DALTONIANA

NEWSLETTER

OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES

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ADMINISTRATIVE REPORTS FROM THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES

During the 6th International IRGCVD Symposium held in West-Berlin on 17th-19th september 1981, the Directorial Committee and the General Assembly decided :

1) That the next (7th) international IRGCVD symposium will be held in end june 1983 in Geneva (Switzerland) with A. Roth as host;

2) That the special themes of this symposium will be "Electrophysiology and colour vision" (as fundamental theme, the invited speaker having still to be designed after discussion between some IRGCVD and ISCEV members), "Metameric matches relevant for assessment of colour vision defects" (as clinical theme and with A. Roth and J. Pokorny as invited speakers), and "Clinical colour vision test batteries" (as clinical theme and with A. Pinckers as invited speaker);

3) That in this Geneva symposium the usual time alloted for a paper will be 15 minutes, namely 10 minutes for the verbal presentation by the author and 5 minutes for the discussion;

4) That the so needed reduction in the number of papers will be obtained not by a referee-system, but by asking to every member to present no more than one paper by himself and no more than one joint paper, and by promoting posters;

5) That it is preferable that the following (8th) international IRGCVD symposium should be held in the same country as the next AIC congress, but that the IRGCVD members could have to decide by written ballot between different proposals. (As the next AIC congress will be held in Monaco with A. Parra as host, I accordingly wrote to Dubois-Poulsen, Parra, Lanthony and Vola for obtaining an invitation for Monaco or France; on the other hand, other proposals from other countries may also be sent to me);

6) That every proposal concerning remedies for the lack of matters for Daltoniana, suggestions for honorary members, financial issues or other matters could be sent to every member of the directorial committee. - Guy Verriest.

As a first measure against the lack of matters for Daltoniana may I ask to all members of the IRGCVD to send me a reprint of each of their just published papers, so that I could eventually reproduce their own abstracts? - Guy Verriest.

STANDARDIZATION COMMITTEE

The Standardization Committee of the IRGCVD met in Berlin to discuss a draft document on colour vision examination to be submitted as a standard to the Concilium Opthtalmologicum Universale. All the members of the committee were present. The draft document, prepared by the chairman in consultation with the members of the committee, had been circulated prior to the meeting and various amendments and additions were discussed. The committee agreed that further correspondence was required before the final draft could be submitted and that, if possible, this should also be printed in Daltoniana for the information of all the members of the IRGCVD. December 1st 1981 was agreed as the final deadline for comments by the committee members.

The committee also discussed future activities. These included the expansion of the present document on colour vision examination in order to produce a more detailed report, specific enquiries such as the level of illumination used by members of the IRGCVD for colour vision tests and alternative classifications of both colour vision defects and colour vision tests. - Jennifer Birch.

FINANCIAL STATEMENTS

December 31, 1980

Revenue	
Membership fees (includes gain on foreign exchange)	$ 1762.04
Interest income	179.20
Other income[1]	582.41
	$ 2541.65
Expenses	
Publication expense	$ 841.99
Administration expense	182.00
Other expense[2]	86.46
	$ 1110.45
Net gain for the year	$ 1431.20
Retained earnings at the beginning of the year	$ 1627.00
Retained earnings at the end of the year	$ 3058.20

Notes : 1 Includes money returned from Europe, monies credited to account from other banks (monies recovered from cheques that were sent on collection)
2 Included bank charges, money paid to A.I.C.

R. Lakowski

LITERATURE SURVEY

Influence of the target size on the detection threshold for luminance and chromaticity contrast, by C. NOORLANDER, M.J.G. HEUTS and J.J. KOENDERINCK (Department of Medical and Physiological Physics, State University of Utrecht, Physics Laboratory, Princetonplein 5, 3584 CC, Utrecht, The Netherlands), J. opt. Soc. Amer. 70/9, 1116-1121, 1980.

The subject was a 27-year old male with normal color vision and normal visual acuity. In a first experiment, the influence of target size on sensitivity to combined luminance and chromaticity contrast was studied. The thresholds for various ratios of luminance modulation to chromaticity modulation were determined for a fixed target size and a fixed temporal or spatial frequency. Discrimination ellipses were determined with square test areas for 1/4° to 1° for a low, medium and high frequency : 1; 3 3/4 and 15 hz in the temporal domain and 16 cycles per degree in the spatial domain. In the second experiment chromaticity and luminance threshold functions for temporal and for spatial modulation were determinded for targets from 1/16° up to 2°. - Square-wave stimuli were presented on a color TV monitor, the mean color of the screen was yellow, average retinal illuminance 350 td. When enlarging the field size the threshold for any luminance-chromaticity combination decreases monotonically (except on high spatial frequencies). For any luminance-chromaticity mixture the summation area for detecting a fine bqr pattern is at least 8x8 periods and the integration area for detecting flicker is more than 1° x 1°. For a fixed spatial or a fixed temporal frequency the change in sensitivity sometimes depends strongly on the ratios of luminance modulation to chromaticity modulation. - If a target is predominantly yellow, its size has similar influence on the sensitivity to both luminance and chromaticity contrast. - Ingeborg Schmidt.

Wavelength difference limit for binocular colour fusion, by M. IKEDA and Y. TAKASHIMA, Vision Res. 20, 693-697, 1980.

The wavelength difference threshold limit $\Delta\lambda$ below which a complete colour fusion takes place was thoroughly examined for the first time by gradually separating two wavelengths of the same brightness into separate eyes until the coloured field looked inhomogeneous. Retinal illuminance was 60 trolands and presentation time was 15 sec during which time the subject indicated whether he perceived an inhomogeneous field or alternation of colour. No reference comparison field was provided. Measurements were made from 400 nm to 700 nm in 10 nm steps for two subjects for a 10° field and in 20 nm steps for one subject for a 2° field. The binocular colour vision limit $\Delta\lambda$ was defined as the wavelength difference at the 50% point of the inhomogeneous appearance. Thresholds varied from 1 nm to 100 nm depending on the spectral region - the smallest being for λ = 470 and 560 nm in the positive side and 490 and 600 nm on the negative side. The function

obtained is similar to a classical hue discrimination curve but with a negative slope of -1. Below 470 nm differences between subjects became more pronounced. Results are discussed in terms of colour differences and opponent colour theory. One interesting aspect is the suggestion (on account of the two minima of the function intersecting with the unique wavelengths blue and yellow) that inhomogeneity may arise whenever mutually opponent colours are perceived in the two eyes. - Janet Voke.

Retinal sensitivity and spatial summation in the foveal and parafoveal regions, by T. INUI, O. MIMURA and K. KANI, J. opt. Soc. Amer. 71, 151-154, 1981.

Using a fundus-controlled perimeter to monitor the exact target position on the retina and fundus picture, increment thresholds were determinded in 8 meridians for 5 eccentricities to 10°. Eight target sizes were used. Typical isopters were plotted, showing a steeper profile in the nasal, upper and lower part of the visual field than in the temporal zones; the characteristics were continuous from fovea to periphery. The stimulus area where summation changed from complete to incomplete, called the critical area, was shown to become continuously larger from fovea to periphery although the number of cones in the area was considered to be almost identifical for foveal and parafoveal regions. The linear relationship between the diameter of the critical area and retinal eccentricity was examined in a second experiment by considering the receptive field sizes involved. Assuming that the psychophysical properties of spatial summation are closely related to the receptive field organisation of retinal ganglion cells, the regression line for receptive field sizes at different eccentricities was calculated using primate experimental data available. The average values of the receptive field centre and the rate of change with eccentricity in the primate determined electrophysiologically were slightly greater than the psychophysical determination in man. - Janet Voke.

On the problem of retinal directional sensitivity, by R.A. WEALE (Department of Visual Science, Institute of Ophthalmology, University of London, Judd Street, London WC1H 9QS, U.K), Proc. R. Soc. Lond. B 212, 113-130, 1981.

When two physically similar pencils of light enter the eye, one through the pupillary centre and the other near the edge, the former appears brighter and, when monochromatic light is used, generally as though it were of a shorter wavelength. This is usually attributed to the photoreceptors, notably the cones, being more sensitive to light traveling along them axially than to light with a radial component.

However, allowance has also to be made for pre-retinal factors. One of these is the angle of incidence on the

cornea : the Fresnel formulae show that, at perimetric angles >15°, the ensuing asymmetry in the fractions of light lost by the two pencils needs compensating. Furthermore, a correction is required for differential light absorbance along different paths in the crystalline lens. Finally, the narrowness of the pencils necessitates the application of diffraction theory : the harmonic content of a light beam varies inversely with the distance between its point of pupillary entry and the optic axis, the effect varying across the spectrum.

The above corrections suggest that there is little difference between the directional sensitivities of human rod and cone mechanisms; the above chromatic effect can be explained partly on the basis of pre-retinal factors, and earlier theoretical explanations are rendered more plausible. - The Author.

Artificial cone responses : A computer-driven hardware model, by S. VALLERGA, R. COVACCI and E.W. POTTALA, Vision Res. 20, 453-457, 1980.

A hardware electronic model of a cone cell has been developed using data of Baylor, Hodgkin and Lamb of a theoretical biochemical model. The model is interfaced to a microcomputer which organises the stimuli and analyses the responses. This serves as a first step in a project to produce a dozen such models to include also second-order retinal neurones to study the following and processing of visual information in the outer layer of the vertebrate retina. The comparison between experimental and the simulated electrical responses with those recorded intra-cellularly from turtle cones is good. Model components were adjusted to produce the closest reproduction of the actual photoresponses for different animals. Although retaining the limitations of the theoretical model the hardware model is considered more flexible than a software model. The authors consider it feasible to simulate the behaviour of a portion of the retinal mosaic. - Janet Voke.

Clinical uses of the visually evoked potential, by D.I. STARK (St. Andrew's Neurosensory Unit, St. Andrew's Hospital, Wickham Terrace, Brisbane, Australia), Austral. J. Ophthal. 8, 211-218, 1980.

Among others, the author states that as a future development congenital and acquired color vision defects will be suitable for investigation by visually evoked potential using coloured checkerboards, since it is known from the literature that this technique provides objective evidence of colour vision defects. - Ingeborg Schmidt.

Measurement of color mechanisms on extrafoveal retina, by H. KITAHARA (Department of Ophthalmology, Jikei University School of Medicine, Japan), Acta Soc. ophthal. jap. 84, 1603-1611, 1980.

The field sensitivities of Stiles' long-wavelength sensitive mechanism (π_5) at the fovea and at 10° and 20° eccentricity were measured to lay theoretically sound color perimetry. The test flash was round and was presented for 0.2 sec at the center of a continuously illuminated round background field. Threshold versus intensity (t.v.i.) curves for 2 normal observers were collected at 3 retinal eccentricities using a 650 nm test light and three wavelengths of main background field : 430 nm, 530 nm and 650 nm. The shape of the foveal t.v.i. curves when the background wavelength was 430 or 530 nm was shallower than when it was at 650 nm. In other words, the field displacement law was not held, and an additional long-wavelength mechanism, was suggested. The fact that the field displacement law is held good even for a 0.2 sec test stimulus at retinal sites out of fovea suggests a difference in the temporal integration properties between the fovea and other retinal regions.

The field action spectra of π_5 at 3 retinal eccentricities have been derived from t.v.i. curves for a 650 nm test light and background lights ranging from 400 nm to 700 nm. The field sensitivity of the upper branch of the t.v.i. curves collected at 10° and 20° was determined by using an auxiliary background of 430 nm superimposed on the main adapting background.

Two differences in the Stiles mechanism measured at the 3 retinal eccentricities were observed. First, the foveal action spectrum has a different shape from the extra-foveal action spectra : this may be due to anatomical differences between the foveal and extra-foveal retina. Second, the absolute test sensitivity decreases markedly as retinal eccentricity increases from 0° to 20°. - Yasuo Ohta.

New test for the detection of tritan defects evaluated in two surveys, by D. VAN NORREN (Institute for Perception TNO, Kampweg 5, 3769 DE Soesterberg, The Netherlands) and L.N. WENT (Department of Human Genetics, State University, Wassenaarseweg 72, 2333 AL Leiden, The Netherlands), Vision Res. 21, 1303-1306, 1981.

An apparatus is described which tests for the presence of a tritan defect. It consists of a flickering blue test field seen on a steady yellow-orange background. The stimulus may be presented attenuated with a 2.5 neutral density filter or unattenuated. Tritans fail to see the attenuated stimulus. Inclusive of explanation the test takes about 2 min. In two surveys of 480 and 1023 subjects respectively, three congenital tritans were found. Also failing the test were two protans with a low sensitivity of the blue cone system and a few subjects apparently not having a tritan defect but possibly ocular pathology. - The Authors.

Study of chromatic mechanisms in dichromats by means of partiel selective adaptation, by S. LETTIERI, L. BONDI and R. RIZZOLI (Istituto di Clinica Oculistica dell'Università degli studi di Parma), Ann. Ottal. Clinica ocul. 104, 479-482, 1978.

The authors studied the Stiles mechanisms in 5 deuteranopes and in 3 protanopes applying partial selective adaptation in a suitably modified Goldmann perimeter. They confirm the extinction of the mechanism π_5 in the protanopes and in the mechanism π_4 in the deuteranopes. In the deuteranopes they observed a two types of behaviour as concerning mechanism π_1. - Luigi Barco.

Rod monochromat sensitivity to sine wave flicker at luminances saturating the rods, by B.C. SKOTTUM, K. NORDBY and S. MAGNUSSEN (Neurobiological Laboratory, Inst. of Psychology, NLHT, 7000 Trodheim, Norway), Invest. Ophthal. 19, 108-111, 1980.

To determine whether the temporal properties of visual stimulus affect rod saturation, temporal contrast sensitivity functions were measured in a rod monochromat over the range of background luminances from 8 to 782 scotopic trolands. The shape of the function did not appear to change but there was a general decrease of sensitivity above 200 trolands. This agrees with the findings of other conventional increment threshold experiments and is consistent with the notion that rod saturation is a pure receptor phenomenon. - J.E. Bailey.

Investigation of congenital disturbances of colour recognition by various methods, by St. BOGACKI, Klinika oczna, No. 2, 71-72, 1981.

Seventeen subjects were studied by means of Ishihara plates, Nagel's anomaloscope, Panel D-15 and FM 100 hue test. In the light of the obtained results a hypothesis was put forward based on the psychological concept according to which patients with colour vision disturbances could be devided into those distinguishing globally the colours and those distinguishing them analytically (!). - Felicia Jakubik.

The selective impairment of hue sensitivity mechanism in the central visual field of pathologic eyes isolated by chromatic adaptation in the Maxwellian view optical system, by H. ABE and K. MORITA (Department of Ophthalmology, Niigata University Medical School, Japan), Acta Soc. ophthal. jap. 84, 1591-1602, 1980.

The spectral sensitivities of the three colour vision mechanisms within the central visual field of pathologic eyes were measured by Wald's selective adaptation method using coloured test lights and coloured backgrounds in a Maxwellian view optical system. The test field, subtending 4'4, 8'8, 17'6, 35'1, 52'7, 1°24' or 2°48', was superimposed at the centre of a 5° background field. The coloured test

lights were obtained by 17 interference filters. For the background lights, the following Kodak Wratten colour filters were used : No. 12 (yellow), No. 32 (purple) and No. 44A (blue-green). The retinal illuminance was for each background 10000 td (4.0 log td). All results were represented as log relative sensitivity for equal energies.

In the early stage of central serous retinopathy and at the foveal level, the sensitivity of the blue mechanism was more lowered than that of the red and green mechanisms. In some cases, the sensitivity of the three colour mechanisms returned to normal after photocoagulation treatment.

In some cases of retinal detachment, the foveal sensitivities of the three colour-sensitive mechanisms were reduced and did not return to their normal levels even if the detached macula was again attached by surgery. The sensitivity of the blue mechanism remains abviously impaired.

In cases of optic nerve atrophy due to optic neuritis, the foveal sensitivities of the three colour sensitive mechanisms were reduced, even if the visual acuity and the critical flicker fusion frequency returned to normal. The impairment of the sensitivity of the blue-sensitive mechanism was obvious.

In early glaucoma, with only small scotomata in the Bjerrum area, the foveal sensitivities of the three colour mechanisms remained normal. In glaucoma with typical glaucomatous visual field defects, the blue mechanism is more effected than the red and green mechanisms.

It is concluded that the use of a blue test object (440 nm) on a bright yellow background is the most significant and sensitive method to identify pathologic changes in an early subclinical stage. Its clinical application to colour perimetry is extremely promising. - Yasuo Ohta.

Physiology of colour vision, Study of the diabetic colour vision defect (Physiologie du sens chromatique, Etude de la dyschromatopsie du diabétique), by J. LEID (Hôpital Sainte Marguerite, Service d'Ophtalmologie, 270, boulevard de Sainte Marguerite, F-13009 MARSEILLE (France), M.D. thesis, Fac. Méd. of the Univ. of Marseille. Stencyl, 261 pp.

The first half of this thesis is a good review of the actual knowledge about colour vision, colour vision defects, colour vision tests and colour vision in diabetic retinopathy.

The second half is a personnal study concerning the results of Lanthony's desaturated Panel in 242 eyes of 150 subjects suffering (recently) from diabetes mellitus. Tritan and especially tetartan tracings were very often encountered, even in eyes without retinopathy or without alteration of visual acuity or of visual field. The author could not demonstrate a relation between the colour vision defect and the kind of treatment. - Guy Verriest.

Clinical study of Stiles' method in the diabetic subject (Etude clinique de la méthode de Stiles chez le diabétique), by V. LECOURT-LEID (same address as J. LEID). M.D. thesis, Fac. Méd. of the Univ. of Marseille. Stencyl, about 110 p.

The first part of this exciting thesis explains the Stiles π mechanisms. The second part describes the results of the use of Vola's method of assessment of the Stiles mechanisms by means of the Tübingen perimeter in normal eyes and in 84 diabetic eyes. The expected impairment of the blue mechanism was found (especially concerning π_3), but the author was particularly interested by an also early impairment of the green and red mechanism, which was not detected by Lanthony's desaturated Panel. - Guy Verriest.

Reversible colour vision defects in obstructive jaundice, by L. VARNEK, H. RING-LARSEN, L. CHRISTIANSEN and E. KROGH (Rigshospitalet and Hvidovre Hospital, Copenhagen, Denmark), Acta Ophthal. (Kbh.) 59, 189-197, 1981.

Seventeen non-alcoholic patients with jaundice but normal levels of serum vitamin A were studied. In all cases, an eye examination including visual acuity and visual fields was normal. A battery of colour vision tests showed in 11 subjects an acquired type of colour vision defect with a tritan axis predominating. For the 100-hue test, a significant correlation between serum bilirubin level and test score was shown. Four subjects could be studied after normalization of serum bilirubin; in all four colour vision was normal. These results suggest that high serum bilirubin in some way caused the acquired colour vision def ct. - Anders Hedin.

Alterations of colour sense and of visual field in patients who underwent an extra-corporeal circulation, by R. FUSCO, M. D'AIETTI and R. PISAPIA (Catt. Ottica fisiologica, Nuovo Policlinico, Cappella dei Cangiani, I-80131 Napoli, Italia), 59° Congresso della S.O.I., Pesaro, 1979.

78 patients, who underwent a cardiosurgical operation and therefore an extra-corporeal circulation, have been tested before and after the surgical operation for visual acuity, colour sense and visual field. A high percentage of differences were observed, ranging from homonymous hemianopia to slighter perimetric defects; alterations of colour sense were often stated but are difficult to classify.

The pathogenetic hypotheses supported by various authors and confirmed by this study : are microemboli of different nature and cortical laminar necrosis. - Luigi Barca.

About disturbances in colour vision in hypertonic disease and atherosclerosis, by M.S. TRUSOV, Oftalmologi Schurnal 1972/1, p. 19.

Examinations of colour vision thresholds in hypertonic disease and in atherosclerosis have been carried out with the home-made anomaloscope AN-59 of the State Optics Institute (construction of G.N. Rautian). 118 patients with hypertonic disease and 36 patients with atherosclerosis were examined. Every eye was examined separately. In total 414 examinations were carried out. It was established that colour perception becomes remarkably disturbed in the presence of hypertonic disease and of atheroclerosis. The degree of disturbance increases with the progressing of the disease. Perception thresholds increase for all basic colours : red, blue, green. However, no direct relationship was found between thresholds of colour perception and height of arterial pressure, changes in the eye fundus or disturbance in the peripheral vision. A better relationship was stated between visual acuity and the thresholds of colour perception. It is concluded that this method of examination with the anomaloscope AN-59 may be used for detection of functional disturbances of the central nervous system in the presence of hypertonic disease and arteriosclerosis. - Marion Marré.

Eye lesions in the hydrolytic industry, by Z.P. RYABUSHKINA, Vestnik Oftalmologii, Nr. 3, p. 76, 1970.

In persons engaged in the hydrolytic industry for over 5 years, being exposed to an elevated content in the air of work premises of alcohol hydrolyzate, furfurol and hydrochloric acid fumes, functional changes supervene in the organ of vision, finding their expression in a concentric narrowing of the field of vision for white, red and green with rising colour thresholds for red and green. The thus discovered functional changes appear as early signs of chronic poisoning, their recognition being of importance for introducing health measures in the industry and in averting further progress of the eye pathology. - Marion Marré.

Congenital anomalies and acquired deficiencies of color vision of the tritan type, Results of a genetic investigation of an isolate, the Kel Kummer, by A. ROTH, A. CHAVENTRE-MANO and A. CHAVENTRE, Bull. Mém. Soc. franç. Ophtal. 92, 336-344, 1980.

The Kel Kummer Touareg of South Sahara is a genetically completely isolated group. Its genetic study has been undertaken over more than 10 years by A. Chaventré and, as part of this, A. Chaventré-Mano investigated colour vision by means of the Ishihara and Farnsworth tests. She reported (1) an absence of protan and deutan anomalies, (2) a high incidence of blue-yellow deficiencies, predominantly tritan

or without a prevalent axis.

This study was extended in 1979 by means of the Besançon anomalometer (A. Roth) which was used for a monocular examination of 3 color matches : the Rayleigh match, the Trendelenburg match, and the Moreland match. The validation was done with normal European subjects and found to be applicable to normal Touaregs. A subject was considered as abnormal when the mean value of the match was outside the normal limits or when the width of the matching zone exceeded the normal range.

Eighty subjects (37 females and 43 males) aged 17 to 74 years were examined. Seven females and 23 males showed anomalous matches : in 23 cases for the blue-green matches only and in 7 for all 3 matches. The absence of protan or deutan defects was confirmed.

When the results of the colour vision tests were compared with the filiation, it appeared that all the subjects with a tritan defect, either pure or with a widening of the Rayleigh match, were genetically related. The distribution was compatible with a dominant autosomal transmission of variable expression and with less penetrance among females. The variability of the defect from one case to another and the presence of an anomalous Rayleigh match in a significant number of cases leaded us to conclude that, although the visual acuities and the optic discs were normal, there was a benign form of autosomal dominant optic atrophy and not a congenital tritanopia. - André Roth.

Our unsatisfactory traffic lights, by M.G. WHILLANS (The Committee on Behalf of Colour Blind Drivers, RR# 2, GALIANO 1 British Columbia VON 1PO, Canada), British Columbia med. J. 23, 373-374, 1981.

The paper recommends the use of shape-coded traffic signals to eliminate the potential driving hazard of colour defectiveness. On the other hand, the above cited committee is gathering information from colour blind drivers to ascertain more precisely the nature of their difficulties. Anybody who has views (e.g. about the reported higher incidence of rear-end collisions among red-blind driver) or suggestions is invited to write to the committee. - Guy Verriest.

Colours of transilluminated traffic signs, by H. TERSTIEGE (Federal Institute for Material Testing BAM, Berlin), Lighting, Research and Technology 12/2, 69-72, 1980.

At the present time there are no international recommendations for colours of transilluminated traffic signs. The latter are used at intersections at which retroreflecting traffic signs are not sufficiently conspicuous. They produce colour in daylight by reflection of natural daylight illumination and at night by transmission of light from internally installed light sources. The investigations

show that for colours of transilluminated traffic signs additional specifications have to be set up. One can make use of the specifications already existing including only supplementary requirements for the contrast of the colours. - Ingeborg Schmidt.

Colour vision and its deficiencies, by L.M. HURVICH (Department of Psychology, University of Pennsylvania, 3815 Walnut Street, PHILADELPHIA, Pa. 19164, USA), Impact of Science on Society 31, 151-164, 1981. French edition : Impact : Science et Société 31, 157-172, 1981.

This is review paper for non specialists dealing about normal colour vision, a theoretical model (linking the photopigment absorptions and the succeeding neural events by the well-know Hurvich and Jameson formula's), the different defects, colour vision testing, vocational implications and alleged cures. Also in this paper, Hurvich described a "neuteranomalous" type of defect, in which the individual uses the same average proportions of mixture stimuli as does the normal person but exhibits a large acceptance range. (This is what the Germans call "colour amblyopia" and what the English call "colour weakness"). - Guy Verriest.

The blue light syndrome, Ed. by H. SENGER, 665 pg., 432 fig. Springer-Verlag, Berlin-Heidelberg-New York, 1980.

The book contains the reviews of papers presented at the "International Conference on the Effect of Blue Light in Plants and Microorganisms" held at the Philipps University, Marburg/Lahn, FRG, in July 1979. Included are papers on various fields of blue light action, papers on photoreceptors and primary reactions, carotenogenesis, carbon metabolism and respiration, interaction between blue light and nitrogen metabolism, chloroplast development and physiology of blue light effects. - Ingeborg Schmidt.

Color Theory and its application in art and design, by G.A. AGOSTON. Ed. by D.L. MacADAM, Springer Series in Optical Sciences Vol. 19 Springer, Berlin - Heidelberg - New York, 1979, 137 pp.

A comprehensive book on the science of color written by an artist-scientist and intended for artists and designers. The book contains chapters on color concepts, perceived colors, light and color, colored materials, color specification, diverse application of the CIE chromaticity diagram and color systems. - Ingeborg Schmidt.

Artist and scientist : partners in colour technology (Trotter-Patterson Memorial lecture), by W.D. WRIGHT Lighting, Research and Technology 12/1, 37-41, 1980.

A survey of 25 years personal approach to color vision defects, by G. VERRIEST (Department of Ophthalmology, Ghent State University, De Pintelaan 135, B-9000 Ghent, Belgium), Sensory World 39, 3-11, 1980.

A review of the authors papers on color vision deficiency, fortunately including many older papers which are less accessible because they are published in French or in journals that no longer exist. For convenience, the material is subdivided into five sections, namely on : (1) Acquired color vision defects. Although the authors classification into 3 main types (type I red-green defects with scotopization of the spectral luminosity curve, type II red-green defects with normal luminosity curve and blue-yellow defects) is now widely used, he stresses that it must be revised in the near future. (2) Congenital color vision defects. Among others the author emphasizes that he is especially interested in minor color vision defects. (3) Spectral luminosity curve. It can be determined by different methods, which give different results because some experimental conditions enhance retinal mechanisms for brightness while others enhance the function of the retinal color mechanisms. (4) Color perimetry. This method yielded some important results, e.g. that loss-sensitivity with age is partly attributable to prereceptoral, partly to retinal changes; it permitted to detect sensitivity losses in all kinds of color vision deficiency, to show that the functional development of the retina during childhood is slowed down in congenital color vision defects. It permits to recognize some acquired retinal diseases by enhancement or depression of given retinal color mechanisms. (5) Ergonomics. After reviewing his papers on color vision problems in traffic the author concludes that, since color deficiency is so frequent, one has still to search how to diminish this handicap in many practical situations. A reference list of 64 articles concludes the paper. - Ingeborg Schmidt.

COLOUR VISION DEFECTS AND PHARMACOLOGY

"Color vision" was the title of the 3rd symposium on "Methods in Clinical Pharmacology" on Oct. 17th 1980 at the University Clinic Frankfurt. Proceedings will be published in Oct. 1981 by Vierweg Verlag, Göttingen, eds. N. Rietbrock, B. Woodcock, R.G. Aiken.

This symposium should summarize recent results from clinical, biochemical, physiological and pharmacological aspects concerning color vision and its drug-induced changes. Contribution were made by G. Verriest upon clinic and systematic of acquired color vision defects, E. Zrenner upon neurophysiology of color vision, R.P. Schuermanns upon color mechanisms and neurotransmitters in the arterially perfused eye, W.E. Müller upon the retina as a neuropharmacological and neurochemical model, C.J. Krüger upon obser-

vations in drug induced color vision defects, J. Aronson upon correlation between color vision deficiencies and inhibition of Na-K-ATPase in patients taking digoxin, and by P.E. Ause, H. Alter, and R.G. Alken upon color vision deficiencies and other pharmacodynamic effects of cardiac glycosides. - Rudolf Giesbert Alken.

4th EUROPEAN CONFERENCE ON VISUAL PERCEPTION

Gouvieux, 8-11th september 1981

Nonmetacontrast masking in a rod monochromat, by B.C. SKOTTUM and K. NORDSDY (Institute of Psychology, University of Oslo, Norway).

Mask and target were luminous round fields of 4.3° and 1.0° diameter respectively; presented concentrically, 5.5° temporally to the fixation point. Duration of the mask was 500 ms, and of the target 10 ms. Stimulus onset asynchronies (SCA) were varied from -300 ms (target preceeding mask) to + 1400 ms (target following mask). Luminance of the mask was 50 td.

The rod monochromats thresholds for the target were higher than those of the control at all SOA-values; differences being greatest during presentation of the mask. The rod monochromat shows an anticipatory threshold rise (similar to the control), a small peak at SOA=0, and then a slight decline. At SOA = +75 ms a new rise, initially steep, but levelling off asymptotically, is displayed. An anticipatory threshold decline sets in about 100 ms before mask turn-off (SOA = +400 ms). It is difficult to decompose the dark adaptation curve (from SOA = +500 ms) into a transient (neural) and a slow photochemical) component.

Spectral sensitivity in retrobulbar optic neuritis, by F. ZISMAN, P.F. KING-SMITH and S.K. BHARGAVA (Univ. of Calif. School of Optometry, Berkeley, Ohio State Univ., School of Optometry, Manchester Royal Eye Hospital, England).

Fifteen patients with diagnosed retrobulbar optic neuritis (RBN) were evaluated using spectral sensitivity techniques described by King-Smith and Garden (JOSA, 66, 7 1976). These techniques allow for the analysis of the spectral sensitivities of the three cone mechanisms, the opponent-color mechanism and the luminance mechanism.

All RBN patients demonstrated a marked reduction in the blue-cone mechanism sensitivity, measured with a 1 degree foveal test spot, at 1 Hz, on a 10000 td yellow background, and a decreased luminance sensitivity for all wavelengths (400 nm to 650 nm), measured on a 1000 td white background at 25 Hz. All but one patient demonstrated a short wavelength loss in sensitivity of the opponent-color mechanism. Involvement of the contralateral eye was noted in all patients where this eye was also assessed.

One patient demonstrated an unusual Pulfrich phenomenon. 11 patients showed a markedly reduced critical flicker fusion frequency.

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(Reviewed by L. Rositani-Ronchi)

Short- and long-term changes in colour vision, by L. RONCHI, S. STEFANACCI and A. SERRA (Istituto Nazionale di Ottica, 6, Largo Fermi, 50125, Florence, Italy).

The eye is presented with the test-field of a LED anomaloscope, where duration, intensity and time distribution of red and green pulses can be manipulated independently from one another. In the short duration range (from 16 to 70 ms), some peculiar effects are recorded, indicating a red-green asymetry. In addition, the independence of chromaticity and luminosity channels is once more tested, on the basis of exposure time dependence of brightness/luminance discrepancy. Some questions are raised about the dicotomy of red LED effectiveness, compared to the green one, when passing from short to long durations.

Mass screening for color vision deficiencies, by S.F. BERGEN (One Colonial Woods Drive, West Orange, New Jersey 07052, USA).

This paper discusses the use of a slide version of pseudoisochromatic color vision plates for testing large groups quickly and efficiently. Remediation for individuals found to be "color blind" is offered (including color discrimination training!).

Examination of Class I, Class II, normals and colour defectives on exchange threshold colorimeter and analytical anomaloscope, by S.R. COBB (Department of Psychology, University of Glasgow, Adam Smith Building, Glasgow, Scotland).

Spectral cone response curves have been established by these techniques for the normal Class I and Class II and colour defective. It is postulated that there is a fourth scotopic response peaking at about 570 nm.