DALTONIANA

NEWSLETTER
OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES
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LITERATURE SURVEY

Complex-unoriented cells in a subregion of primate area 18, by D.H. HUBEL and M.S. LIVINGSTONE (Department of Animal Neurobiology, Harvard Medical School, 25 Shattuck St., Boston, Mass. 02115, USA), Nature, 315, 325-327, 1985.

This paper complements Livingstone and Hubel's earlier study of the 'blobs' revealed by staining Area 17 of the monkey cortex for cytochrome oxidase (J. Neuroscience, 4, 309, 1984; see Daltoniana, Nr. 52, 1, 1984). In area 18, which receives its main cortical input from Area 17, staining for cytochrome oxidase produces a pattern of coarse stripes. The stripes run perpendicular to the 17/18 border, and thick and thin stripes are thought to alternate. The thin stripes contain cells that lack orientational selectivity; two-thirds of these cells exhibit colour selectivity and they are frequently double-opponent in type. However, many of the units in the thin stripes differ from the colour-specific units of Area 17 in that they respond to a spot of optimum size wherever it is positioned over an area that is much larger than the optimum spot. Such cells, whether colour-coded or not, are termed 'complex unoriented' by Hubel and Livingstone. Cells in the thick stripes and in the interstripe regions are orientationally selective and do not enjoy colour specificity.

As might be suspected, the thin stripes of Area 18 draw input from the cytochrome oxidase blobs of Area 17, whereas the interstripe regions of Area 18 draw input from interblob regions of Area 17. The importance of this paper lies in the evidence that the analyses of colour and orientation continue to be segregated in Area 18. - J.D. Mollon.

Segregation of pathways leading from area V2 to areas V4 and V5 of macaque monkey visual cortex, by S. SHIPP and S. ZEKI (Department of Anatomy, University College London, Gower St., London, WC1E 6BT, United Kingdom), Nature, 315, 322-325, 1985.

This paper dovetails prettily with Hubel and Livingstone's study of the properties of cells in different sub-regions of Area 18 of the monkey cortex (see preceding abstract). Combining the horseradish peroxidase tracing procedure with staining for cytochrome oxidase, Shipp and Zeki show that the thin stripes of

Area 18 (Area V2) project to Area V4 whereas the thick stripes project to Area V15. This is consistent with Zeki's earlier demonstration that Area V4 is specialised for the analysis of colour, whereas in Area V5 most cells exhibit a preferred direction of motion and are never colour-specific. Shipp and Zeki concur with Livingstone and Hubel in reporting that most wavelength-selective cells are found in the thin stripes of Area 18. Cells in the interstripe regions are tightly tuned for orientation and are seldom wavelength-specific. Cells in the thick stripes 'generally respond equally well or better to spots of light moved in any direction than to long bars'. - J.D. Mollon.

The possible elemental nature of brown, by K. FULD, S. WERNER and B.R. WOOTEN (Neurol. Universitätsklin., Freiburg i. Br., F.R.G.), Vision Res. 23, 631-637, 1983.

The continous judgmental color-naming technique was used to assess the elemental nature of names descriptive of dark colors. Subjects were instructed to describe the color of a 0.54 deg, 2.5 log Td test field of either 450, 530, 580 or 660 nm, that was surrounded by an achromatic annulus of 3.8 deg outer diameter. The annulus was varied in retinal illuminance from 1.5 to 3.7 log Td. Test field and annulus were flashed simultaneously for 1 sec to the fovea of one eye. Results from 3 subjects indicated that the names blue, green, red and black were necessary and sufficient for describing the 450, 530 and 660 nm test fields. The 580 nm test field required the color name brow, in addition to the names yellow and black, to describe it when intermediate surround intensities were used. Additional results suggested the possible elemental nature of the color name brown. - The authors.

Blue cones contribute to border distinctness, by M. BOYNTON, T. ESKEW Jr and C.X. OLSON (Dept. Psychol., Univ. of Calif. at San Diego, La Jolla, CA 92093, U.S.A.), Vision Res. 25, 1349-1352, 1985.

A conclusion reached by Kaiser and Boynton in wavelength discrimination experiments, that differential blue-cone excitation makes a small contribution to the distinctness of borders in small fields, was verified using a rating procedure for borders produced in the La Jolla Analytic Colorimeter. - The authors.

The effect of a yellow filter on contrast sensitivity, by M. YAP (School of Optometry, Bradford University, West Yorkshire, BD7 1DP, United Kingdom), Ophthal. Physiol. Opt., 4, 227-232.

This is a contribution to the much-asked question of whether yellow filters improve visual performance. By means of an ascending method of limits, spatial contrast-sensitivity-functions were obtained for gratings presented on a video screen (P4 phosphor) viewed with or without a yellow filter. Under photopic conditions (50 cd. m^{-2}), the author reports, the yellow filter improves contrast sensitivity at all frequencies, but it has little effect at mesopic levels (1 cd.m^{-2}). It is not said whether the contrast of the screen was calibrated with and without the yellow filter; and the relevant paper of Campbell and Gubisch (J. Physiol. 192, 345-358, 1967) is not discussed. - J.D. Mollon.

The perception of depth contours with yellow goggles, by J.A. KINNEY, S.M. LURIA, C. SCHLICHTING and D.F. NER1 (Naval Submarine Medical Research Laboratory, Naval Submarine Base, Groton, CT 06349, USA), Perception, 9, 363-366, 1984.

On an overcast day at a skiing resort, skiers were tested for their ability to discriminate the depth of slight depressions in the snow. Discrimination was found to be better when the subjects wore yellow goggles than when they wore goggles fitted with neutral goggles that gave roughly similar luminous transmittance.

The authors interpret their results in terms of the models of Guth and of Ingling: they suggest that opponent signals provide additional brightness when yellow goggles are worn. But a plausible alternative explanation is that the effect is physical and this proposal has been made in a subsequent commentary by R. Corth (Perception, 14, 377-379). The main depth cues likely to be present in the experimental situation are faint shadows. These shadows will be predominantly formed by longer wavelenths, since there will be more scattering of short-wave light. Thus the world really is of physically higher contrast when the observer examines it through yellow goggles - when, that is, the shadows are less washed out by short-wavelengths. - J.D. Mollon.

Unsettled issues in infant color vision, by J.S. WERNER, (Univ. Colorado) and B.R. WOOTEN (Brown Univ.), Infant Beh. Developm. 7, 517-525, 1984.

The purpose of this paper is to clarify several issues in infant color vision that, despite previous reviews in this journal, remain in dispute. We argue that the data are still insufficient to conclude that 2-3 month-old infants are adult-like trichromats, but they are at least dichromats. How closely infant hue perception parallels adult hue perception cannot be discerned from existing data. - The Authors.

Usage de la micro-informatique dans le test de Farnsworth-100 hue, by J.M. BUISSON (Hôpital Saint Georges à Mons, Belgium), Bull. Soc. Belge Ophthalmol., 204-205, 35-46, 1983.

Description of a program for Farnsworth-100 hue test calculation in BASIC language with 17K bytes RAM. This program allows the calculation of the test bionocularly (or for a one-eyed patient test) or monocularly. The data from the test are controlled for each box. Sorted and printed in the normal sequence of caps. The total score is printed and compared wich age normes, which allows, along the successive tests, a follow-up of the pathology. - The Author.

Visual evoked potentials and patterned stimulations: Theoretical aspects and applications to colored alternating checker-boards of different luminous and chromatic contrasts by Fl. RIGAUDIERE (Lab. Rech. en Vision, U.E.R. Lariboisière Saint-Louis, 10 avenue de Verdun 75010 Paris, France), M.D. Thesis, Paris VII Univ., 1985.

VEPs were evoked by black/white or colored/black or colored/colored alternating checkerboards. The luminous and chromatic contrasts were tested on 38 normals and 8 dichromats. The results are compared with those of black and white checkerboards.

Some colored stimulation parameters are objectively expressed by the VEPs waves modifications. The effect of the luminous contrast can be found not only on the early VEPs waves (<250 ms) but also on the late ones (>250 ms) in black and white alternating checkerboards. The influence of the luminous contrast in a colored alternating checkerboard also appears on the early waves and is related to its value and to the alternating colors. The VEPs could be a differential response to excitatory and inhibitory mechanisms. There is an obvious parallelism between these electrophysiological results and the opponent-color theory. - The Author.

The Rayleigh equation using the flicker method.(4) The effect of the color adapting field and the results in deutero-carriers, by Sh. YAMADE (Dept. Ophthalmol., Shiga Univ. of Med. Sci.), Acta Soc.Ophthalmol. Jpn.87 1192-1198, 1983.

Brightness matching of the two stimuli of the anomaloscope was studied using the flicker method with and without the red adapting field. The measurements for 16 normals males, 14 deutans and 13 deutero-carriers, indicated that (1) the selective chromatic adaptation by the red background field is useful to separate the results more clearly; (2) it also usefull for increasing the detection rate of deutero-carriers as all 13 deutero-carriers were discriminated; (3) carriers previously could not be separated from normals because of lack of accuracy of the measurement. - Yasuo Ohta.

The electroretinographic characteristics of the congenital tritan defect, by K. SHINZATO (Eye Clinic, Urasoe Hospital, Urasoe City, Okinawa), H. ICHIKAWA (Dep. Ophthalmol., Nagoya Univ. School of Med.) and M. YOKOYAMA (Dept. Ophthalmol., Mie Univ. School of Med.) Acta Soc. Ophthalmol. Jpn, 87, 1028-1034, 1983.

Electroretinographic studies have been made on 3 cases in a family with a congenital tritan defect: the tritanopia was complete in 2 cases (1 male and 1 female) and incomplete in one case (male). In all the cases blue-cone responses were not recorded. Red- and green- cone spectral responses were normal, but the wave form of ERGs was negative (b/a ratio <1).

The rod responses were normal also for wave form. With high intensity xenon flash, the oscillatory potentials were normal on peak latency, peak interval and amplitude.

The results suggest that the congenital tritanopia was characterized not only by a disturbance of the blue cone system function, but also by an abnormality of the neural circuit of the red-, green-cone system. On the other hand, the rod-system function seems almost normal. - Yasuo Ohta.

The genetics of tritan disturbances, by L.N. WENT and N. PRONK (Dep. Hum. Genet., Univ. of Leiden, P.O. Box 9503, 2300 RA Leiden, The Netherlands), Hum. Genet. 69: 255-262, 1985.

Tritan (blue-green) colour vision disturbances have been found in 79 individuals in 6 families, revealing an autosomal dominant mode of inheritance with a wide variability of test results within families. Evidence is presented that it is - in contradistinction to the X-chromosomally inherited red-green defects - incorrect to make a subdivision between dichromasia (tritanopia) and anomalous trichro-

masia (tritanomaly). On the basis of three small screening series, totaling 1900 individuals, the frequency of tritan disturbances is estimated to be around 2 per 1000. Seven males have been observed carrying both inherited tritan and red-green defects. - The Authors.

Color vision in long-standing diabetes mellitus, by M.S. ROY et al. (Nat. Eye Inst., Bldg 10, Room 10N 226, NIH, Bethesda Md. 20205, USA) Br.J.Ophthalmol. 68, 215-217, 1984.

Twelve insulindependent diabetics with 20/20 visual acuity, fewer than 10 microaneurysms or microhemorrhages at the posterior pole on fluorescein angiography, and more than 25 years of diabetes took the Farnsworth 100 Hue color vision test as modified by Parker. Assessment of the metabolic control included 10 randomly chosen fasting and postprandial blood glucose levels and levels of hemoglobin A_1C. The diabetics were matched for sex, age, and social class with normal controls. The 100 Hue color vision scores were related positively to the degree of retinopathy and negatively to fasting blood glucose levels. However, the 100 Hue color vision scores and types were not significantly different from those of the normal individuals. In these patients, the findings do not confirm that loss of color vision discrimination in diabetics precedes or is associated with minimal degrees of diabetic retinopathy; however, it indicates that higher 100 Hue scores are found in patients with more marked diabetic retinal vascular lesions. - The authors.

Twenty five cases of foveomacular retinitis as result of minimal exposures to light (25 casi di retinite foveo-maculare consecutivi a minime esposizioni alla luce), by F. PASSANI, P. SANTORO, A. LA TORRE and A. FRANCHINI (I. Clinica Oculista dell'Università degli Studi di Firenze, Italy), Atti Fond. G. Ronchi 39, 521-526, 1984.

The authors describe 25 cases of solar Retinitis observed after minimal exposure to the sun collected between 1978-84. The authors conclude that this kind of lesions are not secondary to an acute thermal effect but are secondary to a photochemical change of the pigmented epithelium. - The Authors.

Color vision and retinal nerve fiber layer in early glaucoma, by P.J. AIRAKSINEN, R. LAKOWSKI, S.M. DRANCE and M. PRICE (Depts of Ophthalmol. and Psychol., Univ. of British Columbia, Vancouver, Canada), Am. J. Ophthalmol. 101, 208-213, 1986.

We tested 47 eyes in 47 patients (10 normal subjects, 15 with suspected glaucoma, and 22 with glaucoma) with the Pickford-Nicolson anomaloscope to assess the retinal nerve fiber layer and measure color vision. The 47 subjects were randomly selected from a group of 132 for whom Farnsworth-Munsell 100-hue color error scores were known. The yellow-blue and green-blue anomaloscopi matching ranges correlated significantly with diffuse retinal nerve fiber loss. There was no correlation with localized retinal nerve fiber loss. - The Authors.

Studies on color vision defects in optic nerve disease by using the F-M 100 hue test. II. Relation to contrast sensitivity functions, by R. KAZUSA (Dept.Ophthalmol., School of Med., Kobe Univ.), Acta Soc. Ophthalmol. Jpn. 87, 1442-1447, 1983.

The acquired color vision defect was studied by the Farnsworth-

Munsell 100 hue test in 34 cases (42 eyes) with optic nerve disease, and the results were compared with liminal and supraliminal contrast sensitivity functions. RG deficiency, BY deficiency, generalized deficiency and normal color vision were defined by the axis of color discrimination and the total error score from the 100 hue test. In the cases with RG deficiency and generalized deficiency, which showed generally high total error scores, a profound attenuation of liminal contrast sensitivity was observed over the whole spatial frequency. On the other hand only a slight attenuation was shown in the cases of BY deficiency, which had lesser total error scores than that of RG and generalized deficiency. The liminal contrast sensitivity was almost spared in the cases with normal color vision. From these results, the extent of damage in color vision roughly tended to correspond with loss of contrast sensitivity at the liminal level. At the supraliminal contrast level, most patients with RG deficiency showed attenuation of contrast sensitivity in high and elevation in low spatial frequency. On the contrary, patients with BY deficiency showed attenuation in low and elevation in high spatial frequency or no attenuation and elevation of contrast sensitivity. Thus, the possibility that RG deficiency has a relationship with involvement of high frequency channels, and BY deficiency with low frequency channels was presumed. - Yasuo Ohta.

Xanthopsia treatment with thiamine, by F.E. v. EYBEN, E. GRANN and B. DYRLUND (Dept. of Internal Medicine, County Hospital, Nakskov, Denmark), Acta Ophthalmol. 63, 591-592, 1985.

A patient with a history of profuse alcohol abuse developed xanthopsia, ataxia, and mental changes. Thiamine was given parenterally and the xanthopsia and the other symptoms disappeared rapidly. Since the possible influence by digoxine was ruled out, it is considered probable that the chromatopsia was caused by thiamine deficiency. - Anders Hedin.

INTERNATIONAL SYMPOSIUM ON LOW VISION
Waterloo, Canada, 1986.

Colour vision in optic neuritis, by K.T. MULLEN and G.T. PLANT (Physiol. Lab., Univ. of Cambridge, and Dept. of Neurol., Addenbrook's Hosp., Cambridge, U.K.).

Patients with a past history of optic neuritis were selected with differing degrees of stable residual deficits and with marked interocular differences in sensitivity. Firstly, a comparison was made of contrast sensitivities to chromatic and to luminance stimuli in 10 subjects. Contrast sensitivities were measured to sinusoidal luminance gratings, and to both red/green and blue/yellow chromatic gratings (1 cycle/degree, 0.5 Hz). Detection of the chromatic gratings was solely on the basis of their colour differences. Results suggest that colour contrast sensitivity can be more severely impaired than luminance contrast sensitivity. Secondly the suprathreshold nature of the deficit was investigated. Suprathreshold hue, saturation and brightness matches were made between the more and the less severely affected eye in five subjects, using Munsell colour patches. The results indicate that

the most predominant deficit is a loss of saturation (chroma) perception. In addition, marked changes in perceived hue were found to occur.

NINTH EUROPEAN VISION CONFERENCE
Bad Nauheim, FRG, 1986

Comparison of threshold measurements for coloured targets for observers with normal colour vision and others with colour deficiencies, by J. GORRAIZ and H. HORVATH (Institut für Experimentalphysik der Universität Wien, Strudlhofgasse 4, A-1090 Vienna, Austria).

The contrast threshold for combined chromaticity and luminance differences was measured by presenting simultaneously targets of different contrasts illuminated with colour temperatures of 5650, 2850, or 11 400 K. Their chromaticity differences were small enough to be below the perception threshold. We used subjects with normal colour vision and others with colour deficiencies (tested with a Nagel anomaloscope, Ishihara pseudoisochromatic plates, and the Farnsworth-Munsell test). The results are discussed in terms of: (i) Mac Adam's formula for combined luminance and chromaticity differences, and (ii) the summation and inhibition in the processing of information from the three types of cones. Their sensitivity is assumed to be described by the Smith-Pokorny cone-sensitivity functions. The influence of the colour temperature of the illumination on the threshold is examined on the same basis.

Transient tritanopia and blue cone saturation are not observed in a blue-cone monochromat, by R.L. KLINGAMAN and G. FISHMAN (Department of Physiology, Life College, 1269 Barclay Circle, Marietta, GA 30060, USA; Department of Ophthalmology, University of Illinois Eye and Ear Infirmary, 1835 West Taylor Street, Chicago, IL 69612, USA).

Recent experiments have shown that the blue (B) color sensitive mechanism can be inhibited by signals from the red (R) sensitive or green (G) sensitive mechanism. Mollon and others have noted two characteristics of the B mechanism that appear to be specifically related to these inhibitory interactions. First, when a long-wavelength background is suddenly removed, the B mechanism undergoes a sudden temporary loss of sensitivity; this has been termed "transient tritanopia". Additionally, when the B mechanism's increment threshold is measured on increasingly intense short-wavelength backgrounds, the B mechanism shows 'saturation'. We have studied a blue-cone monochromat who shows neither transient tritanopia nor saturation. This supports the view that these usual behaviors of the B-cone mechanism are a product of inhibitory influences from R and G mechanisms, since our blue-cone monochromat gave no evidence of a functional R or G mechanism.

CORRESPONDANCE

Dear Professor Verriest:

Our provincial highways Ministry may soon be undertaking some trials of improved traffic signals. The evidence is convincing that most color blind drivers have important difficulties with the present signals.

We are advising the Ministry that the critical signals (red, green) should be shape-coded (square, diamond) and framed in white or yellow light. Framing is important for the red-blind (protan) driver. It is not too late to offer better advice.

An agreement about this matter among those advising traffic authorities would be desirable. Your views would be appreciated in the near future.

Sincerely,

M.G. Whillans, M.D., The Color Blind Committee, Galiano.

O.S.A. TOPICAL MEETING ON COLOR APPEARANCE
Annapolis June 29-30, 1987.

Technical Program Committee: Bruce Drum, General Chair; Bill Wooten, Program Chair; James Worthey; C. James Bartleson; James Larimar.

A meeting on the topic of Color Appearance will be held at St. Johns College in Annapolis, Maryland, June 29-30, 1987, sponsored by the Optical Society of America. Immediately following the Color Appearance Conference, on July 1-3, 1987, the International Research Group on Colour Vision Deficiencies (IRGCVD) will hold its 9th symposium at St. Johns College in Annapolis, Maryland.

Color appearance has been defined for purposes of the meeting to be synonymous with suprathreshold color sensation. This definition excludes threshold phenomena such as spectral sensitivity, color discrimination, color matching and colorimetry. Color appearance nevertheless remains a broad topic, ranging from basic questions about color vision to applied problems such as predicting and controlling color appearance in complex real-life environments.

The scientific program will be structured around sessions on broadly defined subtopics. Each subtopic will be highlighted by two invited lectures from leading researchers in the field. In addition, a special evening lecture is scheduled for the first day of the meeting.

Invited lectures:

- Quantifying Color Appearance

Robert M. Boynton, University of California, San Diego
Fred Billmeyer, Schenectady, New York

- Spatial and Temporal Aspects of Color Appearance

Jacob Beck, University of Oregon
Charles F. Stromeyer, III, Harvard University

- Adaptation and Color Contrast

Steven Shevell, University of Chicago

Lawrence Arend, Eye Research Institute of Retina Foundation
- Problems in Color Reproduction
William Cowan, National Research Council of Canada
Leroy DeMarsh, Eastman Kodak Company
- Special evening lecture: "Color in the Hands of the Artist and Eyes of the Beholder"
Dorothea Jameson, University of Pennsylvania.

A limited number of contributed papers covering original unpublished work within the scope of the meeting will be accepted for presentation.

For additional information communicate with the conference manager:

Optical Society of America, 1816 Jefferson Place, N.W. Washington, D.C. 20036, U.S.A. (202) 223-0920.

COTISATION D'UN MEMBRE FRANÇAIS INCONNU

Madame Birch a reçu un versement de 10 livres sterling de l'Agence de Neuilly-sur-Seine de la Banque Nationale de Paris (ref. I925 0022348) sans autre indication de donneur d'ordre que "BIORAM". Quel membre de L'IRGCVD a-t-il ainsi acquitté sa cotisation? - Jennifer Birch.

NINTH INT. SYMPOSIUM OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES

ANNAPOLIS (USA), JULY 1-3, 1987

PRELIMINARY INSCRIPTION FORM

(to be detached from one of the 1986 issues of Daltoniana and to be returned before Januari 1, 1987 either to Dr. G. VERRIEST, Dienst Oogheelkunde, Akademisch Ziekenhuis, De Pintelaan 185, B-9000 Ghent, Belgium, or to Dr. B. DRUM, Wilmer Ophthalmological Institute 601 N. Broadway B-27, Baltimore MD 21205, U.S.A.

The special themes of this symposium will be (a) Cortical mechanisms of normal colour vision, (b) Cortical colour vision disorders, (c) Colour vision defects in retinal and optic nerve disorders, (d) Polymorphisms in normal colour vision.

Free papers will be accepted (methods of examination of central and peripheral colour vision, congenital and acquired defects, genetics of colour vision, practical aspects etc.)

The (principal) authors have to be members of the IRGCVD and are asked :
a) to ask full verbal presentation for no more than two papers (the posters will be briefly presented and will be published!);
b) to send for each paper with this preliminary inscription form two copies of a (preliminary) summary of at most 200 words
c) to remit to Dr. Verriest before the end of the symposium the manuscript (in good english) to be printed in the Proceedings.

PAPER AUTHOR(S) : .....

.....

THEME a / b / c / d TITLE : .....

free .....

.....

.....

WANTED PRESENTATION : poster

OR verbal 5 min 10 min

For further information concerning the scientifical programme contact Prof. J. POKORNY, Eye Research Laboratory, University of Chicago, 950 E 59th Street, Chicago, Ill. 60.637, U.S.A.
For the other matters contact the local organizer : Dr. DRUM (address above).

Signed

Address