



READING MEETING

9-11 JULY 2003

A scientific meeting will be held at the School of Psychology, University of Reading on 9-11 July, 2003. The local organiser will be Dr Elizabeth Gaffan.

Thirty-first Bartlett Lecture

Professor Morris Moscovitch (University of Toronto)

The hippocampal complex as a memory module: Implications for research and theory on recent and remote memory

The Bartlett Lecture will take place at 5.30pm, Thursday 10 July in the Madejski Lecture Theatre, Agriculture Building, Earley Gate.

Symposia:

Thursday 10 July 9.00-12.00

Neuropsychology of Memory

Organisers: Dr W Koutstaal and Dr J Ward

Friday 11 July 9.30-1.00

Early language and its precursors: Domain-general processes

Organiser: Dr G Schafer

Poster Session:

Will be held on Thursday 10 July, at 4.00pm in Room G31, School of Psychology, with refreshments. Delegates may put up posters from midday on Thursday and take them down by 5.30pm.

Platform Presentations

Sessions will be held in the Agriculture Building, Earley Gate, in the Nike Lecture Theatre and Room 1L04. Both theatres have OHPs and data projectors for Powerpoint presentations. Presenters may provide their own laptops and connector leads, or bring 3.5" Windows/DOS formatted floppy disks or CDs for the on-site computers which run Powerpoint 2000 under Windows. Any queries about facilities in the theatres should be sent to the local organiser, Elizabeth Gaffan, (e.a.gaffan@reading.ac.uk).

Coffee will be served in the Student Common Room, lower ground floor, Agriculture Building, except for Thursday 10 July at 3.30pm when it will be served in Room G31, School of Psychology where the Poster Session is being held.

Receptions and Conference Dinner

The School of Psychology welcomes EPS delegates to a free wine reception on Wednesday 9 July, from 6pm, room G31, Psychology Building

There will be a drinks reception at 6.30pm on Thursday evening in G31 and the Quadrangle, School of Psychology. The conference dinner will be at 7.30 for 7.45 at Pepe Sale. A coach to the Restaurant will leave the car park outside the School of Psychology at 7.20pm. A booking form for the dinner is enclosed.

START OF PARALLEL SESSIONS

*Session A***Nike Lecture Theatre, Agriculture Building**

- 2.00 **Jason J Braithwaite***, **Glyn W Humphreys** and **Johan Hulleman***
(Behavioural Brain Sciences Centre, University of Birmingham)
Probing distractor inhibition in preview search: A role for grouping
and inhibition revealed via a luminance probe technique
- 2.30 **Guy Mizon*** and **Nilli Lavie*** (University of Exeter and University
College London) (Introduced by Stephen Monsell)
Engaging inhibition in one task leads to increased distraction in
another.
- 3.00 **Robert J Houghton***, **William J Macken*** and **Dylan M Jones**
(Cardiff University)
Non-visual attention can modulate unrelated visual motion processing.
- 3.30 TEA
- 4.00 **M Jane Riddoch**, **Glyn W Humphreys**, **Sarah Jacobson***, **Graham
Pluck***, **Andrew Bateman*** and **Martin Edwards*** (Behavioural
Brain Sciences, University of Birmingham)
Impaired orientation discrimination and localisation following parietal
damage: On the interplay between dorsal and ventral processes in
visual perception
- 4.30 **Adam Galpin*** and **Geoffrey Underwood** (University of
Nottingham)
Detecting visual anomalies: Eye movements in comparative visual
search
- 5.00 **John P Wann** and **Richard M Wilkie*** (University of Reading)
The what, where and when of high speed steering
- 5.30 Business Meeting (Nike Lecture Theatre, Agriculture Building)
- 6.00 DRINKS RECEPTION (Room G31, School of Psychology)

START OF PARALLEL SESSIONS

Session B

Room 1L04, Agriculture Building

- 2.00 **Ruth Filik*, Kevin Paterson and Simon Liversedge** (University of Derby and University of Durham)
Parsing with focus particles in context
- 2.30 **Timothy Jordan and Geoffrey Patching*** (University of Nottingham)
Using adaptation to determine the role of different spatial frequencies in perception of words, pseudowords, and nonwords
- 3.00 **Geoffrey Patching* and Timothy Jordan** (University of Nottingham)
Assessing the role of different spatial frequencies in word perception by good and poor readers.
- 3.30 TEA
- 4.00 **Sharon Thomas* and Timothy Jordan** (University of Nottingham)
Using repetition priming to investigate visual and audiovisual speech recognition
- 4.30 **Michal Lavidor, Richard Shillcock, Padraic Monaghan*, Martin Meyer*, Adam McNamara* and Andrew W Ellis** (University of Hull, University of Edinburgh, University of Warwick and University of York)
Neural substrates of orthographic neighbourhood effects in visual word recognition.
- 5.00 **Stephen R Welbourne* and Matthew A Lambon Ralph** (University of Manchester)
Subtracting subtractivity? A connectionist account of recovery in single word reading following brain damage.
- 5.30 Business Meeting (Nike Lecture Theatre, Agriculture Building)
- 6.00 DRINKS RECEPTION (Room G31, School of Psychology)

*Session A***Nike Lecture Theatre, Agriculture Building****Symposium: Neuropsychology of Memory**

Organisers: Wilma Koutstaal and Jamie Ward

- 9.00 **J-C Baron*** (Department of Neurology, University of Cambridge)
Mapping the neural substrates of memory impairment in neurological disorders
- 9.30 **A R Mayes** (University of Liverpool)
The neural bases of familiarity and recollection
- 10.00 **M D Kopelman** (Neuropsychiatry and Memory Disorders Clinic,
Guy's and St Thomas's Hospitals, London)
Retrograde amnesia in episodic and semantic memory
- 10.30 COFFEE
- 11.00 **K S Graham, A Kropelnicki*, K Patterson, N Kapur and J R
Hodges** (MRC Cognition and Brain Sciences Unit, Cambridge and
Department. of Clinical Neuropsychology, Wessex Neurological
Centre, Southampton)
Knowledge of vocabulary in patients with focal lesions to the medial
temporal lobe
- 11.30 **A E Budson*** (Division of Cognitive and Behavioral Neurology,
Brigham and Women's Hospital and Harvard Medical School, Boston,
USA)
False recognition in Alzheimer's disease and in patients with frontal
lobe lesions.

End of Symposium

- 12.00 **Pat Rabbitt, Christine Lowe, Neil Pendleton*, Marietta Scott* and
Neil Thacker*** (Age and Cognitive Performance Research Centre,
University of Manchester, University of Manchester Department of
Geriatrics, Hope Hospital, N. Manchester and University of
Manchester Department of Geriatrics, Hope Hospital, N. Manchester)
Memory, intelligence and age
- 1-2 LUNCH

*Session B***Room 1L04, Agriculture Building**

- 9.00 **Massimiliano Zampini***, **David I Shore*** and **Charles Spence**
(University of Oxford and McMaster University, Canada)
Audiovisual temporal order judgments
- 9.30 **Charles Spence, Charlotte Harris*** and **Massimiliano Zampini***
(Oxford University)
The ‘Japanese illusion’ revisited? Impaired vibrotactile movement
discrimination with interleaved fingers
- 10.00 **J H Wearden and L A Jones*** (Manchester University)
Is the growth of subjective time linear or nonlinear?
- 10.30 COFFEE
- 11.00 **Eva Belke***, **A S Meyer** and **Markus Damian*** (Behavioural Brain
Sciences Centre, University of Birmingham and University of Bristol)
The role of target location, repetition, and presentation mode in
semantic blocking
- 11.30 **M Auckland, K Cave, N Donnelly and F Gomez-Pinto** (University
of Southampton)
Context effects in object recognition: Distinguishing between
sensitivity and bias
- 12.00 **Jennifer M Rodd** (Centre for Speech and Language, Department of
Experimental Psychology, University of Cambridge)
When do leotards get their spots? Semantic activation of lexical
neighbours in visual word recognition
- 12.30 **Glyn W Humphreys and Emer Forde** (Behavioural Brain Sciences
Centre, University of Birmingham and Neurosciences Research
Institute, Aston University)
Object naming with impaired semantics: Knowing your hand but not
your body
- 1-2 LUNCH

*Session A***Nike Lecture Theatre, Agriculture Building**

- 2.00 **Ruth Clutterbuck and Robert A Johnston** (University of Birmingham)
Exploring how unfamiliar faces become familiar.
- 2.30 **Anne P Hillstrom*, Yu-Chin Chai* and Brian Norris*** (University of Southampton and University of Texas at Arlington) (Introduced by Nick Donnelly)
Attention to objects that change identity
- 3.00 **John Morton** (Institute of Cognitive Neuroscience, University College London)
"Self" and release from PI
- 3.30 TEA (**NB** will be served in G31, School of Psychology)
- 4-5.30 POSTER SESSION (Room G31, School of Psychology)
- 5.30 **Thirty-first Bartlett Lecture - Professor Morris Moscovitch** (University of Toronto)
The hippocampal complex as a memory module: Implications for research and theory on recent and remote memory
(Madejski Lecture Theatre, Agriculture Building)
- 6.30 DRINKS RECEPTION (Room G31, School of Psychology and the Quadrangle)
- 7.30 for 7.45 CONFERENCE DINNER (Pepe Sale)
(Coach will leave car park outside School of Psychology at 7.20)

Session B

Room 1L04, Agriculture Building

- 2.00 **D V M Bishop, M Maybery*, A Maley*, D Wong*, W Hill*, and J Hallmayer*** (Oxford University, University of Western Australia and Stanford University)
Are language deficits part of the broader autism phenotype?
- 2.30 **Penny Hill*, Dorothy Bishop and John Hogben*** (Department of Physiological Sciences, Oxford University, Department of Experimental Psychology, Oxford University and The University of Western Australia)
Auditory frequency discrimination in children with SLI: A longitudinal study
- 3.00 **Judy E Turner*, Lucy A Henry, Philip T Smith and Penelope A Brown*** (University of Reading and Institute of Psychiatry)
Redintegration and lexicality effects in children: Do they depend upon the demands of the memory task?
- 3.30 TEA (**NB** will be served in G31, School of Psychology)
- 4-5.30 POSTER SESSION (Room G31, School of Psychology)
- 5.30 **Thirty-first Bartlett Lecture - Professor Morris Moscovitch** (University of Toronto)
The hippocampal complex as a memory module: Implications for research and theory on recent and remote memory
(Madejski Lecture Theatre, Agriculture Building)
- 6.30 DRINKS RECEPTION (Room G31, School of Psychology and the Quadrangle)
- 7.30 for 7.45 CONFERENCE DINNER (Pepe Sale)
(Coach will leave car park outside School of Psychology at 7.20)

*Session A***Nike Lecture Theatre, Agriculture Building**

Symposium: Early language and its precursors: Domain-general processes
Organiser: Graham Schafer

- 9.30 **Denis Mareschal*** (Centre for Brain and Cognitive Development, Birkbeck University of London)
The empirical basis of early infant categorisation
- 10.00 **David Rakison** (Carnegie Mellon University, USA)
The acquisition of the animate-inanimate distinction in infancy: Are domain general mechanism sufficient?
- 10.30 **Thierry Nazzi*** (Laboratoire Cognition et Développement, Université René Descartes, France)
Causal properties, names, and object categorization
- 11.00 COFFEE
- 11.30 **Vladimir M Sloutsky*** (Center for Cognitive Science, The Ohio State University, USA)
The role of names in conceptual development: A domain-general mechanism that make them special
- 12.00 **Kim Plunkett*** (University of Oxford)
Early word learning
- 12.30 **Graham Schafer** (University of Reading)
Discussion

END OF PARALLEL SESSIONS

End of Meeting

*Session B***Room 1L04, Agriculture Building**

- 9.00 **Jeannie Judge***, **Paul C Knox*** and **Markéta Caravolas** (Division of Orthoptics and Department of Psychology, University of Liverpool)
Saccade latency to briefly presented targets on a simple cueing task:
Evidence of equivalent performance in developmental dyslexia
- 9.30 **Isabel M Santos*** and **Andrew W Young** (University of York)
Which social characteristics are automatically perceived in faces?
Evidence from the von Restorff effect
- 10.00 **Matthew P Fraser*** and **Andrew W Young** (University of York)
Repetition priming of facial expression recognition
- 10.30 **Andrew J Calder**, **Jill Keane*** and **Andrew D Lawrence*** (MRC Cognition and Brain Sciences Unit, Cambridge)
Impaired recognition of anger following damage to the ventral striatum
- 11.00 COFFEE
- 11.30 **Mark Haselgrove*** (Cardiff University) (Introduced by John M Pearce)
Partial reinforcement extinction effects despite equal rates of reinforcement.
- 12.00 **David A Lagnado*** and **David R Shanks** (University College London)
Priming inconsistency: The influence of hierarchy on probability judgment
- 12.30 **Rachel McCloy***, **Ruth M J Byrne** and **Philip Johnson-Laird** (University of Reading, University of Dublin and Princeton University)
Cumulative risk judgements

END OF PARALLEL SESSIONS

End of Meeting

POSTERS (Alphabetical order) (Abstracts see Pages 37-49)

Thursday 10 July – 4pm
Room G31, School of Psychology

Gerry T M Altmann and Yuki Kamide* (University of York)

Embodying the mapping between language and the visual world: Dissociations between the visual world and its mental representation

Luc Boutsen* and Glyn W Humphreys (Behavioural Brain Sciences Centre, University of Birmingham)

Top-down modulation of object-based visual attention: effects on the same-object benefit

A J Ben Clarke*, Laurie T Butler* and Dianne C Berry (University of Reading)

Contrasting effects of ageing and frontal lobe function in implicit and explicit memory

Paula Clarke*, Kate Nation and Graham Hitch (University of York and University of Oxford)

Do children with autism spectrum disorders fail to use category and associative relationships to facilitate free recall?

Eddy J Davelaar* and Marius Usher* (Birkbeck College) (Introduced by Vernon H Gregg)

Modelling serial position functions of neuropsychological patients

Jayne E Freeman*, and Judi A Ellis (University of Reading)

Aging and the accessibility of naturally-occurring delayed intentions

Alessandro Guida* and Hubert Tardieu* (University René Descartes and Laboratoire de Psychologie et Neuropsychologie de la Mémoire, Boulogne Billancourt)

How to study long term working memory with no experts ?

Clare Harley*, John Wann and Janet Cockburn* (University of Reading)

Increasing physical load during a walking dual-task with a secondary tray-carrying task

Johan Hulleman*, Luan Gedamke* and Glyn W Humphreys (University of Birmingham)

A new way of assessing the strength of figure-ground cues

G M McArthur and D V M Bishop(University of Oxford)

Speech and non-speech discrimination in people with specific language impairment

Kate Nation, Catherine M Marshall and Gerry T M Altmann (University of Oxford and University of York)

Investigating individual differences in children's real-time sentence comprehension using language-mediated eye movements

B Parris*, D Sharma* and B Weekes (University of Sussex and University of Kent)
Is visual word recognition automatic?

Karen J Pine* (University of Hertfordshire)

Assessing children's understanding of a balance task: Do untrained observers attend to gestures?

Paul Sutcliffe*, Dorothy Bishop and Stephen Houghton* (University of Oxford and Centre for Attention and Related Disorders, University of Western Australia)
The effect of stimulant medication on auditory processing performance in children with ADHD

Volker Thoma*, John E Hummel* and Jules Davidoff (University College London, University of California, Los Angeles and Goldsmiths, University of London)

Evidence for holistic representations of ignored images and analytical representations of attended images

Neil Todd (University of Manchester)

The electrophysiology of groove (revisited).

Matthew I Tofield* and John P Wann (University of Reading)

Assessing visual attention in a healthy ageing and stroke population

Lesley J Tranter* and Wilma Koutstaal (University of Reading)

Use it or lose it? An experimental test of the effects of increased cognitively stimulating activity on cognitive test performance in healthy older adults

Benjamin Vincent* and Roland Baddeley (University of Sussex)

Simple, accurate, robust models of the world

Kate Wilmut*, John Wann and Janice H Brown* (University of Reading)

Attention disengagement in 36 month-olds

Probing distractor inhibition in preview search: A role for grouping and inhibition revealed via a luminance probe technique

Jason J Braithwaite, Glyn W Humphreys and Johan Hulleman
Behavioural Brain Sciences Centre, University of Birmingham
j.j.braithwaite@bham.ac.uk

We report 4 experiments examining the role of grouping and inhibition of distractors in preview search (Watson & Humphreys, 1997). For the primary task participants searched for a target letter amongst a second set of random letter stimuli. However, on a minority of trials, one item differed in luminance from the others and participants had to identify this luminance-probe singleton. There was slower identification of probes when the singleton was an old relative to a new distractor (Experiment 1). We distinguished this effect from low-level sensory factors such as forward masking and / or neural fatigue (Experiment 2). Furthermore, Experiment 3 also showed that probe detection varied as a function of the colour group in which the probe fell. Detection was worse for probes that occurred in the old majority group relative to an old minority group (and conversely detection was slow for probes in the new minority relative to the new majority group). This pattern occurred even when the old items changed colour when the target set was presented. The data provide evidence for grouped-based inhibition of old items.

Watson, D.G., & Humphreys, G.W.(1997) Visual marking: prioritizing selection for new objects by top-down attentional inhibition of old objects. *Psychological Review*, 104 (1), 90-122

Engaging inhibition in one task leads to increased distraction in another

Guy Mizon¹ and Nilli Lavie²
1. University of Exeter
2. University College London
G.A.Mizon@exeter.ac.uk

We examined the hypothesis that the rejection of perceived yet irrelevant distractors involves active inhibition. By assessing the effects of engaging response inhibition mechanisms in one task (either a stop-signal task, or a task involving responses that are spatially incompatible with the target) on subjects' ability to ignore irrelevant distractors in a subsequent selective attention task, we observed greater distractor interference following stopped (vs. 'go') responses, and following spatially incompatible (vs. compatible) responses. Since both stopping responses and executing spatially incompatible responses are assumed to engage inhibition (of 'go' responses in the former, and of spatially compatible responses in the latter case) these results suggest that rejection of irrelevant distractors depends on the availability of inhibition mechanisms.

Non-visual attention can modulate unrelated visual motion processing

Robert J Houghton, William J Macken and Dylan M Jones
Cardiff University
HoughtonRJ@cardiff.ac.uk

Whilst it has been known for over a decade that selective attention can modulate the magnitude of the visual motion aftereffect, extant studies have treated the phenomenon as largely due to the spatial allocation of visual attention. A set of novel experiments examined the possibility that motion adaptation could be modulated by concurrent engagement in non-visual attentional tasks. It was found that both auditory string detection and backward counting were powerful attenuators of ongoing motion processing. Notably, the backward counting task did not require the input of sensory information nor any on-line responding during motion adaptation. Thus, the inference that can be drawn is that purely cognitive activities can modulate early visual perception. The results challenge the established view -- implicit or explicit in the majority of modern models of human attention -- that pre-categorical perceptual processes are functionally autonomous from unrelated ongoing post-categorical cognitive processes. Suggestions will be made towards reconciling the present findings with contemporary theories of attention.

Impaired orientation discrimination and localisation following parietal damage: On the interplay between dorsal and ventral processes in visual perception

M Jane Riddoch, Glyn W Humphreys, Sarah Jacobson, Graham Pluck,
Andrew Bateman and Martin Edwards
Behavioural Brain Sciences, University of Birmingham
M.J.Riddoch@Bham.ac.uk

We report the case of a patient with left parietal damage (MH) who is selectively impaired at both detecting and localising targets defined in terms of their orientation. Performance was relatively good in other tasks where the target was defined either by a single feature (colour), or an orientation conjunction. The results are consistent with the idea that the dorsal stream supports some aspects of basic visual perception (i.e., the discrimination and localisation of orientation-defined targets). The effect of a parietal deficit may be to stress processing via the intact ventral stream; this is suggested by the finding that MH performed better when localising targets at a larger display size (where elements were less likely to group into a familiar shape). MH's ability to localise a target was shown to be more impaired than his ability to detect a target, this is consistent with orientation discrimination preceding (or operating independently of) feature localisation.

Detecting visual anomalies: Eye movements in comparative visual search

Adam Galpin and Geoffrey Underwood
University of Nottingham
ajg@psychology.nottingham.ac.uk

The comparative visual search paradigm (Pomplun, Sichelschmidt, Wagner, Clermont, Rickheit, & Ritter, 2001), was used to investigate the visual search of two images placed side by side. Participants' eye movements were recorded whilst they searched two images of arrays of small objects (children's toys) for a difference between them. Analysis of fixation position revealed significant differences in the number and proportion of target directed fixations, depending on the type of difference to be detected. Time-course measures, obtained by allocating fixations into quartiles, demonstrate that search and detection processes exhibit different oculomotor behaviours, supporting previous findings by Pomplun, Sichelschmidt et al (2001). Qualitative evidence from this experiment suggests that on some occasions participants may sense a difference between corresponding image regions and deploy further fixations to elucidate this suspicion. Attempts to quantify this visual 'sensing' are discussed.

Pomplun, M., Sichelschmidt, L., Wagner, K., Clermont, T., Rickheit, G. & Ritter, H. (2001). Comparative visual search: A difference that makes a difference. *Cognitive Science*, 25(1), 3-36.

The what, where and when of high speed steering

John P Wann and Richard M Wilkie
University of Reading
j.p.wann@reading.ac.uk

Successfully steering a path involves both higher level spatial planning and the use of low-level visual information such as optic flow. Here we link the two into a theory of path planning and locomotor control based on active gaze. In this scheme the performer fashions their future trajectory through a series of path fixations. The locomotor control system then acts as an attractor to the point of fixation by nulling the rotation components of retinal flow and non-visual (gaze-angle) information. We report experimental results that test the weight attached to each of these low level sources as well as documenting the role of active gaze in seeking out new trajectory planning points. We propose that this model addresses WHAT information needs to be picked up by the skilled. It also provides a clear mechanism for skill refinement, where to yield a "racing line" the advanced performer learns WHERE to look and WHEN.

Parsing with focus particles in context

Ruth Filik¹, Kevin Paterson¹ and Simon Liversedge²

1. University of Derby
 2. University of Durham
- r.filik@derby.ac.uk

The influence of focus particles such as 'only' on parsing is controversial. Ni, Crain, & Shankweiler (1996) claimed that using 'only' to signal a contrast between two sets can eliminate garden path effects for ambiguous reduced relatives such as:

1. Only businessmen loaned money at low interest were told to record their expenses.

However, Paterson, Liversedge & Underwood (1999) found that while 'only' facilitated reanalysis, initial processing difficulty was not eliminated. With the current studies we investigated whether the influence of 'only' is modulated by the availability of contrast sets in prior referential context (Sedivy, 2002). We report two eye-tracking experiments investigating the conjoint influence of 'only' and context on the parsing of sentences containing temporary relative clause / main clause ambiguities. Although a combination of 'only' and context affected reading times for ambiguous and unambiguous sentences, it did not influence the initial processing of syntactic ambiguities. We conclude that 'only' and context does not guide the processing of syntactic ambiguities but can influence the integration of linguistic material at a discourse level.

Ni, W., Crain, S., & Shankweiler, D. (1996). Sidestepping garden paths: The contribution of syntax, semantics and plausibility in resolving ambiguities. *Language and Cognitive Processes*, 11, 283-334.

Paterson, K.B., Liversedge, S.P., & Underwood, G., (1999). The influence of focus operators on syntactic processing of 'short' relative clause sentences. *Quarterly Journal of Experimental Psychology*, 52A, 717-737.

Sedivy, J. C. (2002). Invoking discourse-based contrast sets and resolving syntactic ambiguities. *Journal of Memory and Language*, 46, 341-370.

Using adaptation to determine the role of different spatial frequencies in perception of words, pseudowords, and nonwords

Timothy Jordan and Geoffrey Patching
University of Nottingham
trj@psychology.nottingham.ac.uk

Psychophysical studies have shown that human vision is selectively sensitive to different spatial frequencies. However, the relative importance of different spatial frequencies to visual word recognition has yet to be determined. To investigate this issue, we used an adaptation technique in which participants adapted to particular spatial frequencies and were then shown briefly presented words, pseudowords and nonwords. Perception of these target strings was tested using a 2AFC paradigm (Reicher-Wheeler task) to avoid artifactual influences of non-perceptual guesswork. Adaptation to each spatial frequency disrupted perception of words, pseudowords and nonwords about equally but perception of each type of string was disrupted most by

adaptation to lower spatial frequencies. These findings suggest that a range of spatial frequency information is used for perception of words (and other letter strings) but that lower spatial frequencies play a particularly important role.

Assessing the role of different spatial frequencies in word perception by good and poor readers.

Geoffrey Patching and Timothy Jordan
University of Nottingham
grp@psychology.nottingham.ac.uk

Numerous studies suggest a link between reading ability and patterns of contrast sensitivity. However, exactly what role different spatial frequencies play in word perception has yet to be determined. In this study, we investigated perception of filtered words and nonwords by good and poor readers. A contrast sensitivity function using sinusoidal gratings was obtained for each participant and, in line with previous findings, good and poor readers showed different patterns of contrast sensitivity. However, when perception of filtered targets was tested (using a 2AFC paradigm to avoid artefactual influences of non-perceptual guesswork), all participants produced higher identification accuracy for words than nonwords across a broad range of target spatial frequencies and no differences were found between good and poor readers. These findings suggest that a range of spatial frequencies are used for word perception equally well by good and poor readers, despite differences in contrast sensitivity. Some implications of these findings for theories of visual word recognition are discussed.

Using repetition priming to investigate visual and audiovisual speech recognition

Sharon Thomas and Timothy Jordan
University of Nottingham
smt@psychology.nottingham.ac.uk

For many years, studies of the recognition of faces and auditory speech have utilized measures of repetition priming. Effects of priming in studies of visual and audiovisual speech recognition, however, have not been fully explored. We wished to establish whether priming techniques used for studying face and auditory speech recognition could also be applied successfully to visual and audiovisual speech recognition, and whether visual and audiovisual speech recognition shares priming characteristics typical of face and auditory speech recognition. To this end, we investigated (1) effects of auditory, visual, and congruent audiovisual primes on target visual and audiovisual speech recognition and (2) effects of incongruent audiovisual primes on target visual and audiovisual speech recognition. The results of these experiments indicate that visual and audiovisual speech recognition are both susceptible to priming effects, and throw new light on the processes involved. Suggestions for developing further priming paradigms for investigating visual and audiovisual speech recognition are also presented.

Neural substrates of orthographic neighbourhood effects in visual word recognition

Michal Lavidor¹, Richard Shillcock², Padraic Monaghan³, Martin Meyer², Adam McNamara² and Andrew W Ellis⁴

1. University of Hull
 2. University of Edinburgh
 3. University of Warwick
 4. University of York
- M.Lavidor@hull.ac.uk

In English, in the lexical decision task, words with large orthographic neighbourhoods (i.e. being only one letter different from several other words) are responded to faster than words with small neighbourhoods, the N effect. Several behavioural studies have shown recently that the right hemisphere (RH) is more sensitive to the N effect than the left hemisphere (LH). The goal of the current study was to investigate the sources of this asymmetric N effect. In an fMRI study, words with few and many neighbours were presented to right-handed participants in one or other hemifield, in a lexical decision task. Neural substrates of the asymmetric N effect were found, with greater RH activation associated with high N words, in particular in the right fusiform gyrus. We describe an account of the asymmetric N effect, and discuss the extent to which the hemispheric differences associated with lexical neighbourhood are language specific or general.

Subtracting subtractivity? A connectionist account of recovery in single word reading following brain damage

Stephen R Welbourne and Matthew A Lambon Ralph
University of Manchester
stephen.r.welbourne@stud.man.ac.uk

We investigate the effect of retraining a damaged connectionist model of single word reading, with the aim of establishing whether changes occurring during the recovery process have the potential to account for the pattern of dissociations found in brain damaged patients. In particular, we seek to reproduce the strong frequency/consistency interactions found in surface dyslexia. A replication of Plaut et al's (1996) model of word reading was damaged and then retrained using a standard back propagation algorithm. Immediately after damage there was only a small frequency/consistency interaction. Retraining the damaged model crystallised out these small differences into a strong dissociation, very similar to the patterns found in surface dyslexic patients. What is more, the percentage of regularisation errors, always high in surface dyslexics, increased greatly over the retraining period, moving from under 10% to over 90%. These results suggest that the patterns performance of brain damaged patients may owe as much to the wholesale changes in the pattern of connectivity occurring during recovery as to the original premorbid structure. This finding offers a potential challenge to the traditional cognitive neuropsychological assumptions of subtractivity and transparency.

Plaut, D. C., J. L. McClelland, Seidenberg, M. S., Patterson, K. (1996). "Understanding Normal and Impaired Word Reading: Computational Principles in Quasi-Regular Domains." *Psychological Review* **103**(1): 56-115.

Tversky, A. & Kahneman, D. (1983). Extensional versus intuitive reasoning: The conjunction fallacy in probability judgment. *Psychological Review*, *90*, 293-315.

Symposium: Neuropsychology of Memory

Organisers: Wilma Koutstaal and Jamie Ward

Mapping the neural substrates of memory impairment in neurological disorders

J-C Baron

Department of Neurology, University of Cambridge

jcb54@cam.ac.uk

In many neurological conditions such as Alzheimer's disease (AD), mild cognitive impairment (MCI), permanent amnesia (PA) and transient global amnesia (TGA), it is difficult if not impossible from standard structural imaging to determine the brain regions that underlie the cognitive impairment. However, mapping of synaptic function (by means of resting-state FDG-PET) and gray matter density (GMD) with MR voxel-based morphometry (VBM) allows one to address this issue at both the functional and the structural levels. Applying this approach to AD, MCI and PA, we find significant glucose hypometabolism in the limbic and paralimbic regions, particularly targeting the posterior cingulate/retrosplenial cortex and hippocampal region, but also in the posterior association cortex and occasionally in prefrontal regions. Correlative analysis with memory scores show that while some of these focal synaptic changes subtend early episodic memory impairment, others seem to represent compensatory processes with progressing impairment. In MCI, dissociations in the correlations between encoding/retrieval performance and resting metabolism/GMD suggest some areas such as the posterior cingulate/retrosplenial cortices may be dysfunctional on the basis of disconnection from hippocampal area damage rather than reflecting local pathology, an idea supported both by correlations between focal atrophy and function at spatially remote but connected sites in AD, and by parallel lesion studies in the non-human primate. During TGA episodes, metabolic disruption may variably affect different brain regions - including but not always the hippocampal area - suggesting TGA may be a core syndrome caused by several distinct sites of dysfunction. These findings document the power of combined functional and structural imaging to unravel the mechanisms of memory impairment in brain diseases.

The neural bases of familiarity and recollection

A R Mayes
University of Liverpool
A.Mayes@liverpool.ac.uk

There is disagreement about the extent to which the processes and neural bases underlying recall (and recollection) and familiarity memory differ. In particular, the effects of reportedly selective hippocampal lesions have produced very distinct results. Some patients show equivalent recall and recognition deficits as well as clear familiarity memory impairments whereas other patients show relatively intact item recognition and normal familiarity memory despite having impaired recall. In the face of these confusing results, evidence from functional magnetic resonance imaging (fMRI) is important. The published literature strongly suggests that hippocampal activity mediates encoding that produces recall, but not familiarity memory alone. A parametric event-related fMRI study will be described that examined the brain activations that accompanied the experience of different levels of familiarity for studied pictures that were not recollected and compared these activations with those accompanying recollection and non-recognition. Although recollection activated the hippocampus, different levels of familiarity did not. However, increasing levels of familiarity linearly downregulated the perirhinal cortex and insula, and upregulated the dorsomedial thalamus, inferior frontal cortex, and left lateral parietal cortex. The study indicates that the experience of familiarity is associated with processing in a complex interconnected set of neural structures. Recollection also activated or deactivated these structures so the extent to which recollection and familiarity are mediated by non-overlapping neural structures remains unclear.

Retrograde amnesia in episodic and semantic memory

M D Kopelman
Neuropsychiatry and Memory Disorders Clinic, Guy's and St
Thomas's Hospitals, London
michael.kopelman@kcl.ac.uk

There are many controversies concerning the structural basis of retrograde amnesia (RA). One view is that memories are held briefly within a medial temporal store ('hippocampal complex') before being 'consolidated' or reorganised within temporal neocortex and/or networks more widely distributed within the cerebral cortex. An alternative is that the medial temporal lobes are always involved in the storage and retrieval (reactivation) of autobiographical memories ('multiple trace' theory). The present study examined retrograde amnesia in 40 memory-disordered patients with focal frontal, temporal lobe, or diencephalic lesions using tests of autobiographical, personal semantic, public information, and semantic memory. Quantitative MRI structural brain volume measurements in critical structures were available, allowing testing of these specific hypotheses.

Knowledge of vocabulary in patients with focal lesions to the medial temporal lobe

K S Graham¹, A Kropelnicki¹, K Patterson¹, N Kapur² and J R Hodges¹

1. MRC Cognition and Brain Sciences Unit, Cambridge

2. Department of Clinical Neuropsychology, Wessex Neurological Centre, Southampton

kim.graham@mrc-cbu.cam.ac.uk

Findings from cases who have become amnesic early in life suggest a partial dissociation between episodic and semantic memory: despite profound amnesia, these patients perform well on tests of factual knowledge. To explain this result, it has been proposed that the perirhinal and entorhinal cortices support the acquisition of new semantic information independently of the hippocampus, which is, in contrast, critical for episodic memory. To test whether this finding would generalise to patients with later-onset amnesia, we developed a novel battery of remote semantic tasks, in which subjects with focal lesions to the medial temporal lobe and age-matched controls performed four tests requiring different levels of semantic knowledge about vocabulary that came into the English language over the last four decades. When patients had to make simple gist-based decisions about words (e.g., associating the term 'karaoke' with music), they showed excellent performance from both pre-injury and post-injury time-periods; we attribute this newly-acquired gist information to slow cortical learning. By contrast, when the patients had to define these words, they performed as well as controls only for words from the 1960s, and were significantly impaired for vocabulary from more recent time-periods. The discrepancy of these findings with the results from the developmental literature suggests that, while damage to the medial temporal lobes in adulthood does not prevent the subsequent acquisition of gist knowledge about new vocabulary, it does significantly impede the normal process of learning full, rich semantic representations for new, low-frequency vocabulary words.

False recognition in Alzheimer's disease and in patients with frontal lobe lesions

A E Budson

Division of Cognitive and Behavioral Neurology, Brigham and Women's Hospital and Harvard Medical School, Boston, USA

abudson@partners.org

Studies of memory in patients with Alzheimer's disease have traditionally focused on these patients' inability to remember information. Distortions of memory in these patients have recently been explored experimentally using false recognition paradigms. False recognition occurs when participants incorrectly claim to have previously encountered a novel item that is in some way related to a previously studied item. False recognition of semantic associates was examined in patients with Alzheimer's disease using a paradigm that provided rates of false recognition after single and multiple exposures to word lists. Using corrected false recognition scores to control for unrelated false alarms, it was found that the level of false recognition was lower in the patients with Alzheimer's disease than in the healthy older adult

controls after a single list exposure. Across five study-test trials, however, false recognition increased in the patients while it decreased in the healthy older adults. Further studies were performed to understand the relationship between these results and deficits in semantic memory, source memory, and frontal lobe function that may be observed in patients with Alzheimer's disease.

Memory, intelligence and age

Pat Rabbitt¹, Christine Lowe¹, Neil Pendleton², Marietta Scott³ and Neil Thacker³

1. Age and Cognitive Performance Research Centre, University of Manchester
 2. University of Manchester Department of Geriatrics, Hope Hospital, N. Manchester
 3. University of Manchester Department of Radiography, Manchester Royal Infirmary
- rabbitt@psy.man.ac.uk

Performance on both intelligence tests and on most tests of memory efficiency markedly declines in old age. In large samples of 5000 + individuals aged between 49 and 92 years age related variance in memory test scores is almost entirely accounted for by current intelligence test scores. Nevertheless more detailed examination of individual cases reveals individuals who, over a period of 11 to 17 years, have experienced marked declines in memory test scores with little or no measurable decline in intelligence test scores. Members of this sub-group and controls matched for Age, Gender and Intelligence test scores were compared on a large battery of tests of memory and information processing speed, and in terms of structural brain changes revealed by MRI and Pet scans. We discuss the implications of these findings for understanding of age related changes as patterned, rather than global in their aetiology and effects on cognitive processes.

Audiovisual temporal order judgments

Massimiliano Zampini¹, David I Shore² and Charles Spence¹

1. University of Oxford
 2. McMaster University, Canada
- massimiliano.zampini@psy.ox.ac.uk

We report a series of experiments in which auditory and visual stimuli were presented from either the left and/or right of fixation at varying stimulus onset asynchronies (SOAs), using the method of constant stimuli. Participants either made an unspeeded temporal order judgment (TOJ) response regarding 'which modality was presented first' or 'which side was presented first', or else made a simultaneous/successive discrimination response. We examined whether or not the various tasks provide consistent measures of multisensory temporal perception (an assumption implicit in much of the literature in this area). The presentation of auditory and visual stimuli from different positions facilitated TOJ performance (i.e.,

just noticeable differences, JNDs, were smaller) when the stimuli were presented across the body midline, but not when both stimuli were either placed on the body midline, or else within the same hemifield (Zampini et al., 2003, in press). Participants were also more precise when judging which modality came first than when judging which location came first. Finally, participants were more likely to judge pairs of auditory and visual stimuli as being synchronous if they came from the same position, rather than from different positions, supporting the importance of spatial location in multisensory binding. In conclusion, these results show that there is no unique solution to the question of what temporal asynchrony will give rise to the perception of audiovisual synchrony for pairs of auditory and visual stimuli. Our results demonstrate that the answer depends not only on the relative position of the stimuli, but also on the response dimension that participants are instructed to use.

Zampini, M., Shore, D. I., & Spence, C. (2003, in press). Multisensory temporal order judgments: The role of hemispheric redundancy. *International Journal of Psychophysiology*.

The 'Japanese illusion' revisited? Impaired vibrotactile movement discrimination with interleaved fingers

Charles Spence, Charlotte Harris and Massimiliano Zampini
Oxford University
charles.spence@psy.ox.ac.uk

We report a series of experiments in which participants had to judge the direction in which two vibrotactile stimuli presented either to different fingers of the same hand, or one to either hand (at stimulus onset asynchronies of 200-600ms) appeared to move. When the participant's hands were placed side-by-side, with the fingers either pointing away from the participant or else pointing toward the midline, direction discrimination performance was generally accurate. By contrast, when the fingers of the left and right hand were interleaved, performance dropped significantly for certain combinations of finger stimulation, depending on which of the two hand postures were adopted. This decline in tactile direction discrimination performance when the fingers of the two hands are interleaved would appear to reflect a failure to represent correctly the spatial origin of near-simultaneous tactile stimuli, and may bear comparison with the errors in movement initiation seen when the hands are clasped together in the so-called 'Japanese illusion' (e.g., Henri, 1898), and also with the 'Aristotle illusion' (e.g., Ponzo, 1910). These results will also be compared to other recent findings showing impaired tactile temporal order judgement performance when the hands are crossed over the midline (e.g., Shore, Spry, & Spence, 2002).

Henri, V. (1898). *Über die Raumwahrnehmungen des Tastsinnes* [On the spatial perception of the tactile sense].

Ponzo, M. (1910). Intorno ad alcune illusioni nel campo delle sensazioni tattili, sull'illusione di Aristotele e fenomeni analoghi [On some tactile illusions, Aristotle's illusion, and similar phenomena]. *Archive für die Gesamte Psychologie*, **16**, 307-345.

Shore, D. I., Spry, E., & Spence, C. (2002). Confusing the mind by crossing the hands. *Cognitive Brain Research*, **14**, 153-163.

Is the growth of subjective time linear or nonlinear?

J H Wearden and L A Jones
Manchester University
wearden@psy.man.ac.uk

Three experiments addressed the question of whether subjective time grows linearly or non-linearly with real time. In the first, participants received a standard duration (actually 10 s, although they were not told this), then had to estimate what percentage other durations (from 1s to 10 s) were of the standard. Estimated percentages were linearly related to actual percentages. In a second study, people had to estimate the *difference* in duration between two tones. Differences were either 100 ms or 200 ms, but were differences between stimuli from a short duration range (300-500 ms) or a longer one (600-1000 ms). Non-linear time growth predicts that duration range would systematically affect estimated difference, but in fact there was no effect. A third experiment used a temporal generalization method, where people had to decide whether comparison durations were or were not the same as a previously-presented standard. In this variant, however, three tones were presented and the *average* of the three tones had to be used as the standard. Temporal generalization gradients were "normal" with this procedure, even when the three tones were very different, suggesting that participants can average durations together to form their simple arithmetic mean. Results of all three experiments suggest that subjective time grows as a linear function of real time.

The role of target location, repetition, and presentation mode in semantic blocking

Eva Belke¹, A S Meyer¹ and Markus Damian²
1. Behavioural Brain Sciences Centre, University of Birmingham
2. University of Bristol
e.belke@bham.ac.uk

In the semantic blocking paradigm, participants are repeatedly asked to name sets of four visually dissimilar objects that are either semantically related (homogeneous) or unrelated (heterogeneous). The naming latencies consistently display a substantial semantic inhibition effect for the homogeneous sets, which has been interpreted as an effect of increased lexical competition within these sets. However, experiments using a simultaneous presentation mode with no repetitions yielded no semantic interference effects when speakers were asked to name sets of semantically related or unrelated objects in one utterance. The present experiments assess the origin of these discrepant findings, exploring the influences of presentation location, presentation timing and the number of repetitions on the emergence of a semantic inhibition effect. The results highlight the importance of repetition in the semantic blocking effect, which turns out to be based on a repetition priming effect that is attenuated by semantic relatedness in the homogeneous but not the heterogeneous sets, yielding a semantic inhibition effect on the surface.

Context effects in object recognition: Distinguishing between sensitivity and bias

M Auckland, K Cave, N Donnelly and F Gomez-Pinto
University of Southampton
mea@soton.ac.uk

Object recognition can be enhanced when the object appears with a set of semantically related objects or a scene. Early experiments demonstrating this effect used a simple naming task, leaving doubt as to whether context improved sensitivity at detecting objects or simply biased the choice of response. Later experiments that used a two-alternative forced choice task to eliminate bias found no context effect. We have devised a six-alternative forced choice procedure, which includes alternatives that are semantically related to the context and alternatives that are physically similar to the target. Thus, every trial in this task presents the opportunity to make either a semantic or perceptual error. Under these conditions, performance at selecting the name of a target object improves when the picture of the target is surrounded by context made up of pictures of four semantically related objects. These results indicate that the facilitation from context is not due entirely to bias at the decision level, but must be at least partly due to improved perceptual sensitivity in object recognition.

When do leotards get their spots? Semantic activation of lexical neighbours in visual word recognition

Jennifer M Rodd
Centre for Speech and Language, Department of Experimental
Psychology, University of Cambridge
jrodd@csl.psychol.cam.ac.uk

Shadowing and priming studies provide strong evidence that during spoken word recognition, the meanings of different words that are competing for recognition (e.g., "*captain*" and "*captive*") are activated in parallel. In contrast, for visual word recognition there is little evidence that the meanings of visually similar words are activated simultaneously. This is consistent with the idea that for reading (in contrast to listening) since all the sensory information necessary to identify a word is available at once, any competition between visually similar words is resolved before their meanings are retrieved. On this account it seems unlikely that any feedback from semantics to earlier stages of word recognition would be beneficial. However, Forster & Hector (2002) recently showed that for nonwords (e.g., "*turple*") the meanings of lexical neighbours (e.g., "*turtle*") can be partially activated. Two new semantic categorization experiments extend this finding to real words. Participants are slower to decide that "*leotard*" is not an animal because of partial activation of the meaning of its animal neighbour "*leopard*". This shows that information about a word's meanings can be available before it is uniquely recognised. This suggests that feedback from semantics to earlier stages of word recognition might usefully influence word recognition.

Forster, K. I., and Hector, J. (2002). Cascaded Versus Noncascaded Models of Lexical and Semantic Processing: The Turple Effect. *Memory and Cognition* 30, 1106-1117.

Object naming with impaired semantics: Knowing your hand but not your body

Glyn W Humphreys¹ and Emer Forde²

1. Behavioural Brain Sciences Centre, University of Birmingham

2. Neurosciences Research Institute, Aston University

g.w.humphreys@bham.ac.uk

We report data on patient FK, who presents with a marked deficit in accessing semantic knowledge about objects, when tested across a range of input and output modalities. FK also showed a high degree of item-specific consistency in object identification. We show that, despite being better at naming some objects than others, FK was equally poor at discriminating the superordinate categories of the stimuli. Also, for 'known' (nameable) items, he tended to be better at matching to a base-level label than to a superordinate-level label. We discuss this unusual pattern of results in terms of a distributed, exemplar-model of semantic representation. We suggest that damage to representations of semantic features can make naming reliant on access to a few specific features that characterize individual exemplars, whilst more general loss of features impairs superordinate classification. We discuss this proposal in relation to other patterns of deficit, in which superordinate rather than basic level knowledge seems to be preserved.

Exploring how unfamiliar faces become familiar

Ruth Clutterbuck and Robert A Johnston

University of Birmingham

rx001@bham.ac.uk

Two experiments examine a novel method of assessing face familiarity that does not require explicit identification of presented faces. Earlier research (Young et al., 1985; Clutterbuck & Johnston, 2002) has shown that different views of the same face can be matched more quickly for familiar than for unfamiliar faces. This study examines whether exposure to previously novel faces allows the speed with which they can be matched to be increased thus allowing a means of assessing how faces become familiar. In Experiment 1, participants viewed two sets of unfamiliar faces presented for either many, short intervals or for few, long intervals. At test, previously familiar (famous) faces were matched more quickly than unfamiliar faces or the learned items. However, the learned items that had been seen on many occasions were matched more quickly than the completely unfamiliar faces or those faces only exposed for a few occasions, but only on different decisions. In Experiment 2, the similarity between face pairs was controlled more strictly. Once again, matches were performed on familiar faces more quickly than on unfamiliar or learned items. However, matches made on learned faces were significantly faster than those made on completely unfamiliar faces. This was observed for both same and

different matched decisions. The use of this matching task as a means of tracking how unfamiliar faces become familiar is discussed.

Attention to objects that change identity

Anne P Hillstrom^{1,2}, Yu-Chin Chai² and Brian Norris²

1. University of Southampton

2. University of Texas at Arlington

hillstro@soton.ac.uk

Spatiotemporal continuity is a powerful cue to object constancy, but is it the only one? A series of experiments test whether identity change in objects that are spatiotemporally continuous will disrupt object continuity. As evidence for a disruption in object continuity, we look for a disruption to object-based attention. Identity change is manipulated by morphing the object from one identity to another over a few frames. Experiments 1 and 2 use a divided attention paradigm, which traditionally shows that reporting two features of one object is more accurate than reporting a feature from each of two objects. We show that having one object rotate does not disrupt this finding but having one object morph does disrupt it. The remaining experiments demonstrate that a morph causes an attentional blink, as would be expected if attention were disengaged from one object and reengaged on another.

"Self" and release from PI

John Morton

Institute of Cognitive Neuroscience, University College London

j.morton@ucl.ac.uk

The A-B, A-C paradigm is a classic way of obtaining proactive inhibition with paired associate learning. The A-B, A-C, A-D paradigm should be even more effective. The principles of encoding specificity suggest that it should be possible to obtain release from PI through changes in state between the A-B, A-C and A-D learning. One possible state change is the notion of current "self". If A-B was learned as one self and A-C as another self, or as an adopted self, PI might be eliminated. This manipulation proved successful both with a dissociative individual and with control subjects.

Are language deficits part of the broader autism phenotype?

D V M Bishop¹, M Maybery², A Maley², D Wong², W Hill² and J Hallmayer³

1. Oxford University
 2. University of Western Australia
 3. Stanford University
- dorothy.bishop@psy.ox.ac.uk

It has previously been suggested that there may be some overlap in the genes that influence autism and those that confer a risk for specific language impairment (SLI). Both disorders are highly heritable, and similar language deficits are seen in SLI and autism. There are also suggestions in the literature that relatives of people with autism are at increased risk of communication problems. Data from the Western Australia Family Study of Autism (WAFSA) were used to evaluate this suggestion. Eighty families were recruited in which at least one child had autism or PDDNOS (index families). Parents and siblings of these index cases were compared with relatives from 65 control families on a battery of neuropsychological and self-report measures, including two tests that are sensitive indices of heritable SLI, nonword repetition, and nonsense passage reading. Index probands did more poorly than control probands on verbal IQ, nonword repetition, and nonsense passage reading. However, there was no difference between control and index relatives on any of these measures. Index parents did differ from control parents on the Social Skills and Communication scales of the Autism-Spectrum Quotient (AQ: Baron-Cohen et al, 2001), a self-report measure of autistic tendencies, suggesting that difficulties in the appropriate use of language are part of the heritable phenotype. It is concluded that the similarities between autism and SLI in phonological processing are superficial and do not arise from similar genetic origins.

Baron-Cohen S, Wheelwright S, Skinner R, Martin J, and Clubley E . The Autism-Spectrum Quotient (AQ): Evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. *Journal of Autism and Developmental Disorders* 31:5-17, 2001.

Auditory frequency discrimination in children with SLI: A longitudinal study

Penny Hill¹, Dorothy Bishop² and John Hogben³

1. Department of Physiological Sciences, Oxford University
 2. Oxford University
 3. The University of Western Australia
- Penelope.hill@magd.ox.ac.uk

Longitudinal studies examining the development of language skills in children with specific language impairment (SLI) show their impairments change over time. However, few studies have followed the development of their auditory processing, making it impossible to determine whether reported auditory deficits are constant or developmentally delayed. To address this we re-tested a group of 10 children with SLI

first tested 30 months previously (Mengler et al, under review) and compared them with 12 matched controls. Re-assessment showed the language problems of children with SLI remained. At time 1 the children with SLI (aged between 8 and 11 year old) were shown to have significantly poorer frequency discrimination than matched controls. When retested at time 2 the performance of both groups had improved but the children with SLI still had poorer frequency discrimination than the controls. There was no significant difference between the groups on the performance of a control task - auditory intensity discrimination, or on backward masking, a measure of auditory temporal resolution. These findings are consistent with a hypothesis of developmental delay in frequency discrimination ability, of about 2.5 years in children with SLI, and suggest that deficits in auditory temporal processing are not necessary to cause SLI.

Redintegration and lexicality effects in children: Do they depend upon the demands of the memory task?

Judy E Turner¹, Lucy A Henry², Philip T Smith¹ and Penelope A Brown¹

1. University of Reading
 2. Institute of Psychiatry
- j.e.turner@reading.ac.uk

The effect of long-term knowledge upon performance in short-term memory tasks was examined for children from 5 to 10 years of age. The emergence of a lexicality effect, in which familiar words are recalled more accurately than unfamiliar words, was found to depend upon the nature of the memory task. Lexicality effects were interpreted as reflecting the use of redintegration, or reconstruction processes, in short-term memory (Hulme et al., 1997). Redintegration increased with age for tasks requiring spoken item recall and decreased with age when position information but not naming was required. Redintegration was found for probed recall when the probe rhymed with a list item and hence was not dependent on spoken output. It was concluded that redintegrative processes are used in tasks requiring a precise phonological knowledge. These results extended the findings of Turner et al. (2000). It was proposed that most effects of redintegration arise during retrieval and the decision-making processes preceding recall.

Hulme, C., Roodenrys, S., Schweickert, R., Brown, G. D. A., Martin, S., & Stuart, G. (1997). Word-frequency effects on short-term memory tasks: Evidence for a redintegration process in immediate serial recall. *Journal of Experimental Psychology-Learning Memory and Cognition*, 23(5), 1217-1232.

Turner, J. E., Henry, L. A., & Smith, P. T. (2000). The development of the use of long-term knowledge to assist short-term recall. *Quarterly Journal of Experimental Psychology Section a-Human Experimental Psychology*, 53(2), 457-478.

Thirty-first Bartlett LectureThe hippocampal complex as a memory module: Implications for research and theory on recent and remote memory

Morris Moscovitch
University of Toronto
momos@psych.utoronto.ca

In the component process model of memory, the hippocampal complex acts as a memory module that interacts with posterior and anterior neocortex to encode, store and retrieve information that is apprehended consciously. The implications of this view will be explored and applied to illuminate aspects of research on recent and remote memory with a word about their distortion, as befits a lecture named to honour Bartlett.

Symposium: Early language and its precursors: Domain-general processes
Organiser: Graham Schafer

The empirical basis of early infant categorisation

Denis Mareschal
Centre for Brain and Cognitive Development, Birkbeck University of London
d.mareschal@psychology.bbk.ac.uk

The ability to group similar objects into categories underpins word learning. A previously published neural network model (Mareschal, French and Quinn, 2000) suggests that 3- to 4-month-olds perceptual categorisation of cat and dog natural images is driven by the feature distribution information in the images used to test the infants in standard visual preference tasks. Here, I report on 5 experiments that explore how changing the distribution information can reverse or eliminate category-based novelty preferences during testing. These experiments illustrate how a model can be used predictively to guide categorisation research. The model and experiments suggests that early infant perceptual categorisation reflects the working of a short-term associative memory system that encodes the distribution information of exemplars encountered. The problem of word learning then reduces to attaching a label to the latent compressed category representation inherent within the associative memory system.

Mareschal, D., French, R. M., Quinn, P. (2000) A connectionist account of asymmetric category learning in infancy. *Developmental Psychology*, 36, 635-645

The acquisition of the animate-inanimate distinction in infancy: Are domain general mechanism sufficient?

David Rakison
Carnegie Mellon University, USA
rakison@andrew.cmu.edu

The development of a concept of animacy is thought by many to be one of the cornerstones of cognitive development. Within the first two years of life, infants learn that animates - typically people, animals, and insect - and inanimates - typically furniture, vehicles, plants, tools, and so on - differ with respect to physical features (e.g., legs vs. wheels), the ways in which they move (e.g., self-propelled vs. caused to move), and whether or not they possess psychological states (e.g., intentions). According to a number of influential theoretical views, the rich, varied, and often ambiguous nature of the input means that the acquisition of this knowledge requires inherent specialized processes, domain specific modules, or innate skeletal principles (Gelman, 1990; Leslie, 1995; Mandler, 1992). As an alternative to these views, it has been suggested that domain general associative learning, coupled with a sensitive perceptual system and a biased attentional system, is sufficient to account for how infants learn about the properties of animates and inanimates (Rakison, 2003; Rakison & Poulin-Dubois, 2001, 2002; see also Quinn, 2002). In particular, it has been proposed that infants are biased to attend to certain correlations among static and dynamic cues, and the resulting represented association acts as the foundation for early categorization and induction. In this paper, I will present a number of empirical studies using diverse experimental infant oriented paradigms to support these claims. In particular, I will outline habituation studies with 10- to 22-month-old infants that show that simple associative learning can account for how infants learn about objects' path of motion, whether they act as agents or recipients in causal events, and whether they are self-propelled. I will also present converging evidence from studies with 14- to 22-month-olds in a novel version of the inductive generalization paradigm which suggest how and when infants begin to understand symbolic function. I will also discuss the effect of language of this learning process, and it will be suggested that object labels constitute another part of the associative mix that act as a glue to bind object concepts.

Causal properties, names, and object categorization

Thierry Nazzi
Laboratoire Cognition et Développement, Université René Descartes,
France
thierry.nazzi@psycho.univ-paris5.fr

We will present two series of experiments investigating the use by infants and young children of two possible cues to object categorization: causal properties and naming. Both sets of studies raise issues regarding the much-discussed distinction between perceptual and conceptual categorization, as well as the links between language acquisition (more specifically word learning) and conceptual development during the first years of life. The first set of studies, motivated by the hypothesis that

causal properties play a crucial role in the specification of "kinds," explores how children between the ages of 30 months and 4 ½ years use a new causal property, making a machine light up and play music, to categorize objects. These studies reveal the emergence, around 30 months, of the ability to use this causal cue in three different situations: to extend names (word-learning task), to sort objects, and to act upon them. From the youngest age tested, the use of this causal cue is possible even when no perceptual cue motivates the grouping of these objects. Moreover, when causal cues conflict with perceptual cues, we observe developmental changes in the way the children resolve these conflicts, changes consistent with the hypothesis of a shift from perceptual to conceptual cues. The analysis of children's errors allows a more specific characterization of this shift. It is proposed that the younger children rigidly exploit the fact that the various categorization cues tend to be correlated to initially predict causal cues from perceptual cues. In cases of conflict, this leads them to initially reinterpret the (causal) data. At a later age, they will be able to de-correlate the two kinds of cues, and will preferably use causal cues in cases of cue conflict. Furthermore, this set of studies will also allow us to explore whether it is crucial for the temporal relation between an object and an event to be causal in order for that relation to be used as a basis for categorization. Finally, we will discuss the implication of language (causal language; word learning) in causal categorization. This will lead us to the second set of studies, which looks at categorization of unfamiliar objects based on the name given to them, in the absence of any other categorization cue (especially perceptual cues). Our experiments showed that infants growing up in either English-speaking or French-speaking environments are able to construct new categories of objects based on their names at 20 months, but not 16 months. Hence, starting around 20 months, the process of word learning seems to be one of fast-mapping names to categories of objects rather than individual objects. The "emergence" of this ability seems to be linked to lexical acquisition, and could be linked to the development of a (more mature) understanding of reference. We will also present ongoing experiments regarding the phonetic specificity of the word patterns attached to these newly-built categories, an issue that has been recently the focus of much research. Finally, if time permits, we will present early evidence that this developmental profile is affected in Williams syndrome, a genetically-determined developmental syndrome, and that these problems might partly explain the atypical lexical and conceptual development observed in this population.

The role of names in conceptual development: A domain-general mechanism that make them special

Vladimir M Sloutsky
Center for Cognitive Science, The Ohio State University, USA
sloutsky.1@osu.edu

Auditorily presented linguistic labels play an important role in young children's conceptual organization and thinking: if two entities share a label, these entities are also expected to share many other properties. Although the prominent role of linguistic labels has been established, mechanisms underlying these effects remain unknown. Two classes of explanations seem plausible; one argues for language-specific effects of labels, whereas the other argues for more general auditory effects.

The latter explanation argues that early in development, the importance of labels may stem from special attention to auditory information. In this talk, we present evidence for privileged processing of auditory information in infancy and early childhood, and for a decrease of attention to auditory information in the course of development. We then consider an important shift that takes place between infancy and the early childhood, the shift from all auditory stimuli being "attention grabbers" and overshadowing visual information to labels (but not other sounds) being "attention tuners" a class of stimuli that attract attention both to themselves and to corresponding visual stimuli without overshadowing or competing for attention.

Early word learning

Kim Plunkett
University of Oxford
plunkett@psy.ox.ac.uk

During the second year of life, young children undergo an explosive growth in lexical development. Current theories attribute these dramatic changes variously to insights into the referential nature of words, a reorganisation of the ability to segment words in continuous speech or changes in underlying non-linguistic categorisation skills. In this talk, I will review some recent evidence consistent with the view that lexical development can be construed as a gradual, exemplar-based process derived from general learning strategies. Experimental, neuroimaging and modelling approaches will be used to illuminate the nature of the learning mechanisms underlying word learning.

Discussion

Graham Schafer
University of Reading
g.w.schafer@reading.ac.uk

A 30-minute question session designed to encourage discussion amongst the speakers and the audience. In particular, we will address the following related issues: The ability of the infant to detect correlation amongst the attributes of 'things in the world' and the relevance of this ability to the early acquisition of concepts, and other linguistic knowledge, given the structure of the input; The role of names in learning about language; Age effects in what used to be viewed as the 'symbolic function': in particular, the age at which we might expect to see the emergence of reference.

Saccade latency to briefly presented targets on a simple cueing task: Evidence of equivalent performance in developmental dyslexia

Jeannie Judge¹, Paul C Knox¹, Markéta Caravolas²

1. Division of Orthoptics, University of Liverpool

2. Department of Psychology, University of Liverpool

jeannie1@liverpool.ac.uk

We investigated saccades to briefly presented targets in an empty visual field in dyslexic adults and also examined the relationship between saccade performance and literacy skills. Dyslexics (n = 9) and controls (n = 10), matched for age, sex and performance IQ, completed a battery of literacy and phonological tasks. Saccade latency and accuracy were measured in a simple cueing task whereby a cue circle (radius 4.5°) appeared concentrically to the central fixation point. After a variable SOA (150-300ms) targets were presented randomly (3°, 6° or 9° left or right) for 20ms. Eye movements were recorded using infrared oculography. Dyslexics were significantly worse than controls on literacy and phonological measures. There were no between group differences for saccade latency or accuracy, and saccade latency did not increase with target eccentricity. Bivariate correlations revealed strong positive associations between literacy and phonological skills in both groups. Furthermore, longer saccade latencies were associated with better single and exception word reading in dyslexics (r = .593, p>0.05, r = .738, p<0.05 respectively) but not in controls. These results suggest that phonological impairments, but not an oculomotor deficit, characterise dyslexics literacy difficulties.

Which social characteristics are automatically perceived in faces? Evidence from the von Restorff effect

Isabel M Santos and Andrew W Young

University of York

imbs101@york.ac.uk

The age, sex and distinctiveness of faces can be judged from objective and partially independent facial features. In contrast, the physical basis of other social judgements such as attractiveness, intelligence and trustworthiness is not as yet understood, despite the consistency with which observers can make these judgements from faces. The present experiments investigated automaticity of the perception of social characteristics in faces, making use of the von Restorff/isolation paradigm. The von Restorff effect involves enhanced memory for perceptually salient items in a list, and we were able to demonstrate that its locus is at the encoding stage of a recognition memory experiment. By manipulating the characteristics of faces in a set to be learnt, we could thus determine whether enhanced encoding was found for faces of isolated (less frequent) age, sex, attractiveness, distinctiveness, trustworthiness, and intelligence. In most of our experiments, the variable on which stimulus faces were selected (perceived age, attractiveness, intelligence, etc) was not mentioned, so that the size of the resulting memory increment for isolated items could be used as an index of the extent to which each social characteristic was automatically perceived.

Using this index, age and gender were found to be automatically encoded from the face. Results for other characteristics were mixed, ranging from distinctiveness and attractiveness, for which there was some indication of automaticity, to intelligence, which did not seem to be automatically encoded. For social characteristics that are not automatically encoded, a von Restorff effect was found only when the experiment required a judgement that led to activation of the appropriate stereotype.

Repetition priming of facial expression recognition

Matthew P Fraser and Andrew W Young
University of York
mf125@york.ac.uk

Short-term repetition priming was investigated in a task involving classifying a sequence of faces presented one at a time. Prime and target pairs of faces were embedded within the sequence, so that relative to the previous face (presented on trial x) a target face (presented on trial $x+1$) could have the same identity (same person's face) and same expression (emotion) as the previous face (SISE condition), the same identity and a different expression (SIDE), a different identity and the same expression (DISE), or a different identity and expression (DIDE).

Experiment 1 was conducted with participants making identity judgements. Priming (facilitated response to the target face) was observed under SISE and SIDE conditions, showing the well-established benefit of repetition priming on facial identity recognition. In Experiment 2, expression judgements were made. Priming was only observed under the SISE condition - there was no benefit of repeating an expression if it was shown on a different person's face (DISE condition). Experiments 3 and 4 demonstrated that short-term priming of expression judgements was found when the internal features of the prime and target faces were physically identical, but not when they only shared a common pattern of facial muscle movements (Ekman's Action Units).

These differences between priming effects for expression and identity probably reflect the different uses of information concerning identity and expression in everyday life.

Impaired recognition of anger following damage to the ventral striatum

Andrew J Calder, Jill Keane and Andrew D Lawrence
MRC Cognition and Brain Sciences Unit, Cambridge
andy.calder@mrc-cbu.cam.ac.uk

In our recent work we have shown that acute administration of sulpiride (a dopamine D2-class receptor antagonist and anti-aggressive agent) produces a transient selective reduction in participants' recognition of facial signals of anger (Lawrence et al, 2002). Here we present further evidence of a disruption in anger recognition in four patients with damage to the ventral striatum, a region with a high concentration of dopamine receptors. Patients completed two tests assessing their recognition of facial signals of happiness, sadness, anger, fear, disgust, and surprise – the Emotion Hexagon and Ekman 60. All four patients showed impaired recognition of anger on the Emotion Hexagon test, while three showed a similar impairment on the Ekman 60.

In a second study we investigated recognition of emotion from vocal signals. Although the vocal expression tasks showed more variable performance, anger again showed the most consistent impairment. Finally we used the same tests in a control group with more dorsally placed basal ganglia lesions and found no evidence of anger impairments. Our findings are consistent with non-human research demonstrating a role for the ventral striatum and dopamine system in aggressive responding, provide the first evidence of ventral striatal involvement in anger coding in humans, and emphasise the importance of cross-species homologies in human affective neuroscience.

Lawrence AD, Calder AJ, McGowan SW, Grasby PM. *Neuroreport* 2002;13.

Partial reinforcement extinction effects despite equal rates of reinforcement

Mark Haselgrove
Cardiff University
haselgrovem@cardiff.ac.uk

The extinction of conditioned responding progresses more slowly if the conditioned stimulus (CS) has been intermittently paired with an unconditioned stimulus (US) than if the CS has been consistently paired with a US. This so-called partial reinforcement extinction effect has been a thorn in the side of theories of conditioning for many years. However, a recent theory of timing and conditioning (Gallistel & Gibbon, 2000) has provided a novel and simple account of this effect by appealing to different rates of reinforcement in place during conditioning. Three experiments will be described that held the rate of reinforcement constant between different groups of rats during conditioning. Despite this control, subsequent nonreinforced trials with the CS still demonstrated a partial reinforcement extinction effect. The implications of these results for trial-based and time-based accounts of extinction will be discussed.

Gallistel, C. R. & Gibbon, J. (2000). Time Rate and Conditioning *Psychological Review*, 107, 289-344.

Priming inconsistency: The influence of hierarchy on probability judgment

David A Lagnado and David R Shanks
University College London
d.lagnado@ucl.ac.uk

Consider the task of predicting which soccer team will win the next World Cup. The bookmakers may judge Brazil to be the team most likely to win, but also judge it most likely that a European rather than a Latin American team will win. This is an example of a non-aligned hierarchy structure: the most probable event at the subordinate level (Brazil wins) appears to be inconsistent with the most probable event at the superordinate level (a European team wins). In this paper we exploit such

structures to investigate how people make predictions based on uncertain hierarchical knowledge. We distinguish between aligned and non-aligned environments, and conjecture that people assume alignment. Participants are exposed to a non-aligned training set in which the most probable superordinate category predicted one outcome, whereas the most probable subordinate category predicted a different outcome. In the test phase participants allowed their initial probability judgments about category membership to shift their final ratings of the probability of the outcome, even though all judgments were made on the basis of the same statistical data. In effect people were primed to focus on the most likely path in an inference tree, and neglect alternative paths. These results highlight the importance of the level at which statistical data is represented, and suggest that when faced with hierarchical inference problems people adopt a simplifying heuristic that assumes alignment.

Cumulative risk judgements

Rachel McCloy¹, Ruth M J Byrne² and Philip Johnson-Laird³

1. University of Reading

2. University of Dublin

3. Princeton University

r.a.mccloy@reading.ac.uk

People tend to find judging cumulative risk difficult (e.g., Doyle, 1997; Svenson, 1994). We report the results of two experiments that examine ways to improve the estimation of how risks accumulate over time, e.g., the risk of pregnancy over five years of using a particular contraceptive. Past research on Bayesian probability judgments suggests two main manipulations that may improve performance: (1) presenting risk information in terms of frequencies (80 out of 100 people; e.g., Tversky & Kahneman, 1983) as opposed to probabilities (80%), (2) restructuring the problem to enable people to focus on a useful subset of the information (e.g., Girotto & Gonzalez, 2001). Our experiments showed that accuracy on cumulative risk judgment problems is improved when problems are partitioned so that participants focus on a useful subset, e.g., women who did not become pregnant in the first year who also do not become pregnant in the second year. Accuracy was not improved when the problems were presented in terms of frequencies instead of probabilities. These findings extend previous work on probability judgments to a new domain and suggest improvements that could be made in the presentation of information about cumulative risks.

Doyle, J.K. (1997). Judging cumulative risk. *Journal of Applied Social Psychology*, 27(6), 500-524.

Girotto, V. & Gonzalez, M. (2001). Solving probabilistic and statistical problems: A matter of information structure and question form. *Cognition*, 78, 247-276.

Svenson, O. (1984). Cognitive processes in judging cumulative risk over different periods of time. *Organisational Behavior and Human Performance*, 33, 22-41

Embodying the mapping between language and the visual world: Dissociations between the visual world and its mental representation

Gerry T M Altmann and Yuki Kamide
University of York
g.altmann@psych.york.ac.uk

The goal of much psycholinguistic research is to understand the processes by which linguistic input is mapped onto a hearer's mental representation of his or her world. Altmann & Kamide (1999) found that hearers direct their eyes during 'eat' towards the one edible object in a concurrent visual scene when they hear 'the man will eat..'. In Experiment 1 we took the scene away before participants heard the critical target sentence. Nonetheless, during the lifetime of the verb (?eat?) there were significantly more eye movements towards where the edible object HAD BEEN than towards where any other object had been. In Experiment 2 hearers were shown a scene depicting a woman, a wine glass on the floor next to a bottle of wine, and a table. At the same time, they heard either 'The woman will put the glass on the table' or 'The woman will wipe the table'. They then heard 'Then, she will pick up the wine and pour it sluggishly into the glass' (the visual scene remained on-screen throughout). During the immediately post-verbal region, we found fewer looks towards the actual glass when participants had heard that the glass had been moved than when they had not. There were correspondingly more looks towards the table. The data demonstrate the feasibility of using eye movements to track the mapping of language onto mental representations.

Altmann, G. T. M., & Kamide, Y. (1999). Incremental interpretation at verbs: Restricting the domain of subsequent reference. *Cognition*, 73(3), 247-264.

Top-down modulation of object-based visual attention: effects on the same-object benefit

Luc Boutsen and Glyn W Humphreys
Behavioural Brain Sciences Centre, University of Birmingham
L.Boutsen@bham.ac.uk

Studies of object-based visual attention reported costs in attention to two objects compared to one object. We investigated the role of top-down factors —task and object previews— on the same-object benefit. Observers responded to displays containing target features that appeared on two objects in different tasks: counting 1 or 2 features, and localising 2 features within objects. We manipulated the object-based location and the visual field location of the features: Features appeared on one or two objects, and in one or two hemifields. In counting, detection of two features showed a benefit when they belonged to different objects rather than the same object. Also, detection improved for between-hemifield locations. In contrast, in localisation a two-object cost occurred: detection improved when features appeared on the same object; there was no visual field effect. Finally, an informative preview of the objects and feature locations reduced the influence of object location in a counting task. However, when the preview objects were uninformative, the two-object benefit

reappeared. Previews had no influence on the effect of hemifield locations. Task demands and object previews can reverse the benefit associated with object-based selection. Object-based selection can be modulated by top-down factors, resulting in differential selection of objects.

Contrasting effects of ageing and frontal lobe function in implicit and explicit memory

A J Ben Clarke, Laurie T Butler and Dianne C Berry
University of Reading
a.j.b.clarke@rdg.ac.uk

Winocur et al. (1996) examined the relationship between tests sensitive to frontal and medial temporal lobe functioning and performance on implicit and explicit versions of word-stem and word-fragment completion tasks in elderly and young participants. Whereas both explicit tasks correlated with medial temporal functioning, only implicit word stem completion correlated with the frontal lobe tests, suggesting a unique frontal lobe contribution to this task. We sought to replicate and extend these findings using a different range of tasks, namely word stem completion, perceptual identification, cued recall and recognition. In addition, we introduced additional neuropsychological measures, and a generate-read study manipulation. Forty-eight older (Mean = 73.86 years; Range = 66-82) and forty eight younger adults (Mean = 19.86 years; Range = 19-38) took part in the experiment with half of each age group performing implicit and explicit memory tasks respectively. As expected, the read-generate manipulation dissociated implicit and explicit task performance, although the pattern was clearest for the younger group. However, in contrast to Winocur et al. (1996), we found no evidence for a frontal lobe component to word stem completion. Possible reasons for this are discussed, as are the theoretical implications.

Winocur, G., Moscovitch, M., & Stuss, D. T. (1996). Explicit and implicit memory in the elderly: Evidence for double dissociation involving medial temporal- and frontal-lobe functions. *Neuropsychology*, 10(1), 57-65.

Do children with autism spectrum disorders fail to use category and associative relationships to facilitate free recall?

Paula Clarke¹, Kate Nation² and Graham Hitch¹
1. University of York
2. University of Oxford
pjc118@york.ac.uk

10 children with autism spectrum disorders (ASD) and 10 normally developing control children matched on IQ, age and gender completed an immediate free recall task designed to investigate memory for category related and associatively related words. The stimuli were six 12-item word lists each consisting of six related words and six unrelated words presented in a random order. Three lists contained category related words (animals, vehicles, & vegetables) and three lists contained associatively related words (seaside, football, & space). The ASD group recalled

significantly fewer associatively related words than the control group. Although the ASD children were unimpaired relative to control children at recalling category-related words overall their performance across the different lists was not consistent. These findings are discussed with reference to the concept of weak central coherence (Frith and Happe, 1994) which proposes that individual's with ASD process information in the absence of global context and meaning.

Frith, U & Happe, F. (1994). Autism - Beyond theory of mind. *Cognition* 50(1-3): 115-132.

Modelling serial position functions of neuropsychological patients

Eddy J Davelaar and Marius Usher
Birkbeck College
e.davelaar@psychology.bbk.ac.uk

Many theories of memory have addressed the serial position effect in immediate free recall of word lists i.e. the better recall for the first (primacy) and last few (recency) words compared to the words from the middle part of the list. Neuropsychological investigations have shown that certain patient groups exhibit subnormal serial position functions. For example, amnesic patients show lower recall performance for pre-recency items, whereas recency items are untouched.

Here, a recently developed neurocomputational model is used to explore the underlying sources for the deviant serial position functions seen in patients with frontal, medial-temporal or striatal damage. The model consists of a dynamic short-term buffer (mediated by prefrontal areas) and a context representation (mediated by medial-temporal areas).

Simulation results of three simplifying assumptions are presented: frontal damage affects buffer capacity, medial-temporal damage affects episodic encoding/retrieval, Parkinson's disease affects probability that items will enter the buffer. Despite changing only a single parameter, the model captures the qualitative pattern seen in patients.

These initial results provide a starting point for developing detailed models of memory performance in neuropsychological patients. This could help in interpreting the neurocognitive deficits in brain damaged patients with reference to serial position functions.

Aging and the accessibility of naturally-occurring delayed intentions

Jayne E Freeman and Judi A Ellis
University of Reading
j.e.freeman@reading.ac.uk

This study examined age differences in the accessibility of naturally-occurring intentions both before and after completion. Following Maylor, Darby and Della Sala (2000) accessibility was measured in terms of the number of activities generated in a 4-min activity fluency task. Each participant undertook two such tasks. A prospective task in which they generated activities intended for completion during the following

week and a retrospective task, one week later, in which they generated activities carried out over the previous week. In a partial replication of Maylor et al.'s findings young, but not healthy older, adults generated more to-be-completed intentions than completed ones, demonstrating an intention-superiority effect (ISE) for everyday activities. The absence of this effect for older adults appears to reflect the reduced accessibility of intentions prior to completion, rather than the impaired inhibition of fulfilled intentions. Despite showing impaired accessibility of intended activities, older adults reported having completed a greater proportion of their intentions during the week than young adults. The finding of an age-related increase in the use of temporal organisation during intention retrieval suggests that older adults may have more structured lives and may use knowledge about the sequence of daily events to support their superior everyday prospective remembering.

Maylor, E.A., Darby, R.J. & Della Sala, S. (2000). Retrieval of performed vs. to-be-performed tasks: A naturalistic study of the intention-superiority effect in normal aging and dementia. *Applied Cognitive Psychology*, 14, S83-S98.

How to study long term working memory with no experts?

Alessandro Guida¹ and Hubert Tardieu²

1. University René Descartes
 2. Laboratoire de Psychologie et Neuropsychologie de la Mémoire,
Boulogne Billancourt
- guida@psycho.univ-paris5.fr

Ericsson and Kintsch (1995) have presented a new memory theory intending to give an answer to the contradiction between the drastic limitations of the short-term memory and the visible effortlessness with which people face the demands of complex task activities. They proposed that expert individuals can use retrieval structures to exceed the limits of working memory (WM) capacity. They do so by using a part of the long-term memory as working memory : the long term working memory (LT-WM). LT-WM characteristics permit to account for data that the WM doesn't seems to account for, and the aim of our study was precisely to test LT-WM characteristics : a greater storage capacity than WM, a greater resistance to interference and a long-term storage capacity.

To do so we have created a new method : personalization. We used Kintsch, Ericsson and Patel (1999) definition of text comprehension expertise. Three conditions must be fulfilled. First, the text has to be well written; second, the reader must have reading skills, and third the text must have a familiar content. We used the third parameter has a factor, by establishing a personalized version of a text (using known locations), so that the subjects could use their LT-WM, *versus* a not personalized content of the same text, for an other group, less convenient to use LT-WM.

The subject task was to recall the objects located in the different places of the texts. Recall was cued by the locations where the objects were. Three results confirmed LT-WM characteristics. First, the subjects in the personalized version recalled significantly more objects than the other subjects. Secondly the subjects with the personalized version were not sensitive to a delay and the interfering task , even if

the other subjects were not really sensitive too. And third point, the fact that the number of objects to be recalled by text varied from 6 to 10, had no effect on the recall performance in the personalized version, while it had an effect for the other group. This allow us to think that our paradigm of personalization is valuable

Ericsson, A., & Kintsch, W. (1995). Long term working memory. *Psychological Review*, 102, 211-245.

Kintsch, W., Patel, V., & Ericsson, A. (1999). The role of long-term working memory in text comprehension. *Psychologia*, 42, 186-198.

Increasing physical load during a walking dual-task with a secondary tray-carrying task

Clare Harley, John Wann and Janet Cockburn
University of Reading
c.harley@reading.ac.uk

Walking is an integral component of many everyday activities and normally requires few cognitive resources. In old age or after some illnesses, such as stroke, walking may become more effortful and leave fewer resources for other activities. In this study, we explored the nature of changes in performance during a dual-task walking experiment with a secondary tray-carrying task. Distance travelled and stride length were measured during brisk walking around a figure-of-eight track. Participants were given three different loads to carry during walking: an empty tray; a tray with 2 empty cups; and a tray with 2 cups full of water. A word generation task measured cognitive performance. There were 9 conditions: walking only; walking and word generation; walking with each of the loads (x3); walking and word generation and each load (x3); and word generation only. Participants were 24 healthy older adult volunteers. Analysis revealed significant dual task decrements in performance for walking distance, stride length, and word generation. A three-way analysis including tray weights, revealed an inverse relationship between load, walking distance and stride length. A positive relationship, however, was found between load and word generation. This experiment demonstrates the complexity of multiple task interaction.

A new way of assessing the strength of figure-ground cues

Johan Hulleman, Luan Gedamke and Glyn W Humphreys
University of Birmingham
j.hulleman@bham.ac.uk

Methods to assess the strength of figure-ground cues generally fall into two categories: (1) Subjective reports about which part of a display is seen as figure. (2) Reaction time measures to stimuli that probe a part of a display. Both methods have drawbacks. Subjective reporting manipulates the process under investigation. Studies with probes can superimpose a new figure on the figure-ground display, possibly changing the representation, or fail to control what subjects do during the

presentation of figure-ground displays (when probes follow the display). In our approach we try to increase control over the behaviour of subjects using a visual short term matching task (Driver & Baylis, 1996), while refraining from explicit figure-ground instructions. We biased figure-ground assignment by presenting the first half of an ambiguous figure-ground display before adding the second half. The first half will initially become figure, since it is presented on a large background. If the first half contains a strong figure cue, it should be resistant against the distraction caused by the onset of the second half, 100 msec later. If, however, the second half contains a strong figure cue itself, this may cancel the initial figure assignment to the first half. Figure assignment was probed afterwards and subjects decided which of two mirror images was part of the figure-ground display.

In our experiment, we used the lower-region cue (Vecera, Vogel & Woodman, 2002). We report an interaction between region presented first, and whether this region is subsequently probed. For upper regions presented first and probed, reaction times are slower than for lower regions presented first and probed. This illustrates the viability of our approach: a strong figure cue will overcome the disadvantage of being presented second, whilst also holding on to the advantage of being presented first.

Speech and non-speech discrimination in people with specific language impairment

G M McArthur and D V M Bishop
University of Oxford
genevieve.mcarthur@psy.ox.ac.uk

We used psycho-acoustic tasks to test how well people with specific language impairment (SLI) discriminated between speech (vowels) and non-speech sounds (tones and complex tones) compared to people with normal spoken language skills (controls). One third of the SLI group were poor at discriminating between the frequency of tones compared to the control group and the remaining people in the SLI group. This subgroup was equally poor at discriminating between vowels and complex tones that were matched for spectral complexity. In contrast, the people with normal discrimination for tones found vowels harder to discriminate than the complex tones despite their similar complexity. This suggested that people with normal discrimination processed vowels in a unique way to non-speech sounds, while people with poor discrimination processed vowels in the same abnormal way as they processed non-speech sounds. We are now working on testing the validity of this suggestion at the level of the brain by measuring the event-related potential brain responses of our people with SLI with poor discrimination to tones, vowels, and complex tones, and comparing them to the brain responses of our controls and people with SLI with normal discrimination. This data will provide some much needed insights into the relationship between non-speech and speech discrimination at the level of behaviour and the brain.

Investigating individual differences in children's real-time sentence comprehension using language-mediated eye movements

Kate Nation¹, Catherine M Marshall^{1,2} and Gerry T M Altmann²

1. University of Oxford

2. University of York

kate.nation@psy.ox.ac.uk

Individual differences in children's on-line language processing was explored by monitoring their eye movements to objects in a visual scene as they listened to spoken sentences. Eleven poor comprehenders and 11 controls were presented with sentences containing verbs that were either neutral in respect to the visual context (e.g. Jane watched her mother choose the cake; where all of the objects in the scene were choosable) or supportive (e.g. Jane watched her mother eat the cake; where the cake was the only edible object). On hearing the supportive verb, fast anticipatory eye movements were made to the target object (e.g. the cake) suggesting that children extract information from the language they hear and use this to direct on-going processing. Poor comprehenders did not differ from controls in the speed of their anticipatory eye movements suggesting normal sensitivity to linguistic constraints. However, poor comprehenders made a greater number of fixations to target objects, and these fixations were of a shorter duration than those observed in the control children, especially in the supportive condition. This pattern of results is discussed in terms of possible processing limitations including difficulties with memory, attention or suppressing irrelevant information.

Is visual word recognition automatic?

B Parris¹, D Sharma² and B Weekes¹

1. University of Sussex

2. University of Kent

bap20@biols.susx.ac.uk

The Stroop task is often used as the classic example of automatic processing. This automaticity argument was recently challenged in an article by Besner, Stoltz, and Boutilier (1997). Using a novel variation on the Stroop task, they coloured in only one letter of the word and found that this manipulation reduced, and in some cases eliminated, the Stroop effect. They argued that it is 'mental set' that determines whether a word is read to the semantic level or not, and that mental set enables a level of control over such processes. We show that there is a hidden effect at one of the letter positions. This effect shows that it is not mental set that is responsible for the effect. Instead, we show that a probable explanation is one based on eye movements and attention. The modulation of the Stroop effect by attention means that the Stroop effect cannot be considered an index of automatic processing, but given that a full Stroop effect is found at this one position, subjects cannot be described as having control over such processes. Furthermore, when considering priming studies using the same paradigm, there seems to be both controlled and automatic processes in visual word recognition.

Besner, D., Stolz, J. A., & Boutilier, C. (1997). The Stroop effect and the myth of automaticity. *Psychonomic Bulletin & Review*, 4(2), 221-225.

Assessing children's understanding of a balance task: Do untrained observers attend to gestures?

Karen J Pine
University of Hertfordshire
K.J.Pine@herts.ac.uk

The aim of this study was to investigate the extent to which, when assessing children's knowledge, untrained observers attend to the additional information conveyed in hand gestures. An ever-increasing body of evidence indicates that the gestures children produce as they speak can offer considerable insight into their thoughts. Moreover, the information that the children convey in their gestures does not always match the information expressed in the accompanying speech. When a new concept is being learned, the developing knowledge is often conveyed in gesture before it is expressed in speech. The balance beam task, used in this and previous studies, has been found to elicit a lot of hand gestures in children. These gestures either matched the children's spoken explanations (concordant), or mismatched (discordant). Previous studies have found that discordant gestures are produced when knowledge is in a transitional state, and are indicators of receptivity to instruction. In this study 42 untrained observers viewed video clips of concordant and discordant children explaining the balance beam task and were asked to provide assessments of the children's understanding of the key task variables. The observers rated discordant children as understanding more variables than concordant children. Furthermore, when asked to assess the child's readiness to learn, discordance was more reliably associated with readiness to learn than concordance. Observers were not explicitly aware of using the children's gestures to aid their assessments. We conclude that children convey additional information in their gestures that is not available in their spoken explanations. The untrained observer is able to glean substantive information from these gestures and this influences their assessments of children's understanding of a task and readiness to learn.

The effect of stimulant medication on auditory processing performance in children with ADHD

Paul Sutcliffe¹, Dorothy Bishop¹ and Stephen Houghton²

1. University of Oxford
2. Centre for Attention and Related Disorders, University of Western Australia

paul.sutcliffe@psy.ox.ac.uk

It has been claimed that children with language and reading impairments have deficits in processing rapidly presented or brief sensory information. However, several researchers have failed to replicate this work, and have suggested explanations in terms of poor attention, task demands or difficulty in frequency discrimination to account for the impaired deficits. A series of studies with normally developing

children found that poor thresholds on a frequency discrimination task often reflected variable performance from session to session, especially in younger children. Although test performance correlated with reading and language ability, this relationship disappeared when measures of attentional skill were taken into account. These investigations suggested that links between poor reading and high auditory thresholds did not reflect a low-level perceptual deficit, rather a fluctuating attention. The findings were recently extended in a study at the Centre for Attention and Related Disorders funded by a study grant from the EPS. Children with Attention Deficit Hyperactivity Disorder (ADHD) were seen whilst on- and off-stimulant medication. Auditory processing performance was repeatedly examined using a frequency discrimination task. Age matched controls were used for comparison. Considerable variability in auditory processing performance was found when off- compared to on-stimulant medication and to the control children. The study illustrated the importance of accounting for comorbid attentional difficulties when examining children with language and reading problems, in particular when measuring auditory processing performance. Furthermore, auditory processing variability might be useful for clinical assessment of young children with attentional difficulties.

Evidence for holistic representations of ignored images and analytical representations of attended images

Volker Thoma¹, John E Hummel² and Jules Davidoff³

1. University College London
 2. University of California, Los Angeles
 3. Goldsmiths, University of London
- v.thoma@ucl.ac.uk

Attended images prime both themselves and their left-right reflections, whereas ignored images prime themselves but not their reflections (Stankiewicz, Hummel & Cooper, 1998). These results are predicted by the hybrid theory of object recognition that the human visual system represents ignored images holistically, and attended images both holistically and analytically. A novel prediction from the hybrid model is that priming for attended images will generalise over configural distortions whereas priming for ignored images will not. Consistent with this prediction, Experiments 1 and 3 demonstrated that split images primed their intact and split counterparts when they were attended but not when they were ignored, whereas intact images primed themselves whether they were attended or not. Experiment 2 demonstrated that a substantial component of the observed priming is specifically visual. These data contribute to the growing body of evidence that one function of visual attention is to permit the generation of analytic (i.e., explicitly relational) representations of object shape.

Stankiewicz, B.S., Hummel, J.E. & Cooper, E.E. (1998). The role of attention in priming for left-right reflections of object images: Evidence for a dual representation of object shape. *Journal of Experimental Psychology: Human Perception and Performance*, 24, 732-744.

The electrophysiology of groove (revisited)

Neil Todd
University of Manchester
Todd@fs1.fse.man.ac.uk

In this paper we present some further data from a study to look for the electrophysiological correlates of sensorimotor planning in beat induction (Todd et al. 2002) by means of high-resolution (64-channel) electroencephalography. The particular focus of the study was on brain activity related to the prediction of missing beats. Previous work (Todd, 2002) has suggested that beat induction is a kind sensory-guided action, so that even in the absence of any overt movement, brain potentials for predicted beats, including missing beats, exhibit premotor or motor characteristics similar to those of an actual movement, i.e. the movement related negativities (Gerloff et al. 1997). The principal stimulus used in the present study was a click anapest rhythm, consisting of three clicks and a gap such that the relative inter-onset intervals are 1, 1, 2I. The stimuli were presented under three conditions: passive (listen only) predictable, active predictable (synchronise finger extension) and active-passive (imagine beat). The anapest stimuli were preceded by a passive unpredictable condition as a control. A further condition, with two missing beats randomly alternated with the anapest, was added in order to investigate the P300 as function of stimulus uncertainty. The results are consistent with the earlier work and further strengthen the case for beat induction as a form sensory-guided action by providing more accurate spatio-temporal localisation of movement-related potentials. The data also provide evidence of executive movement related planning in the form of N2/P300 waves consistent with a role for the posterior parietal lobe in sensorimotor coordination (Jackson et al. 1999).

Gerloff, C., Camilo, T., Uenishi N, Cohen, L., Leocani, L and Hallett, M. (1997) Steady-state movement-related cortical potentials: a new approach to assessing cortical activity associated with fast repetitive finger movements. *Electroencephalography and Clinical Neurophysiology* 102(2), 106-113

Jackson, S., Jackson, M. and Roberts, M. (1999). The selection and suppression of action: ERP correlates of executive control in humans. *Neuroreport* 10, 861-865.

Todd, N.P.McAngus, Lee, C.S. and O'Boyle, D.J. (2002) A sensory-motor theory of temporal tracking and beat induction. *Psychological Research* 66(1), 26-39.

Todd, N.P.McAngus (2002) The electrophysiology of groove. *Paper presented at the meeting of the Experimental Psychology Society, Cambridge, July 2002.*

Assessing visual attention in a healthy ageing and stroke population

Matthew I Tofield and John P Wann
University of Reading
m.i.tofield@reading.ac.uk

Detecting motion components in the visual scene may be the first indication of an impending collision, however, this is often overlooked in current driving re-assessment procedures. We tested for deficits in peripheral processing by using displays that tested peripheral attention with brief (90ms) episodes of relative motion, changing size, luminosity and changing colour, and crucially, collision detection. Four groups of participants (N= 67: 1 x stroke, 3 x healthy ageing groups,) spanning an age range of 20 to 85 years, were presented with stimuli on a video screen at 10°, 20°, and 30° eccentricities. Their natural gaze response was recorded using eye gaze monitoring technology. Results: As participants age increased, their performance decreased. Post-hoc analysis confirmed that the older drivers performed worse than the young and middle age drivers in all conditions. Comparing the stroke participants against the healthy ageing drivers revealed the same systematic decrease in performance with increasing age, that was previously found for the healthy ageing drivers. However, younger stroke participants (mean = 49.3 years) made recoveries that placed their performance alongside that of the middle aged healthy controls. The implications of treating stroke patients as though they belong to a homogenous group when assessing suitability to return to driving is clearly hazardous, as our results suggest that stroke as well as normal aging effect peoples visual attention differently. Therefore we conclude that stroke patients should not generally be assessed as though they belong to a homogenous group, and that assessment of visual attention should be part of any assessment criteria for measuring fitness to drive in stroke patients making a return to driving.

Use it or lose it? An experimental test of the effects of increased cognitively stimulating activity on cognitive test performance in healthy older adults

Lesley J Tranter and Wilma Koutstaal
University of Reading
l.j.tranter@reading.ac.uk

Several studies have suggested a link between maintained cognitively stimulating activity and increased performance on cognitive tests in older adults. However, the causal connection is not clearly established. The current research seeks to provide experimental evidence to support the disuse hypothesis which suggests that some age-related cognitive decline may be attributable to reduced use of mental abilities. We primarily focused on the effects of cognitively stimulating activity on age-related changes in fluid intelligence. A sample of 44 older adults (mean age 67.12) was divided into two groups, each having a similar group-mean level of crystallised intelligence. Both groups were tested (pre and post) on a battery of cognitive measures: Raven's Standard Progressive Matrices, Alice Heim 4 II, Cattell's Culture Fair, WAIS-R Blocks and Digit Symbol Substitution Task, Trail Making Task A and B and Digit Copying. The experimental group was engaged in a

10-week period of increased, novel, cognitively stimulating activity involving both home and laboratory-based tasks and was compared to a control group who were tested pre- and post-test only. Analysis showed a significantly greater increase in the experimental compared with the control group in pre- to post-test performance on two measures: one the fluid measure 'Cattell's Culture Fair,' the other a measure of visuo-spatial construction, 'WAIS-R Blocks'. Partial support for the hypothesis was obtained. Future research will explore the durability and nature of the experimental effects observed.

Simple, accurate, robust models of the world

Benjamin Vincent and Roland Baddeley
University of Sussex
B.T.Vincent@sussex.ac.uk

Out of the many of features in our environment, one must distinguish which, and in what way, each affects any item of interest. Often, it is required that we achieve this understanding very quickly given only a few observations of the world. The vast majority of statistical and machine learning models fail to achieve anywhere near the level of performance of humans. One reason why this is so is because the problem is 'under-complete,' that is, there is insufficient information to lead to a unique solution. Given this, 'regularisation techniques' are often employed which act to narrow down the range of solutions and biases the final solution in a particular direction. It is proposed here that a very useful regulariser would be to 'ignore as many things as possible'. This technique is implimented, using Bayesian methods, into a multiple regression model and compared to other methods. Three main advtantages are achieved by 'ignoring as many things as possible', 1) solutions are very simple, thus understandable, 2) solutions are accurate and robust, 3) these solutions can be achieved with low amounts of data. This approach can be practically applied to animal/human learning and statistical analysis of collected data. It is also of note that this work has important similarites and differences to the approach of 'bounded rationality'.

Attention disengagement in 36 month-olds

Kate Wilmut, John Wann and Janice H Brown
University of Reading
k.wilmut@reading.ac.uk

Attention disengagement and the integration of visuo-spatial and motor systems were investigated in 36 month-olds using the gap paradigm. Few studies have focused on the integration of developing systems in this age group. Children were seated in front of a Perspex board displaying a central fixation point (star) and six peripheral targets (snowmen), and were asked to look at or hit targets when illuminated by LED's (a plastic hammer was provided). Saccade/hand movement latencies to peripheral targets were measured on gap trials, in which a temporal gap (200ms) was inserted between fixation offset and target onset, and on overlap trials, in which there was no temporal gap between fixation and target. As predicted, a robust

gap effect was found in the saccade latencies of both look, and look and hit responses. However, the size of the gap effect was greater in the look and hit response, suggesting that toddlers are still refining their disengagement processes, such that when a second process (hand movement) is involved, attention disengagement is less skilled. In addition, no gap effect was seen in hand movement latencies in the hit response, suggesting an immaturity in the integration of the two systems.

READING INFORMATION

Accommodation

Accommodation has been reserved for the nights of 8, 9 and 10 July in Whiteknights Hall (ensuite and non en-suite). Alternative accommodation is shown below and should be booked directly with the hotel or guest house. Reservations for University accommodation and/or the Conference Dinner, can be made on the enclosed booking form, which should be returned to Eve Sweeney, School of Psychology, University of Reading, Earley Gate, Reading, RG6 6AL (Tel: 0118 378 8523) before 23 June, 2003.

Cheques must be made payable to University of Reading

Hotels and guest houses close to campus

Reading Comfort Inn, 39 Christchurch Road, Tel: 0118 931 1311

Elmhurst Hotel, 51 Church Road, Tel: 0118 966 1588

Donnington House, 82-86 London Road, Tel: 0118 926 5258

Abadair House, 46 Redlands Road, Tel: 0118 986 3792

Brackenhurst Guest House, 230 Wokingham Road, Tel: 0118 966 7829

Further accommodation can be found on the following websites:

<http://www.readingtourism.org.uk/accommodation/>

<http://www.britainexpress.com/hotels/berkshire/Reading.htm>

<http://www.travel-hotels-england.co.uk/berkshire-hotels/reading-hotels-1.htm>

<http://www.glevdonparkhotel.com/reading.htm>

Messages and Internet

Messages for those attending the meeting can be left at Reception, School of Psychology, 0118 378 8523 or by email to Eve Sweeney, e.m.sweeney@reading.ac.uk.

Access

See map back cover.

By Air

There is a frequent Railair bus service from London Heathrow Airport to Reading Station, and also a direct train service from Gatwick Airport.

By Train and Bus

Reading is on many routes from the North West, West and South West, and there is a frequent service from London Paddington. The University is a short taxi ride from Reading Station. Please note that the entrance to Whiteknights Hall and Earley Gate for Psychology and Agriculture buildings, neither are accessible by car from the University Main Entrance (Queen's Drive) in Shinfield Road. (See maps back cover and inside back cover)

Buses are obtainable from the Station to the University Main Entrance (Nos 9, 12 and 20). The Nos 41 and 42 (again from the Station) will take you to Upper Redlands Road close to Whiteknights Hall, and to Earley Gate Entrance. Additionally, a number 17 bus from Friar Street will take you to the Three Tuns public house, on the corner of Wokingham Road and Church Road, which is close to Earley Gate entrance (see map back cover). See local bus information available here <http://www.reading-buses.co.uk/>.

By Car

From the west, east and south, travel to Junction 11 of the M4. At the roundabout follow signs for the A3270 to Shinfield and the University. This road runs parallel to the motorway. Pass Foster Wheeler on your left. At the next roundabout turn left (A327) past the European Weather Centre. Straight over the next roundabout. Straight over the next roundabout follow signs for the A327. Keep going straight on through the first set of traffic lights. Turn right at the second set of traffic lights immediately after the main entrance to the University (which is on your right), into Elmhurst Road. Travel to the end and turn right into Upper Redlands Road, where you will find the entrance to Whiteknights Hall on the right. (See maps back cover and inside back cover)

From the north, travel towards the town centre, joining the inner distribution road and following the signs for the University. Just after the major junction with a right turning to the A33, leave the inner distribution road by the exit on the left, signposted to the University. Still following the signs to the University travel along London Street and Silver Street. At the top of the hill, immediately past a parade of shops, turn left at the roundabout onto the A327 (Christchurch Road). Turn left at the first set of traffic lights, into Elmhurst Road. Travel to the end and turn right into Upper Redlands Road, where you will find the entrance to Whiteknights Hall on the right. (See maps back cover and inside back cover)

Further directions can be found at <http://www.rdg.ac.uk/maps/>

Parking

Parking is available both at Whiteknights Hall and at Earley Gate. Please note that you cannot drive across campus from Whiteknights Hall to the School of Psychology or Agriculture Building, but must drive round campus to Earley Gate entrance. Please see map (inside back cover).

Eating and Drinking

Lunch

The Common Room, lower ground floor in the Agriculture Building serves sandwiches and snacks. Lunches can also be obtained at the Science and Technology Building (No 46 on map, inside back cover) close to the School of Psychology, and on main campus at The Blue Room behind Park House (No 12 on map, inside back cover) and The Student Union (no 11 on map, inside back cover). The Three Tuns in Wokingham Road near Earley Gate entrance serves bar meals.

Close to campus**Restaurants**

Devana Indian restaurant, 80 Christchurch Road, 0118 987 1803

Sizzling Wok, (Thai), 62 Christchurch Road, 0118 987 1190

Blue Ginger (Indian) 83-85 Wokingham Road, 0118 935 2999

Miahs Garden of Gulab (Indian), 130-134 Wokingham Road, 0118 966 7979

Pubs

Three Tuns, Wokingham Road, (near Earley Gate entrance) (serves meals until 7.30pm)

Queens Head, Christchurch Road, (near Main Entrance to the University) (serves food until approx 7pm)

Reading Town Centre

There are a large number of restaurants in the centre of Reading, particularly at the Riverside at the rear of the Oracle Shopping and Leisure Complex, whose main entrance is in Broad Street.

This website gives a good selection http://www.readingrestaurants.com/town_centre/

Places of Interest**Reading**

Full details can be found at <http://www.readingtourism.org.uk/>

Conference Dinner

This will be held at Pepe Sale, 3 Queens Walk, Reading, Tel: 0118 959 7700. The cost including wine will be £28. Please book, and indicate any dietary requirements, on the enclosed form which should be returned to Eve Sweeney, School of Psychology, University of Reading, Earley Gate, Reading, RG6 6AL (Tel: 0118 378 8523) before 23 June, 2003.