DALTONIANA

NEWSLETTER
OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES

President: Prof A ROTH (Switzerland)

General Secretary & Newsletter Editor
Prof J D MORELAND
Department of Communication & Neuroscience
Keele University
KEELE Staffordshire ST5 5BG UK

Treasurer
Mrs J BIRCH
The City University
Northampton Square
LONDON ECW 0HB UK

Secretary-Treasurer for the Americas
Dr B DRUM
Wilmer Institute, Johns Hopkins Hospital
550 N Broadway
BALTIMORE MD 21205 USA

Secretary-Treasurer for the Eastern Hemisphere
Prof M MARRÉ
Universitäts-Augenklinik
Fetscherstraße 74
8019 DRESDEN Germany

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IRGCVD News

Results of the Directorial Committee elections

Sixty voting papers, of which two were invalid, were returned in the postal ballot. There were five returns with a total of 14 uncast votes. The final count was made (by two tellers) when we were reasonably sure that all the returns had been received.

The 10 successful candidates (with votes in parentheses) are as follows:

Drum (55), Pokorny (54), Birch (50), Zrenner (48), Marré (47), Dain (40), Mollon (39), Sperling (37), Adams (29) and Ohta (28).

These join the Directorial Committee for the Term 1991-1995. The officers of the group remain as before but the terms of office for the President and General Secretary will end in 1993.

Daltoniana extends its thanks to the retiring and former members of the Committee, Professors Wolfgang Jaeger and Antonina Serra and to those, now re-elected, for all their help on behalf of the group.

We thank the other candidates, Bresnick, Cole, Eisner, Jacobs, Kitahara, van Norren and Scheibner for their participation in the election and welcome Dr Tony Adams as a new member of the Committee.

Report on the IRGCVD Sydney Symposium

The XIth IRGCVD Symposium took place from 20-23rd June 1991 in Sydney, Australia. The invited paper, contributed papers and posters on the program included the following topics: developing and evaluation of color vision tests, occupational aspects of color vision, assessments of acquired deficiencies, genetics and basic research on color vision. On the topic of testing methods, three properties of color vision tests were considered: ease of assessment, accurate diagnosis, and early detection of disease. The approaches used to improve such methods included the design of new tests, evaluation of former tests on larger samples or on different testing environments, and a variety of sophisticated analyses of test results. The results reported are important for clinical assessment of congenital and acquired color vision defects. Another class of papers and posters were basic studies on the performance of color normal observers and acquired color vision defectives. These studies provided information about visual function for color normal observers, and the function loss and possible mechanisms caused by disease. Several attempts were made to associate change in visual function with pathology. For issues related to genetics and congenital color vision deficiencies, the molecular geneticists and psychophysicists focused on similar problems but from different methodological perspectives. Papers from both fields stressed current understanding of variations in genotypes of visual pigments and in phenotypes in color vision performance. Finally, there were reports about the severity of function loss in color vision defectives and the standards for defining color vision defects as an occupational handicap. Practical consequencies of discrimination loss for color defective observers were discussed. In conclusion, this meeting brought together both fundamental studies on visual function and clinical research on color vision deficiencies. The

interdisciplinary studies provided one with an opportunity to relate a common problem from different aspects, and provided me with a valuable overview of recent developments in this field.

Tsaiyao Yeh, Göttingen

Daltoniana Archive

It is important to maintain at least one complete set of Daltoniana for an archival record. We have such a set with the exception of Daltoniana 61 issued in 1987 (probably between May and October). The Editor would be grateful for help in filling this gap.

Literature Review and News

All members are urged to send material for the literature review to the Editor. Items of news, which are of potential interest to members would also be welcome.

Literature Survey

Contributions from D. Trusiewicsz

Investigation of colour vision for clinical use. D TRUSIEWICSZ, Med Komunik, 1980, 6, 168-171 (in Polish).

Basing on the presented case of serous maculitis, helpfulness of investigations using Farnsworth Munsell 100-Hue test to follow up course of the disease, has been discussed.

The use of tritan plate and pseudoisochromatic plates for detection of colour vision disturbances. D TRUSIEWICZ and A KORDALEWSKA, Klin. oczna, 1980, 82, 79-81 (in Polish).

In a group of 111 patients examinations showed inflammatory or degenerative changes in the macula or optic nerve in 27 cases and congenital dyschromatopsia in 84. The results showed that Velhagen's plates are useful for the detection of congenital disturbances of red-green vision as well as acquired disturbances of blue-yellow vision. The Tritan plate detected congenital protanopia, protanomaly and deuteranopia in 100% of cases, but deuteranomaly was detected in 87.5% of cases only. The test was useful also in about 64% of cases with acquired disturbances.

Light-conducting-fibre properties of retinal receptors. I U ROMANIUKOWA and R ROMANIUK, Klin. oczna, 1981, 83, 29-30 (in Polish).

The authors define the role of photoreceptors as the "optical fibres" in the process of vision. In the paper the Stiles-Crawford laws are presented. The creation and examination of the "optical fibre" model of the retina may contribute insight into vision physiology.

Investigations of the relative spectral sensitivity of the eye. U KOKOWSKA, B KEDZIA and M TULISZKA. Klin oczna, 1982, 84, 5-7 (in Polish).

The investigations were carried out at two different luminance values (0.5 and 3.5 nit) and test field of 7.2° diameter: without adaptation to colour and with adaptation to red (650 nm, 50 nit) and green (550 nm, 54 nit) lights. The measurements were made by the flicker photometry. It was found that the relative spectral sensitivity of the eye in the studied subjects was not significantly changed with luminance change from 0.5 to 3.5 nit. On the other hand, changes in the sensitivity observed during adaptation to colours could not be explained simply by means of the three-component theory of colour vision.

Diagnostic difficulties in congenital achromatopsia. Z ZAGORSKI, Klin oczna, 1982, 84, 109-110 (in Polish).

Achromatopsia is frequently an unrecognized cause of bilateral amblyopia associated with nystagmus and photophobia. For the diagnosis of achromatopsia, anomaloscopic examination and ERG are of decisive significance. Frequently, however, simpler clinical tests for estimating colour vision are

sufficient. The use of myotic agents can reduce the troublesome symptoms occurring in daylight in this disease.

Acquired dyschromatopsias in glaucoma. A KORDALEWSKA and K ZEBROWSKA. Klin oczna, 1982, 84, 349-352 (in Polish).

In 40 patients with glaucoma (72 eyes) changes in colour discrimination were studied over 2 years. Open angle glaucoma was present in 50 eyes and in 22 cases glaucoma was caused by closing filtration angle. Colour vision was tested by means of pseudoisochromatic charts, Nagel's anomaloscope, Farnsworth's Panel D-15 test and the Farnsworth-Munsell 100-Hue test. Acquired dyschromatopsias were found in 20-30 per cent of cases depending on the test used. In most cases the main disturbances were present in blue-yellow vision. During follow-up, a tendency was observed for increasing intensity of these changes. In 59.7% (43 out of 72 eyes) of cases colour vision disturbances preceded constriction of the visual field for white.

Differential light wavelength thresholds depending on adaptation to colour. M TULISZKA, B KEDZIA and U KOKOWSKA. Klin oczna, 1983, 85, 23-24 (in Polish).

Using the method of just noticeable difference, measurements were made on differential thresholds of light wavelengths under various conditions of chromatic adaptation. Using a 2° field at 3.5 cd.m^{-2}, luminance thresholds were measured in three subjects against a dark background and against backgrounds with colours corresponding to wavelengths 450 nm, 550 nm and 600 nm. Two of the subjects were normal trichromats and one was deutan (identified by means of Ishihara's charts).

Visual efficiency in degenerative maculopathies. D TRUSIEWICZ, A KORDALEWSKA and K ZEBROWSKA. Klin oczna, 1984, 86, 121-123 (in Polish).

In 31 patients (53 eyes) with visual acuity normal or only slightly decreased and with slight macular changes the function of the central retina was tested. In 58.5% of eyes disturbances of twilight vision were found, in 56.6% of cases retinal sensitivity threshold curves were changed, in 35.9% of cases acquired dyschromatopsia was present. The type and degree of these changes could not have been predicted from the appearance of the fundus. Twenty-one patients were treated with Cavinton. For the evaluation of the dynamic development of the disease and therapeutic results the 100-hue test and static perimetry were most useful.

Influence of high-pressure sodium lamps on visual acuity. D TRUSIEWICZOWA and W STANIOCH. Klin oczna, 1987, 89, 489-491 (in Polish).

Colour discrimination, visual acuity for far and near and the position of the near point in daylight, fluorescent and sodium light were examined in 21 persons (42 eyes). During these examinations the intensity of illumination at the surface of the applied tests was kept constant. Sodium light illumination at photopic level caused disturbances in discrimination of the tints of colours and an insufficiency of accommodation, especially in hyperopic and presbyopic eyes. The results show that high pressure sodium lamps may be used for external illumination of streets, squares and motorways, but they should not be used for the illuminations of interior stands demanding near visual work.

Negative effects of alcohol on vision. Z M SKRIPNICENKO. Vestn Oftalmol, 1987, 3, 73-74 (in Russian).

The studied group comprised 100 chronic alcoholics aged from 20 to 70 years with alcohol abuse during 3-19 years.

Considerable constriction of the visual field for red and green colours was found in nearly all studied patients, in three of them tubular visual field constriction for green colour was present. The degree of visual field constriction depended on the clinical condition (the degree of alcoholism progression). Disturbances of colour recognition in alcohol intoxication are caused by changes in the activity of alcohol dehydrogenase. The suggestion is made that ethanol affects the inner retinal layers which may explain transient impairment of blue and yellow colour recognition.

The significance of congenital and acquired dyschromatopsias for evaluation of the suitability for work at the Polish state Railways. A MACIEJASZ and B MACIEJASZ. Med Komunik, 1987, 6, 169-171 (in Polish).

The importance of normal colour vision in subjects working in different types of transport is stressed. The history of discoveries in colour vision physiology and methods for examination of congenital and acquired colour vision defects are described. In 1970, at the Meeting of the Polish Ophthalmological Association in Warsaw, A Maciejasz has presented an apparatus (of own construction) for examination of congenital and acquired colour vision defects, named chronoanomalometer. The present paper describes a modified version of the apparatus.

Colour filters as means for correction of colour disturbances. A KORDALEWSKA. Klin oczna, 1988, 90, 12-14 (in Polish).

Eighty persons with congenital dyschromatopsia were subjected to trials of improvement of the colour discrimination. The author used short-wave "cut-off" filters: 525, 585, 588 and 622 nm. The filters were positioned before one or both eyes of the observer on the whole area of the glass or only on its prepupillary part. The ability of colour discrimination was tested by pseudoisochromatic charts of Ishihara, Rabkin and Velhagen. The filters were also used during professional work. In congenital dyschromatopsias, foremost in deuteranomaly one can achieve an improvement (in test performance) by means of long-wave filters transmitting above 588 nm used binocularly.

The functional state of photoreceptive mechanisms in patients with total achromasia. A S NOVOKHATSKY, L A VEDMEDENKO. Oftalmol zurn, 1988, 5, 285-287 (in Russian).

The paper describes the state of visual functions in patients with total achromasia in the presence of photophobia. Ophthalmoscopy revealed malformation of the macular area and, to a lesser degree, of the optic nerve. The vessels of the retina, as well as the periphery of the eye fundus, were normal. Visual acuity, visual field, dark adaptation and colour perception were examined, special attention being paid to the state of dark adaptation.

Examination of 17 patients, has shown fall of visual acuity within 0.1, total achromasia, normal peripheral boundaries of the visual field. The final level of dark adaptation by the 45th minute corresponded to the norm, but dark adaptation was accelerated: after 2-3 min dark adaptation it reached about 1/2 of the norm, and by 5-6 min it corresponded to the normal values observed by the 45th minute. The paper discusses a question about peculiarities of the photoreceptive complex in patients with total achromasia.

Protective sun-glasses and colour discrimination. D TRUSIEWICZ and L BRUDNIAK. Klin oczna, 1989, 91, 37-39 (in Polish).

The influence on colour vision of 4 kinds of sun-glasses with various transmittance characteristics and absorption of 25, 50, 75 percent was evaluated. Sixty persons with normal colour discrimination took part in investigation. The selection of filters for professional drivers and railway engine drivers was performed on the basis of Nagel's anomaloscope and Farnsworth-Munsell's 100-Hue tests.

Disturbances of colour vision in a petrol refinery in Plock. J TRZCINSKI, J STEPIEN and B BERNER. Klin oczna, 1989, 91, 43-44 (in Polish).

Attention is drawn to the problem of the influence of petrol derivates on the frequency of acquired dyschromatopsia. It has been observed, using Farnsworth-Munsell's 100-Hue test, that the total error score increases proportionately to the period of employment, ie the period of the contact of the workers with petrol derivatives.

Contributions from I.A. Chisholm.

Visual function deficits in glaucoma: electroretinogram pattern and luminance nonlinearities. J V ODOM, J G FEGHALI, J JIN and G W WEINSTEIN. Arch Ophthalmol., 1990, 108, 222-227.

Part of the pattern of the electroretinogram may be attributed to the summation of responses to luminance variation. Thirty-five subjects of whom 11 were normal, 11 glaucoma patients with established disease and 13 suspects for glaucoma were examined by two replications of four conditions: namely 10- and 20-Hz flicker and 4- and 10-Hz pattern reversal. The patients with glaucoma showed significant reduction in the electroretinogram: the greatest amplitude reductions were found for the 10-Hz flicker and the 4-Hz pattern electroretinograms.

Visual acuity loss in retinitis pigmentosa: relationship to visual field loss. S A MADREPERLA, R W PALMER, R W MASSOF and D FINKELSTEIN. Arch Ophthalmol., 1990, 108, 358-361.

Two hundred and thirty-five patients with typical retinitis pigmentosa and who showed no evidence of other visual acuity limiting problems in the eye were used in this analysis. Visual field was examined on the Goldman perimeter using a V-4-e and a II-4-e target. It was found that Snellen visual acuity remained stable so long as the V-4-e isopter was greater than 30 degrees from fixation. However, once the V-4-e isopter encroached within 30 degrees of fixation Snellen acuity began to fall and this became more marked once the field was light within 15 degrees of fixation.

Electrophysiological changes in juvenile diabetics without retinopathy. S JUEN and G F KIESELBACH. Arch Ophthalmol., 1990, 108, 372-375.

Components of both the scotopic and photopic electroretinogram were studied in 31 juvenile diabetics, 13 of whom showed mild background retinopathy, and were compared with 15 age-matched normal controls. The authors found a significantly reduced amplitude and component-specific delayed peak implicit times in both diabetic groups and the authors suggest that retinal dysfunction is already present in juvenile diabetics without ophthalmoscopic or photographic evidence of retinopathy, and has been identified within seven years of the onset of diabetes.

Color matching and foveal densitometry in patients and carriers of an X-linked progressive cone dystrophy. J E E KEUNEN, J A M VAN EVERDINGEN, L N WENT, J A OOSTERHUIS and D VAN NORREN. Arch Ophthalmol, 1990, 108, 1713-1719.

A family studied over five generations showed clear evidence of an X-linked progressive cone dystrophy. This paper describes the results obtained from a study of 17 affected males and 13 possible female carriers. The affected males showed characteristic pictures of cone dystrophy with a reduced pigmentation at the fovea. The carriers showed no fundus abnormality other than structural changes known to accompany myopia. Anomaloscope examinations with a Nagel type I anomaloscope, demonstrated a mild pseudoprotanomaly in the majority of the carriers. Foveal densitometry findings agreed with the anomaloscope findings. The authors stress that foveal cone photopigment impairment is present in both carriers and affected patients at an early stage of the disease.

A form of congenital stationary night blindness with apparent defect of rod phototransduction. N S PEACHY, G A FISHMAN, P E KILBRIDE, K R ALEXANDER, K M KEEHAN and D J DERLACKI. Invest Ophthalmol Vis Sci, 1990, 31, 237-246.

This is the report of an individual with an unusual form of congenital stationary night blindness. The patient's dark-adapted thresholds were cone mediated and his dark-adapted electroretinogram represented activity of the cone system only. The absence of a rod a-wave but the presence of normal rhodopsin density indicate to the authors that this form of night blindness involves a defect of phototransduction which is limited exclusively to the rods.

Glaucomatous visual field damage: luminance and color-contrast sensitivities. W M HART, S E SILVERMAN, G L TRICK, R NESHER and M O GORDON. Invest Ophthalmol Vis Sci, 1990, 31, 359-367.

The authors modified a Humphrey visual field analyzer to give a background in the yellow and using a stimulus in the blue. All the threshold static perimetry was done with a 30-2 program. Comparisons were made at each point examined between the conventional and the blue/yellow sensitivities. The results from 16 glaucomatous eyes were compared against 14 normal eyes, by using the Humphrey's stat pack software. In the glaucomatous eyes the blue/yellow sensitivity was more impaired than was evident with the conventional parametric sensitivity, in instances where defect depths were less than 1.0 log unit. However for defects which were greater than 1.0 log unit in depth, the blue/yellow color contrast perimetry was no more sensitive than the conventional.

SWS (blue) cone hypersensitivity in a newly identified retinal degeneration. S G JACOBSON, M F MARMOR, C M KEMP and R W KNIGHTON. Invest Ophthalmol Vis Sci, 1990, 31, 827-838.

Three unrelated patients showed evidence of a retinopathy typified by night blindness, cystoid maculopathy and similar scotopic and photopic electroretinograms. The results of the patient's investigations showed reduced but detectable rod function, decreased sensitivity of middle wave length sensitive and long wave length sensitive cones and a hypersensitivity of short wave length cones. The authors considered the atypical ERG wave form and this retinopathy to be mediated predominantly by the short wave length cones.

(See also Amer J Ophthalmol, 110, 124-134 by same authors)

Hue discrimination and S cone pathway sensitivity in early diabetic retinopathy. V GREENSTEIN, B SARTER, D HOOD, K NOBLE and R CARR. Invest Ophthalmol Vis Sci, 1990, 31, 1008-1014.

The authors studied 24 insulin-dependent diabetics. Only patients who showed no evidence, or at the most, very early evidence of background retinopathy were used in the study. Hue discrimination was studied by means of the Farnsworth-Munsell 100-hue test. Patients also performed a two-color increment threshold test to measure the sensitivity of the mid- and short-wave length sensitive cone. No significant correlation was found between the Farnsworth-Munsell 100-hue error score and the level of retinopathy. Short-wave length cone pathway sensitivity loss, however, correlated significantly with both the level of retinopathy and the degree of macular edema. The authors conclude that their method of measuring the short-wave length cone sensitivity by an increment threshold technique was more sensitive than hue discrimination for detecting color vision deficit in early retinopathy.

The protective effect of ascorbic acid in retinal light damage of rats exposed to intermittent light. D T ORGANISCIAK, Y JIANG, H WANG and I BICKNELL. Invest Ophthalmol Vis Sci, 1990, 31, 1195-1202.

Three groups of rats were used in this study. Group one consisted of dark-reared rats supplemented with ascorbic acid and subsequently exposed to multiple doses of intermittent light. Group two consisted of unsupplemented dark-reared rats and group three of cyclic-light-reared rats. Two weeks after light treatment ascorbate supplemented animals had rhodopsin and retinal DNA levels significantly higher than in the unsupplemented animals. In both types of rats rhodopsin levels were influenced by the number of light doses. Though no evidence was found that the ascorbic treatment had any effect on the rate of rhodopsin bleaching, regeneration was found to be greater in the supplemented rats after light exposure.

Electroretinographic responses of the short-wavelength-sensitive cones. P GOURAS and C J MACKAY. Invest Ophthalmol Vis Sci, 1990, 31, 1203-1209.

By using conventional electroretinographic equipment, ganzfeld blue stimulation on a white background, coupled to computer averaging the authors feel they consistently can isolate the short-wave length sensitive cone responses from the response of the long- and mid-wave length cone systems. S cone ERG has both an a- and a b-wave component both of which are slower than

those of the long-or mid-wave length responses at the same level of retinal adaptation. The results compare favourably with the results from a known sex-linked achromat with retention of rod- and short-wave length cone vision only.

The dyschromatopsia of optic neuritis is determined in part by the foveal/perifoveal distribution of visual field damage. S E SILVERMAN, W M HART, J O GORDON and C KILO. Invest Ophthalmol Vis Sci, 1990, 31, 1895-1902.

Selective damage to specific components of the afferent visual system is used to explain the finding of predominant patterns of hue discrimination loss in various ocular diseases. The authors examined two groups of patients, one with nonproliferative diabetic retinopathy, the other with late-stage retrobulbar neuritis, with the Farnsworth-Munsell 100-hue test and threshold static dyschromatopsia. The group with retrobulbar neuritis showed an almost equal distribution of blue/yellow dyschromatopsia and red/green dyschromatopsia. For the retrobulbar neuritis subjects the authors found a strong association between the spatial distribution of field defect and the type of hue discrimination loss. Eyes with greater field depression at the fovea relative to the perifoveal area showed a preponderance of red/green hue loss whereas eyes with greater relative perifoveal depression showed a relative preponderance of blue/yellow hue losses. This association was not present in the patients with diabetic retinopathy.

Autosomal dominant congenital stationary night blindness and normal fundus with an electronegative electroretinogram. K G NOBLE, R E CARR and I M SIEGEL. American Journal of Ophthalmology, 1990, 109, 44-48.

The authors report the results of their study on three members of a three-generation family with autosomal dominant congenital stationary night blindness with normal fundi. An electroretinogram on all subjects showed normal photopic b-wave amplitude and implicit times. However, under scotopic conditions the rod response was absent, and with a bright flash stimulus there was a normal a-wave but no b-wave. The dark adaptation curves of two of the patients show a normal final cone threshold, however, the final rod thresholds are increased significantly.

Correlation of visual function and retinal leukocyte velocity in glaucoma. W E SPONSEL, K L DEPAUL, and P L KAUFMAN. American Journal of Ophthalmology, 1990, 109, 49-54.

A group of patients with glaucoma or ocular hypertension underwent visual field assessment, contrast sensitivity and perimacular leukocyte velocity estimations using the Oculix blue field entoptic technique. Significant asymmetry of visual function and asymmetry of retinal leukocyte velocity in this study population were found. The eye with a higher velocity of retinal leukocyte flow tended to have better visual function. No significant intraocular pressure, visual field correlation was found on analysis although the inverse relationship between intraocular pressure and contrast sensitivity was significant.

A comparative study of grating and recognition visual acuity testing in children with anisometropic amblyopia without strabismus. D S FRIENDLY, M S JAAFAR and D L MORILLO. American Journal of Ophthalmology, 1990, 110, 293-299.

The Bailey-Lovie-Ferris visual acuity charts and Teller visual acuity cards were used to compare recognition and grating visual acuity at near testing distances in 32 children. Each child had been shown to be anisometropic. Amblyopia was present but without strabismus. The testing was carried out with full optical correction being worn. Of the eyes with amblyopia the letter visual acuities worse than 20/30 (6/9) were found to have grating acuities of 20/30 or better. Test/retest correlations were good for the letter cards but not as good for the grating card.

Variable expressivity in X-linked congenital stationary night blindness. W G PEARCE, M REEDYK and S G COUPLAND. Can J Ophthalmol, 1990, 25, 3-10.

Patients with X-linked congenital stationary night blindness show impaired night vision, nystamus and myopia. Discrepancies in the clinical features do exist between different families and this study is based on analysis of 42 affected patients from 10 families. The authors found a wide variation in the clinical expression of the disease but felt their findings were consistent with a single allele.

Maturation of the photopic b-wave and oscillatory potentials of the electroretinogram in the neonatal rabbit. J GORFINKEL and P LACHAPELLE. Can J Ophthalmol, 1990, 25, 138-144.

The authors studied the ontogenesis of the b-wave from the light adapted rabbit electroretinogram and examined for the contribution of the oscillatory potential to the wave form at each stage of development. The authors found a changing peak time in amplitude of the photopic b-wave with increasing age consistent with the development of new components corresponding to the oscillatory potentials. The origin of the oscillatory potentials appears to be stratified within the retina and individually they may originate from various retinal structures. The photopic b-wave and the oscillatory potential were both present as soon as the eyes open and the oscillatory potentials contribute not only to the amplitude but to the morphology of the b-wave.

Clinical measures of central differential sensitivity in glaucoma. C CAPOFERRI, A GARAVAGLIA, C NASSIVERA and R BRANCATO. Can J Ophthalmol, 1990, 25, 193-196.

Forty glaucomatous patients and 43 age-matched glaucoma controls were utilized in this study. Each patient underwent the macular threshold test of the Humphrey field analyzer to both white and blue targets. Differential sensitivities to both white and blue were significantly repressed in the glaucoma group as a whole. Sensitivities to blue stimuli were related to age in the normal group while in the glaucoma group they were related to horizontal cup/disc ratio.

Authors' Abstracts

The use of visual field indices in detecting changes in the visual field in glaucoma. B C CHAUHAN, S M DRANCE and G R DOUGLAS. Invest Ophthalmol Vis Sci, 1990, 31, 512-520.

We present results from 64 glaucoma patients and glaucoma suspects followed up for a median period of 7.4 yr who had a median of seven examinations using Program 31 on the octopus perimeter. The patients also had manual visual fields recorded on either the Tübinger or Goldmann perimeter during the same period. By examining all manual fields over the follow-up, we classified 37 patients as deteriorating and 27 as nondeteriorating by using predetermined field criteria which we believed to be clinically significant. In a masked fashion, the indices mean defect (MD) and corrected loss variance (CLV), in addition to the three cluster analysis indices SIZ, CLUS, and PCLUS were computed for each patient and regressed on time. When a significant positive index/time slope ($p < 0.05$) was defined as indication of deterioration, all indices had remarkably poor sensitivities because their slopes did not reach statistical significance in the great majority of patients. When, regardless of statistical significance, positive slopes were defined as indication of deterioration and negative slopes as nondeterioration, the most sensitive index, PCLUS, still had a sensitivity of less than 65%. The indices were better in detecting the presence or absence of visual field deterioration in fields that were initially normal than in those that were initially abnormal. Since the testing modalities of manual and automated perimetry are different, our study was not designed to compare the sensitivity of one technique over the other. Our study does, however, demonstrate that the indices used currently may not be clinically reliable in the assessment of changes in the visual field.

Chromatic, spatial, and temporal losses of sensitivity in Multiple Sclerosis. S J DAIN, K W RAMMOHAN, S C BENES and P E KING-SMITH. Invest Ophthalmol Vis Sci, 1990, 31, 548-558.

Chromatic, spatial, and temporal losses of sensitivity were measured in 15 eyes of 10 patients with recovered optic neuritis. Chromatic sensitivities (for both red-green and blue-yellow) were measured using color-mixture thresholds; the chromatic sensitivity loss was classified as "selective" if it was significantly greater than the achromatic loss. Spatial and temporal sensitivities were measured with contrast sensitivity functions and flicker modulation sensitivity, respectively; these losses were classified as selective if the losses at high (spatial or temporal) frequencies were significantly greater (or significantly less) than losses at low frequencies. All patients had central fixation and were optically corrected carefully. In 1 eye, selective losses of sensitivity for red-green and blue-yellow were combined with a selective loss of sensitivity at high spatial (but nontemporal) frequencies. This type of loss may indicate a selective loss of small axons in the optic nerve. The 8 other eyes that showed significant losses were generally nonselective in their chromatic, spatial and temporal losses; this may indicate a nonselective loss of small and large axons.

The discrimination of similarly colored objects in computer images of the ocular fundus. M H GOLDBAUM, N P KATZ, M R NELSON and L R HAFF. Invest Ophthalmol Vis Sci, 1990, 31, 617-623.

The STARE (STructured Analysis of the REtina) project uses object-identification and artificial intelligence techniques to provide automated diagnoses from color pictures and fluorescein angiograms of the ocular fundus, or automated change detection from sequential images. As part of the object-identification process, we apply expert judgment and experimentation to define features - such as size, shape, color, and texture - of objects (disk, blood vessels, lesions) in digitized images. In our initial investigations, we explored color alone, because it yields a great deal of information in the classification process. We verified that even similarly colored lesions (exudates, cottonwool spots, and drusen) could be classified by color with moderate success by a quadratic discriminant function. When color alone is not sufficient, refinement in the classification of objects may be achieved by using more features in statistical pattern recognition. Ultimately, we build a description of the fundus image which can be used either to identify one or more diagnoses that can cause the pattern of lesions in the ocular fundus or to recognize change in sequential images.

Artificially increasing intraocular pressure causes flicker sensitivity losses. V V TOI, P A GROUNAUER and C W BURCKHARDT. Invest Ophthalmol Vis Sci, 1990, 31, 1567-1574.

It has been reported that psychophysical flicker sensitivity, electroretinogram (ERG), pattern electro-retinogram (P-ERG), and visual evoked cortical potential (VECP) responses are affected by ocular hypertension and glaucoma. Moreover, it has also been revealed that artificially augmented intraocular pressure (IOP) impairs electrophysiologic responses. In this investigation the authors varied the levels of IOP of ten normal subjects and determined their flicker sensitivities at these levels. Temporarily elevated IOPs were produced by exerting pressure on the eyeball through the eyelids by a new type of ophthalmodynamometer. The results obtained showed that increasing IOP produced loss of flicker sensitivity. For an IOP of 27.2 ± 2.1 mm Hg, significant losses occurred in the range of frequencies lower than 20 Hz. For a higher IOP (40.7 ± 2.1 mm Hg) the loss was significant at frequencies higher than 5 Hz. However, the critical flicker frequency was not affected significantly at either level of IOP. The authors also discovered a phenomenon, called "curtain phenomenon", in that for a critical level of IOP, a high flicker frequency stimulus could completely fade out. The authors' results suggest that the psychophysical flicker sensitivity measurement is a more sensitive technique for the investigation of the effect of the variation of the IOP and that the curtain phenomenon constitutes an interesting indication for additional study of the ocular hypertension mechanism.

Evaluation of an iris color classification system. J M SEDDON, C R SAHAGIAN, R J GLYNN, R D SPERDUTO, E S GRAGOUDAS and THE EYE DISORDERS CASE-CONTROL STUDY GROUP. Invest Ophthalmol Vis Sci, 1990, 31: 1592-1598.

A system for classification of iris color based on standard photographs, developed for use in a multicenter study, is described. Categories of iris color are distinguished based on predominant color (blue, gray, green, light brown, or brown) and the amount of brown or yellow pigment present in the iris. Two trained readers independently graded 339 iris photographs; discrepancies in grades were adjudicated. Measures of interobserver reliability were 0.76 by kappa for exact agreement and 0.97 for weighted kappa. The distribution of iris color grades demonstrates that the system achieved an appropriate level of detail within the authors' study population, which included patients with

various racial backgrounds from five urban clinical centers. This simple, reliable classification system for iris color is offered for use in clinical research.

Electrophysiological and psychophysical flicker sensitivity in patients with primary open-angle glaucoma and ocular hypertension. K HOLOPIGIAN, W SEIPLE, C MAYRON, R KATY and M LORENZO. Invest Ophthalmol Vis Sci, 1990, 31: 1863-1868.

Temporal sensitivity was assessed in patients with primary open-angle glaucoma (POAG) and ocular hypertension (OHT). Three measures of flicker sensitivity were obtained: psychophysical modulation thresholds, visual-evoked potentials (VEPs), and focal electroretinograms (FERGs). We found elevated psychophysical thresholds at higher temporal frequencies (30-50 Hz) in patients with POAG, relative to thresholds for age-matched controls. The OHT patients had elevated psychophysical thresholds only at 50 Hz. On the other hand, VEP amplitudes in POAG patients were reduced at all temporal frequencies, with the magnitude of the loss increasing with temporal frequency. The OHT patients, however, showed no reductions in VEP amplitude at any temporal frequency. Finally, POAG patients' FERG amplitudes were reduced at 30-50 Hz; whereas FERG amplitudes in the OHT patients were normal at all temporal frequencies. These results indicate that OHT patients can exhibit psychophysical threshold losses at high temporal frequencies which are not observed in the suprathreshold electrophysiological amplitude measures. On the other hand, patients with POAG show both psychophysical and VEP losses across a range of temporal frequencies. In addition, the decreases in FERG amplitudes in POAG patients suggest changes in the functioning of the outer retina in this disease.

Color perimetry for assessment of primary open-angle glaucoma. P A SAMPLE and R N WEINREB. Invest Ophthalmol Vis Sci, 1990, 31: 1869-1875.

The authors report the development of a color perimetry procedure which compares sensitivity of the short-wavelength color-vision mechanism in the peripheral visual field for normal eyes, eyes with ocular hypertension, and eyes with primary open-angle glaucoma. To isolate the short-wavelength cone mechanism, they modified an automatic projection perimeter to blue-on-yellow color perimetry and used a monochromatic 440-nm stimulus and a broad-band bright yellow background. The three groups of subjects were matched for age and lens density. Refraction, pupil size, acuity, and medication were controlled. Under these conditions, most glaucomatous eyes showed reduced sensitivities more than two standard deviations below normal. Normal control eyes were significantly different from eyes with ocular hypertension only in the superior nasal field ($P < 0.05$), but normal eyes differed from eyes with primary open-angle glaucoma in all areas of the field ($P < 0.01$).

The a-wave of the human electroretinogram and rod receptor function. D C HOOD and D G BIRCH. Invest Ophthalmol Vis Sci, 1990, 31: 2070-2081.

The amplitude of the leading edge of the a-wave of the human electroretinogram (ERG) was compared with predictions from a computational model of the light-induced responses of rod mammalian receptors. According to this model, a linear process describes the amplitude and time course of the response to relatively low flash intensities and at brief times after the onset of the flash. At higher flash intensities, a nonlinear process, described by the Naka-Rushton function or a saturating exponential, is involved. The primary focus here is on intensity-response data recorded with a clinical ganzfeld apparatus. The leading edge of the rod a-wave recorded from normal observers and patients with congenital stationary night blindness (CSNB) was described by a linear process for flash intensities up to the maximum available flash intensity, 2.0 log scot td-sec. This finding is consistent with the model of the rods' response. It suggests, however, that when ERGs are recorded with clinical systems limited to 2.0 log scot td-sec, these data cannot be used to distinguish between changes in the parameters (eg, semisaturation intensity versus maximum response) of the human rod receptors. Responses to flash intensities up to 3.4 log scot td-sec were recorded using a custom, high-intensity ganzfeld system. Both the linear and nonlinear components of the model were needed to fit the ERGs recorded with this system. This suggests that changes in different receptor parameters can be distinguished with higher intensity flashes.

INSTRUCTIONS FOR BOSTRÖM-KUGELBERG PSEUDOISOCHROMATIC PLATES (THIRD EDITION, 1981).

Translated from Swedish. Maija Mäntyjärvi, M.D. Dept. of Ophthalmology, University Hospital of Kuopio, Kuopio, Finland.

The Boström-Kugelberg pseudoisochromatic plates are quite sensitive in screening red-green color defectives; however, a few normals may be classed as defectives (sensitivity 91-92%, specificity 98-99%, according to different studies). This plate test is not widely used; possibly because the instructions are in Swedish only. Therefore, I have translated the instructions into English for those of you, who may be interested in using the plates for screening purposes.

INSTRUCTIONS

The test consists of 20 plates.

- 15 plates with numbers and different combinations of colors
- 2 plates (labelled T and U) with a winding line, which have to be traced with a pointer. The winding line's starting point is on the left (possibly indicated by an arrow).
- 3 plates (labelled G, H and O) without a figure: dissimulation plates.

These plates can, in most cases, distinguish normal from defective color vision. However, it is not possible to classify the type of the defect with these plates. For that, an anomaloscope or other tests are required. As in the earlier editions, there are no plates for detecting a tritan defect. Before starting the test, the examiner must be sure that the examinee is in good condition (mental and physical). Further, no glare from sunshine or another strong light source should interfere with the testing.

Daylight illumination of the plates is recommended but not direct sunlight. If natural daylight is not available, artificial illumination simulating daylight with a color temperature of 6500 K may be used. Illumination with a normal incandescent lamp is unsuitable.

Plates should be shown at a viewing distance of 30-50 cm. The plates should be perpendicular to the line of sight. The examinee may use his or her glasses; provided that they are not tinted.

Before starting the test, the examinee has to understand it: the plates with a number are to be read, the winding lines in the plates are to be traced with a pointer; moreover he or she has to understand that in some plates, there might be neither numbers nor a pattern. Also, tracing the numbers with a pointer is allowed. (The pointer must be made of a soft material not to damage the surface of the plate). The examinee should be warned not to guess the numbers. Further, it should be noted, that the examinee should not change the position of his or her head during the test to try to find the figures better; nor should the distance of the plates be changed.

The time for each of the plates should not exceed 15 seconds.

The response to every plate is recorded.

If the examiner is not sure of the result, the test may be repeated but the order of the plates should be changed.

The results are interpreted as follows:

1. Normal color vision most probable, if all of the plates are correctly interpreted.
2. Defective color vision most probable, if two or more plates are incorrectly interpreted.
3. Color vision defect suspected, if the examiner is not sure of the result; e.g., if the examinee has read 1-2 plates incorrectly, or a right answer has come after several wrong answers, or a longer time than 15 seconds has passed before finding a right answer.

PRESS RELEASE

AVA 1992

The Annual Meeting of the Applied Vision Association (AVA) will be held from 6th-8th April 1992 at the Department of Optometry and Vision Sciences, UMIST, Manchester.

The theme of the meeting is

"PSYCHOLOGY IN VISION"

and includes the Sixth Geoffrey Burton Memorial Lecture "Parallel Machine and Serial Behaviour in Vision" given by Professor G W Humphreys, PhD FBPsS, Professor of Cognitive Psychology, University of Birmingham.

Papers are invited on the following topics:

Interpretation of visual images

Face recognition

Stereovision

Representational problems in vision

Art and illusions

Mental imagery

Pre-attentive vision

Visual cognition

Agnosias

Visual modelling

Categorical perception

There will also be an Open Contributions session.

Abstracts of intended contributions (approximately 400 words) should be submitted to the address below **BY 1ST DECEMBER 1991.**

The conference will include a Trade and Book Exhibition. Accommodation can be arranged in Wright Robinson Hall of Residence, adjacent to the Department of Optometry and Vision Sciences, or in the hotel-style accommodation of the nearby Manchester Conference Centre. The conference social programme includes the Annual Dinner of the AVA.

For further details, contact:

Dr Chris Dickinson
Department of Optometry and Vision Sciences
UMIST, PO Box 88
Manchester
M60 1QD

Tel: 061 200 3874 Int + 44 61 200 3874
Fax: 061 200 3887 Int + 44 61 200 3887