduct his doctoral thesis studies. These include reports of his work on relative spectral luminous efficiency curves for different field sizes, field positions, and levels of luminance; color-matching data for foveal and extra-foveal viewing; discrimination data for saturation, hue, and chromaticity under different conditions of adaptation; and haploscopic

matching to investigate the effect of adaptation to white and colored light at various luminances and for various lengths of time. Dr. Wright's thesis work, using his own colorimeter for the measurements, resulted in the 2° spectral coefficient curves for ten observers. Together with like data by J. Guild for seven observers and the relative luminances of the equi-energy spectral colors standardized by the CIE in 1924, the Wright data helped define the CIE 1931 Standard Colorimetric Observer.

Dr. Wright was founder Chairman of The Colour Group (Great Britain) from 1940 to 1943, and its Secretary from 1944-1948. He has been involved in many additional activities including Vice-President of the Physical Society (1948-1950), Secretary of the International Commission for Optics (1953-1966), Chairman of the Physical Society Optical Group (1956-1959), Director of Undergraduate Studies in the Imperial College Physics Department (1960-1968), and activities on many CIE and other committees. Dr. Wright was the first president of the International Colour Association (AIC) from 1967 to 1969, and organizer of its 2nd International Congress Colour 73 at York in 1973. He was the recipient of the first Newton Medal of The Colour Group (Great Britain) in 1963 and the Deane B. Judd AIC Award in 1977. He is the actual president of the IRGCVD.

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VISION LABORATORY OF THE CENTER FOR HUMAN INFORMATION
PROCESSING AND DEPARTMENT OF PSYCHOLOGY -- UNIVERSITY
OF CALIFORNIA AT SAN DIEGO

This laboratory was established in 1974 when Robert M. Boynton and Donald I.A. MacLeod were recruited to fill faculty positions in the Department of Psychology. More recently, Carol M. Cicerone and Mary M. Hayhoe have been added to that faculty. In addition, Allen L. Nagy is doing full time research in the laboratory. The laboratory has also typically included several graduate students and a post-doctoral fellow each year, and so far it has produced four Ph.Ds.

Much of the research in color has been concerned with peculiarities of the blue-cone system of human vision. Research on minimally distinct borders has shown that B cones do not contribute to the perception of short contours (11, 12, 13). Discriminations mediated by B cones were found to differ from those which depend by R and G cones in the following ways : slight separations of the fields being compared improve B-cone discriminations, have little effect on R, G-cone discriminations if based on chromatic differences, and are deleterious for comparisons that introduce luminance differences (3); B cones do not contribute to luminance as

measured by flicker photometry (7); discriminations of small color differences that depend only upon B-cones obey different laws than do those based upon R, G-cones (4); as mapped by a psychophysical technique B-cones are sparsely distributed in the human retina (14); the temporal response of B-cones is sluggish (2); the response of the B-cone system is altered by the usual method of isolating B-cone responses using long-wavelength selective adaptation (15).

Other work in color vision has established the following: subjects who are dichromatic by conventional tests (protanopes or deuteranopes) have shown a residual function of the supposedly missing cone type, as revealed by color naming and color matching experiments (9,10); there is evidence for a fourth cone type in heterozygous female carriers of dichromacy; in normal observers, colored backgrounds selectively suppress the red or green cone contributions to luminance, causing flicker photometric sensitivity to approach surprisingly closely the sensitivity of a single cone type (6).

In addition to these experimental studies, a textbook on "Human Color Vision" has been published (1), and there has been an interest in color systems and color models. A physiologically meaningful chromaticity diagram has been developed (8), as well as smoothly differentiable equations based upon the Smith-Pokorny fundamentals, which should be useful for developing models of chromatic discrimination (5).

References

1. Boynton, R.M. Human color vision. Holt, Rinehart, and Winston, 1979.
2. Boynton, R.M. and Baron, W.S. Sinusoidal flicker characteristics of primate cones in response to heterochromatic stimuli. J. Opt. Soc. Amer. 65, 1091-1100 (1975).
3. Boynton, R.M., Hayhoe, M.M. and MacLeod, D.I.A. The gap effect: chromatic and achromatic visual discrimination as affected by field separation. Optica Acta 24, 159-177 (1977).
4. Boynton, R.M. and Kambe, N. Chromatic difference steps of moderate size measured along theoretically critical axes. Color Research and Application 5, 13-23 (1980).
5. Boynton, R.M. and Wisowaty, J.J. Equations for discrimination models. J. Opt. Soc. Amer. (in press).
6. Eisner, A. The contribution of different cone types to luminance while the eye is adapted to colored backgrounds. Ph. D. dissertation, UCSD, 1979.
7. Eisner, A. and MacLeod, D.I.A. Blue cones do not contribute to luminance. J. Opt. Soc. Amer. 70, 121-123 (1980).
8. MacLeod, D.I.A. and Boynton R.M. Chromaticity diagram showing cone excitation by stimuli of equal luminance. J. Opt. Soc. Amer. 69, 1183-1186 (1979).
9. Nagy, A.L. The large-field substitution Rayleigh matches of dichromats. J. Opt. Soc. Amer. (in press).

10. Nagy, A.L. and Boynton, R.M. Large-field color naming of dichromats with rods bleached. J. Opt. Soc. Amer. 69, 1259-1265 (1979).
11. Valberg, A. and Tansley, B.W. Tritanopic purity-difference function to describe the properties of minimally distinct borders. J. Opt. Soc. Amer. 67, 1330-1335 (1977).
12. Tansley, B.W. and Boynton, R.M. Chromatic border perception : the role of red- and green-sensitive cones. Vision Research 18, 683-697 (1978).
13. Tansley, B.W. and Glushko, R.J. Spectral sensitivity of long-wavelength sensitive photoreceptors in dichromats determined by elimination of border percepts. Vision Research 18, 699-706 (1978).
14. Williams, D.R. Foveal structure and color vision. Ph.D. dissertation, UCSD, 1979.
15. Wisowaty, J.J. and Boynton, R.M. Temporal modulation sensitivity of the blue mechanism : measurements made without chromatic adaptation. Vision Research, in press (under revision).

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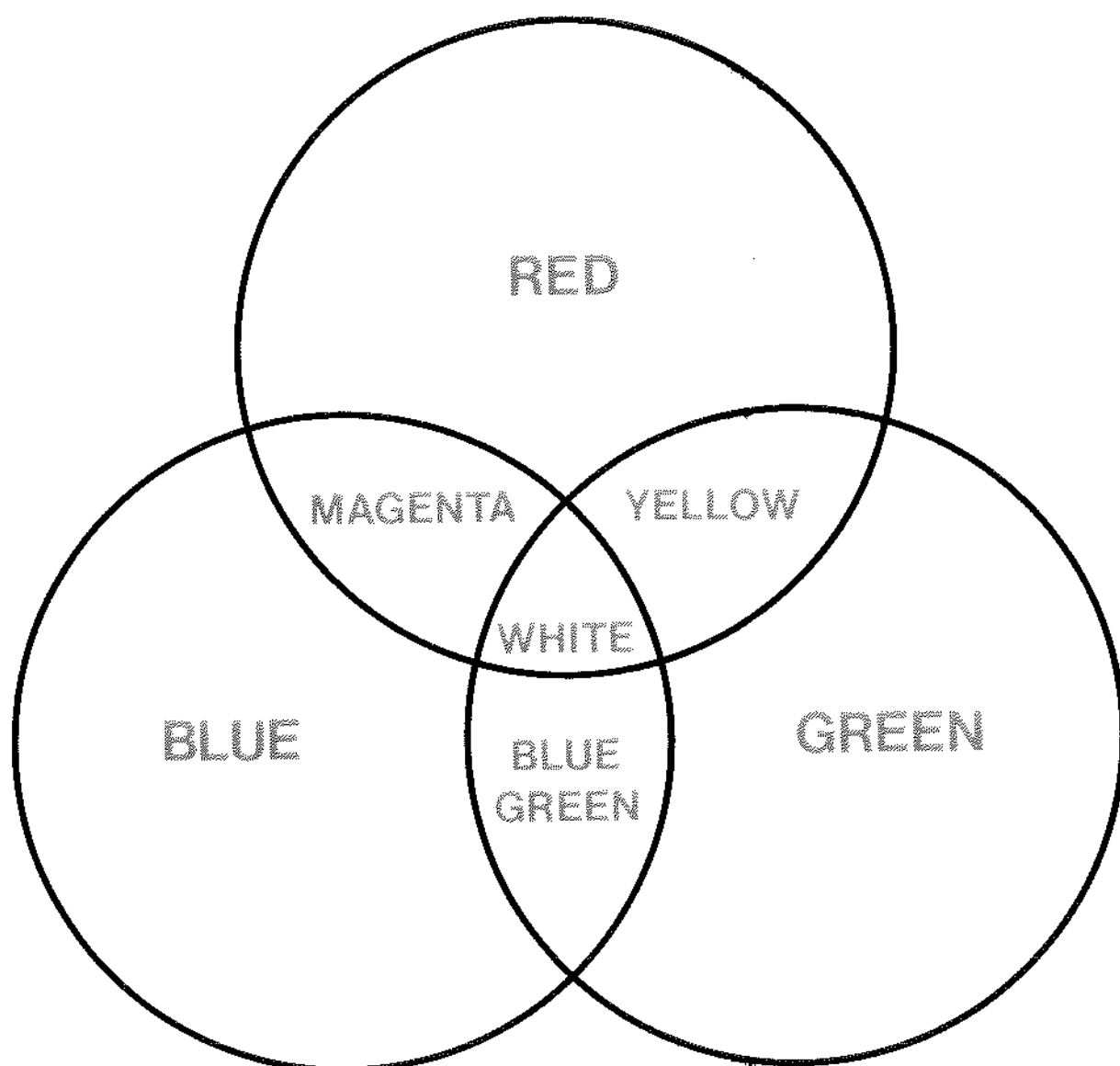
VISION PSYCHOPHYSICS AND DISORDERS OF THE VISUAL SYSTEM

Baltimore, Md., 11-14th November 1981

This interdisciplinary symposium for vision scientists and clinicians is dedicated to Louise L. Sloan and will be held in Cross Keys Inn in Baltimore. A. Patz will read a special lecture on "Louise L. Sloan : Pioneer in Clinical Vision Research". The other sessions will concern retinal vascular disease (with invited papers of Dr. Finkelstein and G. Bresnick), glaucoma (with invited papers of H. Quigley and R. Lakowski), inherited macular degeneration (with invited papers of G. Fishman and R.W. Massof), macular disease (with invited papers of St. Fime and V. Smith), amblyopia (with invited papers of D. Guyton and R. Harwerth), and neuro-ophthalmology (with invited papers of N. Miller and I. Bodis-Wollner). For further information write to R. Massof, Wilmer Ophthalmological Institute, Johns Hopkins Hospital, 600 North Wolfe Street, Baltimore Md. 21205, USA.

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Dr. Janet Voke