

Bulletin of the Applied Vision Association



Postgraduate meeting abstracts
Christmas meeting programme
AVA2002 Call for papers
References on Vision

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VISION

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*AIM OF THE AVA: TO PROMOTE AND ADVANCE THE APPLICATION
OF RESEARCH WORK IN ALL AREAS RELATED TO VISION*



Noticeboard



AVA on the Internet

The Applied Vision Association now has its own world wide web pages at:
<http://www.dmu.ac.uk/ava/>

The pages contain details of who is on the committee, contact emails, latest details on forthcoming AVA meetings and links to other vision related pages. There are also archives of abstracts from previous AVA meetings.

There is also an AVA anonymous ftp site at: <ftp://ftp.psy.dmu.ac.uk>

This site contains:

- a hyperspectral data set of natural scenes produced by Gavin Brelstaff (see <http://www.crs4.it/~gjb/ftpJOSA.html>).
- David Foster's bootstrap program for estimating the accuracy of a statistical estimate derived from a set of experimental data (see <http://www.op.umist.ac.uk/bootstrap.html>).

If there is anything else you think this archive should contain then let us know.

AVA and OPO Subscriptions

Membership for 2001/2002 will be as follows: ordinary members £20, student members £10. It is now possible to pay by direct debit or credit card.

Editorial

This issue of the Bulletin contains the abstracts of the successful AVA/Colour Group Postgraduate meeting held earlier this month at Newcastle. It also contains the programme of the forthcoming AVA Christmas meeting at Aston and a call for papers for the AVA annual meeting. Professor Mark Georgeson will be giving the 2002 Geoffrey J. Burton memorial lecture. If you have any comments on the Bulletin of the AVA then do contact me: mscase@dmu.ac.uk

Deadline for copy for the next Bulletin – 4th January 2002

Geoffrey J. Burton Memorial Fund

The fund was established in 1986 with the aim of providing financial assistance to students (postgraduates studying for a higher degree or first-year postdoctoral junior scientists) based in the UK travelling to any conferences or meetings at which they will be presenting a paper or poster. Donations to the fund can be directed to the AVA secretariat and cheques etc. should be made payable to "The Geoffrey J. Burton Memorial Fund".

The maximum award to any one individual is £400.

The AVA Committee has decided that from now on there will be a single award made once a year. The closing date for awards will be the last day in February each year and will be for conferences held from 1st March to the end of the following February (i.e. there will not be retrospective awards). Applicants do not have to be presenting at an AVA conference.

The next closing date for applications is:

28th February 2002

for conferences held between 1st March 2002 and 28th February 2003.

To apply for an award you need to complete an application form which is available from:

The AVA Secretariat,
College of Optometrists,
42 Craven Street,
London,
WC2N 5NG.

A PDF format version of the application form is available on the AVA web site at:

<http://www.dmu.ac.uk/ava/>

AVA / Colour Group Postgraduate Meeting

2nd November 2001, University of Newcastle

There was an invited talk given by Professor Roger Watt

The prize for best poster was awarded to: Vandana Mehta

The prize for best paper was awarded to: Jennifer Skillen

Many thanks to Andrew Welchman and Marina Bloj for organising this meeting.

PAPERS

Characteristics of the accommodation system in myopia and emmetropia.

Fuensanta Vera-Diaz, Dpt. Of Optometry, University of Bradford

Despite extensive myopia research, fundamental questions underlying the mechanism of myopisation remain unresolved. Many studies have tried to identify the factors which induce the increase in axial length associated with myopia development. One area of interest is in the relationship between myopia and the accommodation response. Previous results have shown that inaccuracies of the accommodation response occur in some myopes during and after prolonged near work. The aim of the study described is to examine the characteristics of myopic individuals that exhibit inaccurate accommodation responses. The results suggest that inaccuracies in the accommodation response occur predominantly during the progression of myopia. The implications of the findings in relation to models of myopia development are discussed.

A comparison of real life and computer generated motion in depth
V.L. Tuck, J.M. Harris. Department of Psychology, University of Newcastle upon Tyne, UK.

When an object moves directly towards or away from us in depth the motion signals generated in each eye are equal but opposite. Researchers

often use computer generated stimuli to simulate real world 3D motion on a 2D screen by presenting equal and opposite motion signals to each eye. Whilst this type of presentation simulates motion in depth, it is not identical to object motion in the real world. So, are observer responses to real life 3D motion identical to their responses to computer simulations of 3D motion? We have chosen to explore this question by looking at direction discrimination responses to monocular and binocular presentations of motion in depth. To compare observer responses over the two situations we conducted a series of experiments using real world motion in depth and computer simulations of the same 3D motion stimuli. In the real world experiments, an LED was moved directly towards and away from observers. Small movements were made at points in front of, around and behind a stationary fixation LED and observers were asked to report the direction of movement. Computer replications of the experiment were then carried out using the same observers. Comparisons in performance between viewing with one eye and two were made for both sets of stimuli. So far, two main findings have emerged. 1) With real life stimuli, binocular viewing is superior to monocular viewing for a range of positions in front of and around fixation whilst that advantage is lost for stimuli presented behind fixation. This is not the case for computer simulations as binocular performance deteriorates as the motion gets further from fixation and closer to the observer. 2) Thresholds for direction discrimination are lower for real life motion in depth than for computer presented motion in depth. This holds for binocular and monocular viewing. To help explain these findings we have identified several cues present in the real life stimuli but not in the computer simulations. A further series of experiments, to ascertain how useful these cues are in the direction discrimination of 3D motion, is now underway.

Quality of life, visual function and ocular health in South Asian and Caucasian adults in Bradford, UK

R Patel(1), S Pardhan (2), J Gilchrist (1) A Hobbiss (3)

1. Department of Optometry, University of Bradford, BD7 1DP UK

2. Department of Optometry and Ophthalmic Dispensing, Anglia Polytechnic

University, CB1 1PT

3. Clinical Epidemiology Unit, University of Bradford, BD7 1DP UK

Purpose: South Asians constitute a majority of the ethnic minorities in the UK. In Bradford, they comprise one-sixth of the total inner city

population. This study aimed to investigate the quality of life, ocular disease, visual and functional vision of older Asian and Caucasians visiting an optometric practice in Bradford.

Method: All patients over the age of 45 years who visited the practice over a 12-month period were invited to participate. A comprehensive assessment of the visual function using a battery of tests including log MAR distance acuity, near acuity, face recognition and contrast sensitivity was carried out on the first eligible 100 South Asians and 100 Caucasians. Measurements were obtained for each eye as well as binocularly in the absence and presence of a glare source. Stereopsis and central visual field using an Amsler chart were also measured. A diagnosis of the ocular health was made. Data on the quality of life (QOL) were obtained by patients completing the NEI-VFQ 25 questionnaire.

Results: Univariate and multivariate Regression analysis were employed to determine tests that were significantly associated with QOL scores. Non-parametric tests (Mann-Whitney) tested for differences in the questionnaire score by race ($p < 0.05$). Analysis of the data from the two racial groups showed that, although Asians were significantly younger and had significantly better visual function (functional vision and contrast sensitivity with and without glare), their quality of life scores were worse compared to those of Caucasians who showed worse visual function. In fact Asians showed significantly lower scores for items relating to driving, role dependency and ocular pain. Asians had significantly higher frequency of cataracts and lower frequencies of age-related macular degeneration. A large number of Asians (39%) were unaware of the presence of their cataract.

Discussion: Issues other than visual function are responsible for the relatively lower quality of life scores in the Asian group compared to Caucasians. These issues and their clinical implications are discussed.

Keynote Lecture

Visual factors as possible cause of the Paddington Rail Crash of 5/10/99

Profesor Roger Watt Department of Psychology, University of Stirling

The Importance of Spatial Scale in Determining Illusions of Orientation and Curvature

J. Skillen¹, D. Whitaker¹, Ariella Popple² and P.V. McGraw¹.

¹Department of Optometry, University of Bradford. UK; ² Gatsby CNU, UCL, UK.

Interactions between 1st-order (luminance-defined) and 2nd-order (contrast-defined) information have been widely demonstrated in the orientation domain. The Fraser twisted cord illusion is an example where the global, 2nd-order structure is pulled towards the orientation of the local, 1st-order structure. When 1st-order orientation exceeds approximately 10 degrees a reversal of the Fraser effect to a Zollner effect occurs, where the 2nd order structure is pushed away from the orientation of the 1st order structure. We investigated interactions between 1st and 2nd-order information using a Fraser twisted cord illusion within the domains of orientation and curvature. Observers were presented with horizontal 1st-order gratings whose contrast was modulated by a Gaussian envelope elongated along the length of the grating. The orientation and curvature of the 1st-order carrier was systematically varied and its effect on the perceived orientation and curvature of the 2nd-order envelope was established. Spatial frequency effects were examined by varying the frequency of the carrier within an envelope of fixed size. We show that the relative spatial scale of carrier and envelope represents a decisive factor in determining the magnitude and direction of interaction effects and conclude that the perceived 2nd-order structure of a stimulus is biased by the properties of the 1st-order structure in a manner that depends on relative, rather than absolute spatial scale.

The Effect of Reduced Colour Depth on the Colour Reproduction of Web Images

Efthimia Bilissi, Imaging Technology Research Group, University of Westminster, Watford Road, Harrow, Middlesex HA1 3TP

Accurate colour reproduction of images viewed across the Internet can be a difficult task due to problems, such as variable viewing conditions. The standard RGB colour space (sRGB) has been proposed to overcome this problem without the need for special software applications. Different graphics adapter bit-depth settings also affect the number of displayable colours on a web browser. For this reason, the 216 colours 'web safe' palette has been introduced. To understand the effect of device characteristics on

the process of image reproduction via the web, the characterisation of some common devices was carried out. This created a controlled environment whereby experiments could be conducted with reproducible results. Device characterisation also enabled the accurate conversion of scanned images to sRGB by using a step- by-step process that followed the specification of the colour space. The investigation of colour reproduction on a Cathode Ray Tube display under different bit-depth settings has been conducted using a suitable test target, which was converted to the sRGB colour space and also to the 'web safe' (216 colours) palette. These two images were displayed under 8-bit and 24-bit depth of the graphics card adaptor. Colorimetric measurements concerning colour differences were performed and evaluated. Experimental investigation of the true colour (24-bit colour depth) image while displayed under 8-bit setting via different browsers followed. The outcome of the investigations was evaluated and combined to determine the relationship between the different parameters described above and their effect on image quality.

Non-classical mediators of chromatic contrast induction **Kit Wolf and Anya Hurlbert, University of Newcastle**

The chromatic contrast between a figure and its surround is a major determinant of its colour appearance. The magnitude of the induced colour change depends non-linearly on the properties of the immediate surround, and is also influenced by the chromaticities of remote surfaces up to 10 degrees distant from the figure (Wachtler & Sejnowski, 2001). We investigated a possible role of such remote fields in 'stabilising' the colour of the figure against local changes in chromatic context. When the colour of the background alone is varied in the direction of increasing L-cone excitation, the colour change induced in the center-square is less than when both background and remote surfaces are L+ shifted. By varying the S-cone contrast between the remote squares we tested the prediction that increasing the number of distinct surfaces in the scene should improve colour constancy (suppress the local contrast induction). For most observers there was no difference between conditions with two or eight distinct colours in the remote context. We also show that segmenting the remote surfaces from the figure by increasing their luminance reduces the contrast suppression. A final experiment attempted to localise the neural mechanisms involved. A Wheatstone viewer was used to present the stimuli haploscopically, the figure and remote context being presented either to the same eye or to different eyes. The effect of the remote context

was identical in both cases, pointing to a binocular site.

Reference:

Wachtler, T., Albright TD, Sejnowski TJ. (2001) Nonlocal interactions in color perception: Nonlinear processing of chromatic signals from remote inducers. *Vis Res.* 41, 1535-1546

POSTERS

Early neural activity and its role in the development of structural and functional organisation of retinal ganglion cells in the turtle

Vandana Mehta and Evelyne Sernagor Department of Neuroscience, School of Neuroscience and Psychiatry, University of Newcastle upon Tyne.

Mature retinal ganglion cells (RGCs) with distinct functional properties have distinct morphologies, leading to the postulate that such structure-function correlation manifests in developing RGCs. Spontaneously arising retinal neural activity is an epigenetic factor critical for the maturation of RGC receptive fields (Sernagor and Grzywacz, 1995). Based on these findings it is hypothesised that embryonic spontaneous activity influences the outgrowth of RGC dendritic trees. To test this hypothesis, the structure-function correlates of developing turtle RGCs were investigated. The study was performed from Stage 23 (S23) when light responses emerge, until 15 weeks post-hatching. RGCs were labelled with Lucifer Yellow using patch electrodes while their responses to light were recorded. The results reveal that immature receptive fields expressed at S23-25 are not homogeneous and do not show a direct correlation with the layout of their dendritic trees. Changes in dendritic morphology during development were also investigated in RGCs back-labelled with the tracer horseradish peroxidase. Following intense dendritic proliferation up to S25, dendritic arbours undergo remodelling, and pruning at ulterior stages. Pruning is significant in large field RGCs. It is concluded that the lack of homogeneity expressed by immature receptive fields originates from sparse synaptic inputs onto the RGCs rather than from the spatial layout of their growing dendritic trees. When spontaneous activity is chronically blocked in vivo with curare, a cholinergic nicotinic antagonist, RGC dendritic growth is inhibited. Conversely, persistent and enhanced spontaneous activity caused by rearing hatchling turtles in the dark (Sernagor and Grzywacz, 1996) induces abnormally strong dendritic proliferation in large field RGCs. It is concluded that immature spontaneous activity promotes dendritic growth in developing RGCs.

Fourier statistics of fruit in foliage - a match with human contrast sensitivity?

C. A. Párraga, T. Troscianko, D. J. Tolhurst

Department of Experimental Psychology, University of Bristol,

The human visual system encodes luminance as a Fourier band-pass function and chrominance as a low-pass function. It is tempting to think that this imbalance reflects a property of the natural world. However, it has been found that there is no such difference between the Fourier luminance and chrominance spectra of a wide variety of natural scenes. If a main task of the chromatic channels is to encode information about fruit in foliage, we asked whether the Fourier properties of such scenes are different from the set of images analysed earlier. We therefore obtained 91 digital images of fruit, and other scenes, using a custom-calibrated digital camera. We analysed these scenes to obtain their luminance and red-green chrominance spectra. The results indicate that scenes containing fruit and foliage have power spectra which are more in keeping with human contrast sensitivity. Chrominance images of these scenes have steeper spectral slopes than luminance images. This is particularly the case when the red fruit occupies more than 10% of the total area of the image, corresponding to relatively close-up viewing. These results suggest that the spatiochromatic properties of human vision optimise the neural representation of scenes containing fruit and leaves.

The Effect of Speed and Time on Induced Motion

K.J. German, J.M. Harris. Department of Psychology, University of Newcastle upon Tyne, Newcastle upon Tyne, UK.

Purpose: In a previous experiment, induced motion in depth was directly compared with induced lateral motion at various speeds. The results indicated no significant effect of type of motion (lateral vs motion in depth) but there was a significant effect for speed: the induction effect decreased with increasing speed. However, time covaried with speed. Here we explore whether this fall off in magnitude is due to time, speed, or both factors. Two experiments are reported: (1) time remains constant whilst manipulating speed; (2) speed remains constant whilst manipulating time. The hypotheses are: (a) if time is the determining factor, then experiment 1 should show no significant decline in magnitude when speed is increased, whereas experiment 2 should show a change in magnitude as time is altered; (b) if speed is the determining factor, then experiment 1 should

show a change in magnitude as speed is increased, whereas experiment 2 should show no significant change in magnitude.

Methods: Observers viewed 3 vertically aligned dots oscillating in one of 2 sets of directions: (a) continuously side to side (lateral motion), or (b) continuously forward and back (motion in depth). Observers fixated the central target dot and performed a nulling task to make the target dot appear stationary. The amount of motion required to null any movement in the target was taken as a measure of the induced motion perceived.

Results: For experiment 1, perceived induced motion ranged from 0% to 90%. The effect of speed was significant: with time constant, the magnitude of induced motion decreased as a function of increasing speed. The effect of type of motion and the interaction of speed and type of motion were not significant. For experiment 2, perceived induced motion ranged from 50% to 80%. The effect of time was not found to be significant: with speed constant, the magnitude of induced motion did not alter significantly as time increased. The effect of motion and the interaction of time and motion were also not significant.

Conclusion: For the parameters used, the results suggest that speed is the predominant factor in the perception of induced motion, whether the motion is lateral or in depth. The results are discussed in relation to the theories of induced motion.

Higher-order statistical structure in colour-opponent representations of natural images

R. J. Paltridge & M. G. A. Thomson

Colour & Imaging Institute, University Of Derby, Kingsway House East, Kingsway, Derby, UK.

It has been suggested that natural scenes must surely display very significant colorimetric redundancy even when down-projected onto computational approximations of the three colour-opponent channels of human vision. For example, the power spectra of red/green-channel natural-image data are hardly more low-pass than that of the corresponding luminance-channel data, a result which seems at odds with human colour contrast-sensitivity (this is essentially low-pass) and which is unlikely to be affected significantly by optical/neural degradation at the retina [1]. Is this high-spatial-frequency data ignored because of limited neural capacities, or is it really predictable from data in the other colour channels? The present work tries to answer this question by analyzing the statistics of a newly developed, high quality database of hyperspectral

images collected in a collaborative project between Aston, Derby and Keele universities. A variety of opponent-channel representations are tested (including spaces derived through characteristic vector analysis), and techniques borrowed from higher-order statistics are used to assess the cross-channel dependencies in a manner which does not depend on the exact power spectra in the three channels. The results imply that data in the three channels become increasingly correlated with increasing spatial frequency. This finding is in line with results reported by Ruderman et al.[3], who observed that whilst spatial edges tend to be co-located in all three channels, the directions of the colour changes at those edges are often independent. We discuss (a) the possible physical basis of these findings in terms of simple generative scene models, and (b) the consequences of these findings for the 'scaleinvariance' property that is often assumed to hold for natural scenes.

[1] C. A. Parraga, G. Brelstaff, T. Troscianko and I. R. Moorhead. Color and luminance information in natural scenes, *J. Opt.Soc.Am.A*, 15(3):563-569, March 1998.

[2] T. A. Yates, M. G. A. Thomson, R. J. Paltridge, S. Westland and S. M. Wuerger. Higher-order Statistics and the Coloured Structure of Natural Scenes, *ECVP2001*, 2001.

[3] D.L. Ruderman, T.W. Cronin and C.C. Chiao. Statistics of Cone Responses to Natural Images : Implications for Visual Coding, *J.Opt.Soc.Am.A*, 15(8):2036-2045, August 1998.

AVA Christmas Meeting

VISIONS OF VISION

Aston University

17 December 2001

This year's AVA Christmas Meeting will take place in Vision Sciences at Aston University on Dec 17th. If you would like to attend you should contact Vicky Heath (v.e.heath@aston.ac.uk) to register. Cheques should be made payable to 'Applied Vision Association' and receipts will be handed out on the day. Overseas visitors can defer payment until the day (sorry, no credit cards) but should still register via e-mail to Vicky.

Registration fees, provisional programme and contact details below.

Programme

Vision Sciences, Aston University
Room G03

10.15 am
Registration in reception of Vision Sciences

10.55 am
Welcome and Introduction

Session 1
11.00 am
Complex scenes, simple neurons, and complex applications
Tom Troscianko, David Tolhurst & C. Alejandro Parraga

11.30 am
Local image structure, metamerism, norms and natural image statistics
Lewis D. Griffin

11.45 am
Boundary extension in a virtual world
Ian M. Thornton & Chris G. Christou

12.00 noon

Pre-attentive segmentation and correspondence in stereo

Zhaoping Li

12.15 pm

Seeing edge blur: receptive fields as multi-scale neural templates

Mark Georgeson

12.30 pm

Rod contribution to colour appearance

Lindsay MacDonald, Young-Shin Kwak & M. Ronnier Luo

12.45 - 1.30 pm

Lunch and posters

Session 2

1.30 pm

Revealing perception and action pathways in normal vision: clutching at straws?

Peter Thompson & Andrew Dunn

2.00 pm

Stereomotion speed discrimination at multiple disparity pedestals

Kevin R. Brooks & Lee S. Stone

2.15 pm

Detection of 3-D motion is predicted from probability summation of mechanisms sensitive to lateral motion and motion in depth

Julie M. Harris & Jane H. Sumnall

2.30 pm

A non-orthogonal basis-set for orthogonal components of complex motion

Tim. S. Meese, Shazia Malik, & Clare Wildey

2.45 pm

Global motion mediated by a red-green mechanism

Alexa I. Ruppertsberg, Sophie M. Wuerger & Marco Bertamini

3.00 pm

Fragmenting the barber pole illusion

Johannes M. Zanker

3.15 - 3.45 pm

Tea, coffee and posters

Session 3

3.45 pm

Interactions between visual stimuli across the visual field

Robert J. Snowden

4.15 pm

Integration of spatial frequency signals in visual search

Michael J Wright & Louise Alston

4.30 pm

The eyes can search large displays more effectively than small ones:
an oculomotor paradox?

Eugene McSorley & John M. Findlay

4.45 pm

The shape of orientation pop-out

Ariella Popple & Yury Petrov

5.00 pm

Motion vs. position in the perception of head-centred movement

Tom C. A. Freeman & Jane H. Sumnall

5.15 onwards

Posters and wine

Speed, accuracy and performance in visual search

Adam Reeves & Nayantara Santhi

Dynamic visual processes in normal reading: Implications for
developmental dyslexia?

Kristen Pammer, Ruth Lavis & Piers Cornelissen

How do task demands influence human gaze shifts in a 3-D scene?

Andrew E Welchman & Julie M Harris

Variations in perceptual changes viewing an ambiguous stimulus:
methodological difficulties

G. A. Hamilton, S. Wilson, & Paul A. Goddard

Variations in perceptual changes viewing an ambiguous stimulus:
differences between naive and experienced observers

Paul A. Goddard, G. A. Hamilton & S. Wilson

Pattern-contingent colour aftereffects are formed at a subconscious level
Archil Kezeli, Irakli Intskirveli, Manana Chomeriki, Natela Lomashvili
& Megi Sharikadze

Color sensitivity function and specific visual adaptation

Maka Malania, David Janelidze & Maia Rionishvili

Trade stands (all day)

CRS

TrackSys

REGISTRATION FEES

AVA member £10 (student), £15 (regular)

Non-member £15 (student), £25 (regular)

Neurosciences Research Institute

Aston University

Aston Triangle

Birmingham

B4 7ET UK

For more information contact:

Dr Tim Meese

t.s.meese@aston.ac.uk

AVA Annual Meeting and AGM College of Optometrists, London 27 March 2002

Meeting theme: Achromatic Vision

The Geoffrey J. Burton memorial lecture will be given by:

**Professor Mark Georgeson,
Aston University**

CALL FOR PAPERS

Abstracts (up to 400 words) for paper or poster presentation from potential contributors are requested.

Deadline for submission of abstracts: 27 February 2002

For more information contact:

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Psychology and SLT,
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Dr Richard Jones,
G030 A50, Sensory Systems ,
Protection and Performance Department, CHS,
QinetiQ,
Farnborough,
Hampshire ,
GU14 0LX.
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AVA books for sale

The AVA still has a number of new books for sale from conferences that it has organised over the years.

Payment can be by credit cards (***yes we can now accept them!***) cheque or postal order in UK pounds to "Applied Vision Association". Send your payment with the order to:

AVA Secretariat,
Applied Vision Association,
College of Optometrists,
42 Craven Street,
London WC2N 5NG.

Books available:

The cost for each book is £15 (including postage in the UK) for AVA members or £20 for non-AVA members. If you are outside the UK then add £5 per book to each of the prices above.

Gale, A.S., Astley, S.M., Dance, D.R. and Cairns, A.Y. (1994) **Digital Mammography**. Elsevier (424 pages).

Gale, A.S., Brown, I.D., Haslegrave, C.M., Krusysse, H.W. and Taylor, S.P. (1993) **Vision in Vehicles IV**. North Holland (355 pages).

Brogan, D., Gale, A. and Carr, K. (1993) **Visual Search 2**. Taylor and Francis (477 pages).

The cost of the Dalton conference book is £43 (including postage in the UK) for AVA members or £48 for non-AVA members. If you are outside the UK then add £5 per book.

Dickinson, C., Murray, I. and Carden, D. (1996) **John Dalton's Colour Vision Legacy**. Taylor and Francis (784 pages).



Selected References



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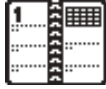
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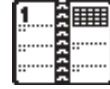
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This is the last time that Chris Dickinson will be supplying references for the AVA bulletin. We'd like to thank Chris for her contributions over the years and for pointing us toward papers we would otherwise not have found.

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Meetings Calendar



2001

December 17 AVA Christmas Meeting, Aston University
Contact: t.s.meese@aston.ac.uk

2002

March 27 AVA Annual Meeting and AGM
College of Optometrists London
Contact: mcase@dmu.ac.uk

May 5-10 ARVO, Ft Lauderdale, FL.
<http://www.arvo.org>

August 25-29 ECVP, Glasgow, Scotland
<http://www.ecvp.org>

September 11-12 Optical Performance of the Eye, UMIST
<http://www.umist.ac.uk/optometry/conference.htm>