DALTONIANA

NEWSLETTER
OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES
President: Prof. W.D. WRIGHT (U.K.)

Secretary for the Western Hemisphere:
Dr. R. LAKOWSKI
Department of Psychology, University of British Columbia, VANCOUVER 8 (Canada)

General Secretary and Editor of the Newsletters:
Dr. G. VERRIEST
Dienst Oogheelkunde, Akademisch Ziekenhuis
De Pintelaan 135 - B-9000 GENT (Belgium)
(verantw. uitg.)

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

Tweemaandelijks Tijdschrift

Nr. 46 - 1st September 1982

THE LAST PAGE OF THIS ISSUE IS THE CALL FOR PAPERS FOR THE 7TH INT. IRGCVD SYMPOSIUM IN GENEVA, JUNE 1983.

- x -

REMIND THAT EVERYBODY IS ASKED TO SEND MATTERS FOR DALTONIANA!

LITERATURE SURVEY

Colour vision in cat, by R.P. SCHUURMANS (Max-Planck-Inst., Bad Nauheim). Thesis, Amsterdam, 1981. Stencyl, 118 p.

Summed action potentials of the spectrally different mechanisms were recorded in the arterially perfused cat eye from the cornea (ERG) and optic nerve (ONR) as well as in the intact animal from the visual cortex (VECP). Spectral sensitivity functions, obtained by threshold amplitude criteria with Ganzfeld-stimuli, revealed in the dark adapted eye a rod (500 nm) mechanism and, when selective chromatic adaptation was applied, three clearly distinct photopic mechanisms with sensitivity maxima near 460, 510 and 560 nm.

The criteria applied in differentiating rod from cone responses electrophysiologically were that the 510 nm mechanism could follow flicker as high as 38 c/s, was present during strong purple adaptation light and could be found in the cone dominated VECP recording. Apparently, in cat under photopic conditions besides a 460 and 560 nm cone mechanism a 510 nm mechanism can be recorded from the receptor layer on up to the neurons generating the VECP, which differs in many respects from rods.

The characteristics of the short wavelength sensitive cone mechanism, determined in presence of strong yellow adaptation lights (4.7 log Td) with test stimuli presented at threshold values, differ in many respects from the long

wavelength sensitive cone mechanisms. They can be described as follows : At all recording sites the amplitudes increase slowly with stimulus intensity and reach smaller maximal amplitudes of slower time course. Furthermore, a positive off-effect is lacking and the optic nerve potential reflects a predominantly tonic discharge by the ganglion cells.

Besides the response characteristics, interactions between the short and long wavelength sensitive cone mechanism have been assessed by chromatic adaptation lights revealing colour-opponency exhibiting itself in a shift of sensitivity maxima as well as narrowing of spectral branches and in two paradoxical phenomena for the sensitivity of the short wavelength sensitive cone mechanism : A gradual increase after the onset (sensitization) and a transient decrease after the termination (desensitization) of a yellow adaptation light. The latter two phenomena indicate that the short wavelength cones' sensitivity is controlled by signals from longer wavelength sensitive cones.

These electrophysiological data were extended with neuropharmacological data obtained in the arterially perfused eye revealing neurotransmitters used by the spectrally different mechanisms as well as interactions between the different cone mechanisms. Adding strychnine or bicuculline to the perfusion medium revealed reversible, dose-related change in the response characteristics of the ERG and ONR indicating glycine and GABA mediated inhibitions present not only in the inner plexiform layer but also in the inner nuclear layer of the cat's retina. Furthermore, the injection of 1-2 µM bicuculline resulted in a loss of the transient desensitization of the short wavelength sensitive cone mechanism but did not affect its sensitization during the on-set of the adaptation light. These results indicate that GABA might be involved in a neuronal circuitry which modulates the short wavelength cones sensitivity through the action of longer wavelength sensitive cones.

Although it is not proven that the cat perceives colour, the data presented show that it has three spectrally different classes of receptors which work in a photopic range of adaptation, can be recorded from the receptor layer on up to the visual cortex, interact with each other as shown both electrophysiologically as well as neuropharmacologically, providing evidence for a trichromatic vision in cat. - The Author.

Characteristics of the blue sensitive cone mechanism in primate ganglion cells, by E. ZRENNER (Max-Planck-Institute for Physiological and Clinical Research, Bad Nauheim, FRG) and P. GOURAS (Columbia University, New York, USA), Vision Res. 21, 1605-1609, 1981.

The identification of a blue cone mechanism in single retinal ganglion cells is usually based on action spectra showing a peak sensitivity to blue light (440-540 nm).

Because the degree of antagonism between long and middle wavelength sensitive cones varies considerably among different ganglion cells, action spectra with maximum sensitivity to blue light can also occur without involving blue cones. In order to clarify this interesting ambiguity several independent functional criteria are demonstrated which appear to uniquely distinguish the blue mechanism. These include : response saturation accompanied by a prolonged after-discharge, pre-excitatory inhibition to blue stimuli, transient suppression of the blue signal at the offset of a long-wavelength adapting light, a relatively large receptive field size, excitatory tonic responses inhibited by a longer wavelength cone mechanism, a low flicker fusion frequency, a high absolute sensitivity to blue light and a virtually identical action spectrum in every cell (41 examined). Experiments with yellow adapting light in blue sensitive ganglion cell show that apparently long wavelength cones control the sensitivity of ganglion cells to blue light, probably by modulation of the conductances in the blue cones' ionic channels. Thereby the blue sensitive ganglion cell's responsiveness to simultaneous color-contrast can be greatly enhanced. - E. Zrenner.

Absolute spectral sensitivity at different eccentricities, by Bj. STABELL and U. STABELL (Institute of Psychology, University of Oslo, Oslo, Norway), J. Opt. Soc. Amer. 71, 836-840, 1981.

Absolute spectral-threshold functions were measured during the cone-plateau period and in a dark-adapted state at 0, 6, 17, 28, 45 and 65° temporally to the fovea. It was found that, when the photopic functions were brought together at 660 nm, they closely coincided in the 520-700-nm region of the spectrum, irrespective of location suggesting that the relative spectral sensitivity and the weighted contributions of the middle- and long-wave cone photopigments remain invariant across the retina. On the other hand, the results suggest that the relative contribution of the short-wave cone mechanism increases between fovea and 17°, stays essentially constant between 17 and 28°, and decreases between 28 and 65°. Furthermore, the results suggest that the absolute sensitivity of the middle- and long-wave cones decrease between fovea and 65°, whereas the absolute sensitivity of the rods increases from fovea to 17° and decreases between 17 and 65°. Finally, the log difference between the absolute dark-adapted cone and the rod threshold was found to increase between fovea and 45° and to decrease between 45 and 65°. - The Authors.

Spectral sensitivity of the dark-adapted extrafoveal retina at photopic intensities, by U. STABELL and Bj. STABELL (Institute of Psychology, University of Oslo, Oslo, Norway), J. Opt. Soc. Amer. 71, 841-844, 1981.

By using a heterochromatic brightness-matching technique, in which the test and comparison fields were presented in succession, spectral equal-brightness functions were measured

in a dark-adapted state at a retinal illumination of 1000 photopic Trolands at 6, 28, 45 and 65° temporally to the fovea. In addition, the spectral equal-brightness functions were measured at 10, 100, 1000 and 6400 photopic Trolands at 17° temporally. In striking contrast with previous results, all the spectral brightness functions obtained were found to be basically scotopic in form, with peak sensitivities at about 500 nm. The difference in results between the present study and previous studies could be ascribed to the difference in method employed. Thus it was found that simultaneous, relative to successive, presentation of test and comparison fields depresses rod activity in the test field to a considerable extent. It was concluded that rods may function and influence the brightness response in extrafoveal vision at much higher intensity levels than was previously assumed.- The Author.

Brightness interactions between rods and cones, by B. DRUM (Department of Ophthalmology, George Washington University, Washington, D.C. 20037, USA), Perception & Psychophysics 29, 505-510, 1981.

Two parafoveal test targets with different spectral compositions were matched in brightness to a fixed-luminance foveal reference target under scotopic adaptation conditions. The idea of the experiment was to find a reference luminance for which one of the matching test targets stimulated only rods while the other stimulated both rods and cones. If brightness was proportional to the linear sum of rod and cone responses, then the luminance of the matching rod+cone target would be predictably closer to rod threshold than would that of the rod target. The results were complicate by evidence that rod responses to the test targets selectively enhanced weak chromatic signals. Nevertheless, it was possible to show that cone activity never reduced the matching luminance as much as predicted by the additivity hypothesis, and sometimes even increased it. These findings suggest that cone activity can suppress brightness signals from rods. - The Author.

Pi-4 : Adaptation of more than one class of cone, by C. SIGEL and L. BROUSSEAU (Department of Psychology, Northeastern University, Boston, Massachusetts 02115, USA), J. opt. Soc. Amer. 72, 237-246, 1982.

The π_4 color mechanism was isolated in 3 observers with a 500-nm, 200-msec, 1-deg foveal test flash. Stiles's field displacement law was tested with increment thresholds upon monochromatic adapting fields of several wavelengths. The data of all 3 observers reject the displacement law. Data that use a 10-msec-duration test flash likewise reject the displacement law. We conclude that the π_4 branch represents light adaptation controlled by more than one class of cone. A model of the π_4 detection pathway is proposed that quantitatively describes the increment-threshold data. - The Authors.

Spectral tritanopic saturation function agrees with spectral distinctibility (Die spektrale tritanopische Sättigungsfunction beschreibt die spektrale Distinktibilität), by W. THOMA and H. SCHEIBNER (Physiol. Inst. II Univ. Düsseldorf, FRG), Farbe + Design 17, 49-52, 1980.

In a bipartite photometer field various monochromatic lights were matched with a standard white. The minimal distinct border criterion after Boynton and Kaiser was applied. The distinctibility of the border line was estimated on a 7 point scale. The function obtained was compared to the tritanopic spectral saturation function. This function is defined as the red-green response function divided by the spectral brightness function. The correlation between the estimated function and the tritanopic saturation function was satisfactory and corroborated the hypothesis that the red-green transfer channel participates in the good spatial resolution of trichromats. - The Authors.

Is the binocular rivalry mechanism tritanopic?, by D.C. ROGERS and M. HOLLINS (Department of Psychology, Davie Hall, University of North Carolina, Chapel Hill NC 27514, USA), Vision Res. 22, 515-520, 1982.

Binocular rivalry for a series of colored targets was measured in 3 trichromats and 2 red-green dichromats by cumulating those times when only one target or the other was perceived (exclusive visibility time). Targets were black and colored 3c/deg square-wave gratings, 1° in diameter. For trichromats, exclusive visibility time increased as a function of color difference between the targets, but for dichromats there was no effect of color on binocular rivalry. Taken together, these data indicate that the binocular rivalry mechanism is tritanopic : it is responsive to color signals only from the medium- and long-wave-sensitive cones. - The Authors.

Development of scotopic sensitivity and the absorption spectrum of the human ocular media, by J.S. WERNER (Department of Psychology, University of Colorado, Boulder, Colorado 80309, USA), J. Opt. Soc. Am. 72, 247-258, 1982.

Scotopic spectral sensitivity was measured for 9 observers (aged 4.5 months to 66 years) from 400 to 650 nm (10-nm steps) by using a 42° naturally viewed stimulus. The dependent measure was the visually evoked cortical-potential amplitude that was phase locked to an 8-Hz flickering stimulus. Sensitivity was similar for all observers at middle and long wavelengths, but at short wavelengths there was a decrease in sensitivity with increasing age. The density of the preretinal ocular media was estimated by subtracting the log scotopic spectral-sensitivity function of each observer from the human rhodopsin-absorbance spectrum when the two sets of curves were pinned at long wavelengths. The density of the infant ocular media was lower than that for

adults. To quantify the sequence of ocular media development, scotopic sensitivity was determined for additional 42 observers (aged 1 month to 70 years) at two spectral points : 553 nm, where the optic-media density is low, and 405-430 nm, where the density is high. From these data, optic-media density at 400 nm was calculated. Despite substantial individual difference within each age, a clear aging function emerged. Preretinal optic-media density increased monotonically from birth throughout adulthood. Thus optical density at 400 nm differs by about a factor of 22 between the average 1-month-old infant and the average 70-year-old adult. - The Authors.

Ageing of the retina (Le vieillissement de la rétine), by L. BABEL, Bull. Mém. Soc. Franç. Ophtalmol. 91, 349-355, 1979.

The spectral luminous efficiency curve of ageing man is shifted toward the longer wavelengths. The short wavelengths are absorbed by the lens. Maione and Carta have shown a contraction of achromatic isopters obtained with coloured tests : especially for short wavelengths but also for red. For ageing : PIC tables were difficult to read and the 100 hue showed tritan axis. The range of the Rayleigh match is deviated toward short wavelengths. - J. Vola.

Clinical examination of colour vision by means of the Besançon anomalometer (Examen clinique de la vision colorée avec l'anomalomètre de Besançon), by A. ROTH, A. REPIQUET, J.C. RENAUD and VIENOT, Bull. Mém. Soc. Franç. Ophtalmol. 91, 340-349, 1979.

This anomalometer was designed by the authors to measure not only the Rayleigh and Trendelenburg matches but also different other equations and specially the Moreland one. The light source is transmitted by 4 optical fibers bundles through 4 interchangeable interferential filters. Luminance is adjusted by a photometric wedge. Colour matches are made by direct observation on a bipartite field on the front side of the apparatus. Fields are horizontally separated. Wavelength discrimination function and colorimetric purity discrimination can be also evaluated. - J. Leid.

Lanthony's New Color Test. IV. Neutral zone and neutral grays, by A. PINCKERS (Department of Ophthalmology, University of Nijmegen, The Netherlands), Ophthalmologica 184, 51-57, 1982.

The classification of neutral grays is helpful for the differential diagnosis of color vision defects, especially when anomaloscopic examination is not possible. In congenital color vision defects the PR-RP region of the spectrum appears "dark" to protan-defective subjects and "light" to deutan-defective subjects. Acquired color vision

defects have a common base type, the type III blue-yellow defect. The defect develops depending on the site of the primary lesion and also on the fixation mode. Classification of neutral grays may help in differentiating optic nerve diseases from retinal diseases; when visual functions become mediated by rods, sensitivity shifts and the BV-B region of the spectrum will appear relatively "light" to the patient. - The Author.

The status of color fields today, by J.E. BAILEY (Southern California College of Optometry, 2001 Associated Road, Fullerton, California 92631, USA), J. Am. Optom. Assoc. 51, 843-847, 1980.

Pathology of the visual system can alter color perception in the central and peripheral visual field. Pseudoisochromatic plates and pigment panel tests can be used to study macular color vision. Perimetric techniques using color targets extends testing to the peripheral field. This facilitates detection of early, sometimes subtle, defects that are missed with conventional white-target perimetry. The stimulus conditions and methods of color perimetry are reviewed in this paper, particularly recent methodological advancements which offer a potential for increased sensitivity in detection of pathology. - J.E. Bailey.

About inversion of colour visual fields under scotopic conditions in persons with normal visual functions, by A.S. NOVOKHATSKY and V.M. ZAKHARCHENKO, Oftalmologi Schurnal 17, 519, 1975.

It is well known that under scotopic conditions changes in regimes of colour and light perception take place. The character of changes in colour visual fields under these conditions is the subject of the study presented. The interest to this subject is also connected with the fact that in literature it is elucidated in the works of only two authors (C. Ferree and G. Rand, 1924, H. Wentworth, 1930). Results of their studies are diametrically opposite.

In the work described here the last model of the home-made projection-registrating perimeter PRP-60 was used. In a total, colour fields of vision were studied, under scotopic conditions, in 100 persons with normal visual functions, aged from 10 to 70 years. It was established that under scotopic conditions mean visual fields for red and green colours narrowed by 6-34° as compared to the same fields under photopic conditions. But most surprising appeared to be considerable narrowing of visual field on blue colour - its inversion. Phenomenon of inversion was found in 97% of the subjects. In some persons this narrowing almost reached the point of fixation. It should be pointed out that under photopic conditions inversion on blue colour was observed only in 7% of the 100 persons mentioned above who had normal visual functions. All these 7 persons belonged to adult and elderly age.

Analysis of the results obtained allows to conclude that the main cause of inversion on blue colour, under scotopic conditions, is physiologic pecularities of visual apparatus, namely those of receptory part. Central parts of visual analyser are regarded as playing a rather lesser role in appearance of inversion on blue colour. - M. Marré.

Microprocessor-controlled light-emitting diode dark adaptometer, by P.A. O'MARA, H. ZWICK, E.S. BEATRICE and D.J. LUND (Div. Biorheology, Letterman Army Inst. of Res., Presidio of San Francisco, Cal. 94129, USA), Med. Biol. Electron. Comput., 1981.

A light-emitting diode (LED) display is controlled by a microprocessor. The apparent intensity of the LED display is controlled by varying the pulse width while holding the pulse repetition rate constant. During the period of dark adaptation, the absolute threshold is measured using the method of limits. Separate series of threshold values are obtained for red and green LED stimuli. The design uses inexpensive programmable and conventional integrated circuits. Stimulus parameters, test administration, and data acquisition, are under software control. - The Authors.

Luminosity functions of human electroretinogram wavelets evoked with pattern-reversal stimuli, by M. KORTH (Institut für Physiologie und Biokybernetik der Universität Erlangen-Nürnberg, D 852 Erlangen, Universitätsstrasse 17, West Germany), Invest. Ophthalmol. 19, 810-816, 1980.

Concomitant determinations of the spectral sensitivity of the b-wave and of the wavelets which are superimposed on the ascending slope of the b-wave of the human electroretinogram were made in 2 subjects with the use of alternating colored checkerboard patterns. The method of constant criterion response was applied to the luminance curves of the b-wave and of the wavelets relating the peak latency of the response to the stimulus intensity. The spectral sensitivity of the b-wave showed a Purkinje shift and was of mesopic activity at those adaptation levels at which the wavelets could be observed for the first time. The spectral sensitivity of the wavelets could be described best by the curve of the peripheral cones at all intensity levels associated with the appearance of high-frequency potentials. Thus the wavelets represent a means for studying photopic retinal activity unaffected by the contributions of the scotopic system. - The Author.

Genetics and physiology of colour vision. VII., by G.H.M. WAALER (Inst. of Forensic Med., Univ. of Oslo, Norway).

The first heresy : The one-locus idea for protan and deutan. Females with protan and deutan in their two X-chromosomes have normal colour vision. The problem of discrepancy between the found 0.44 and the expected 0.64 per cent colour vision girls (1927) was completely solved. Duplicity

of pure colours (blue, green, yellow, red) conditional on two places for a double bond in the hexagon of vitamin A, was by a theoretical physicist, calculated to be in accordance with photon strength. "Green and yellow valences" give the central region of the spectrum, where light stimulation gives addition of effects from the rods and cones. A completely new discovery : Substraction of cone effects from rod effect in the two peripheral parts of the spectrum, giving a negative b-wave in ERG (second heresy). There is also a duplicity of Wald's rhodopsin and the hindered (Pauling, 1945) 11-cis isomer of vitamin A. If the two forms invade a rod, the chemistry is so specific, that only one of them takes the place in this rod. This is a heresy built upon the rules of heredity. A unique family of 8 (brothers and sisters) shows a difference, in anomaloscopic testing, between a homozygotic (P/P) mother and her protanope son. - The Author.

Studies on colour pattern reversal VER using a color television Stimulator, Comparison of the VERs between normal and deutan, by T. MATSUKI (Dept. Ophthal., Fukushima Medical College, Japan), Folia ophthalmol. jap. 31, 1180-1188, 1980.

The goal of these studies was to find out the difference in VERs to the colour checkerboard pattern reversal stimuli between normal and colour defective subjects.

The colour checkerboard patterns were generated by a colour television (KV-13F1, SONY) and a microcomputer (Apple II). With this sytem, 3-colour (orange, green, blue) checkerboard patterns were able to generate various check sizes and different reversal frequencies. In the stimuli of orange and green checkerboard reversal patterns, orange and green checks were not equiluminant technically. The energy values were as follows : orange check, 0.131 W/cm ; green check, 0.083 W/cm. The VERs to these colour checkerboard reversal patterns were obtained from 12 normal and 2 colour blind subjects. The monopolar electrodes were attached to Oz on the scalp.

The characteristics of the VERs were analyzed as follows : (1) A difference in VERs to monocoloured checkerboard reversal patterns among 3 colours could not be found out between normal and colour blind subjects; (2) With the orange and green checkerboard reversal patterns at 15.4 Hz of the reversal frequencies, the VERs for the colour blind subjects showed an increase in amplitude, while the number of reactive waves in VERs was only half of that for normal subjects; (3) The amplitudes of the VERs to the orange and green checkerboard reversal patterns without shift decreased more those with shift. - Yasuo Ohta.

Congenital X-linked incomplete achromatopsia, by J.A. FLESCHMANN and F.E. O'DONNELL jr., Arch. Ophthalmol. 99, 468-472, 1981.

Twenty-nine members of a family were examined; there are 9 affected males and 7 carrier females. The findings were the following : (1) the disorder is a slowly progressive abiotrophy, with progressive macular scarring and cone dysfunction; (2) carrier females sometimes can be found by ophthalmoscopic and fluorescein angiographic abnormalities in the macula; (3) genetic linkage studies suggest possible linkage with the glucose-6-phosphate dehydrogenase locus.

Colour vision was examined with the FM 100 hue and a (not specified) PIC test. According to the authors "color vision was completely absent. With the exception of the three completely achromatic patients, all patients managed to identify at least one of the demonstration or test plates of the pseudoisochromatic test". The photopic ERG was absent.

Comment.

Notwithstanding the fact that the color vision test battery was insufficient to prove that there really is a central achromatopsia the abolished cone-ERG is a guarantee for disturbed cone function. There is a cone dysfunction but is it a congenital achromatopsia? The patients complained of gradual worsening of visual acuity and color vision. The authors found progressive macular scarring and cone dysfunction. These findings in my opinion are sufficient to conclude that the disease described is not a congenital X-linked achromatopsia but an X-linked progressive cone dystrophy. - A. Pinckers.

Dichromatic opponent color vision (Dichromatisches Gegenfarbensehen), by A. KLAUDER and H. SCHEIBNER (Physiol. Inst. II, Univ. Düsseldorf, Moorenstr. 5 D-4000 Düsseldorf, FRG), Farbe + Design 15/16, 65-70, 1980.

With a tristimulus colorimeter after Guild-Bechstein the spectral stimulus functions of two protanopes were measured. After the determination of the neutral zone, the dichromatic colour space and the alychne - the latter by the blind vector and a transverse vector - two further primaries : first a luminance free chrominance vector at the intersection line of alychne and dichromatic colour space, second and achromatic luminance vector at the intersection line of neutral zone and dichromatic colour space. The appertaining spectral response curves were calculated from the measured spectral distimulus values. The first is identical with a protanopic spectral luminous efficiency, the latter is in good agreement with a spectral opponent response curve determined according to the method of hue cancellation. Apparently the protanope's perception is restricted to the colours blue and yellow. - The Authors.

Colorblindness in Africa, by A. ADAM (Everyman's University, Tel-Aviv, and Department of Human Genetics, Sackler School of Medicine, Tel-Aviv University, Israel), Metab. Pediatric Ophthalmol. 5, 181-185, 1981.

Data on the occurence of red-green "colorblindness" in Africa comprise only some 650 affected males, of about 50 out of more than 1000 indigenous populations. Frequencies of all defects range from less than 1% in a few sub-Saharan tribes to 6% in North Africans, with wide variation of protan-deutan ratios. The findings and the methods used for their collection are examined critically with particular reference to the theory that relates world variation in the frequencies of colorblindness to the pressure of natural selection on primitive man to the relaxation of selection since the beginning of agriculture. It is argued that most available data from Africa lack the major parameters needed for a proper examination of the theory : the majority of colorblinds were not fully diagnosed in terms of the various mutations causing protan or deutan, severe dichromatic anopias or milder trichromatic anomalies; the majority of African populations were not sampled and the majority of available samples were far too small for valid estimations of gene frequencies or for statistical assessment of differences between neighbor populations. It is recommended that the missing data be collected through a very rapid screening of literate males with pseudoisochromatic plates, followed by the diagnosis, with a portable anomaloscope, of all those failing the screening. - The Author.

Color matches of patients with retinitis pigmentosa, by R.S.L. YOUNG and G.A. FISHMAN (Eye and Ear Infirmary University of Illinois 1855 West Taylor Street, Chicago, Illinois 60612, USA), Invest. Ophthalmol. 19, 967-972, 1980.

The color matches of 46 retinitis pigmentosa (RP) patients were found to differ significantly from those of 55 unaffected observers. The color matches of group I (trichromatic) RP observers were more protanomalous (i.e., required a greater red/green mixture ratio) than those of unaffected observers. The matches of group II (dichromatic) RP observers were more protanopic (i.e., required less yellow to match the red primary) than those of the group II unaffected observers. In view of current evidence, this difference can be attributed to reductions in the pigment optical density of cone photoreceptors in eyes of RP patients. - The Authors.

Annular macular dystrophy, by J. COPPETO and S. AYAZI, Am. J. Ophthalmol. 93, 279-284, 1982.

Of 21 individuals from 3 generations of a single family with annular macular dystrophy, 6 showed only dyschromatopsia, 1 had dyschromatopsia and foveal hyperpigmentation, and 4 individuals had dyschromatopsia, foveal hyperpigmen-

tation, and perifoveal circular pigment epithelial atrophy. Normal findings obtained on electrophysiologic testing suggests that this is a focal (macular) disorder rather than a generalized fundus disorder.

Comment.

The authors state that case 8 (IV-10) shows a severe "tritanopic" color vision defect in each eye but the corresponding fig. 8 clearly shows a bipolar deutan defect. It is one of the characteristics of the FM 100 hue test that a deutan defective individual commits errors in the yellow and blue region of the spectrum and that a tritan defective individual makes errors in the red and blue-green part of the spectrum. I'm not sure but, after careful reading of the case histories and examination of the pedigree given, I'm afraid that in the whole text the term tritanopic has to be replaced by "deutan" and vise-versa. - A. Pinckers.

Comparative study of colour visual field and colour vision in choked disc (Etude comparative du champ visuel en couleur et du sens chromatique au cours de l'oedème papillaire) by D. ANDREANOS, D. KARATINOS, G. PETROVTOF, J. VERGADOS and N. MAGOURITAS (Athens, Greece), Bull. Mém. Soc. fr. Ophtalmol. 21, 224-229, 1979.

Seventeen patients with primary papiloedema were examined by Goldmann perimeter with white, blue, green and red targets, by AOHRR and by 100 Hue. 42% of patients were found with red-green axis, no one with blue-yellow axis. Blind spot is enlarged for colour objects : largest for red, narrower for blue and green. Photometric dysharmonies are more important for red and blue. There is no correlation between visual field and dyschromatopsia. - J. Vola.

Original paper :

The NEITZ ANOMALOSCOPE OT

A. Pinckers
(Nijmegen, The Netherlands)

Thanks to Prof. Ohta the Neitz anomaloscope OT was available in my department for routine clinical color vision examination. The instrument, as shown at the IRGCVD Symposium in Berlin, is attractively shaped and easy to handle for both the patient and the examiner.

Standardization was with 25 healthy subjects. Presetting of the Yellow knob on 15 scale units. Each subject was asked to adjust 3 times the Red-Green mixture knob. For each subject the mean of the 3 settings was calculated. The mean Red-Green mixture value for the whole group of 25 subjects was 41.9 scale units, the standard deviation being 1.76 scale units.

The Neitz OT anomaloscope was included in the test battery for routine clinical color vision examination. During a 6 month period more than 300 patients were examined :
- in 25 normal patients the mean Red-Green mixture value was 41.9 scale units, exactly the same as found in the standardization procedure;
- in 15 congenital red-green defective individuals all the mixture data did fall within the areas indicated on the Neitz OT test chart;
- in 3 congenital achromats the Neitz OT curve did not differ much from the Nagel II anomaloscope curve, the Neitz OT curve being a little steeper;
- pseudoprotanomaly (Jaeger & Nover) was present in patients with damage at the level of the receptor cells (pigmentary dystrophy, cystoid macular edema), absent in patients with optic nerve diseases (optic neuritis, tumors).

In conclusion the Neitz anomaloscope OT reveals to be a good instrument. If patients are asked to make a choice between the Nagel II and the Neitz OT they do prefer the Neitz OT anomaloscope.

OBITUARIES

LOUISE L. SLOAN

Dr. Louise L. Sloan, member of honour of the International Research Group on Colour Vision Deficiencies, died March 1, 1982. Bob Massof was asked to provide an obituary, that till now did not reach us.

W.A.H. RUSHTON
(1901-1980)

William Rushton died on June 19, 1980, aged seventy-eight. His early career was devoted to the physiology of nerve and when he began work on vision, he was already forty-six, an age at which many have already retired from active research; and yet he went on to change the Zeitgeist of our field. By reflection densitometry he showed that in the dichromatic retina there is only one measurable photopigment in the red-green range; for the difference spectrum (the change in transmissivity after a partial bleach) has the same form whether the bleaching light is red or blue-green. His was never the only evidence for the classical theory of dichromacy, but his direct physical measurements led to the fading of the Fick hypothesis and by 1980 had been substantially responsible for the quiet convergence on

trichromatic fundamentals that resembled those of König and Stiles.

Rushton himself was an admirer of Stiles, and one of his important contributions during the 1960's was to publicize and exploit the two-colour increment-threshold technique. To an axiom implicit in Stiles' paper of 1939 he gave the name "Principle of Univariance". Because any individual class of cones obeys this pinciple, and so is colour blind, it is possible to "silence" one or two of the three classes by moving along an appropriate line in colour space. This idea he cleverly exploited in the "exchange threshold" technique, a development of the increment-threshold method in which it is possible to isolate more securely the cones that are responsible for detection.

As an undergraduate and research fellow at Cambridge, Rushton was a member of Thomas Young's college, Emmanuel, and from 1938 until his death he was a fellow of Trinity, the college of Newton, Clerk Maxwell and Lord Rayleigh. The shadows of these giants, of which he was so conscious, seemed to reinforce simultaneously both his own modesty and his intolerance of pedestrian or illogical work. His witty, devastating and sometimes unforgivable criticisms were relished by listeners and feared by speakers. These oral maulings, which survive only in folk memory, served to drive from our field many of its weaker heresies; but it is only fair to say that they also held back an understanding of how far visual thresholds are controlled by opponent processes. - J.D. Mollon.

Kakichi UMAZUME
(1895-1981)

Kakichi Umazume was born on December 7, 1895 in Tokushima and died on December 1, 1981 in Tokyo. He was professor of ophthalmology at the Tokyo Medical College from 1932 to 1967. Among his many activities we have to cite his report on Colour vision in clinical ophthalmology (Japanese Society of Ophthalmology in 1956), the achievement of the Tokyo Medical College (TMC) Colour Vision Test and that of the Umazume-Ohta Scotometric Plates. Many of his pupils became specialists in clinical colour vision problems : Harutake Matsuo, Ryo Seki, Sakae Obi, Kaneo Shimizu, Toshima Hashimoto, Akira Hayashi, Yasuo Ohta, Morishige Mukai, Hitohiro Sakanashi, Kyosuke Sato, Michiko Ohta, Nariyoshi Endo, Tadotoshi Fukuda, Koji Kurata etc. Professor Umazume was so undoubtly the chief of one of the most important actual schools in our field. - Harutake Matsuo and Guy Verriest.

Gaetan E. JAYLE
(1904-1982)

Gaetan E. Jayle was born in Paris on 1st january 1904. He studied medicine in Montpellier and went as anatomist to Marseille in 1933. However his interest in ophthalmology directed him to the eye department of Prof. Aubaret. In 1942 he succeeded to Prof. Aubaret as chief of this department.

He was a renowned ocular Surgeon. He wrote with his pupils (Ourgaud, Bérard, Saracco, Metge), his brother (Max Jayle) and his colleagues (Derrien, Auber, Vola, Boyer) many papers about surgical techniques, immunological research, interfaces between endocrinology and ophthalmology, and especially functional eye examination of which he was a pioneer in France. Two voluminous reports for the french ophthalmological Society (on night vision in 1950, on dynamic electroretinography in 1965) have to be mentioned first, but some papers on visual field examination at low illuminance and on the prototype of an adapto-perimeter are also very important. He created post-universitary and audio-visual teaching in his country, stimulated regional activity and developped international exchanges. - Martine Riss-Jayle.

Jacques VAN DE CASTEELE
(1934-1982)

Jacques Van de Casteele was born in Ghent and died in Heverlee. He studied medicine in Leuven, tropical medicine in Antwerp and ophthalmology in Ghent. He became a military ophthalmologist especially engaged in aviation visual problems, a.o. concerning visual field, dark adaptation and colour vision. He was member of the Special Senses Committee of the Advisory Group for Aerospace Research and Development of the NATO, and also member of the International Research Group on Colour Vision Deficiencies. - Guy Verriest.

JOURNALS ON COLOUR

Couleur. - This is the journal of the Centre Français de la Couleur. The redaction committee includes F. Parra (director), M. Albert Vanel, Francis Schmitt, Emile Barthes, Robert Seve, A. Dubois-Poulsen and G. Bertrand. All french-speaking IRGCVD members should have to join. Annual subscription rate (4 issues) : 96 FF in France, 106 FF abroad. Address : Centre Français de la Couleur 43, rue Cuvier, F-75231 Paris Cedex 05, France.

Color Research and Application. - This outstanding publication is the only English-language journal that covers the entire spectrum of color. It fills the void created by diverse publications which offer only minimal coverage of this broad subject. Each issue presents reports reports on the state-of-the-art, original full-length articles, news notes, meeting announcements and book reviews. Dr. Fred Billmeyer, Jr., edits the journal which is going into its seventh year of publication with about 2,000 subscribers. "We try to cover all aspects of color - the science, but also art, design, history, architecture and others" the professor notes. "Color crops up in so many places and in so many ways that we really get a broad readership". Throygh John Wiley and Sons, Subscription Department, 605 Third Avenue, New York, NY 10157, USA.

THIRD EUROPEAN CONFERENCE ON BRAIN RESEARCH

French Alps, 3rd week of March 1983.

The conference consists of workshops, round tables and panel sessions. A panel discussion on pattern, movement and colour detection concerns neurophysiology of the visual centres, human psychophysics and clinical data. The aim is to provide a forum for discussion of a variety of results obtained by neurophysiologists, psychophysicists, neurologists and ophthalmologists. of particular interest are implications of neurophysiological findings to human vision and questions about the visual system posed by clinical findings. Persons interested in participating are asked to contact Dr. J.J. Kulikowski, Visual Sciences Laboratory, UMIST, PO Box 88, MANCHESTER M60 1QD, England.