

DALTONIANA

NEWSLETTER

OF THE INTERNATIONAL RESEARCH GROUP ON COLOUR VISION DEFICIENCIES

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Tweemaandelijks Tijdschrift

Nr. 51 - 15th June 1984

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+ THE LAST PAGE OF THIS ISSUE IS THE CALL FOR +
+ PAPERS FOR THE 8TH INT. IRGCVD SYMPOSIUM +
+ IN MARSEILLES, JUNE 1985. +
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LITERATURE SURVEY

The relationship between spectral sensitivity and spatial sensitivity for the primate r-g X-channel, by C.R. INGLING Jr and E. MARTINEZ-URIEGAS (Div. Biophysics and Inst. Vision, Ohio State Univ., Columbus, OH 43210, U.S.A.) Vision Res. 12, 1495-1500, 1983.

Which visual channel detects high spatial frequencies during careful fixation? Color vision models based on psychophysical data contradict electrophysiological results. According to electro-physiology, the channel which mediates foveal acuity originates in the small, tonic color-opponent r-g units of the X-cell pathway. However, psychophysical models assign acuity to the Vλ channel because when acuity is used as a criterion for equating luminosity it is additive. In all opponent-color models the r-g channel is subadditive and hence is excluded from mediating acuity. We show that the r-g channel adds cone signals for high spatial frequencies and subtracts them for low, and conclude that the major achromatic channel for human foveal vision originates within the r-g color-opponent channel. Quantitative analysis makes explicit the interaction between the spatial and spectral variables for the simple-opponent cells which predominate in primate foveal vision. - The Authors.

Test and field spectral sensitivities of colour mechanisms obtained on small white backgrounds : action of unitary opponent-colour processes?, by D.H. FOSTER and R.S. SNELGAR (Dept. of Communic. and Neurosc., Univ. of Keele, Staffordshire ST5 5BG, U.K.) Vision Res. 23, 787-797, 1983.

It has been shown that for human foveal vision the test spectral sensitivity curve obtained in the presence of a large white background exhibits peaks at about 440, 530 and 610 nm and a small dip or notch at about 580 nm. Additionally, field spectral sensitivity curves for the medium- and long-wavelength

sensitive colour mechanisms when derived in the presence of a small monochromatic background (auxiliary field) spatially coincident with the test field are sharper than the corresponding Stiles's \mathcal{M} mechanisms and peak at about 530 and 605 nm. The short-wavelength sensitive colour mechanism shows no such effect, the peak remaining at about 440 nm. The test spectral sensitivity curve obtained on a large white background and the sharpened field spectral sensitivity curves obtained on a spatially coincident monochromatic auxiliary field have each been interpreted in terms of an opponent-process theory of colour vision; the response of the non-opponent luminance system is considered to be reduced by selective achromatic adaptation (with the large white background) or by selective contour masking (with the spatially coincident auxiliary field). The present study combined the two techniques of achromatic and spatial adaptation: a small white auxiliary field spatially coincident with the test field was used in measurements of both test and field spectral sensitivities. Under these conditions, it was found that the test spatial sensitivity curve showed more clearly defined peaks and a deeper notch at about 580 nm than when obtained on the large white background and that the test curve was well fitted by the upper envelope of the short-wavelength and sharpened medium- and long-wavelength field spectral sensitivity curves, suggesting the possibility that three unitary opponent-colour mechanisms may underlie test and field spectral sensitivities. A test of this hypothesis is proposed concerning the effect of auxiliary-field chromaticity on the position of the notch at about 580 nm in the test spectral sensitivity curve. -
The Authors.

A new concept of retinal colour coding, by W. PAULUS and A. KRÖGER-PAULUS (Neurol. Universitätsklinik und Univ.-Augenklinik, Moorenstrasse 5, D-4000 Düsseldorf, BRD) Vision Res. 23, 529-540, 1983.

A theory of retinal colour coding based closely on recent anatomical and physiological results is presented. Opponent colour channels are shown to be an inevitable result of any randomly distributed retinal cone mosaic, the structure of red-green opponent colour channels remaining uninfluenced by a predominance of "red" or "green" cones. These findings circumvent the conflict between anatomical results with more "green" than "red" cones and psychophysical estimations with more "red" than "green" cones. The effect of receptor compression and opponent colour transformation on colour perception is investigated. Non-opponency of pure green and pure red could be attributed to receptor compression, the Bezold-Brücke phenomenon, however, to the antagonism of "red" and "green" cones within the receptive field surround of red-green opponent cells. The fundamental colours are estimated to be supersaturated violet, yellow-green and yellow-red. -
The Authors.

Intracellular recordings from a biplexiform ganglion cell in Macaque retina, stained with horseradish peroxidase, by E. ZRENNER, R. NELSON and A. MARIANI (Max-Planck-Inst. for Physiol. and Clin. Res., 6350 Bad Nauheim, Parkstr. 1, F.R.G. and Lab. of Vision Res., Nat. Eye Inst., Nat. Inst. of Health, Bethesda, Md 20205, U.S.A.), Brain Research 262, 181-185, 1983.

A biplexiform ganglion cell, which is characterized by dendritic contacts with rods, has been penetrated with an HRP-filled microelectrode in the retina of Maccaca fascicularis. Its fine curvy axon could be traced to the optic disc. One of several dendritic processes ascended through all retinal layers and ended in the layer of rod spherules. Under all conditions of chromatic adaptation, the cell produced depolarizing responses with a rapid onset and a slow decay. Besides a strong rod input the recordings indicate signals from at least two spectrally different cone mechanisms. - The Authors.

Cellular mechanisms for color-coding in holostean retinas and the evolution of color vision, by D.A. BURKHARDT, J. GOTTESMAN, J. LEVINE and E.F. MacNICHOL Jr. (Vis. Lab., Univ. Minnesota, Minneapolis, MN 55455; Dept. Biol., Boston College, Chestnut Hill, MA 02543; Marine Biol. Lab., Woods Hole, MA 02543; Dept. Physiol., Boston Univ. School Med., Boston, MA 02118, U.S.A.), Vision Res. 23, 1031-1041, 1983.

Electrophysiological recording and microspectrophotometry were used to analyze retinal function in representatives of the two surviving genera of holostean grade fish - the bowfin (Amia calva) and gars (Lepisosteus sp.). The properties of the cone photopigments, horizontal cells and ganglion cells show that these holostean retinas have cellular mechanisms for color vision which are fundamentally similar to those previously described for teleosts, turtle and mammals. These findings suggest that trichromatic receptor systems and opponent color-coding mechanisms may have evolved in primitive Neopterygii more ancient fish, before the advent of teleosts. In conjunction with other recent data on living representatives of primitive fishes, these findings also add renewed plausibility for the view that vertebrate color vision could have taken a common origin some 400 million years ago from an ancestral aquatic jawed vertebrate. - The Authors.

A flaw in equations for predicting chromatic differences, by M. BOYNTON, A.L. NAGY and X. OLSON, Color Res. Applic. 8, 1983.

Many formulas for predicting perceived color differences require that three terms be squared prior to the extraction of the square root of their sums. Two of these terms relate to chromatic differences measured along tritan and red-green axes. The root-mean-square calculational procedure predicts that the relative directions of simultaneous chromaticity changes along these principal axes should not affect the perceived color difference. Experimental data are presented which strongly disconfirm this prediction. - The Authors.

Sensitivity to spatiotemporal colour contrast in the peripheral visual field, by C. NOORLANDER, J.J. KOENDERINK, R.J. DEN OUDEN and B. WIGBOLD EDENS (Dept. of Med. Physiol. Physics, State Univ. of Utrecht, Physics Laboratory, Princetonplein 5, 3584 CC Utrecht, The Netherlands), Vision Res. 23, 1-11, 1983.

Contrast detection thresholds for spatiotemporal colour modulation were determined at several retinal locations. Colour discrimination is studied for red-green modulation of a yellow field and for yellow-blue modulation of a white field. For constant target size colour vision deteriorates if the stimulus is moved away from the fovea, but if the shift is combined with a suitable enlargement of the larger size colour discrimination at the periphery is comparable to that at the fovea. We did not find any retinal location along the horizontal meridian which was red-green or yellow-blue colour blind. Chromatic bars were detected in the nasal peripheral retina at eccentricities of up to at least 50°; temporal colour contrast was perceptible at nasal eccentricities of up to at least 90°. - The Authors.

A time induced tritan defect, by S.P. TAYLOR (Dept. Optom., Univ. of Wales Inst. of Sci. and Technol., Cardiff CP1 3NU, U.K.), Vision Res. 23, 745-748, 1983.

It is hypothesized that if blue is signalled more slowly than red in the visual system, and if integration time is longer for blue than for red, then a tritan defect should be apparent for normal observers. Data from short-exposure viewing of the City University Colour Vision Test indicate that, at 3.75 msec a significant tritan error occurs. - The Author.

An action spectrum for the production of transient tritanopia, by J.J. WISOWATY (Dept. Psychol. Univ. Califor. San Diego, La Jolla, CA 92093, U.S.A.), Vision Res. 23, 769-774, 1983.

The site of yellow blue chromatic-opponency has been thought to include synergistic input from either or both of the longwave-sensitive cone types to the "yellow" side. It has remained controversial whether one of these cone types provides all the "yellow" input or if both contribute to some extent. By measuring the action spectrum of adapting fields that produce transient tritanopia at their offset it appears that both the red- and green-sensitive cone types contribute in approximately the same ratio that they contribute to luminance. There also appears to be a contribution from an antagonistic red green mechanism in producing transient tritanopia. These findings seem consistent with current physiological and psychophysical evidence. - The Author.

Comparative evaluation of several colour vision tests (in Spanish), by E. HITA (Departamento de Optica, Facultad de Ciencias de Granada), J. PERALES (Escuela Universitaria de Magisterio, Gran Via, 54, Granada) and A. CRUZ (CSIC, Madrid), Opt. Pur. Apl. 15, 87-92, 1982.

Ishihara (1979), Tokyo Medical College and Ulloa (Spanish test similar to the Stilling one) colour vision tests of pseudoisochromatic type have been administered on a sample of 82 male children aged from 8 to 14 years, who had previously made at least one mistake in the Ishihara test.

The results of the three tests are analyzed in order to found both agreeing and disagreeing diagnoses. The coincidence between TMC and Ulloa tests is larger than the one established in the other cases. When comparing TMC and Ulloa tests with Ishihara's, it was noted a very low classification of the protan-like anomalies on the sample. In each case both non-typical and typical responses are studied which was also done to validate the Ulloa test.

The authors suggest to use Ishihara test in children of that age as it related to the other tests. - Javier Perales.

Studies on color vision test (1) Panel D-15 test and Lantern test for schoolchildren, by T. YASUMA (Dept. Ophthalmol. Nagoya Univ. School of Med.), Y. TAKAYANAGI and H. UESAKI (Nagoya Ophthalmol. Assoc. for School Children), Jap. J. Clinic. Ophthalmol. 36, 119-125, 1982.

A screening test of color vision by 9 Ishihara plates was performed in 16,839 males and 15,930 females of the 4th grade primary school. Anomaloscope, Panel D-15 and Ichikawa's Lantern test were used for 814 males and 77 females picked up by the screening test. (A) Results in children with normal color vision. (1) An overwhelming majority of the females picked up by the screening test had normal color sense, possibly being carriers of congenital defects; (2) Visual acuities of these children considered normal were significantly poor compared to that of a control group ($p < 0.001$); (3) There were no correlation between visual acuity and results of Panel D-15 nor between visual acuity and results of the lantern test; (4) About half of the children who showed an "irregular pattern" at the Panel D-15 first trial passed the second trial; (5) The errors at the Lantern test decreased significantly at a second trial ($p < 0.001$; "practice effect"); (6) There was no correlation between the results of Panel D-15 and Lantern tests. (B) Results in color defectives. (1) Those who had failed at the Panel D-15 the first trial did also not pass the second trial; (2) Forty percent of the children who showed an "irregular pattern" at the first trial with the Panel D-15, passed the second trial; (3) There was no significant difference between protans and deutans in the "practice effect" at the Panel D-15; (4) There was no significant difference between the errors at the 1st and 2nd trials with the lantern test; (5) When comparing with non-selected color defective groups of middle and senior high school our group shows a high percentage of strong grade ($p < 0.005$). This indicates the difficulty of determining the grade of color defectiveness in children as young as the 4th grade primary school. - Yasuo Ohta.

A property of the photopic monochromatic ERG in congenital color blindness, by T. YOSHIDA and M. YOKOYAMA (Dept. Ophthalmol., Mie Univ. School of Med., Japan), Acta Soc. Ophthalmol. Jpn. 85, 1456-1462, 1981.

This paper describes the spectral characteristics of the photopic b-wave studied in normals, protanopes and deuteranopes under chromatic adaptations. The isolation of individual cone systems using chromatic adaptation is not readily carried out with ERG methods. Furthermore, separation of the green and red systems is very difficult because their spectral functions overlap widely. Very intense chromatic adaptation as described by Wald and a spectral scanning method revealed the blue system peaking at about 480 nm with yellow adaptation (Wratten No. 16), isolated ERG responses of the red cone system peaking at about 580 nm with blue light adaptation (Wratten No. 47B) and the green cone system at about 594 nm with red light adaptation (Wratten No. 29). The latter peak will be shifted to 540 nm if strong background light is used. Deuteranopes had the maximum response at 566 nm, mostly the same with normal, under white adaptation and it was shifted to 594 nm under red adaptation, as seen in normal cases. Protanopes had the maximum response at 540 nm under white or red adaptations and their b-wave amplitudes were found to be reduced by blue adaptation without any shifting of the λ_{max} . - Yasuo Ohta.

Colour-blind drivers' perception of traffic signals, by M.G. WHILLANS (RR #2, Galiano, BC VON 1PO, Canada), Can. Med. Assoc. J. 128, 1187-1189, 1983.

There is a dangerous and widespread assumption that colour-blind drivers drive as safely as drivers with normal vision. Colour-blind drivers have difficulties recognizing traffic and vehicle signals. However, simple and practical solutions such as changes to the design, colour and shape of signals will aid these drivers. - The Author.

Defective colour vision in children, by A.R. HILL (Oxford Eye Hospital, Walton Str., Oxford OX2 6AN, UR). Chapter to be published in : A. MacFARLANE (ed.), Progress in Child Health, 1983.

Is screening worthwhile?, by P.A. ASPINALL (Princess Alexandra Eye Pavillon, Edinburgh, Scotland) and A.R. HILL (Oxford Eye Hospital, Walton Str., Oxford OX2 6AN, U.K.). Chapter to be published in : A. MacFARLANE (ed.), Progress in Child Health, 1983.

Zapfenrestaktivitäten bei verschiedenen Typen angeborener totaler Farbenblindheit (Remnants of cone activities in different types of congenital achromatopsia), by H. KRÄSTEL, W. JAEGER und A. BLANKENAGEL (Universitäts-Augenklinik Heidelberg), Bergheimer Strasse 20, D-6900 Heidelberg, BRD), Fortschr. Ophthalmol. 79, 499-502, 1983.

Besides complete congenital achromatopsia, different types of incomplete autosomal recessive achromatopsia can be

distinguished, which are characterized by remains of cone function. Using large field stimuli and chromatic adaptation, residual cone activities can be demonstrated even in cases which, in the usual clinical evaluation of vision, seem to lack any photopic function. In fact, incomplete achromatopsia largely outnumbers the complete cases, when large field testing conditions are used. This is somewhat contradictory to the hitherto classification of complete as typical and incomplete as atypical achromatopsia. It is discussed whether the additional receptor mechanisms work by means of the usual cone pigments erythrolabe, chlorolabe, and cyanolabe. Interactions between the additional receptor mechanisms and the rods can be shown, but rod inhibition occurs only to a small amount. Therefore, lack of rod inhibition rather than purely scotopic vision should be regarded as common feature of congenital achromatopsias - the complete as well as the incomplete ones. - The Authors.

Electrophysiological studies of color vision in diseases of the retina and the optic nerve, by L.P. GRIGORIEVA, M.A. BLYAKHER and A.E. FURSOVA, Vestnik Oftalmol. 5, 44-49, 1979.

The authors present the results of an analysis of photopic electroretinograms and occipital potentials induced in response to white and monochromatic (662, 539 and 438 nm) stimuli in weak-sighted schoolchildren with descending partial atrophy of the optic nerve and central dystrophy of the retina. In the latter case impairments of all the three color receptors of the vision system with the deepest reduction of the red color receptor were revealed. The data obtained make it possible to judge to a certain degree about the localization and the depth of the pathological process. This can be a supplement to clinical characterization and differential diagnosis of diseases of the retina and the optic nerve. - The Authors.

Diagnostic importance of investigations into the color perception capacity in retinal affections, by V.N. MARINCHEV, Vestnik Oftalmol. 1, 59-61, 1977.

In different retinal affections the author employed a number of simple color tests, viz. polychromatic and pigmental E.B. Rabkin's tables, the test of "9 color spots", along with Amsler's marker and campimetry after Bjerrum.

The diagnostic efficacy of color tests and also their possibilities relative to differentiation of some affections involving the retina and the optic nerve are shown.

The author recommends wide use of the said tests in the ophthalmological practice in view of their simplicity, high sensitivity and accessibility. - The Author.

Farbige Reizpunkte im zentralen Gesichtsfeld bei überstandener retrobulbärer Neuritis und bei Schielamblyopie - ein Vergleich (Coloured stimuli within the central visual field of patients with optic neuritis in the late recovery period and of others with strabismic amblyopia - A comparison), by P. GRÜTZNER, W. DEUKER and H.-H. DEUKER (Augenkl. Stadt. Klin. Darmstadt, B.R.D.), Fortschr. Ophthalmol. 79, 522-524, 1983.

In the late recovery period of optic neuritis with normal visual acuity small coloured stimuli often are misinterpreted. In strabismic amblyopia with central fixation colour vision is quite normal. Therefore, colour vision testing may be helpful in differential diagnosis. - The Authors.

The selective impairment of blue sensitive mechanism by chromatic adaptation in the Maxwellian view optical system in pathologic eyes with fundus disease - Studies of spatial summation and temporal summation, by H. ABE, K. MORITA, A. OHMOMO and K. SATO (Dept. of Ophthalmol., Niigata Univ. School of Med., Japan), Acta Soc. Ophthalmol. Jpn. 85, 1596-1605, 1981.

The area-spectral sensitivity curves (spatial summation) and duration-spectral sensitivity curves (temporal summation) of the 3 foveal colour mechanisms were measured in normal and pathologic eyes by G. Wald's selective adaptation method using coloured test lights and chromatic background in a Maxwellian view optical system. For the studies of spatial summation, test fields ranging between 4'4 and 2°48' were superimposed on the centre of a 5° background field. The spectral sensitivities were measured for test lights of 440, 540 and 580 nm (the peak wavelengths of the three cone mechanisms). For the background the following Kodak Wratten filters were applied: No. 12 (yellow), No. 32 (purple) and No. 44A (blue-green). The retinal illuminance was for each background 10,000 Td. For study of temporal summation, the thresholds were determined for chromatic stimuli of 52'7 using exposures ranging from 5 to 1,000 msec. All measurements were represented as log relative sensitivity for equal energies.

Results: (1) In normal eyes, the area-sensitivity relationship for the blue mechanism was found to be much steeper than those for the green and red mechanisms. In pathologic eyes suffering from chorioretinal disease, optic nerve disease and glaucoma, the area sensitivity curves (especially for the blue mechanism) showed a much steeper decline than normally. (2) In normal eyes, the spectral sensitivity-duration curve for the blue mechanism showed prolongation before reaching the stage of lack of temporal summation (when compared with that of the green and red mechanisms). In pathologic eyes, the duration-sensitivity curves (especially for the blue mechanism) showed much steeper decline, prominent decrease of sensitivity and much large prolongation before reaching the stage of absence of temporal summation.

It may be concluded that in the initial stage of pathology the spatial and temporal summation are selectively or more distinctly disturbed for the blue mechanism. In the advanced stage all 3 mechanisms are disturbed; however the disturbance of the blue mechanism is greater. - Yasuo Ohta.

Digitalis-induzierte Farbsinnstörungen bei therapeutischen Glykosid-Serumspiegeln (Digitalis-induced colour vision deficiencies and therapeutic glycoside serum concentrations), by G. DUNCKER, K.D. KOLENDA and F. SCHENK (Städt. Krankenh. Kiel, B.R.G.), Fortschr. Ophthalmol. 79, 503-505, 1983.

In a study of 29 cases, each group treated with common maintenance therapies, patients who received Digoxin and Digitoxin presented a significant higher (100 hue) total error score in comparison to the control group (30 cases). No definite difference in the total error score was found among patients treated with Digitoxin and Digoxin. Our results show that colour vision is influenced in digitalized patients already by therapeutic glycoside serum concentrations. It is our opinion that the retina is the primary location for digitalis influences. The penetration of Digitoxin and Digoxin concerned with the blood-retina-barrier appears to be almost equal although lipid-solubility differs. - The Authors.

Correlation between color vision scores and quantitative perimetry in suspected glaucoma, by J. FLAMMER and St. M. DRANCE (Dept. Ophthalmol., Univ. Br. Col., and Vancouver Gen. Hosp., Vancouver, Canada), Arch. Ophthalmol. 102, 38-39, 1984.

The mean differential threshold, studied on the Octopus perimeter, and color vision, estimated by the Farnsworth-Munsell 100-hue test, were studied in glaucoma suspects and patients with questionable early field defects. The results of both tests were significantly correlated. The color vision scores correlated with the central, paracentral, and midperipheral parts of the visual field. This result suggests that both functions are disturbed in glaucoma and that the disturbance may be present diffusely throughout the visual field. - The Authors.

The senses, by H.B. BARLOW (Physiol. Lab. Univ. of Cambridge, U.K.) and J.D. MOLLON (Dept. of Exper. Psychol., Univ. of Cambridge, U.K.), Cambridge Texts in the Physiological Sciences 3, Cambridge Univ. Press. 484 pp., Hard cover £30.00, Paperback £12.50.

This book describes what is known about man's sense organs and the brain mechanisms concerned with sensory analysis. It is intended for medical undergraduates and graduates as well as for students in other disciplines that concern themselves with the senses, such as psychology, optometry, education, and art.

The contributors are all well known in their own fields and have co-operated closely to produce a coherent textbook that is up-to-date, accurate, authoritative and interdisciplinary. One of the Editors is a physiologist with a research

interest in perception, the other an experimental psychologist with a research interest in physiology. This complementarity is reflected throughout the text and the medical student will find more material on cognitive and behavioural aspects of perception than is found in traditional medical textbooks, whereas the psychologist will find useful reference material on topics, such as physiological optics and the vestibular system, that are not normally treated in detail in psychology textbooks. Thus the treatment of vision ranges from the biochemistry of the cornea to iconic storage, while the treatment of smell ranges from olfactory transduction to the role of odours in reproductive behaviour. Detailed anatomical drawings, annotated reference lists, and a comprehensive index add to the value of the book. - The Publisher.

Neuronal operations in the visual cortex, by G.A. ORBAN (Katholieke Universiteit te Leuven, Belgium). Springer, Berlin. 190 fig., 29 tables, 385 p. Cloth DM 98, approx. US \$ 38.10, 1984.

This monograph describes the neuronal properties in the primary visual cortices of cats and monkeys. The material is derived mainly from single cell studies, complemented with relevant neuroanatomical and behavioral data. After a comparison of the cat and monkey visual system, and a description of the visual cortical areas, the input-output relationships of the visual cortex are outlined. The receptive field organization and influence on cortical cells of contrast, wavelength, spatial and spatio-temporal parameters and binocular disparities are described, as are the mechanisms giving rise to these properties. The relevance of these studies to coding and visual perception are discussed as well.

The author has not only attempted to summarize and evaluate his own work and experimental data from other scientists, but also to stimulate new experiments by pointing out where appropriate results are missing and by suggesting new working hypothesis. - The Publisher.

The demon in the aether, The story of James Clerk Maxwell the father of modern science, by M. GOLDMANN (BBC). Publ. Adam Hilger, 320 pp., hardcover, £18.00, 1983.

This new biography analyses the role of Maxwell's family and Scottish background, and examines how his work relates to that of Faraday, Kelvin and his European and American contemporaries.

Maxwell is a pivotal figure in the history of science : the models he developed to establish his revolutionary new results unified and completed the classical, Newtonian view of the Universe. He unified electricity and magnetism, predicted the existence of electromagnetic waves and identified these with light, so that optics became a branch of electromagnetism, and in doing this, invented field theory, the paradigm of 20th century physics. In showing how the velocities of the atoms in a gas should be distributed - the Maxwell

distribution - he developed the transport theory of gases. He revived the three-receptor theory of vision and explained colour blindness, and also took the first colour photograph. He predicted the only possible construction of Saturn's rings, wrote the founding paper on cybernetics - and worked out how a piece of paper tumbles to the floor. - The Publisher.

Colour printing and colour printers, by R.M. BURCH.
Publ. Adam Hilger, xviii + 300 pp, 8 pl., hardcover, 18.00, 1983.

This much sought-after and yet to be superseded account of colour printing was first published in London in 1910, and today original copies of the book are collectors' items. This new edition is a reprint of that original text, now with an introduction by Ruari McLean. Burch's book is the only definitive history of colour printing techniques, and encompasses every aspect from the 15th to the early 20th century, concentrating largely on English work, though references to other countries could not be excluded, especially in the early chapters. It contains detailed descriptions of virtually every known process, including chromo-lithography, colour etching, xylography, intaglio and photo-mechanical processes, and chiaroscuro, and covers important figures such as Le Blon and Baxter, making it an interesting and useful work of reference on the subject. Although it is now something of a period piece, the final chapter by William Gamble, "Modern Colour Processes" has been retained. For obvious reasons it has not been possible to include the original colour plates specially printed for the 1910 edition, but the original half tone illustrations have been reproduced. - The Publisher.



S A H L G R E N ' S S A T U R A T I O N T E S T
(S S T)

The SST is a new color vision test specifically designed for detecting and grading acquired dyschromatopsia. The test has been carefully validated*.

The SST contains three groups of colored test caps, contained in a wooden box. There are two gray caps, five bluish purple caps of different saturation, and five bluish green caps of different saturation. The caps are mixed in a random order and presented to the subject to be tested. The subject's task is to sort out all caps perceived to contain any bluish purple or bluish green color, leaving the gray caps aside. The number of caps perceived to be pure gray gives directly a quantitative estimate of the saturation threshold. The saturation threshold for bluish purple and bluish green colors is characteristically raised at an early stage of acquired dyschromatopsia. The test colors have been selected in such a fashion that the test remains useful also in cases with congenital color vision defects.

The pigment papers are taken from the Swedish Standard SS 019102, ensuring a high and uniform quality. The plastic caps are large enough to be handled with ease also by arthritic fingers. The caps are contained in a wooden box.

The current price is U.S. \$ 90:00 including air mail but excluding any customs fees and local taxes. The SST can be delivered immediately upon receipt of prepayment.

* L. Frisén and H. Kalm: Sahlgren's Saturation Test for detecting and grading acquired dyschromatopsia. American Journal of Ophthalmology 92: 252 - 258, 1981.

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