

DALTONIANA

NEWSLETTER

OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES

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LITERATURE SURVEY

Opponent colour cells in different layers of foveal striate cortex, by P. GOURAS (Neurophysiology Section, Lab. of Visual Research, National Eye Institute, Bethesda, Maryland, U.S.A.), J. Physiol. 238, 583-602, 1974.

The majority of cells in layer 4B of the striate cortex of the Rhesus monkey have opponent colour properties indicating that opponency plays an important part in the early stages of visual processing. However these cells do not show orientation or directional selectivity which is apparent in the outer layers of cells. It is therefore implied that different cell layers may be involved in colour contrast and the perception of colour per se. More opponent colour cells receive inputs from the R and G sensitive cone mechanisms than from the blue sensitive one. - J. Birch-Cox.

Spatio-temporal frequency characteristics of color-vision mechanisms, by D.H. KELLY (Stanford Research Institute, Menlo Park, California 94025), J. opt. Soc. Amer. 64/7, 983-990, 1974.

A flickering grating of variable temporal and spatial frequency was used to study the flicker and contrast sensitivity of the human visual process. In the spatio-temporal frequency domain, low-frequency inhibition occurs not only for white light but also for red-, green- and blue-selective adapting conditions. Throughout most of the spatio-temporal domain the green sensitivity is greater than the achromatic sensitivity, the red is less and the blue is least of all. The results can be qualitatively explained in terms of antagonistic interactions in the early visual pathways. - Ingeborg Schmidt.

Some relationships between the psychophysics and neurophysiology of color vision, by R.W. WINTERS (Department of Psychology, University of Miami, Coral Gables, Florida), Amer. J. Optom. 51/8, 550-566, 1974.

Stimulus encoding must be viewed in terms of the relative amounts of neural activity produced in many parallel neurons at various stages of the visual pathway. This "across-neuron pattern" code for color is used to account for color sensations and hue discriminations in normal trichromats and dichromats. It is argued that stimuli that have different spectral composition but give rise to identical or nearly identical color sensation in different individuals, evoke similar across-neuron-response patterns in lateral geniculate cells. Brightness and saturation are also interpreted in terms of an across-neuron pattern theory. - Ingeborg Schmidt.

Effects of blur and overlap on brightness matching, by G.A. FRY and W.W. SOMERS (College of Optometry, The Ohio State University, Columbus, Ohio), J. Opt. Soc. Amer. 64, 717-725, 1974.

The effects of blur and separation or overlap on heterochromatic brightness matching with a bipartite field in which a monochromatic half-disk is placed in contact with a standard white half-disk have been investigated. The effect of blur can be eliminated by using an achromatizing lens to compensate for axial chromatic aberration and by using separate aperture stops for the two half disks by varying their relative sizes to equalize the effects of diffraction. Overlap and separation can be avoided by controlling the position of the eye so that both beams pass through the center of the pupil. At a wavelength of 566nm about the same luminance is required to make the colored half-disk match the white half-disk regardless of whether the half disks are in contact or separated or overlapped. At higher and lower wavelengths changing from contact to separation increases the relative luminance required for the colored stimulus to match the white one, except that for the shortest wavelength (442nm). Results obtained with contacting and overlapping stimuli show reasonably good agreement. The authors suggest an explanation. - Ingeborg Schmidt.

Relation of macular pigment and photoreceptor distribution to the perception of brightness differences, by W.W. SOMERS and G.A. FRY (College of Optometry, Ohio State University, Columbus, Ohio 43210) Amer. J. Optom. 51/4, 241-251, 1974.

The effects of using the equal brightness criterion and the minimum border criterion in making matches between white and monochromatic colors have been studied. The same bipartite circular fields (100' and 50' in diameter) are used in both series. For a flicker experiment the bipartite fields were replaced by alternating circular fields of the same size and finally by an annular arrangement (outside diameter of the annulus 100', inside 50'). As long as the subject fixates a point on the border at the center of the bipartite pattern in both types of measurement and the effects of blur and overlap or separation are reduced to a minimum the two criteria yield essentially the same results across the entire spectrum for both field sizes. At the

blue and the bipartite data were similar to the flicker measurements. However, both bipartite methods indicated a much greater sensitivity of the eye in the red end of the spectrum than the flicker results, with a peak sensitivity at 633nm. Differences in matching can be found when fields of different sizes are used. These appear to be attributable to macular pigment and the distribution of photoreceptors. The experiments with different field size indicate that it is the central region of the fovea that is primarily used for making both flicker and bipartite matches. An annular arrangement of the flickering stimuli showed that the peripheral part of the fovea is much less sensitive to green and to red than the central fovea. That the results are in conflict with the data taken by Kaiser (J. opt. Soc. Amer. 61/7, 966-971, 1971) can be explained by differences in the experimental arrangement. - Ingeborg Schmidt.

Color naming and hue discrimination in congenital tritanopia and tritanomaly, by D.O. SMITH, Vision Research 13, 209-218, 1973.

The authors evaluated the color names used by 2 tritanomals and 1 tritanope for spectral wavelengths. Color names red, green, yellow, blue and white were allowed. The tritan observers used color names yellow and red similarly to normal observers. The greatest difference between normal and tritan observers occurred in the wavelength range 450-500 where tritans confused blue and green. The authors derived measures called the Indices of Nameable Color Difference (I.N.C.D.) from the data. This measure is comparable to wavelength discrimination and the relation of I.N.C.D. to λ for the tritans was similar in form to reported wavelength discrimination data for tritans. The authors found no evidence of a shift in loci of spectral lines for the tritanomals, a finding which they state supports the concept that tritanomaly is a partial reduction system. - V.C. Smith.

Contrast sensitivity, Westheimer function and Stiles-Crawford effect in a blue cone monochromat, by N.W. DAW and J.M. ENOCH, Vision Research 13, 1669-1680, 1973.

These authors measured the functions named in the title on a blue-cone monochromat of best corrected acuity 20/200+. In comparison with previous reports, the contrast sensitivity peaked at 1 cycle/deg (previous reports 2 c/d) and showed higher sensitivity. The authors attributed the shift in peak sensitivity to the eccentric retinal area tested (5° parafovea). The Westheimer function showed its minimum at 1° which the authors suggest is compatible with the contrast sensitivity data. The Stiles-Crawford measurements on isolated blue cones gave typical data. The measurements at the rod adaptation level were not typical of cone receptors, but showed a falloff in sensitivity which the authors attributed to the rods. The authors found no evidence of cones with a 500 nm pigment. - V.C. Smith.

Dichromatic convergence points obtained by subtractive colour matching, by J. BIRCH, Vision Research 13, 1755-1765, 1973.

Using a Lovibond Tintometer, 30 observers with congenital sex-linked defects made matches to Munsell samples. The matches either followed a line similar to isochromatic lines or grouped in large ellipses. The length of the line segments or ellipse size was correlated with the Nagel matching range. For dichromatic observers the line segments were extended to derive convergence points for both individual and pooled data. The protanopic convergence point fell close to $x = .75$, $y = .25$, with little variance. The deuteranopic convergence point showed considerable inter-subject variability, showing greater agreement with Pitt's estimate ($x = 1.08$, $y = -0.08$) than with the Nimeroff estimate ($x = 1.53$, $y = -0.53$). These results are attributed to variation in macular pigment. - V.C. Smith.

Infant color perception, by J.F. FAGAN III (Dept. of Psychology, Case Western Reserve Univ., Cleveland, Ohio, 44106), Science 183, 973-975, 1974.

The subjects were 62 male and 62 female infants from 21 to 25 weeks old and 14 males and 19 females 13 to 16 weeks old, all free from any known visual abnormalities. Checkerboards composed of two Munsell papers differing in hue but equated for value (brightness) and chroma (saturation) were paired with unpatterned targets of either paper and the amount of visual fixation paid to patterned and unpatterned stimuli recorded. Any preference for a checkerboard over a plain target depends on the perception of hue differences and also readily elicits the infants natural preference for patterned over plain targets. The greater the difference in the hues making up a checkerboard, the stronger is the preference for pattern. Conclusion : infants are capable of discriminating on the basis of hue by 4 to 6 month. The author assumes that it should be possible, using his method, to observe the early development of color perception and to detect early deficiencies in color vision. - Ingeborg Schmidt.

Graphic method of depicting the colour perception rate, by L.B. SUKHININA (Outpatients clinic NO. 30 at the united hospital No. 9, Leningrad), Vestn. Oftal, 1974/1, 67-69.

The clinical test of the rate of color discrimination is carried out on the polychromatic charts for testing color vision by E.B. Rabkin (1965). After 30 seconds adaptation to a white Whatman sheet within the aperture of a mask covering the Rabkin chart a color circle is shown at an illumination equal to the illumination of the Whatman paper. The test objects are presented one after another from the smallest to the largest in the colors red, yellow, green, blue and neutral gray, on a black background. Exposure of each object is 1 sec. The smallest circle that can be distinguished in its color at that exposure time serves as criterion of the rate of color discrimination. The result can be recorded by color, saturation and angular size of this circle. Two graphic methods of representation of the results are described. - Ingeborg Schmidt.

Age-specific "standards" of functional capacity of the macular region in the retina of healthy children and adolescents according to the photochromostress-test findings, by L.I. DALECHINA (Chair of Eye Diseases, Pediatric Faculty, II Pirogov Medical Institute, Moscow), Vest. Oftalm. 1974 No. 3, 73-76.

A photochromo-stress test of the macula with white, green and red light was carried out on 97 children, age 7 to 16, with normal visual acuity, normal eye media and fundus. The restoration time of visual acuity varied within the limits of 4 to 35 sec and in the 10-12 years age group it was quicker in boys than in girls. The average restoration time was not different in the 3 illuminations. The data suggest that in children a restoration time approaching 40 sec should be regarded as above normal. The intensity of the lights was not given. - Ingeborg Schmidt.

Acquired dyschromatopsia in successfully treated retinal detachments, by S.K. BHARGAVA, C.I. PHILIPS and P.A. ASPINALL (Department of Ophthalmology, University of Manchester, England, and Department of Ophthalmology, University of Edinburgh, Scotland), Acta Ophthal. (Kbh.) 51/6, 829-840, 1973.

Ten patients with successfully treated unilateral retinal detachment were tested with the Farnsworth-Munsell 100-hue test binocularly and uniocularly. The results were compared with those of a matched control group. The authors point out that a comparison between the affected eye and the contralateral normal eye may give information that is concealed when abnormality is judged from absolute error scores (i.e. Verriest's limits for different ages). A method is presented for inter-eye comparison of 100 hue error scores. The difference between error scores of two normal eyes is correlated to the absolute score. It is shown, however, that the inter-eye difference of the square roots of the error scores is not significantly influenced by the absolute score. Tolerance limits for normality are laid down. When these were applied to the experimental group, three patients had normal colour vision and in seven the affected eye was significantly abnormal. The defect was found to be either YB, RG or non-specific. It is concluded that two qualitatively different types of colour vision deficiency (YB and RG) may arise from retinal detachment, although high age or myopia may contribute to the YB defect. In this material, one patient was highly myopic (YB) and five were more than 45 years old (three YB). - The binocular score of the patients was significantly worse than the best uniocular score. This odd result is so far without explanation, although eye dominance is discussed as a factor of influence. -Anders Hedin.

Disturbances of colour discrimination in the visual field of patients with acute hepatitis, by B. LUKASZEWICZ, J. WYSOCKI and J. WOZNY, Klin. Oczna, 617-620, 1972.

In 50 patients the visual field was determined for red, green, blue-violet and white objects. The majority of patients exhibited a reduction of the colour fields (in smallest degree for green). This phenomenon was not correlated with age, sex, protein-level in the blood-serum, albumins, aminotransferase, alkaline phosphatase and thymol test results. The disturbances are long-lasting. - Felicia Jakubik.

Progressive cone dystrophy; four cases of unusual form, by N. OHBA (Department of Ophthalmology, University of Tokyo, School of Medicine, Hongo, Bunkyo-ku, Tokyo 113, Japan) Jap. J. Opth. 18/1, 50-69, 1974.

Four sporadic cases, two males and two females with selective involvement of cone mechanism were reported. Visual disturbances began at the second to fourth decade of life after a period of normal vision. Main symptoms : reduced visual acuity; aquired color vision defects. The result were similar to those found in congenital achromatopsia; daylight blindness. Dark adaptation and ERG studies revealed severe involvement of cone mechanism throughout the entire retina with little or no defect of rod mechanism. The fundi appeared quite normal. The EOG was normal. These findings suggest a new form of progressive cone dystrophy. - Ingeborg Schmidt.

The effect of retinitis pigmentosa on brightness and saturation under photic intermittency, by G. Mac DONALD (Department of Psychology, University of Alberta, Edmonton, Canada), Amer. J. Optom. 51/4, 264-265, 1974.

The test target was a small bipartite field of monochromatic light presented to the right eye. The lower half of the field was made intermittent by an episcotister. Three spectral areas were tested : 620, 580 and 520 nm. The luminance was set at 3.5 log units above threshold. Under steady illumination both, a subject with normal vision and one with retinitis pigmentosa (scotopic vision completely deteriorated, photopic vision intact) perceived the expected changes in brightness and saturation. When the visual target was presented intermittently, both observers reported brightness enhancement, however only the observer with normal vision reported desaturation, whereas that with retinitis pigmentosa was unable to detect desaturation under any condition of intermittency. The results suggest that desaturation involves a luminosity mechanism which may operate alone or in interaction with chromaticity mechanisms. - Ingeborg Schmidt.

Contribution to the objective evaluation of colour disturbances after administration of antimalarica, by J. BALIK and V. REJHOLEC (J.B. Praha 2, U. nemocnice 2) Cs. Oftal. 30, 1, 9-12, 1974.

Electroretinographic examination with colour filters of 405, 444, 501, 557, 591 and 656 nm in a group of 18 patients using antimalarica for a longer time and with colour vision defects and in a group of 13 patients without colour vision disturbance showed a statistically verified difference in response for the filters of 405, 444, 501 and 591 nm. The disturbance has not the character of inborn colour perception disturbances. - Marion Marré.

Scintillating punctuate retinopathy (La rétinoopathie ponctuée scintillante), by P. TURUT, R. ASSEMAN and G. ROBINET, Bull. Soc. franç. Ophtal., 72, 1135-1137, 1972.

Description of an own case of central tapetoretinal degeneration with intra-retinal golden spangles. The 100 hue test showed a global and important dyschromatopsia in the right eye and a blue-yellow defect in the left one. - Jean Vola.

Oedematous maculopathies (Maculopathies oedémateuses), by G. COSCAS, Société d'Ophtalmologie de Paris, Rapport 1972.

In this important report colour vision is studied in each case by means of 6 tests : Ishihara, H-R-R, Tritan plate, Panel D-15, 100 hue, Nagel anomaloscope.

In 68 cases a blue-yellow defect was found (71,2%) : 46,2% at the trichromatic stage and 25% at the dichromatic stage (chiefly when oedema is old and important and when acuity is between 20/200 and 20/30); the Rayleigh equation is displaced to the red.

Furthermore, the author discovered a type I red-green defect in 6 cases and a defect without prominent axis in 5 cases. Colour vision was normal in 15% of the cases.

In central serous chorio-retinopathy a blue-yellow defect appears very early, sometimes with a visual acuity as good as 20/25.

In senile disciform macular degeneration and in diabetic maculopathy the defect is early and of blue-yellow axis.

In Berlin oedema, the blue-yellow defect is associated with a red-green one.

In 6 cases of chorio-retinitis with macular oedema, the author found one type I red-green defect and 5 blue-yellow defects associated with red-green defects.

In macular oedema after retinal detachment treated by light coagulation he found either a blue-yellow axis or a dyschromatopsia without prominent axis.

The great pronostic value of the colour vision defect is emphasized. - Jean Vola.

Effect of color on reported autokinetic movement, by B. WALLACE (Dept. of Psychology, Western Illinois Univ., Macomb, Illinois, 61455), Perceptual and motor Skills 37/3, 785-786, 1973.

The stimulus source of autokinetic movement was produced placing a gelatine filter (either red, green, violet or yellow) over an illuminated pinpoint hole in a box. The stimuli were equated for luminance. The subjects were college freshmen with normal color vision. Each dark adapted for 30 min and then performed 10 trials, each lasting 60 seconds. The autokinetic movement was estimated verbally. The overall main effect of color on the magnitude of reported movement was not significant. - Ingeborg Schmidt.

Effects of goggle-altered color perception on sleep, by C. BOWE-ANDERS, J.H. HERMAN and H.P. ROFFARG (Dept. of Psychiatry, Montefiore Hospital and Medical Center and Albert Einstein College of Medicine, Bronx, New York), Perceptual and Motor Skills 38, 191-198, 1974.

During all waking time on the experimental days, for 4 to 5 days, the subjects wore goggles equipped with No 29 Wratten color filters which screen all light save the red band. The experiments led to the conclusion that significant perceptual readjustments due to color distortion, lighting reduction and restriction of the range of peripheral vision though strongly affecting dream content, do not result in measurable changes in the basic physiological parameters of sleep. - Ingeborg Schmidt.

Audio-visual signalling and the detection of signals in vigilance, by L. BRZEZINSKA, Prace Centralnego Instytutu Ochrony Pracy 70, 223-230, 1971.

The article deals with investigations intended to elucidate the kind of signalling enabling the detection of more signals in tasks requiring vigilance : namely mixed audio-visual signals, exclusively visual or exclusively auditory ones. The results revealed that the audio-visual signalling is the most effective one (greatest number of detected signals and least number of false alarms). The other types of signalling may be applied with success, but not in every situation. - Felicia Jakubik.

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LISTS OF THE PUBLICATIONS ON COLOUR VISION
DEFICIENCIES OF MEMBERS OF THE RESEARCH GROUP

53. Papers of Prof. J. MORELAND (School of Optometry,
University of Waterloo, Waterloo, Ontario, Canada).

- MORELAND, J. - Modifications of the Wright trichromatic colorimeter for extrafoveal and peripheral observations. Optica Acta, 1955, 2, 101-104.
- MORELAND, J. - Small field tritanomaly in peripheral vision. Die Farbe, 1955, 4, 241-245. Proceedings of the International Discussion of Problems in Color Metrics, 1955, Heidelberg.
- MORELAND, J. & CRUZ, A. - Colour perception with the peripheral retina. Optica Acta, 1958, 6, 117-151.
- MORELAND, J. - Discussion Report : Visual processes in man and animals. Progress in Photobiology, 1965, pp. 123-130. Edited by E.J. Bowen, Blackwell.
- MORELAND, J. - The blue arcs of the retina. Die Farbe, 1966, 15, 73-86.
- MORELAND, J. - On demonstrating the blue arcs phenomenon. Vision Research, 1968, 8, 99-107.
- R MORELAND, J. - Threshold measurements of the blue arcs phenomenon. Vision Research, 1968, 8, 1093-1106.
- R MORELAND, J. - Possible mechanisms of the blue arcs of the retina. Journal of Physiology, 1969, 201, 60-61P.
- R MORELAND, J. - The mechanism of the blue arcs phenomenon. Color 69, 188-196 (1970).
- R MORELAND, J. - Retinal topography and the blue arcs phenomenon. Vision Research, 1969, 9, 965-976.
- MORELAND, J., NAISEBY, J., BARRAS, T.C., CROSS, A.G., OLIVER, L., PRICE, T.J.G. & TYRELL, A.J.R. - Sight tests for seafarers (Report of the Committee to review The Board of Trade sight test standards for persons serving or intending to serve in the Merchant Navy or in The Fishing Fleet.) Her Majesty's Stationery Office. London, 1970, pp. 1-9.
- R MORELAND, J. - The effect of inert ocular pigments on anomaloscope matches and its reduction. Modern Problems in Ophthalmology, 11, 12-18 (1972).
- MORELAND, J. - Inert pigments and the variability of anomaloscope matches. Amer. Journal of Optometry, 49, 735-741 (1972).
- R MORELAND, J. - Peripheral colour vision, Chapter in Handbook of Sensory Physiology, Visual Psychophysics, Vol. VII/4, 517-536 (1972). Springer-Verlag, Berlin-Heidelberg.

Last call for papers!

THIRD SYMPOSIUM OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR
VISION DEFICIENCIES

AMSTERDAM (THE NETHERLANDS), 25th - 27th JUNE 1975

"RESEARCH IN COLOUR VISION DEFICIENCY"

PRELIMINARY INSCRIPTION FORM

(to be detached from one the 1974 issues of Daltoniana
and to be returned before 31st December 1974 to Dr. G. VERRIEST,
Dienst Oogheekunde, Akademisch Ziekenhuis, De Pintelaan 135,
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The main themes of this symposium will be :

1. Basic mechanisms of defective colour vision.
2. Peripheral colour vision.
3. Genetics of colour vision.

Free papers relating to other subjects will be accepted.

All papers must be read and written in good English.

Furthermore the authors are asked :

- a) to send before the 1st April 1975 two copies of a summary of
at most 200 words to Prof. Dr. R.A. CRONE, Oogheekundige
Kliniek, Akademisch Ziekenhuis, Eerste Helmersstraat, 104,
Amsterdam-W, The Netherlands;
- b) to insert for their oral presentation slides with (English)
text intended to render the subject more understandable for
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- c) to give to Dr. VERRIEST and before the end of the symposium
the manuscript to be printed in the Proceedings (taking
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