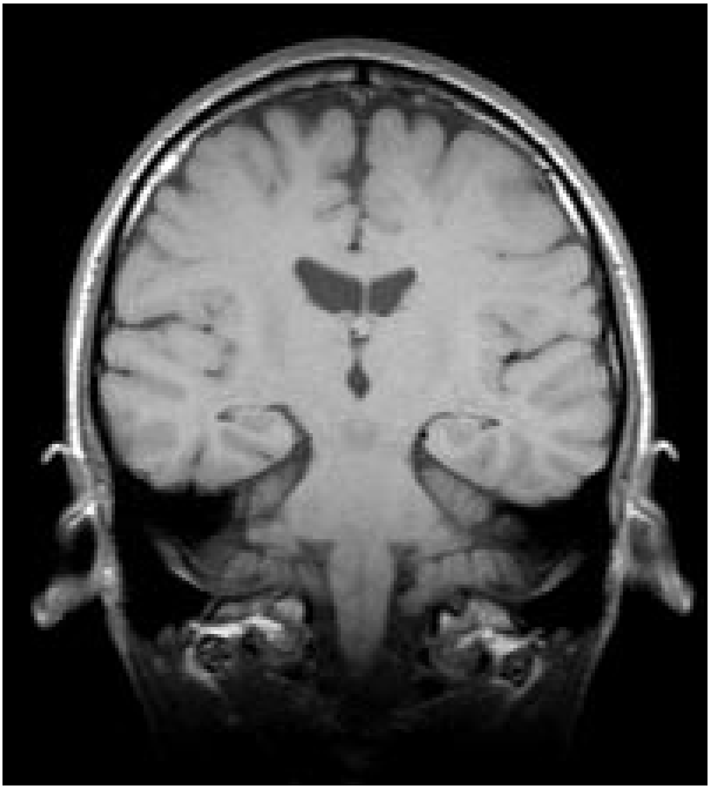
vision

Bulletin of the Applied Vision Association



AVA/Colour Group Postgraduate meeting abstracts and meeting report
AVA 2000 - London call for papers
References on Vision

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APPLIED VISION ASSOCIATION

APPLIED VISION ASSOCIATION
42 CRAVEN STREET
LONDON WC2N 5NG
Tel: 0207-839-6000 Fax: 0207-839-6800

ava@college-optometrists.org

THE APPLIED VISION ASSOCIATION IS A REGISTERED CHARITY NO: 1049146

COMMITTEE OF MANAGEMENT

Dr Graham Edgar, Sowerby Research Centre, British Aerospace PLC, FPC 267, P.O.Box 5, Filton, Bristol BS12 7QW.
Tel:0117 9366192 Fax: 0117 9363733
email: graham.edgar@src.bae.co.uk

Dr Mark Bradshaw, University of Surrey.
Tel: 01483 300800 x3014 Fax: 01483 532813
email: M.Bradshaw@surrey.ac.uk

Dr Sarah Waugh, University of Aston
Tel: 0121 359 3611 ext 5425
email: s.j.waugh@aston.ac.uk

Mr Andrew Welchman, University of Newcastle
email: A.E.Welchman@ncl.ac.uk

AVA Secretariat: Mr Nick de Brunner, College of Optometrists
Tel: 0171 839 6000 Fax: 0171 839 6800
email: ndebrunner@college-optometrists.org

AVA CORPORATE MEMBERS:

Data Cell Ltd., S C House, Van Wall Business Park, Maidenhead, Berks., SL6 4UB. Contact: Mr Giles Doe.

Institute for Human Factors TNO, P.O.Box 23, 3769 ZG Soesterberg, The Netherlands. Contact: Dr A van Meeteren.

National Illumination Committee of Great Britain, c/o CIBSE, Delta House, 222 Balham High Road, London SW12 9BS.

Dutch Working Group Ergophthalmology, c/o NORI, Meibergdreef 47, 1105 BA, Amsterdam, The Netherlands. Contact: Dr T. J. T. van den Berg.

Pilkington Optronics, Glascoed Rd.,St Asaph, Denbighshire, LL17 0LL Contact: Mr J. Foley.

Sowerby Research Centre, British Aerospace, P.O.Box 5, Filton, Bristol BS12 7QW. Contact: Dr KT.Carr.

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://hc.les.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 1999/2000 will be as follows: ordinary members £18, student members £9. Those members who pay by standing order for the AVA and Ophthalmic and Physiological Optics please check that the correct amount is being paid to the AVA.

Editorial

This issue of the Bulletin contains abstracts and a meeting report from the AVA/Colour Group postgraduate meeting held at City University. This issue also announces that the 2000 Geoffrey J Burton lecture will be given by Professor Andy Smith at the AVA Annual Meeting in March. We enclose a call for papers for that meeting. 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 - 14th February 2000

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:

29th February 2000

for conferences held between 1st March 2000 and 28th February 2001.

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 Annual Meeting and AGM
Motion Perception and Imaging

Wednesday 15th March 2000
College of Optometrists, London

Call for Papers

Applied Vision Association (UK) invite Paper and Poster presentations for a special One-Day Conference on motion perception and imaging.

We invite papers/posters in the following areas:
1) Motion perception (psychophysics, neurophysiology, modelling)
2) Imaging studies (fMRI, PET, MEG, VEPs not just confined to motion)
3) Open contributions on any aspect of pure or applied vision will also be considered.

and including the:

GEOFFREY J. BURTON MEMORIAL LECTURE

Professor A.T. Smith
Department of Psychology, Royal Holloway, London
"fMRI studies of the human visual cortex"

The meeting will also include the Annual General Meeting of The Applied Vision Association.

Abstracts will be published in the journal "Spatial Vision".

Applications, in the form of a 250 word abstract, should be sent to Dr Mark Scase, Dept Human Communication, De Montfort University, Leicester, LE7 9SU either by post or emailed to mscase@dmu.ac.uk

Before 31 January 2000

Further information can be obtained from Mark Scase or Patrick Ward (mscase@dmu.ac.uk or paward@dera.gov.uk)

Registration is £25 for non AVA members and £16 for members (£15 and £10 for students) which includes refreshments and lunch.

For more information and details on AVA membership see:
http://www.dmu.ac.uk/ava/

For further details please contact :-
Dr Mark Scase,
Department Human Communication,
De Montfort University,
Scraptoft,
Leicester,
LE7 9SU.
e-mail: mscase@dmu.ac.uk
Tel: [+44] (0116) 257 7811 (direct line)
Fax: [+44] (0116) 257 7767

or

Dr Patrick Ward,
CHS,
DERA,
Farnborough,
Hampshire,
GU14 0LX.
e-mail: paward@dera.gov.uk
Tel : [+44] (01252) 39 3583
Fax: [+44] (01252) 39 2097

AVA & Colour Group Post-Graduate Meeting

Wednesday 10th November 1999
City University, London
1:30-5:40pm
Abstracts and Meeting Report

Guest Speaker
Professor Alan Cowey, FRS, Oxford University

"Evidence for implicit processing of colour in blindsight and in cortical colour blindness"

The AVA and Colour Group decided to give 2 prizes, one of £100 for the best talk and another of £100 for the best poster. The presentation standard overall was very high but eventually the judges came to a decision. The prizes were awarded to Paul Morrill and Andrew Welchman.

Timetable
13.30 Registration

14.00 Sumner & Mollon
Chromaticity as a signal of ripeness in fruits taken by primates

14.20 Barbieri & Georgeson
The role of spatial derivatives in visual coding of edges.

14.40 Walton, Levitt & Lund
Visuotopic organisation of feedback connections from area V5/MT to areas V3 and V1 of Macaque

15.00 Professor Alan Cowey
Evidence for implicit processing of colour in blindsight and in cortical colour blindness

15.45 Granville Tea & Posters:

Hebb, Fowler, Clisby & Stein

Tinted filters in reading

Tuck & Cornelissen
The time dependent effects of motion detection and attention on a lexical decision task

Welchman & Harris
Disappearing tricks: How the area of surrounding texture affects perceptual fading

Powell & Georgeson
Motion Opponency in Motion Detection

Párraga, Tolhurst & Troscianko
Are we optimised to perceive natural images?

Ozgen & Davies
Acquisition of categorical colour perception

Pilling
Effect of duration of inter-stimulus interval in the coding of colour in delayed matching tasks

16.30 Morrill & Barrett
Does high spatial frequency processing take longer?

16.50 Walkey, Barbur, Harlow & Makous
Chromatic Sensitivity in the Mesopic Range.

17.10 Watt & Bradshaw
Binocular disparity and scene-based pictorial cues in the control of prehension

17.40 Prize announcement

Meeting close

Abstracts

Chromaticity as a signal of ripeness in fruits taken by primates

Petroc Sumner, J D Mollon

Dept. Experimental Psychology, Downing Street, Cambridge CB2 3EB.
email: gphs100@cam.ac.uk

It has previously been reported that the trichromacy of primates is optimized for the natural visual search task of finding fruits in the forest canopy (Regan et al. 1998; Sumner and Mollon, 1999 Colour Group January meeting). Sumner and Mollon reported also that primate trichromacy is optimized for finding young leaves, and that it is the spectral properties not of the particular targets, but of the mature leaf background that determines what photopigments are optimal for detecting the target leaves or fruits. Here we turn to the separate task of discriminating ripe fruits from unripe. We have measured the reflectance spectra of many samples of fruit eaten by chimpanzees and three frugivorous monkey species. If the fruit are plotted in a colour space appropriate for catarrhine primates, several distinct ripening patterns are evident. The degree of ripeness of many species would be discernible by dichromatic primates, but for most fruit a trichromatic consumer would be at an advantage. However, by calculating which set of possible pigments would maximise the chromatic distance between samples of each fruit species, we show that the spectral positions of the primate long- (L) and middle-wave (M) cones are not optimised for this task.

The role of spatial derivatives in visual coding of edges.

Gillian Barbieri & Mark Georgeson

School of Psychology, University of Birmingham
email: G.S.A.Barbieri@bham.ac.uk

In machine vision, the usual definition of an edge is a point at which intensity changes most steeply across space. These edge points can be located by finding a peak in the (smoothed) gradient magnitude or first derivative or by finding zero-crossings (ZCs) in the second derivative.

Our previous psychophysical work supports the use of local derivatives of luminance for locating edges in human vision, but does not distinguish

between locating edges at a peak in the (smoothed) gradient magnitude or 1st derivative or at zero- crossings in the 2nd derivatives. We presented stimuli that consisted of a uniform ramp of luminance (i.e. constant gradient) with a localised region of gradient change either added to or subtracted from the ramp. This localised gradient increment or decrement always gives a ZC in the 2nd derivative, and corresponds to a gradient maximum for increments but a gradient minimum for decrements. The threshold for detecting a gradient change was nearly constant, irrespective of the background gradient, unlike the detection of luminance and contrast changes which follow a Weber-like law. This insensitivity to the background gradient is more consistent with detection based on a 2nd derivative representation than one based on the 1st derivative. However, we also found that subjects could reliably distinguish between increments and decrements of gradient change near threshold. Increments were classified as a single edge while the decrements contained multiple features, even though the shapes of their 2nd (and higher) derivatives are the same. Thus analysis of spatial structure cannot be based on the 2nd (or higher) derivatives alone.

Does High Spatial Frequency Processing Take Longer?

Paul Morrill & Brendan T. Barrett
Dept. of Optometry, University of Bradford, Richmond Road, Bradford, BD7 1DP
email: p.morrill@Bradford.ac.uk

Introduction: There is evidence to suggest that neural processing is slower for high spatial frequencies relative to low spatial frequencies. An opposing view is that, once differences in stimulus visibility are accounted for, extra time is not required for processing of targets containing higher spatial frequencies. This study investigates the effects of exposure duration upon position thresholds measured with narrowband stimuli. **Methods:** Vernier thresholds were measured in three subjects using abutting sinusoidal gratings with spatial frequencies of 1, 2, 4 & 8c/deg for a range of contrasts (0.025-0.8) and exposure durations (55-2400msec). In addition, contrast detection thresholds were determined for each spatial frequency for the same range of exposure durations. The contrast of the gratings was scaled according to the detection threshold for that exposure duration. This enabled the effect of exposure duration upon Vernier performance for equally visible targets to be examined. **Results:** When Vernier thresholds are plotted against target visibility in contrast threshold units (grating-contrast /detection threshold), data for the different exposure durations collapse to form single function. The average slope of the best fitting functions was -0.47 +-0.05 and did not differ significantly across spatial frequency or between subjects. Exposure duration was found to have little effect upon Vernier performance for equally visible sinusoidal targets. **Conclusions:** The results suggest that the improvment in performance which arises from the use of longer exposure durations can be accounted for by increased target visibility. This implies that longer processing times are not required to extract relative positional information from targets containing higher spatial frequencies.

Chromatic Sensitivity In The Mesopic Range

Walkey H.C, Barbur J.L, Harlow J.A. & *Makous W.

Applied Vision Research Centre, City University, London, U.K.
*Center for Visual Science, University of Rochester, Rochester, N.Y.
email: h.c.walkey@city.ac.uk

Purpose: The aim of this study was to investigate how chromatic sensitivity changes with retinal illuminance. **Methods:** We measured chromatic discrimination thresholds for 18 directions of colour space. Measurements were obtained for a 2.0° square stimulus, presented foveally and at 3.5° eccentricity on a uniform background field. Dynamic luminance contrast and light flux techniques were employed to mask the detection of photopic and scotopic luminance contrast signals caused by the onset of a chromatic change. The test was carried out after dark adaptation for background luminances in the range 45 to 0.004 cd m^{-2}. Thresholds were also obtained at 3.5° with a background luminance of 0.09 cdm^{-2}, on the cone plateau of the dark adaptation curve. **Results:** Reduction of retinal illuminance produced non-uniform elevation of chromatic detection thresholds. The greatest elevation was along the tritan axis (with a doubling of ellipticity over the range of light levels investigated). The measurements of chromatic sensitivity following either complete dark adaptation or during the cone plateau phase of the dark adaptation curve yielded essentially the same results. **Conclusions:** The results reveal a loss of chromatic sensitivity in the mesopic range affecting preferentially the blue-yellow axis. This preferential loss of blue-yellow sensitivity, could be due to S-cone signals only operating in the Weber region for higher levels of S-cone excitation. The cone plateau measurements suggest that rod signals have little or no influence on chromatic sensitivity in the near periphery.

Binocular disparity and scene-based pictorial cues in the control of prehension

Simon Watt and Mark Bradshaw

Department of Psychology, University of Surrey Guildford, Surrey, GU2 5XH
email: s.watt@surrey.ac.uk

Binocular cues are typically considered to be pre-eminent in the control of reaching and grasping behaviour. However, in the absence of such information, prehension movements can still be accurate and reliable. The present study therefore assessed the contribution of both binocular information and scene-based pictorial information in the control of human reaching and grasping movements**. Methods**. Participants reached for and picked up objects under binocular and monocular viewing, both in the absence of a visible scene around the target objects (complete darkness with 'self-illuminated' objects), and under normal (fully illuminated) viewing. Analysis of kinematic parameters indicated that the absence of scene-based information severely disrupted both the transport component and the grasp component of the reach. In these conditions, movements reached lower peak velocities, showed an extended deceleration period and resulted in larger peak grip apertures. Removal of binocular information, in contrast, did not significantly affect the major indices of the transport component, although it did affect the grasp component. The systematic bias in performance caused by the manipulation of the available visual cues may also be consistent with the adoption of a more conservative 'strategy' by the visual system in response to perturbation of the input. **Conclusions.** Our results suggest that information in the surrounding scene affects both the transport and the grasp components of the reach, whereas binocular information is more important in the control of grasp formation. It is concluded that in normal viewing conditions, reaching and grasping movements are less dependent on binocular information than has previously been thought.

Are we optimised to perceive natural images?
C.A. Parraga, D.J. Tolhurst* & T. Troscianko

Department of Experimental Psychology, 8 Woodland Road, Bristol BS8 1TN
*Department of Physiology, Downing Street, Cambridge CB2 3EG
email: Alej.Parraga@bristol.ac.uk

It is often argued that the visual system must be optimised (by evolution and by neonatal adaptation) to encode the information in the natural visual environment. We have tried to test this proposition psychophysically by comparing people's discrimination thresholds for small spatial changes in natural and unnatural visual stimuli. **Methods.** Systematic sequences of natural visual stimuli were made by "morphing" one monochrome digitised photograph step-by-step into another. People with normal vision measured their thresholds for discriminating between morphed stimuli in a two-alternative forced-choice experiment; a staircase procedure sought how large a morphing change was needed for the observer to discriminate between a reference and a test stimulus on 75% of trials (Tolhurst et al., 1998). **Results.** In the control condition, each stimulus in the experiment could potentially have been a photograph of a truly natural scene, and people were able to discriminate spatial changes in the scenes of about 0.5-2%. The stimuli were made unnatural in a systematic way by changing the slopes of their power spectra. When the spectral slopes were made shallower than normal (image whitening) or steeper than normal (blurring), the discrimination thresholds increased. **Conclusions.** This seems to be a direct confirmation, at least in the domain of second-order statistics, that the human visual system is optimised for dealing with natural as opposed to unnatural stimuli. A preliminary computational model of the discrimination process was based on the fact that the visual cortex contains simple cells which have a spatial-frequency bandwidth of about 1-1.5 octaves. This simple model of low-level processes in the visual system was surprisingly effective at explaining the forms of the relationships between discrimination threshold and spectral slope, and the ways that these differed between picture sets and observers.

Supported by the MRC.

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Motion Opponency in Motion Detection.

Edward Powell & Mark Georgeson,

School of Psychology, University of Birmingham
email:E.J.Powell@bham.ac.uk

Several models of motion detection (e.g. Adelson & Bergen, 1985; Simoncelli & Heeger, 1998) incorporate an opponent stage of analysis, in which motion direction is coded by the difference in output between opposite (e.g. leftward and rightward) detectors. This paper provides psychophysical evidence for such a process. A two-alternative forced-choice staircase procedure was used to measure contrast thresholds for moving sinewave gratings (0.5 c/deg, 8 or 20 Hz drift rate) in the presence of a counterphase flickering mask. Low contrast maskers made movement detection easier (facilitation) while higher contrast masks made it more difficult (masking), resulting in a characteristic dipper-shaped threshold function. Importantly, sensitivity to motion depended on the difference between opposite motion signals. A motion energy model that incorporates motion opponency and a divisive gain control successfully predicts both unmasked detection and masked discrimination performance.

Acquisition of categorical colour perception.

Emre Ozgen and Ian R. L. Davies

Department of Psychology, University of Surrey Guildford, UK.
email: Emre.Ozgen@surrey.ac.uk

Colour perception shows categorical effects: within category discriminations are harder than equivalent cross-category discriminations. In two experiments we explored the development of such categorical effects by training subjects to divide a well-learned category (blue or green) into two. After three days training subjects showed categorical effects on a same-different judgement task that were restricted to the colours they trained on. In experiment three, the categorical effect was eliminated by using verbal interference in the ISI, but not by visual interference, possibly implicating verbal coding in the categorical effect.

Effect of duration of inter-stimulus interval in the coding of colour in delayed matching tasks.

Michael Pilling.

Psychology Department, University of Surrey, Guildford. GU2 5XH.
email: M.Pilling@Surrey.AC.UK

Subjects did a same-different judgment task under two sets of matching instructions, judging if two colours had the same name (name match) and judging if the stimuli were physically identical (physical match). Under name match instructions, identical pairs (A-A) were identified as same more quickly than non-identical (A-a) p rs. This effect was strongest for simultaneous presentation and declined to zero with a 5000ms ISI. These results parallel those found by Posner et. al. (1969), for letter stimuli. Under physical match instructions, same category (A-a) pairs were recognised as different more accurately than different category pairs (A-B) even though the perceptual distances were equated. This tendency was found to be strongest with longer ISI's. This result is interpreted as demonstrating the existence of two codes in colour memory with different characteristics, a transient physical code and a more durable but less precise categorical code.

It's that ole' devil called "Tinted Filter's in reading" again!

G S Hebb *1, Mrs Sue Fowler *1, Mrs Christine Clisby *2, Professor J F Stein *1

*1: University Laboratory of Physiology, Parks Road, Oxford OX1 3PT, UK
*2: The Learning Difficulties Research Clinic, c/o Orthoptic Department, The Royal Berkshire Hospital, Reading, RG1 5AN
email: gillian.hebb@physiol.ox.ac.uk

Dyslexics often complain that letters appear to blur and move around. Magnocellular function is thought to be reduced in Dyslexia. Magno cells help control eye movements. Often Dyslexics' binocular control is poor, contributing to unsteady viewing and visual reading errors. Tinted lens use for reading disability is well reported. It commenced with no scientific backing in the 1980's. Irlen lenses, the associated scotopic sensitivity syndrome, and associated claims have not been thoroughly confirmed, or refuted yet. Three cone types, and four colours in colour opponency, suggest any benefit from colour overlays / glasses ought to be achievable using simply either yellow, blue, green or red filters. Yellow filters may increase contrast. Hence blue filters (negative yellow) may reduce contrast. Dyslexics reporting the illusion of visual motion whilst reading prefer blue filters. Our results suggest, children who have worn blue lenses >1 year (Old Blue's) have a significantly higher blue/yellow contrast sensitivity function compared to controls ($P = 0.05$). Blue filters significantly reduced Old Blue's ability to detect motion compared to controls ($P = 0.02$). Many Old Blue's no longer report the illusion of visual motion whilst reading, suggesting that the beneficial effect occurred soon after commencing the treatment. To elucidate the effect of blue lenses, children commencing blue lens /overlay treatment (New Blue's) had their blue/yellow and luminance contrast sensitivity (chromatic & achromatic), motion detection, and fixation stability tested at baseline and 3 months. Data for controls retested after six months will be presented.

The Time Dependent Effects Of Motion Detection And Attention On A Lexical Decision Task

Val Tuck, Ruth Lavis & Piers Cornelissen

Department of Psychology, Ridley Building, University of Newcastle upon Tyne NE1 7RU
email: v.l.tuck@ncl.ac.uk

The effects of motion detection thresholds and attentional speed on a word recognition task were investigated using 48 undergraduate/graduate subjects. All subjects carried out a random dot coherent motion detection task, an attentional blink task and a time course lexical decision task involving 5 stimulus exposure durations ranging from 40 – 80msecs. Subjects also undertook a set of psychological tests. Logistic regression analysis revealed that low motion detection thresholds and fast attentional speed were predictive of high scores on the lexical decision task. These effects varied across stimulus exposure durations and a time dependent interaction was also indicated. Such findings may be crucial to the understanding of certain reading disabilities.

How does the area of surrounding texture affect perceptual fading?

Andrew E Welchman & Julie M Harris

Department of Psychology, Ridley Building, University of Newcastle upon Tyne, NE1 7RU
email: a.e.welchman@ncl.ac.uk

A small grey peripheral target embedded within a dynamic random noise surround perceptually fades from view following around 10 seconds of steady fixation (Ramachandran & Gregory, 1991). We wished to examine the extent to which long-range interactions might be involved in the processing underlying this phenomenon. We presented a $2.25deg^2$ square target in a surrounding texture ranging in total size from 3 to $130deg^2$ to determine the effects on the time taken for perceptual disappearance of the target. We examined fading for two types of target – one differing from the surround in texture, the other differing in coherence of motion. Time-to-fade was found to increase as the area of the surrounding texture increased. In other words, a target surrounded by a small area of texture faded from view faster than a target surrounded by a full screen of texture. The type of target affected the magnitude of the effect (motion targets disappear faster than difference of texture targets), but produced similar functions. The result suggests that the mechanisms responsible for fading are quite spatially extensive. We offer two levels of explanation for the results, one in terms of on-centre, off-surround contrast detection of the target in the periphery, and the other in terms of figure-ground segmentation.

Meeting Report

The Department of Optometry and Visual Science at City University played host to the joint AVA/Colour Group Postgraduate Meeting, held on Wednesday November the 10th 1999. The meeting was well supported with 48 delegates attending. Five papers, and six posters were presented by postgraduates from a wide variety of institutions.

The Guest Lecture was given by Professor Alan Cowey, FRS, from the University of Oxford. In what proved a fascinating talk, Professor Cowey discussed evidence from a variety of neurological studies for the implicit processing of colour in blindsight and cortical colour blindness. In keeping with the broad interests of this joint meeting, the lecture provoked questions ranging from technical aspects of the studies presented, right through to more general issues in interpreting evidence from neurological patients.

The diversity of interests represented was also reflected in the postgraduate talks, which covered an array of topics including whether the trichromacy of primates is optimised for detecting ripe fruits, spatial derivatives in the visual coding of edges, chromatic sensitivity in the mesopic range, and binocular disparity in the control of prehension movements.

The prize for best talk however, was awarded to Paul Morrill from the University of Bradford for his paper entitled, "Does high spatial frequency processing take longer?". He reported that once differences in target visibility were taken into account, Vernier performance did not improve with increasing stimulus duration, nor did it differ significantly with spatial frequency, leading him to suggest that the extraction of relative spatial information from higher spatial frequency targets does not require longer processing times.

The poster presentations took place during afternoon tea, and once again the contributions spanned a wide range of topics including such diverse contributions as psychophysical evidence for motion opponency in motion detection, and a study reporting changes in categorical colour perception as a result of training.

The prize for best poster was awarded to Andrew Welchman from the University of Newcastle upon Tyne for his presentation entitled, "Disappearing tricks: how the area of surrounding texture affects perceptual fading.". He found that perceptual fading of a peripherally presented motion or texture defined patch occurred more slowly as the area of the surrounding texture increased, leading him to argue that the mechanisms responsible for this effect are not based only on local interactions at texture borders, but are spatially extensive.

The great variety of presentations and the high standard of the talks and posters made this a very enjoyable and stimulating meeting. Personally, I found that the opportunity to present my work in a friendly atmosphere, coupled with some incisive questioning, made the meeting very worthwhile.

Lively discussion continued after the talks, and many of us then retired to a local hostelry where I am happy to report that some of the prize money was redistributed.

Many thanks to Anya Hurlbert and Andrew Welchman for their efforts in planning this successful meeting and to Professor John Barbur and Vicki Brearley for organising events on the day.

Simon Watt
University of Surrey

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 cheque or postal order in UK pounds (sorry, no credit cards) 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., Kruysse, 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.

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References supplied (as usual!) by:

Chris Dickinson
MJCCMD@fs1.op.umist.ac.uk

Meetings Calendar

2000

March 15	AVA 2000 Annual meeting and AGM, London Abstract deadline: 31st January 2000 Email: mscase@dmu.ac.uk
April 28-29	Functional Brain Imaging in Vision Ft Lauderdale, Florida, USA Abstract deadline: 1st February 2000 http://www.elsevier.com/locate/vision2000
April 30-May 5	ARVO Ft Lauderdale, Florida, USA Abstract deadline: 3rd December 1999 http://www.faseb.org/arvo
August 27-31	ECVP Groningen, The Netherlands Abstract deadline: 1st March 2000 http://ecvp.med.rug.nl
September 15	AVA Natural Images 3, Bristol Abstract deadline: 4th August 2000 contact: I_Moorhead@dera.gov.uk
November 4-9	Society for Neuroscience New Orleans, LA http://www.sfn.org