DALTONIANA

NEWSLETTER
OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES
President: Prof. W. JAEGER (D.R.D.)

Treasurer:
Mrs. J. BIRCH
The City University, Northampton Square
LONDON ECW OH8 (England)

General Secretary and Editor of the Newsletters:
Dr. G. VERRIEST
Dienst Oogheelkunde, Akademisch Ziekenhuis
De Pintelaan 185 - B-9000 GENT (Belgium)
(verantw. uitg.)

Secretary for the Socialist Countries:
Dr. M. MARRE
Universitäts-Augenklinik, Fetscherstrasse 74
8019 DRESDEN (D.D.R.)

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LITERATURE SURVEY

Spectral sensitivity of cones of the monkey Macaca fascicularis, by D.A. BAYLOR, B.J. NUNN and J.L. SCHNAPF (Dept. of Neurobiol., Sherman Fairchild Sci. Building, Stanford Univ. School of Med., Stanford, CA 94305, USA) J. Physiol. 390, 145-160, 1987.

This paper gives the full experimental details of Baylor, Nunn and Schnapf's electrophysiological measurements of the spectral sensitivities of single cones from the Cynomolgus macaque monkey. Individual outer segments were drawn into suction pipettes and were illuminated transversely by monochromatic flashes; the photon density of the flash was adjusted at each wavelength to give a criterion peak photocurrent. When stimulated in this way, isolated cones obeyed the Principle of Univariance (although Univariance might not hold perfectly under physiological conditions, owing to possible coupling between receptors and to spectral differences in the axial distribution of absorbed photons when cones are stimulated normally). The wavelengths of peak absorption for the three classes of cone were approximately 430, 531 and 561 nm, and the standard deviation within a class was less than 1.5 nm. Short-wave cones were rare in the sample. On the basis of the electrophysiological cone sensitivities, and assumed values for pre-receptoral absorptances, the authors reconstruct the human colour-matching functions, and also the pi mechanisms of W.S. Stiles. - J. D. Mollon.

Age and the transmittance of the human crystalline lens, by R.A. WEALE (Dept. Vis. Sci., Inst. Ophthalmol., Judd. St., London WC1H 9QS, U.K.) J. Physiol., 395, 577-587, 1988.

Prompted by contradictions in the literature, Weale returns to the problems of the spectral absorption of the lens in the UVA and visible regions (327-700 nm) and its variation with age. Measurements were made approximately 30 h post mortem using a commercial spectrophotometer. The previously reported absorption peak at 360 nm is confirmed, but individual lenses are found to vary in the extent to which they exhibit a transmission window near 330 nm. A very small, but apparently reliable, increase in absorption occurs at 590 nm. The absolute values of absorbance are lower than those recorded by Cooper and Robson. An increase of absorbance with age was found in all spectral regions, although the slope may be less in the UVA. - J.D. Mollon

Random array of human visual pigment genes at Xq28, by D. VOLLRATH, J. NATHANS and R.W. DAVI (Dept. Biochem., Stanford Univ. School Med., Stanford, CA 94306, USA) Science, 240, 1669-1672, 1988.

This is a technical paper presenting tests of Nathans' model of how the genes for the long- and middle-wave pigments are arranged on the X-chromosome. The authors take advantage of two recently developed tools: (b) digestive enzymes that are specific for relatively long sequences of bases and thus cleave the DNA only at large intervals; (a) pulse modulation electrophoresis, in which the electric field applied across the gel is repeatedly reversed; this trick makes it easier to separate large fragments of DNA according to their size.

The authors offer 3 tests of the previously published model of the opsin gene complex (Science, 232, 203, 1986) in which the gene for the long-wave pigment lies at the 5' edge of a compact head-to-tail array that may contain several middle-wave genes but never more than one long-wave gene;

- DNA was analysed from five males whose number of middle-wave genes was known independently (vide op. cit.) to vary from 0 to 4. Enzymes were used that cut only outside the limits of the complete array. The weight of the resulting fragment increased linearly with the number of middle-wave genes (39 kb per copy), as required by the model. In the case of DNA from an individual with one long-wave gene and one middle-wave gene, the total length of the fragment was less than 200 kb, a result that confirms the close linkage of the two genes (i.e. they lie very close together);

- An enzyme was used that was likely to cleave a small number of times per repeat unit. Such an enzyme should give DNA fragments of two kinds: "repeat fragments" in which both end points lie within repeated sequences and "end fragments" that have one end point lying in unique DNA outside the opsin gene complex. Fragments of the former type should increase in number with the number of copies of the middle-wave gene, whereas the latter type should not, since the complete array has only two ends. Three fragments were found that varied in number with the number of copies of the middle-wave gene; and their total length (37.6 kb) was similar to the size of the repeating unit estimated by the preceding method. A further 32-kb fragment was independent of the number of copies of the middle-wave gene. This 32-kb

fragment must include DNA from outside the repeating units of the opsin gene complex, since it is cleaved by one of the more selective enzymes (see above) known to cut only outside the complete array; and it must lie at the 5' end of the complete array, since it can be identified by a cDNA probe that is known to extend in the 5'direction from one of the short, repeated, fragments (refer to Figure 3 of the paper).

- The 32-kb fragment hybridized with a probe known independently to correspond to sequences that lie immediately 5' to the long-wave gene and have not homology with the middle-wave gene. It follows, as required by the original model, that the long-wave gene lies at the 5' end of the opsin gene array.

As a reason for the absence of variation in the number of copies of the long-wave gene, Nathans and his colleagues (as in the earlier papers) point to the position of the long-wave gene at the 5' end of the array: unequal crossing over will produce varying numbers of copies of the intact middle-wave gene but not of the long-wave. (The reader may initially find this argument a little obscure: for if one casually draws the two chromosomes misaligned at meiosis with the long- and middle-wave genes apposed, then the situation appears symmetrical and it seems as easy to generate two copies of the long-wave gene (by a break-point at the 5' end of one array) as two copies of the middle-wave gene (by a break-point at the 3' end of one array). Essential to Nathan's argument is one particular feature of the opsin complex: on the 3' side of each gene (but not on the 5') is a long stretch of DNA that does not code for the opsin but is homologous between the two genes. Consider the two genes misaligned at meiosis: a breakpoint will not occur to the 5' side of beginning of the long-wave gene because this DNA will not synapse with the DNA that lies on the 5' of the middle-wave gene; and a breakpoint to the 3'side of this point will produce a hybrid gene; but the DNA lying between the long- and middle- wave genes, being homologous, will synapse, and a breakpoint in this region will generate one chromosome with an extra middle-wave gene. One interesting question arises: why do the homologous but non-coding stretches of DNA, flanking the 3' ends of the opsin genes, not rapidly diverge in sequence so as to prevent unequal crossing-over?) - J.D. Mollon.

An account of responses of spectrally opponent neurons in macaque lateral geniculate nucleus to successive contrast, by B.B. LEE, A. VALBERG, D.A. TIGWELL and J. TRYTI (Dept. of Neurobiol., Max Planck Institute for Biophysical Chemistry, D-3400 Göttingen, F.R.G., and Dept. of Biophysics, Univ. of Oslo, N-Oslo 3, Norway) Proc. R. Soc. Lond. B 230, 293-314, 1987.

Coloured surfaces in the normal environment may be brighter or dimmer than the mean adaptation level. Changes in the firing rate of cells of the parvocellular layers of macaque lateral geniculate nucleus were studied with such stimuli; chromatic mixtures briefly replaced a white adaptation field. This paradigm is therefore one of successive contrast. Families of intensity-response curves for different wavelengths were measured. When taking sections at different luminance ratios through these families of curves, strongly opponent cells displayed spectrally selective responses at low luminance ratios, while weakly opponent cells had higher chromatic thresholds and responded well

to stimuli at higher luminance ratios, brighter than the adaptation field. Strength of cone opponency, defined as the weight of the inhibitory cone mechanism relative to the excitatory one, was thus related to the range of intensity in which cells appeared to operate most effectively. S-cone inputs, as tested with lights lying along tritanopic confusion lines, could either be excitatory or inhibitory. Families of curves for different wavelengths can be simulated mathematically for a given cell by a simple model by using known cone absorption spectra. Hyperbolic response functions relate cone absorption to the output signals of the three cone mechanisms, which are assumed to interact linearly. Parameters from the simulation provided estimates of strength of cone opponency and cone sensitivity which were shown to be continously distributed. Cell activity can be related to cone excitation in a trichromatic colour space with the help of the model, to give an indication of suprathreshold coding of colour and lightness. - The Authors.

Short-wavelength-sensitive cones do not contribute to mesopic luminosity, by W. VERDON and A.J. ADAMS (School of Optom., Univ. of California, Berkeley, California 94720, U.S.A.), J. Opt. Soc. Am. A, 4, 91-95, 1987.

It has been suggested that the short-wavelength-sensitive cones (S cones) play a significant role in the transition from scotopic to photopic vision (the Purkinje shift). We address this issue directly over a 5-$\log_{10}$-unit range of light levels covering scotopic, mesopic, and photopic vision. At each light level we make flicker matches to two reference stimuli by 2-Hz flicker photometry. The two reference lights (441 and 481 nm) differ only in their stimulation of S cones; each light produces identical quantal catches for rods and M and L cones. This novel technique utilizes the different magnitudes of the rod and cone Stiles-Crawford effects. Despite the large differences in S-cone stimulation by the two reference lights (more than 1 $\log_{10}$ unit), the pairs of luminosity functions are indistinguishable at each light level tested. The results indicate that S cones do not contribute to either photopic or mesopic luminosity. - The Authors.

Tyndall's paradox of hue-discrimination, by J.D. MOLLON (Dept. Exp. Psychol., Univ. of Cambridge, Downing Street, Cambridge CB2 3EB, UK) and O. ESTEVEZ (Acad. Med. Centre, Labor. Med. Phys., Meibergdreef 15, 1105 AZ Amsterdam, The Netherlands) J. Opt. Soc. Am. A 5, 151-159, 1988.

We confirm a remarkable but forgotten property of human color vision that was described over 50 years ago by Tyndall (J. Opt. Soc. Am. 23, 12, 1933): if wavelength discrimination is measured in the region of 455 nm, the sensitivity of the eye improves when a large fraction of the monochromatic light in each half of the matching field is replaced by white light that is common to the two halves. We demonstrate that a similar facilitation also occurs when the shortwave monochromtic components are held constant in luminance and a long-wave desaturant of increasing luminance is added to the shortwave discrimanda. We relate these phenomena to the properties of postreceptroal visual channels. - The Authors.

An experiment on color naming of yellow flashes of variable duration, by L.R. RONCHI (Ist. Naz. di Ottica, Florence, Italy), Am. J. Optom. Physiol. Opt. 64, 256-262, 1987.

An investigation into the stability of color appreciation after repeated testing with a light emitting diode (LED) system was undertaken. Experienced subjects viewed a LED simplon that had been set at a plateau intensity (in the photometric range), the principal variation being pulse duration (16 to 320 ms). A forced choice color naming technique was applied. The investigation revealed a red shift for short duration exposures and an intense yellow shift for long exposures. Prolonged repeated testing produced a peculiar effect in the midrange: a loss of color, supplemented by a white effect, interpreted as a masking or tuning effect, by the achromatic channel. - The Authors.

Effect of filters upon object color naming, by J.E. SHEEDY (School Optom., Univ. of Calif., Berkeley, California, USA), Am. J. Optom. Physiol. Opt. 64, 504-512, 1987.

Color constancy refers to the phenomenon that the perceived colors of objects are largely unaltered by changes in the illuminant or by viewing through colored filters. Deviations from perfect constancy, induced by filters similar to ophthalmic tints, were investigated in this study. Munsell color chips were forced choice categorized into R, Y, G, or B. This accurately located the boundaries between these colors on the chip color circle. Testing was performed through 23 different adaptive conditions and chromaticity shifts created by filters. The technique simulates real world situations in which the chromaticity of the objects and the adaptation of the observer both change. Generally, color constancy held quite well. The boundaries between the four colors shifted for some filters, indicating some deviation from perfect constancy. Red filters resulted in more color chips appearing red, blue and green filters resulted in more chips appearing blue, and filters along the Planckian locus resulted in more chips appearing green. - The Authors.

Effects of yellow filter glasses on the results of photopic and scotopic photometry by E.A. AARNISALO (Dept. Ophthalmol., Satakunta Central Hospital, Pori, Finland) Am. J. Ophthalmol. 105, 408-411, 1988.

I measured the luminosity of a white surface with seven different yellow filter glasses and a photometer with two different sensitivities, which resembled the photopic and scotopic sensitivity of a Commision Internationale d'Eclairage standard observer. When measured with filters GG 400, GG 420, GG 435 and GG 455, there was a small and almost equal reduction in the relative photopic and scotopic luminosities. Measured with filters GG 475, GG 495, and OG 515, there was a more marked reduction in the scotopic luminosities than in the photopic luminosities. - The Authors.

An automatic display system for pseudoisochromatic plates. Report I. Standard Pseudoisochromatic Plates Part I (SPP-I), by K. HUKAMI and Sh. SHIMAMOTO (Dept. Ophthalmol., Fukui Medical School, Japan) Jpn. J. Clin. Ophthalmol. 39, 1299-1303, 1985.

Pseudoisochromatic plates are a simple and useful system to

detect congenital color defectives. It is desired that the plates be presented in a standardized manner to ensure accuracy of the results. A new, automatically driven display system for the pseudoisochromatic plates was developed. Each plate is attached on a rotating disc and is illuminated by neutral light of constant level. Each plate is presented through a window for 3 seconds to the test subject at a distance of 75 cm. Answers and diagnosis are printed out by a built-in microcomputer.

This display system was used incorporating the SPP Part-I. Each examinee could be tested in less than 1 minute. The system did not require particular skill of the examiner. - Yasuo Ohta.

Assessment of the desaturated Panel D-15. II: Comparison between the desaturated Panel D-15 and the Farnsworth 100-hue tests (Evaluation du Panel D-15 Désaturé II: Comparaison entre les tests Panel D-15 désaturé et Farnsworth 100-hue), by P. LANTHONY (Paris) J. Fr. Ophtalmol. 10, 579-585, 1987.

Colour vision was examined in 319 subjects by means of the desatured Panel D-15 and the Farnsworth 100-hue test used as reference test. The results, expressed by scoring, were as follows: (1) a strong correlation (r=0,80) was evidenced between the 2 tests; (2) the scores of the desaturated Panel D-15 were predicted from the 100-hue scores, by means of a suitable regression equation, thus allowing the calculation of norms of the desaturated Panel D-15 by reference to the well-established norms acording to age of the 100-hue test; (3) the normal or pathological character of the scores of the desaturated Panel D-15 was infered from these norms, and was in good agreement with the scores of 100-hue test (K=0.68); (4) the normal or pathological character of the qualitative patterns of the desaturated Panel D-15 was also inferred from the scores. So: minor errors were normal from 30 years old patients; a single diametral error is normal; 3 or 4 diametral errors are normal from 65 years of age. - The Author.

Test results of OSCAR color vision tester, by T. MOTOHASKI, Sh. NOYORI, K. SHIMIZU, Y. OHTA, A. SEKI and T. MIYAMOTO (Dept. Ophthalmol., Tokyo Med. Coll., Japan) Jpn. J. Clin. Ophthalmol. 39, 1203-1206, 1985.

We examined 83 subjects with congenital color vision defects using OSCAR (objective screening color anomalies and reduction) color vision tester developed by Estevez (1983). The findings wee compared with those by anomaloscope and pseudoisochromatic color plates. Examinations by OSCAR allowed the classification of color vision defects into protan and deutan at a fair degree of accuracy comparable with anomaloscope. It gave poor results in estimating the degree of color vision defect. Because of the case of operation, the device could be used by infants of 4 years or more in our present series. These features seem to be excellent features of the OSCAR system. - The Authors.

Screening of red-green color-deficient observers using the chromatic pupillary response, by R.S.L. YOUNG (Dept. Ophthalmol. and Vis. Sci., Texas Tech. Univ., Lubbock, TX 79430, U.S.A.), J.E. CLAVADETSCHER and D.Y. TELLER (Dept. Psychol. and Physiol./Biophys., Univ. of Washington, Seattle, WA 98195, U.S.A.) Clin. Vision Sci. 2, 117-122, 1987.

(1) In addition to its response to changes in illumination, the pupil of the eye produces transient constrictions to the temporal exchange of two equiluminant chromatic stimuli. In the present study, chromatic pupillary responses to red-green and green-red exchanges were studied in 9 color normal subjects and in 3 deutan and 3 protan subjects. (2) Normal subjects showed vigorous pupillary constrictions to both directions of chromatic exchange. Deutan subjects showed weaker responses to both directions of exchange, and protan subjects showed a very vigorous response to red-green and virtually no response to green-red. (3) Recording sessions could be completed in less than 10 min. Preliminary data from one infant and one toddler are also presented. (4) We conclude that chromatic pupillary responses may provide a rapid, objective screening test for red-green color deficiencies in nonverbal subjects. - The Authors.

Color mixture data for normals and tritanopes, by Gl.A. FRY (Coll. Optom., Ohio State Univ., Columbus, Ohio, USA), Am. J. Optom. Physiol. Opt. 64, 649-652, 1987.

In the author's theory of color vision the blue and the green fundamental fall on a tritanopic confusion line. This provides the basis for comparing the mixture data of a tritanope with those of a normal. At the red end of the spectrum the data conform very well to what is predicted by theory. At the blue end the data point to the possibility that the pigment responsible for the red response may differ from the pigment involved at the red end of the spectrum. - The Authors.

Rayleigh match in congenital stationary night blindness, by F.A. ABRAHAM and N.ELAZAR (Maurice and Gabriela Goldschleger Eye Inst., Sackler Fac. of Med. Tel-Aviv Univ. Chaim Sheba Med.-Center, Tel-Hachmer, Israel) Metabolic Pediatric and Systemic Ophthalmol. 11, 97-99, 1988.

Rayleigh matches performed by 13 patients with Schubert-Bornschein type congenital stationary night blindness with normal color vision, revealed that they use consistently slightly more red light primary in order to achieve a brighter yellow match than a control group with normal color vision and visual acuity. The matching differences between the two groups ere statiscally significant. - The Authors.

An unusual form of incomplete achromatopsia in a pair of siblings, by A. KANDATSU, H. KITAHARA and K. KITAHARA (Dept. Ophthalmol., The Jikei Univ. Sch. of Med., Japan) Jpn. J. Clin. Ophthalmol. 39, 585-588, 1985.

Strong dyschromatopsia was observed in a 9-year-old boy and his sister aged 5 years. Both manifested reduced visual acuity of 0.1 in either eye. No fundus abnormalities were present. They could not read any of Ishihara's plates except Nr. 1. They made over 400 errors on the 100-hue test with a red-green axis. Spectral sensitivities of the brother at 4° temporally at scotopic levels were similar to the CIE scotopic curve. His spectral sensitivity at the fovea at photopic levels showed a reduced cone response in the long wavelength region. It was higher than in protanomalies. The red-green settings of color matchings shifted towards red. Yellow settings showed a higher number than in protanomalous settings. The findings indicate that

the cases manifest a kind of incomplete achromatopsia with reduced effective optical density of red and green cones. - Yasuo Ohta.

Unilateral intraocular lens, Matching brightness and colour perception against the phakic healthy fellow eye by E. AARNISALO (Dept. of Ophthalmol., Satakunta Central Hosp., Pori, Finland) Acta Ophthalmol. (Kbh) 66, 104-109, 1988.

A combination of yellow and neutral filters was placed in front of an eye with IOL in order to find a colour and brightness match with the healthy phakic fellow eye. A Munsell standard blue pigment colour target was used as a test. Nine persons with a unilateral IOL were examined. The yellow Schott filter GG 420 was chosen by 2 observers, GG 435 by 5 and 455 by the remaining 2. In combination with the yellow filter a Schott neutral filter 0.1 NG was preferred by 3 observers, and each of the neutral filters 0.3 NG, 0.45 NG and 0.6 NG was chosen by 2 observers. The luminance of the coloured test target was measured to be 120 cd/m^2 without filters and 86 to 31 cd/m^2 as measured through the selected filter combination. - The Author.

Color vision in cataract, aphakia and pseudophakia (Farbensehen bei Katarakt, Aphakie und Pseudophakie), by M. MARRE E. MARRE und S. HARRER (Med. Akad. Dresden, GDR and Augenabt. Hanusch-Krankenhaus Wien, Österreich) Klin. Mbl. Augenheilk. 192, 208-215, 1988.

Color vision examinations were performed using a clinical test battery and two spectral laboratory methods. With aphakia and iris-clip lenses (ICL) there were slight acquired blue-yellow defects 6 months to 3 years after surgery, especially when the more sensitive laboratory methods were used. They were possibly caused by photochemical damage to the retina or by a barrier deprivation syndrome. Color vision with posterior chamber lenses (PCL) was superior to that with ICL, and in aphakic subjects it was quite normal. In the clinical tests no differences could be found between PCLs of clear PMMA material and those with UV absorbing properties. Slight acquired blue-yellow defects in the immediate postoperative phase after implantation of PCLs can be attributed to postoperative irritation and are reversible. Lasting and severe blue-yellow defects indicate inflammation or macular edema. - The Authors.

Sensitivities in older eyes with good acuity: eyes whose fellow eye has exudative AMD, by A. EISNER, S. FLEMING, M.L. KLEIN, and W.M. MAULDIN (Neurol. Sci. Inst. and Dept. Ophthalmol., Good Samaritan Hosp. and Med. Center, Portland, Oregon, and Dept. Ophthalmol., Oregon Sci. Univ., Portland, Oregon, U.S.A.), Invest. Ophthalmol. Vis. Sci. 28, 1832-1837, 1987.

We compared several indices of foveal visual function between 2 groups of people aged 60 and older. One group was comprised of individuals who had good acuity in one eye, but had a history of exudative aging macular degeneration (AMD) in the other eye. We measured visual function in these individuals' good eyes only. The second group was a normative group; it was comprised of individuals who had good acuity in each eye. None of the eyes which we tested from either group had funduscopic evidence of macular pathology other than macular drusen and/or

hypopigmentation. We found that eyes whose fellow eye had suffered from exudative AMD themselves suffered compromised foveal function, even when they retained 20/20 or better acuity. Losses of sensitivity mediated by blue-sensitive cones tended to be greater for 1° than for 3° diameter test stimuli. Absolute sensitivity losses at long test wavelengths were probably due to several factors, including decreased effective cone photopigment density. Slow rates of recovery during dark adaptation were associated with the presence of many macular drusen and/or macular hypopigmentation. Eyes whose fellow eye had suffered from exudative AMD had more macular drusen and hypopigmentation than eyes whose fellow eye had not suffered from exudative AMD. - The Authors.

Color discrimination in ocular hypertension, Panel D-15 test under low illuminance, by H. TAMURA, K. MATSUDA, Ch. HARA, M. YOSHIHARA and I. AZUMA (Dept. Ophthalmol., Osaka Medical College, Japan) Folia Ophthalmol. Jpn. 36, 775-783, 1985.

Color discrimination was investigated in 16 eyes with ocular hypertension and 8 normal eyes using the Panel D-15 test with 4 grades of Fuji neutral density filters. The patients tended to show acquired tritan pattern under low illuminance. Those who had poor color discrimination indicated low sensitivity in Tübingen perimetry. The Panel D-15 test is useful for estimating the depression of visual function in ocular hypertension. - Yasuo Ohta.

Anomalies in the appearance of colours and of hue discrimination in optic neuritis, by K.T. MULLEN and G.T. PLANT (Physiol. Lab., Univ. of Cambridge, Downing Street, Cambridge CB2 3EG, U.K.) Clin. Vision Sci. 1, 303-316, 1987.

(1) The experiments described aim to quantify the changes in the appearance of colours in optic neuritis by measuring the changes in hue, chroma (saturation) and value (lightness) in the affected eye. In addition we tested whether deficits in hue discrimination can be solely accounted for by losses in perceived saturation or lightness. (2) Stimuli were Munsell chips taken from the Munsell Book of Color. An interocular matching technique was used to measure colour appearance. A modified version of the Farnsworth-Munsell 100-hue test was used to investigate hue discrimination. (3) Results show that the predominant deficit is a loss of chroma (saturation) which can occur at any hue. Changes in hue can also occur. These are not confined to any particular hue and occur such that hues tend to shift in appearance towards one of the four unique hues. Deficits in the discrimination were found which were not accounted for by losses in chroma or value. (4) Overall, the results indicate that in the case of optic neuritis there were notable exceptions to Köllner's rule and the Verriest and Wald-Marré classifications of optic disorders. - The Authors.

A centrally generated coloured phosphene, by G.T. PLANT (Physiol. Lab., Univ. of Cambridge, Cambridge, CB2 3EG U.K.) Clin. Vision Sci. 1., 161-172, 1986.

A case is described of a small homonymous scotoma resulting from a vascular lesion affecting the right optic radiation anteriorly. A phosphene was continously present within the

abnormal region of the visual field which consisted of three rows of interlocking, roughly hexagonal coloured "cells". Observations have been carried out on the dimensions of the pattern in terms of degrees of visual angle; the spectral colours equivalent to the perceived colours; on brightness and colour constancy of the phosphene; and on residual visual function within the scotoma. It is concluded that the phosphene is generated by visual neurones which are concerned with the analysis of colour. The neurones are likely to be organised in repeating subunits analagous to those found in striate cortex but not scaled with eccentricity. At the level in the visual system concerned colour and brightness constancy are established. - The Author.

Drug induced disorders of cone function and cone interaction (Medikamentös induzierte Funktionsstörungen der Zapfenfunktion und Zapfeninteraktion), by E. ZRENNER and J. NOWICKI (Max-Planck-Inst. für physiologische und klinische Forschung, Bad Nauheim, F.R.G.) Fortschr. Ophthalmol. 82; 589-594, 1985.

Four cases are presented to show that several widely used drugs (Carbamazepin, Chloroquine, Phenacetin) can specifically affect cone mechanisms as well as a circumscript retinal circuit connecting short- and long-wavelength sensitive cones, the intact interaction of which is necessary for measuring the phenomenon of transient tritanopia after the offset of yellow adapting light. Transient tritanopia and spectral sensitivity, together with the conventional colour vision tests provide a most sensitive psychophysical test for early detection of drug-induced cone dysfunctions, that are usually not detected by standard ophthalmological routines. - The Authors.

Origins of colour vision standards within the transport industry, by A.J. VINGRYS and L. COLE (Dept. of Optom., Univ. of Melbourne, Parkville, Victoria, Australia), Ophthal. Physiol. Opt. 6, 369-375, 1986.

Colour vision standards should reflect changes in our understanding of the nature of these defects as well as technogical advances that place less importance upon the visual senses of the human operator. Therefore it is suggested that visual standards be subject to routine reviews in order to assess their suitability for modern work environments. This paper gives a chronological account of the introduction of colour vision standards by several national transport authorities and identifies historical reasons that led to their implementation. It is concluded that the same factors that gave rise to the adoption of early colour vision standards are still relevant for modern transport systems. However the recent deployment of automatic or semi-automatic control of navigational systems has substantially altered man's role from being the primary source of information input to one of a monitoring process. This has generated a good deal of debate and uncertainty regarding the level of responsibility that a human operator has for the control of modern transport vehicles. Nevertheless, it is argued that in the absence of complete automation some type of visual standard is needed whenever visual judgements must be made by human observers. - The Authors.

Imprimerie et daltonisme (Printing and colour vision defectiveness), by P. LANTHONY (C.H.N.O. des Quinze-Vingts, Paris, France), IG Revue de la Fédération Française de l'Imprimerie et des Industries Graphiques, nr. 364, p. 6-9, 1988.

The first page of this paper contains very interesting data on the tasks in the printing industry for which colour vision has to be normal. - Guy Verriest.

Colour vision: A Science and an art (La vision des colours: une science et un art), by J. LEID and V. LEID 1988 (4 Place Royale 64000 PAU, France).

A 93 page brochure in French, with 52 diagrams, developing the subject of colour vision in man in a accessible way but without oversimplification. The main aim of the brochure is to provide a large number of concerned persons with basic knowledge in colour vision. We have therefore chosen a didactic presentation, explaining at first colour in its physical, psychophysical and psychosensorial aspects. Dyschromatopsia is described and its types classified. Finally, a wide section is devoted to clinical exploration of colour vision. The conclusion opens on the current value of investigating dyschromatopsia. - Jean Leid.

Clinical perspective in colour (Perspectives Cliniques Colorées), by J. LEID (4 Place Royale 64000 PAU, France), a 16 minute motion-picture film.

It deals with dyschromatopsia in a simple and informative manner. The first part briefly describes the nature of colour vision in man. The second part describes the main types of dyschromatopsia and their classification. Finally the third part is devoted to the main tests used in France to detect colour vision defects. - Jean Leid.

OBITUARY

ARTHUR LINKSZ (1900 - 1988)

The ophthalmologist and physiologist Arthur Linksz died on March 26, 1988 in New York. He was 87 years old. Arthur Linksz was born in the Austrian-Hungaryian Empire (now Czechoslovakia) on June 23, 1900. His early medical studies were done in Prague (where the lectures of Tschermak determined his vocation for visual physiology), in Kiel, in Munich and in Budapest, where he was in private practice till 1938. Nazism constrained him to exile in America in 1939. In the U.S.A. he was at first member of the Dartmouth College in Hanover, then resident in New York from 1944 when he became an American citizen. His professional activity from 1943 to 1983 was divided between private practice, medical working and surgery in the Manhattan Eye Hospital and teaching as clinical professor of ophthalmology at New York University and in New York Medical College. His activity was honored by many distinctions, as the Jackson Memorial Lecture in 1958. The publication of his "Physiology of the eye" (I: Optics, 1950; II: Vision, 1952) confered to him an international authority. He wrote about 50 papers on aspects of visual physiology and 4 books: "An essay on color vision" (1964), "On writing, reading

and dyslexia" (1973), "An Ophthamologist looks at art" (1980) and the autobiography "Fighting the third death" (1977-1986). He suffered of Parkinson disease during the last years of his life. He was survived by his wife Julia, two sons and three grandchildren.

Arthur Linksz was an unique personality in visual physiology by the clarity of his teaching, his eclectism and the loftiness of his ideas. In matter of color vision, besides the chapters of his "Physiology of the eye: Vision" and about 10 papers, his best known contribution remains his book: "An essay on color vision and clinical color vision tests". He was a member of the IRGCVD since its foundation. - P. Lanthony

We wait for obituaries for Prof. Dubois-Poulsen and for Prof. Pickford.