

**JOINT WITH THE CANADIAN
SOCIETY FOR BRAIN,
BEHAVIOUR AND COGNITIVE
SCIENCE (CSBBCS)**

**YORK
MEETING**

8-10 JULY 2009

A scientific meeting will be held at the Hospitium and Tempest Anderson Hall, Museum Gardens, York on 8-10 July 2009. Note that the venue is NOT on the University of York Campus. The local organiser is Tom Hartley.

Sixteenth EPS Prize Lecture

Thursday 9th July, 6pm

Fractionating the Musical Mind: Insights from Congenital Amusia
Dr Lauren Stewart (Goldsmiths University of London)

Followed by a related Jazz Recital

Symposium - To accompany the Prize Lecture

Thursday 9th July, 2.30pm – 5.30pm

Music in mind and brain

Organiser: Dr Victoria Williamson (Goldsmiths University of London)

Symposium

Wednesday 8th July, 1.30pm – 5pm

CSBBCS Past President's symposium - Computational perspectives on learning and memory

Organiser: Professor Doug Mewhort

CSBBCS Hebb Distinguished Contribution Award Lecture

Wednesday 8th July, 5pm

Attention and sensory memory in the visual, auditory, and tactile domains: Evidence from noninvasive brain imaging using EEG, MEG, and fMRI.
Professor Pierre Jolicoeur (University of Montreal)

Poster Session

This will be held in conjunction with the drinks reception on Wednesday evening on both floors of the Hospitium. Delegates may put up posters at the beginning of the conference so that more delegates have a chance to see them during coffee breaks, and should take them down at the end of the conference.

Platform Presentations

Sessions will be held in the upper floor of the Hospitium and in the Tempest Anderson Hall (inside the Yorkshire Museum). These are within 2 minutes walk of one another. Laptops (windows PCs) will be available in BOTH rooms (upstairs Hospitium and TA Hall). They will have Office 2007 installed. Speakers are recommended to bring presentations on USB stick or CD to avoid technical problems. Speakers can bring their own laptops with any necessary connecting cables. Special care needs to be taken with Macs, whose screen resolution should be set at 1280x1024 before linking to the AV equipment. Any queries about facilities in the theatres should be sent to the local organiser, Tom Hartley (t.hartley@psychology.york.ac.uk).

Refreshments will be served in the Ground Floor of the Hospitium.

The conference dinner will be held at the Merchant Taylors' Hall, Aldwark on Thursday 9th July at 8.15pm. A booking form is enclosed.

The 2009 Donald O. Hebb Distinguished Contribution Award from the Canadian Society for Brain, Behaviour and Cognitive Sciences

Presented to **Professor Pierre Jolicœur, Ph.D.**

A graduate of McGill University (B.Sc.) and Harvard University (Ph.D.) Pierre Jolicœur is world-renowned for his pioneering empirical work and theoretical development in fundamental areas of human experimental psychology. His internationally acclaimed discoveries at the intersection of research on attention, memory, and perception over the last 25 years have profoundly influenced scientific development in each of these areas.

Early in his career, Jolicœur provided the empirical foundations for the study of basic visual routines, using psychophysical and chronometric techniques. He published the seminal papers on curve tracing and on the perception of inside-outside relations. This work established the feasibility of the study of basic visual operations in human observers, and has enabled the study of basic visual routines. Not incidentally, these experiments have paved the way for major later developments in neurophysiological investigations.

Jolicœur's research has been just as influential in the field of visual search, wherein observers are required to identify a target object hidden among distractors. Perhaps the principal contribution was the systematic exploration of the principle of "linear separability." The target object is found easily and quickly if it differs from the distractors on all relevant underlying features. In contrast, a slow and effortful search is required if the features of the target are not linearly separable from the features of the distractors.

More recently, Jolicœur has challenged the claimed effortlessness and automaticity of the processes that encode information into short-term memory. In a series of related articles Jolicœur demonstrated that encoding information into short-term memory requires central processing capacity. He called the process that performs this encoding short-term "consolidation". The importance of this work is that it provides clear-cut demonstrations of the capacity limitations on short-term consolidation and provides the field with effective new techniques for studying these limitations. This aspect of Jolicœur's research provides foundational knowledge toward an understanding of human thought and consciousness.

In summary, Pierre Jolicœur is an outstanding scientist whose groundbreaking discoveries have led to widespread national and international recognition. Throughout his career, Jolicœur has also made sustained contributions to scientific training and education. His achievements have recently been recognized by an appointment at the Université de Montréal, as Professeur Titulaire and holder of the Canada Research Chair in Experimental Cognitive Science. He is a Fellow of the Royal Society of Canada. In all respects, he is an outstanding recipient of the BBCS Hebb Award.

(the entire citation can be found at: <https://www.csbbcs.org/hebbrec09.html>)

Donald O. Hebb Graduate Student Awards.

The Donald O. Hebb Graduate Student Award is made to the student member of CSBBCS who, in the opinion of the CSBBCS award committee, has presented the best paper or poster at the annual meeting.

Candidates for the Award for best paper:

Naseem Al-Aidroos, Attentional determinants of visual working memory capacity

Tamara L. Ansons, The influence of the immediate context on recognition judgments

Cindy Hamon-Hill, Disrupted embodied simulation during judgment of appropriateness of facial emotion to context.

Jason D. Ozbuko, When you don't have a clue about the cue: Costs associated with item-specific cued recall in a forced-response paradigm

James R. Schmidt, Contingency learning in seven plus or minus two items: An implicit, working memory dependent process

Kirk A. Stokes, New considerations for the cognitive locus of memory impairment in the Irrelevant Sound Effect

Greg Louis West, Electrophysiological evidence for biased competition in V1 favoring motivationally significant stimuli

Candidates for the Award for best poster:

Gillian Dale, Individual differences in diffusion of attention predict the attentional blink

Adam K. Dubé, The relationship between adults' conceptual understanding of inversion and associativity

Mary H. MacLean, Self-reported affective state predicts the attentional blink

(all denoted by * in this programme)

START OF PARALLEL SESSIONS

Session A**Tempest Anderson Hall, Yorkshire Museum**

- 9.30 **Christopher J. Berry, David R. Shanks and Richard N.A. Henson**
(University College London, MRC Cognition and Brain Sciences Unit)
Testing models of recognition, priming and fluency.
- 10.00 **Aidan J. Horner and Richard N.A. Henson** (MRC Cognition and
Brain Sciences Unit)
MR and MS priming: S-R learning contributions to priming at multiple
levels of stimulus and response representation.
- 10.30 COFFEE
- 11.00 ***James R Schmidt, Jan De Houwer and Derek Besner** (University
of Waterloo, Ghent University)
Contingency learning in seven plus or minus two items: An implicit,
working memory dependent process.
- 11.30 **Lorraine G. Allan, Samuel D. Hannah and Shepard Siegel**
(McMaster University)
Signal detection, aging, and contingency assessment.
- 12.00 **Maarten Speekenbrink and David R. Shanks** (University College
London)
Cue learning in a changing environment.
- 12.30-1.30 LUNCH

START OF PARALLEL SESSIONS

Session B

Upper Floor, Hospitium

- 9.30 **Albert N. Katz and Jonathan Woodbury** (University of Western Ontario)
On the “meaning” of a “meaningless” utterance.
- 10.00 **Ada Le, Renante Rondina, Ben Amsel and George Cree** (University of Toronto)
Statistical feature-based semantic relations, not knowledge type, govern speed of semantic computation.
- 10.30 COFFEE
- 11.00 **Michael E.J. Masson and Daniel N. Bub** (University of Victoria)
Hand action representations evoked during language comprehension.
- 11.30 ***Cindy Hamon-Hill and John Barresi** (Dalhousie University)
Disrupted embodied simulation during judgment of appropriateness of facial emotion to context.
- 12.00 **Satoru Saito, Ryo Ishibashi and Ryoko Honma** (Kyoto University)
The role of verbal working memory in action control: Examining the nature of experimentally induced action slips.
- 12.30-1.30 LUNCH

Session A**Tempest Anderson Hall, Yorkshire Museum**

Symposium: CSBBCS Past President's symposium - Computational perspectives on learning and memory.

Organiser: Professor Doug Mewhort

- 1.30 **Gordon D. A. Brown** (University of Warwick)
Temporal distinctiveness in mathematical models of memory.
- 2.00 **David R. Shanks, Christopher J. Berry and Richard N.A. Henson**
(University College London, MRC Cognition and Brain Sciences Unit)
A perspective on implicit and explicit memory: Development of a computational model.
- 2.30 **Zoltan Dienes** (University of Sussex)
Do amnesiacs learn quickly and happy people slowly?
- 3.00 **Randall Jamieson, Matt Crump and Sam Hannah** (University of
Manitoba, Vanderbilt University, McMaster University)
An exemplar account of classical conditioning.
- 3.30 TEA
- 4.00 **Michael N. Jones** (Indiana University)
The myth of semantic features.
- 4.30 **Doug J. K. Mewhort** (Queen's University)
Reflections on learning, memory, and language: A stitch in time saves
nine or How a little computation could have saved us a lot of trouble.

End of Symposium

- 5.00 **CSBBCS Hebb Distinguished Contribution Award Lecture**
Professor Pierre Jolicoeur (University of Montreal)
Attention and sensory memory in the visual, auditory, and tactile
domains: Evidence from noninvasive brain imaging using EEG, MEG,
and fMRI.
(Tempest Anderson Hall, Yorkshire Museum)
- 6.00-8.00 POSTERS AND DRINKS RECEPTION. Both floors of the
Hospitium

*Session B***Upper Floor, Hospitium**

- 1.30 **Louise Phillips, Roy Allen and Rebecca Bull** (University of Aberdeen)
Lifespan aging and belief reasoning.
- 2.00 **Catherine G. O'Hanlon and Irimi Manola** (University of Newcastle)
The interplay between colour vocabulary, attention to colour, and performance on a Theory of Mind-type task in typically developing preschoolers and children with autism.
- 2.30 **Anna Pecchinenda** (University of Hull)
Top-down modulation of visual attention to social cues.
- 3.00 **Debbie M. Riby and Peter J. B. Hancock** (University of Newcastle, University of Stirling)
Tracking eye movements proves informative for studying gaze detection in Williams syndrome and Autism.
- 3.30 TEA
- 4.00 **Courtenay Frazier Norbury, Helen Griffiths, Kate Nation** (Royal Holloway University of London, University of Oxford)
Cues to word learning in autism spectrum disorders.
- 4.30 **Shannon A Johnson, Jillian H. Filliter, Tim J. Pleskac and Sarah Queller** (Dalhousie University, Michigan State University, Indiana University)
Modeling decision-making processes in autism spectrum disorders.
- 5.00 **CSBBCS Hebb Distinguished Contribution Award Lecture**
Professor Pierre Jolicoeur (University of Montreal)
Attention and sensory memory in the visual, auditory, and tactile domains: Evidence from noninvasive brain imaging using EEG, MEG, and fMRI.
(Tempest Anderson Hall, Yorkshire Museum)
- 6.00-8.00 POSTERS AND DRINKS RECEPTION. Both floors of the Hospitium

*Session A***Tempest Anderson Hall, Yorkshire Museum**

- 9.00 **Bob Uttl and Kelly Kisinger** (University of Calgary)
Analyses of accident records: Meaning of missing values.
- 9.30 **Bryan Moreton and Geoff Ward** (University of Essex)
Adherence to and departures from time scale similarity in real world recall: An examination of retrieval rates, recency, and temporal contiguity.
- 10.00 **Nigel Gopie, Lynn Hasher, Fergus I.M. Craik, Colin M. MacLeod and Myra A. Fernandes** (University of Toronto, University of Waterloo)
Do older adults remember irrelevant information differently from younger adults?
- 10.30 COFFEE
- 11.00 ***Jason D. Ozubko and Colin M. MacLeod** (University of Waterloo)
When you don't have a clue about the cue: Costs associated with item-specific cued recall in a forced-response paradigm.
- 11.30 **D. Stephen Lindsay and Justin Kantner** (University of Victoria)
Top-down constraint in recognition memory.
- 12.00 **Colin M. MacLeod** (University of Waterloo)
Production and generation: How distinct are the benefits in memory?
- 12.30 ***Tamara L. Ansons and Jason P. Leboe** (University of Manitoba)
The influence of the immediate context on recognition judgments.
- 1.00-2.00 LUNCH

*Session B***Upper Floor, Hospitium**

- 9.00 **Christine D. Tsang, Jennifer Walsh and Nicole J. Conrad** (Huron University College at Western, Saint Mary's University)
The role of tempo on infant musical preferences for lullabies and playsongs.
- 9.30 **Nicole J. Conrad and Christine D. Tsang** (Saint Mary's University, Huron University College at Western)
An examination of the role of musical training on musical aptitude and literacy skills in children.
- 10.00 **Victoria Williamson, Graham Hitch and Alan Baddeley** (Goldsmiths University of London, University of York)
Comparing short-term memory for verbal and musical sequences: A tale of two paradigms.
- 10.30 COFFEE
- 11.00 **Holger Wiese and Stefan R. Schweinberger** (Friedrich Schiller University of Jena)
The structure of semantic person knowledge: Event-related potential correlates of non-strategic categorical and associative priming.
- 11.30 **Mike Burton, Rob Jenkins, David White and Rachael Main** (University of Glasgow)
Everybody's beautiful: Intra- and inter-personal perceptions of attractiveness.
- 12.00 **Rob Jenkins, A. Mike Burton and Graham MacKenzie** (University of Glasgow)
Face identity aftereffects do not imply adaptation to facial identity.
- 12.30 **Douglas Martin and Neil Macrae** (Northumbria University, University of Aberdeen)
Individual differences in face processing.
- 1.00-2.00 LUNCH

Session A**Tempest Anderson Hall, Yorkshire Museum**

2.00 **Amy Irwin, Deb Hall, Chris Plack** (MRC Institute of Hearing Research, University of Manchester)
How do listeners react to different urban soundscapes? An fMRI study of perception and emotion.

Symposium: Music in mind and brain
Organiser: Dr Victoria Williamson (Goldsmiths University of London)

2.30 **Henkjan Honing** (University of Amsterdam)
Is beat induction innate or learned?

3.00 **Barbara Tillman** (University of Lyon)
Pitch expectations in musical and artificial tone structures: The influence of listeners' implicit knowledge.

3.30 TEA

4.00 **Bruno Repp** (Yale University)
Two filled duration illusions in psychophysics, but apparently only one in music.

4.30 **Pam Heaton** (University of London)
Is auditory processing less domain-specific in autism than in typical development?

5.00 **Peter Vuust** (Royal Academy of Music, Aarhus University Hospital)
"It don't mean a thing . . . , or does it? Neural processing of polyrhythmic structures in music.

End of Symposium

5.30 EPS Business Meeting – Upper floor, Hospitium

6.00 **Sixteenth EPS Prize Lecture - Dr Lauren Stewart** (Goldsmiths University of London)
Fractionating the Musical Mind: Insights from Congenital Amusia (Tempest Anderson Hall, Yorkshire Museum)

7.00 Jazz recital – Hospitium

8.15 CONFERENCE DINNER - Merchant Taylors' Hall, Aldwark

*Session B***Upper Floor, Hospitium**

- 2.00 **Christopher Kent, Duncan Guest, and James S. Adelman** (University of Bristol, Oxford Brookes University, University of Warwick)
The time course of perceptual processing in absolute identification.
- 2.30 **John Brand and Chris Oriet** (University of Regina)
Dimension averaging in visual arrays: The role of integral versus separable stimuli.
- 3.00 **Zhiguo Wang, Kan Zhang and Raymond M. Klein** (Chinese Academy of Sciences, Dalhousie University)
Inhibitory tags following static but not fast dynamic search.
- 3.30 TEA
- 4.00 **Roland Baddeley and Ben Tatler** (University of Bristol, University of Dundee)
The information theory of eye movements when viewing natural scenes: Effects of task and the role of spatial scale.
- 4.30 **Yoko Ishigami and Raymond Klein** (Dalhousie University)
Measuring the components of attention across the lifespan using the Attention Network Test (ANT).
- 5.00 **Peter Dixon, Darryl W. Schneider and Brian Duffels** (University of Alberta, Carnegie Mellon University)
Spontaneous task switching.
- 5.30 EPS Business Meeting – Upper floor, Hospitium
- 6.00 **Sixteenth EPS Prize Lecture - Dr Lauren Stewart** (Goldsmiths University of London)
Fractionating the Musical Mind: Insights from Congenital Amusia (Tempest Anderson Hall, Yorkshire Museum)
- 7.00 Jazz Recital – Hospitium
- 8.15 CONFERENCE DINNER - Merchant Taylors' Hall, Aldwark

Session A**Tempest Anderson Hall, Yorkshire Museum**

- 9.00 **Katherine Macleod Robinson and Adam K. Dubé** (University of Regina)
Children's inversion and associativity concepts: Can brief instruction improve conceptual knowledge?
- 9.30 **Joni Holmes, Susan E. Gathercole and Darren Dunning** (University of Northumbria, University of York)
Adaptive training leads to sustained enhancement of poor working memory in children.
- 10.00 **Ben Dyson** (Ryerson University)
Object-based auditory memory: Effects of space, preparation and time.
- 10.30 COFFEE
- 11.00 **Stephan Lewandowsky and Klaus Oberauer** (University of Western Australia, University of Zurich)
No evidence for time-based forgetting in memory over the short term.
- 11.30 **Klaus Oberauer, Simon Farrell, Chris Jarrold and Stephan Lewandowsky** (University of Bristol, University of Western Australia)
Cognitive-load effects in the complex span procedure: Global or local?
- 12.00 **Helen Tam, Chris Jarrold, Alan D. Baddeley and Caroline Harvey** (University of Bristol, University of York)
Serial position effects in a working memory task: An investigation on temporal distinctiveness and processing type.
- 12.30 **Annie Jalbert, Kimberly M. Connolly, Ian Neath, Tamra J. Bireta and Aimée M. Surprenant** (Memorial University of Newfoundland, The College of New Jersey)
More on the irrelevance of length to the word length effect.
- 1.00-2.00 LUNCH

*Session B***Upper Floor, Hospitium**

- 9.00 **Magdalena Chechlacz, Pia Rotshtein, Wai-Ling Bickerton, Peter C. Hansen, Shoumitro Deb and Glyn W. Humphreys** (University of Birmingham)
Separating object- from spatial neglect resolves the neuroanatomy of visual attention.
- 9.30 **Carmel Mevorach, Harriet Allen, John Hodsoll, Lilach Shalev and Glyn Humphreys** (University of Birmingham, The Hebrew University)
The left intraparietal sulcus and its battle against saliency.
- 10.00 ***Greg Louis West, Adam A.K. Anderson, Susanne Ferber and Jay Pratt** (University of Toronto)
Electrophysiological evidence for biased competition in V1 favoring motivationally significant stimuli.
- 10.30 COFFEE
- 11.00 **Claudia Metzler-Baddeley, Roland J. Baddeley, P. George Lovell, Amanda Laffan and Roy W. Jones** (University of Bath, University of Bristol)
The nature of visual deficits in dementia with Lewy bodies and Posterior Cortical Atrophy: How and where is vision going wrong?
- 11.30 **Robert Francis Hess, Benjamin Thompson, Glen Gole and Kathleen Tara Mullen** (McGill University, University of Auckland, Wesley Hospital)
Anomalous parvocellular responses from the LGN in humans with amblyopia.
- 12.00 **Kathy T. Mullen, Benjamin Thompson and Robert F. Hess** (McGill University)
Responses of the human visual cortex and LGN to temporal frequency (TF) for achromatic, L/M opponent and S-cone opponent stimuli measured with high-field fMRI.
- 12.30 **EPS/British Science Association Lecture - Christel Gudberg** (University of London)
Are phosphenes reliable measures of conduction time in the visual system?
- 1.00-2.00 LUNCH

*Session A***Tempest Anderson Hall, Yorkshire Museum**

- 2.00 **Geoff Ward, Lydia Tan and Rachel Grenfell-Essam** (University of Essex, City University)
List length effects and output order in free recall: Implications for the relationship between immediate free recall and immediate serial recall.
- 2.30 ***Kirk A. Stokes, Karen M. Arnell and Matthew P. Goldhawk** (Brock University)
New considerations for the cognitive locus of memory impairment in the Irrelevant Sound Effect
- 3.00 **Simon Farrell** (University of Bristol)
Relating forward, probed and backward recall in architectures of serial recall.
- 3.30 TEA
- 4.00 ***Naseem Al-Aidroos and Jay Pratt** (University of Toronto)
Attentional determinants of visual working memory capacity
- 4.30 **David J. Sanderson and David M. Bannerman** (University of Oxford)(Sponsor Jasper Robinson)
Short-term and long-term memory in spatial exploration.
- 5.00 **Paul N. Wilson** (University of Hull)
When selecting a shortcut, men use path geometry and women use landmarks.

End of parallel sessions

End of meeting

*Session B***Upper Floor, Hospitium**

- 2.00 **Elizabeth Schotter, Victor Ferreira and Keith Rayner** (University of California)
Timing of extrafoveal processing in multiple object naming: A test of serial and parallel processing.
- 2.30 **Debra Malpass and Antje S. Meyer** (University of Birmingham)
Effects of foveal and parafoveal distractors on object naming
- 3.00 **Stephanie Waechter, Derek Besner and Jennifer A. Stolz** (University of Waterloo)
Visual word recognition: Spatial attention as a necessary preliminary to semantic processing.
- 3.30 TEA
- 4.00 **Shannon O'Malley, Imran Ansari, Evan Risko and Derek Besner** (University of Waterloo, University of British Columbia)
Reading aloud: Strong evidence against context independent automatic lexical processing.
- 4.30 **Elisabet Service, Hely Yli-Kaitala, Sini Maury and Jeong-Young Kim** (McMaster University, University of Helsinki)
Differences between children's and adults' learning and memory in a foreign-word repetition task.
- 5.00 **Jakke Tamminen and Gareth Gaskell** (University of York)
Offline consolidation facilitates access to novel word forms and meanings.

End of parallel sessions

End of meeting

1. **Alaitz Aizpurua and Wilma Koutstaa** (University of Minnesota, University of the Basque Country)
Aging and flexible remembering: Contributions of conceptual span and fluid intelligence.
2. **Roy Allen, Kelly Botterill and Peter McGeorge** (University of Aberdeen) (Sponsor Louise Phillips)
Spatial versus featural information in a tracking task.
3. **Anthony P. Atkinson** (Durham University)
Impaired recognition of emotions from body movements is associated with elevated motion coherence thresholds in autism spectrum disorders.
4. **Alison Austin and Theodora Duka** (University of Sussex) (Sponsor Jennifer Rusted)
Differential control of attention in aversive and appetitive conditioning.
5. **Erin L. Beatty, Valerie A. Thompson and Jamie A. Prowse Turner** (University of Saskatchewan)
Memory is an unreliable marker for conflict detection in reasoning.
6. **Andreas Breuer, Michael E. Masson and Daniel N. Bub** (University of Victoria)
The effect of object rotation on the activation of hand action representations.
7. **Joanna Brooks, Robert H. Logie and Sergio Della Sala** (University of Edinburgh)
To the left, to the left: Over-representation of the left side of space in an auditory-driven spatial working memory task.
8. **Chrissy Chubala and Steve Smith** (University of Winnipeg)
An emotional blink of attention elicited by anticipation of an aversive event.
9. ***Gillian Dale, Karen M. Arnell, Chris Rudyk and Krysta Unternahrer** (Brock University)
Individual differences in diffusion of attention predict the attentional blink.
10. ***Adam K. Dubé and Katherine M. Robinson** (University of Regina)
The relationship between adults' conceptual understanding of inversion and associativity.
11. **Rowena J. Eason, Jonathan E. Peelle, Jennifer M. Rodd and Matthew H. Davis** (MRC Cognition and Brain Sciences Unit, University College London)
Effects of attention on the neural processing of ambiguous speech.
12. **Heike Elchlepp, Stephen Monsell and Aureliu Lavric** (University of Exeter)
Partitioning task switch costs with ERP: Lexical access is delayed by a switch.
13. **Lucy Ellis** (University of Bristol) (Sponsor Simon Farrell)
The modulation of inhibition of saccadic return by environmental statistics: Is there a role for predictive cues?

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- 14. Jonathan M. Fawcett and Tracy L. Taylor** (Dalhousie University)
Comparing item-method directed forgetting to the active suppression of rehearsal: Further evidence from reaction-time probes.
- 15. Lesya Ganushchak, Andrea Krott and Antje Meyer** (University of Birmingham)
Is it a letter? Is it a number?
- 16. Rémi Gaudreault, Claudette Fortin and Françoise Macar** (Laval University, CNRS – Marseille)
Attention in timing: A comparison of interference and break effects.
- 17. Peter J. Hills, Magda A. Werno and Michael B. Lewis** (Anglia Ruskin University, Cardiff University)
Happy people are less accurate at face recognition than sad people.
- 18. William Hockley and Tyler Bancroft** (Wilfrid Laurier University)
Examinations of the picture superiority effect for associative recognition.
- 19. Mark Hurlstone** (University of York)
Modelling grouping effects in verbal and spatial short-term order memory.
- 20. Holly Joseph, Hazel Blythe and Simon Liversedge** (University of Oxford, University of Southampton)
Differential effects of word frequency in adults and children during reading.
- 21. Kristjan Kalm, Matt Davis and Dennis Norris** (MRC Cognition & Brain Sciences Unit)
fMRI of grouping effects in auditory-verbal short term memory.
- 22. Hwan Cui Koh and Elizabeth Milne** (University of Sheffield)
Perceptual style in children with Autism Spectrum Disorders (ASD) and Typically Developing (TD) children from Singapore and England: An examination of cultural influences on field-independence.
- 23. Shahnaz Koji, Myra A. Fernandes, Michael J. Dixon and Jennifer Aquino** (University of Waterloo)
Changing the spotlight of attention: The influence of emotion on visual attention.
- 24. Georgios Kountouriotis, Rosie Floyd, Stacey Davies, Natasha Merat and Richard M. Wilkie** (University of Leeds)
How do we maintain road position when steering a bend?
- 25. Anna S. Law, Stephen R. H. Langton and Robert H. Logie** (Liverpool John Moores University, University of Stirling, University of Edinburgh)
The impact of visuo-spatial working memory load on attention to eye gaze.
- 26. Yu-Cheng Lin and Pei-Ying Lin** (National Cheng Kung University, University of Toronto)

Do word spaces facilitate reading speed or reading comprehension? Evidence from Chinese children who are average and poor readers.

27. Yu-Cheng Lin and Pei-Ying Lin (National Cheng Kung University, University of Toronto)

Reading comprehension in Chinese children: Contributions of vocabulary, semantic-syntax analysis, and sentence disambiguation.

28. Oliver Lindemann, Roel Bousardt and Harold Bekkering (Donders Institute for Brain, Cognition and Behaviour) (Sponsor Martin Fischer)

Magnitude interference between number processing and response force planning.

29. *Mary H. MacLean, Karen M. Arnell and Gillian Dale (Brock University)

Self-reported affective state predicts the attentional blink.

30. Doug Mahar, Jade Mendham and Alan Baddeley (Queensland University of Technology, University of York)

Vibrotactile short-term memory.

31. Gerard M. Martin, Alexander E. Bridger and Darlene M. Skinner (Memorial University of Newfoundland)

A foraging task demonstrates an interaction between path integration and place learning.

32. Greg McLean, Anne Castles, Veronkia Coltheart and Geoff Stuart (Macquarie University, La Trobe University)

No evidence for a prolonged attentional blink in developmental dyslexia.

33. Sukhvinder Singh Obhi and Shannon Matkovich (Wilfrid Laurier University)

Cancelling intentions: A chronometric study.

34. Jason David Ozubko, Kathleen L. Hourihan and Colin M. MacLeod (University of Waterloo, University of Illinois at Urbana-Champaign)

Pre-instruction retrieval undermines directed forgetting.

35. Marita Partanen, Dorothy Edgell, Bruce Bjornson and Deborah Giasch (University of British Columbia, University of Victoria)

Overlapping cortical systems for reading and temporal processing.

36. Hannah Pimperton and Kate Nation (University of Oxford)

Suppress to impress: Poor comprehenders show domain-specific deficits in the suppression of irrelevant information.

37. Jay Pratt, Donna Burdzy and Alison Chasteen (University of Toronto)

Right-hand man or the man upstairs? How does the concept of the divine influence visual attention?

38. Michelle Pratt and Elisabeth Hill (University of London)

Understanding executive function skills in relation to movement in children diagnosed with DCD.

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- 39. Christian Riegel, Katherine M. Robinson, Jo-Anne LeFevre and Chris M. Herdman** (University of Regina, Carleton University)
Literary language and technology: To scroll, or not to scroll.
- 40. Jack C. Rogers, William Marslen-Wilson and Matthew H. Davis** (MRC Cognition and Brain Sciences Unit)
The effect of lexical ambiguity on spoken word recognition using Homographic and Heterographic Homophones: Neural and behavioural evidence.
- 41. Stefan R. Schweinberger, Romi Zäske, Christian Walther, Jessika Golle, Gyula Kovács and Holger Wiese** (Friedrich-Schiller University, Budapest University)
Young without plastic surgery: Perceptual adaptation to facial age.
- 42. Paul D. Siakaluk, Penny M. Pexman, Holly-Anne R. Dalrymple, Jodie Jacob and William J. Owen** (University of Northern British Columbia, University of Calgary)
The embodied insult Stroop effect.
- 43. Emily D. Sibbald and C.M.S. Plowright** (University of Ottawa)
The role of aggression in orphaned worker bumblebee (*Bombus impatiens*) reproduction.
- 44. Stephen D. Smith, Michelle S. Di Nella and Stephanie Villeneuve** (University of Winnipeg)
Love is blindness: Superior likeability ratings for images following erotic distractors in an emotional blink of attention task.
- 45. Biljana Stevanovski, Michelle Ashlyn Valley and Kimberley Smith-Evans** (University of New Brunswick)
The role of object and spatial working memory in inhibition of return.
- 46. Kevin Thomas** (Trinity College Dublin) (Sponsor Fiona Newell)
The role of previous task relevance in time estimation.
- 47. Bob Uttl and Dylan Smibert** (University of Calgary)
What is on student minds when they rate their professors?
- 48. Bob Uttl and Mekale Kibreab** (University of Calgary)
Self-report measures of prospective memory are reliable but not valid.
- 49. Nicholas Watier, Charles Allain Collin and Isabelle Boutet** (University of Ottawa)
Spatial frequency thresholds for configural and featural discriminations in upright and inverted faces.
- 50. Megan Willis, Romina Palermo and Laurie Miller** (Macquarie, Australian National University, University of Sydney, Royal Prince Alfred Hospital) (Sponsor Andrew Calder)
The role of the ventromedial prefrontal cortex in facial expression processing.

Testing models of recognition, priming and fluency

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We present tests of single- and dual-system versions of a signal-detection computational model of recognition, priming and fluency (Berry, Shanks, & Henson, 2008) in a continuous identification with recognition (CID-R) paradigm. The CID-R paradigm allows recognition judgments and identification reaction times (RTs; which form the basis of priming and fluency measures) to be measured concurrently for each item in a memory test. The models differ in the extent to which they predict that recognition judgments are related to identification RTs. The results of two behavioral experiments largely favored the single-system model predictions: Identification RTs to items judged old were shorter than those judged new (overall and within old and new items); priming occurred for items not recognized, and priming for these items was smaller than the overall priming effect; priming for unattended items reduced to chance as recognition approached chance-levels; identification RTs decreased as recognition confidence increased; and finally, priming and recognition were weakly (but not reliably) correlated. The predictions of another version of the model which incorporates a high-threshold recollection component (e.g., Yonelinas, 1994) are also considered. The results are largely consistent with the notion that a common memory signal drives recognition, priming and fluency.

Berry, C. J., Shanks, D. R., & Henson, R. N. A. (2008). A unitary signal-detection model of implicit and explicit memory. *Trends in Cognitive Sciences*, 12, 367–373.

Yonelinas, A. P. (1994). Receiver operating characteristics in recognition memory: Evidence for a dual process model. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 20, 1341–1354.

MR and MS priming: S-R learning contributions to priming at multiple levels of stimulus and response representation

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Prior exposure to a stimulus can facilitate its subsequent identification and classification, a phenomenon called priming. Recent research has suggested that priming in speeded classification tasks is largely driven by the formation of direct stimulus-response (S-R) bindings, retrieval of which can bypass some of the processes engaged during initial presentation (Dennis & Schmidt, 2003; Dobbins, Schnyer, Verfaellie, & Schacter, 2004; Horner & Henson, in press). At what level of representation do such S-R bindings occur? For example, it has been debated whether responses are coded at the specific level of motor-output (Dobbins, Schnyer, Verfaellie, & Schacter, 2004), or at a more abstract level of interpretation (Logan, 1990). Using long-lag repetition priming of semantic classification of visual objects, we present evidence to suggest S-R bindings form simultaneously at multiple levels of stimulus and response representation. Specifically, our studies suggest the existence of at least two levels of stimulus representation, and at least three levels of response representation. How do such S-R

bindings interact with the common conception, for example from identification tasks, that priming reflects facilitation of one or more component processes (Witherspoon & Moscovitch, 1989)? We attempt to answer this within a tentative Multi-Route, Multi-Stage (MR-MS) framework of priming.

Dennis, I., & Schmidt, K. (2003). Associative processes in repetition priming. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 29(4), 532-538.

Dobbins, I. G., Schnyer, D. M., Verfaellie, M., & Schacter, D. L. (2004). Cortical activity reductions during repetition priming can result from rapid response learning. *Nature*, 428(6980), 316-319.

Horner, A. J., & Henson, R. (in press). Bindings between stimuli and multiple response codes dominate long-lag repetition priming in speeded classification tasks. *Journal of Experimental Psychology: Learning, Memory, and Cognition*.

Logan, G. D. (1990). Repetition priming and automaticity: Common underlying mechanisms? *Cognitive Psychology*, 22, 1-35.

Witherspoon, D., & Moscovitch, M. (1989). Stochastic independence between two implicit memory tasks. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 15(1), 22-30.

Contingency learning in seven plus or minus two items: An implicit, working memory dependent process

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When words are correlated with the colours they are printed in (e.g., MOVE is presented 75% of the time in blue), colour identification is faster when the word is presented in its expected colour (MOVE in blue) than in an unexpected colour (MOVE in green). Experiment 1 demonstrated that this form of contingency learning and subsequent unlearning (when words were no longer correlated with colours) are extremely rapid. Experiment 2 demonstrated that a working memory load prevents contingency learning. These data support the hypothesis that a small number of trials are stored in working memory for learning.

Signal detection, aging, and contingency assessment

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The number of articles concerned with contingency assessment has increased steadily since the pioneering research by Herb Jenkins and colleagues in 1965. It was also in 1965 that Gus Craik suggested that aging effects on performance should be analyzed within a signal-detection framework. Surprisingly, there have been few reports about the effect of age on contingency assessment, and none of these have incorporated a signal

detection approach. We will present research demonstrating the utility of applying signal detection to understanding differences in contingency assessment seen in older participants (seniors) compared with university students.

Craik, F. I .M. (1965). Age differences in confidence and decision processes. Unpublished Ph.D. thesis. University of Liverpool.

Jenkins, H. M., & Ward, W. C. (1965). Judgment of contingency between responses and outcomes. *Psychological Monographs*, 79 (1, Whole No. 594).

Ward, W. C., & Jenkins, H. M. (1965). The display of information and the judgment of contingency. *Canadian Journal of Psychology*, 19, 231-241.

Cue learning in a changing environment

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Investigations of Multiple Cue Probability Learning (MCPL) typically focus on stationary environments where the predictive validity of cues is stable across time. Based on previous work, we present an experiment on MCPL when the relations between cues and outcome change over time. In a simulated environment, participants learnt to predict share price on the basis of two market indicators (cues). In a between-subjects design, we varied the type (abrupt or gradual) and timing (synchronous or asynchronous) of change. We found no main effects of the type and timing of change on overall performance. A fine-grained analysis of the learning dynamics showed that participants learnt to track the changes quite well. In addition, there was evidence of a wide variation in individual strategies. To get more insight into the learning processes, we fitted a number of formal learning models to the data, including a dynamic Bayesian Filter, the Generalized Context Model, and the Associative Learning Model. We discuss results in light of a main distinguishing feature of these models, namely whether they learn in a global or local manner.

On the “meaning” of a “meaningless” utterance

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Some language is considered as not conveying ideas or information but as a means of establishing or maintaining social solidarity. For instance, uttering “You’re welcome” is a phatic response to being thanked. In three studies we show that so-called phatic responses do convey information. We demonstrate this by a careful examination of the responses to being thanked as a function of request-directness, relative interlocutor social status and gender. In a more general sense, these data provide a cautionary note for psycholinguistic researchers on the importance of pragmatic and social factors for models of language processing.

Statistical feature-based semantic relations, not knowledge type, govern speed of semantic computation

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There exist several demonstrations in the semantic memory literature of the primacy of functional knowledge in the computation of semantic concepts. These data have been used to argue for a special status for functional knowledge, relative to sensory knowledge, in conceptual representation. We argue that relevant statistical semantic variables were not adequately controlled in these studies. We report evidence from multiple feature verification experiments that suggest an equivalent speed of computation for both sensory and functional knowledge, with an advantage for sensory knowledge in some conditions. These findings are interpreted in terms of embodied cognition, feature complexity, and feature imageability.

Hand action representations evoked during language comprehension

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We provide behavioral evidence that mental representations of hand actions associated with manipulable objects such as cell phones are evoked when the names of objects are heard. Two kinds of action representations are distinguished: those applied when using an object for its intended purpose (functional), and those used when grasping an object to move it (volumetric). We track the time course of the evocation of these action representations when object names are presented in isolation and show how this time course is changed when objects are presented in the context of sentences describing functional or volumetric interactions.

Disrupted embodied simulation during judgment of appropriateness of facial emotion to context.

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By having participants hold or bite a pen in their mouth for two of four blocks of trials, we tested whether inhibition of or interference with embodied simulation would affect one's accuracy for judging when a target's facial expression was appropriate to context. Dynamic facial displays of 4 targets were individually paired with images to which they were responses (match) or paired with other images (mismatch). Participants holding the pen improved on mismatch trials and worsened on match trials. Participants biting the pen performed better initially than hold participants on mismatch trials and did not exhibit a reversed pattern of accuracy. These results provide evidence of a disruption in normal embodied simulation.

The role of verbal working memory in action control: Examining the nature of experimentally induced action slips

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In two experiments, we presented participants with video recordings of two simple actions on a computer display, each accompanied by a tone. The participants imitated these actions either in the order presented or in reversed order, performing the actions in time with tones. This technique produced action spoonerisms and other types of action slip (Mattson & Baars, 1992). The former increased equally when articulatory suppression and body movement suppression were performed concurrently, but the latter increased more under the movement suppression condition than under the articulatory suppression and silent control conditions. Furthermore, when conflict regarding the sequence of the two actions was minimized, the effect of articulatory suppression on the frequency of action spoonerisms decreased. The data suggested that articulatory suppression can induce action slips by weakening action binding under conflict regarding action sequences.

Mattson, M. E., & Baars, B. J. (1992). Laboratory induction of nonspeech action errors. In B. J. Baars (Ed.), *Experimental slips and human errors: Exploring the architecture of volition* (pp. 151-193). New York: Plenum.

Symposium: CSBBBCS Past President's symposium - Computational perspectives on learning and memory
Organiser: Professor Doug Mewhort

Temporal distinctiveness in mathematical models of memory

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We describe a simple mathematical model of human memory, and show how it can account for a number of seemingly paradoxical phenomena as well as providing an alternative explanation of classic data. In particular we use the model to argue that (a) many data that have been taken as evidence for a separate short-term memory can be explained instead with a single-system model, (b) a unitary account can shed light on the serial position curve associated with classical amnesia, (c) there is no need to assume forgetting due to passive trace decay, and (d) similar principles describe memory retrieval over both short and long time scales.

A perspective on implicit and explicit memory: Development of a computational model.

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The relationship between implicit (e.g., repetition priming) and explicit (e.g., recognition) memory is a fundamental problem in memory research. Can a single-system model account for patterns of dissociation more parsimoniously than the far more popular dual-system account? Successes of and challenges to a single-system computational model, conceptually very similar to signal detection theory, are reviewed. Amongst the model's successes are the ability to predict dissociations between priming and recognition in normal and amnesic individuals and a coherent view of how fluency relates to implicit and explicit memory. We describe further experiments in which a two-alternative-forced-choice (2AFC) recognition test permits the concurrent measurement of priming and recognition. This method allows a series of critical diagnostic tests between single- and dual-system models to be performed. The results reveal that it is surprisingly difficult to reject a single-system model of repetition priming and recognition.

Do amnesiacs learn quickly and happy people slowly?

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Implicit learning of simple associations can be modelled imperfectly but usefully with a Rescorla Wagner rule, which produces an exponentially decaying influence of past trials on current expectations. The rate of decay is set by the learning rate. Thus, a learning rate can be determined for a subject by looking at the function relating current choice to past trials in a simple associative learning situation. Using this logic I present a simple task for measuring learning rate, then investigate the difference in learning rate between those with and without amnesia. I argue theoretically and show empirically that paradoxically amnesia is associated with a large learning rate. I argue that a transient increase in negative mood should also increase learning rate and present initial tests of this claim.

An exemplar account of classical conditioning

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We adapt a model of human memory to treat Classical conditioning as an example of cued recall. According to the model, memory preserves the events of individual trials as separate traces. A probe presented to memory contacts all traces in parallel and causes each to become active. The activated traces are summed into an echo, as in Minerva. Learning is measured by assessing the presence of the UCS in the echo. The model predicts standard phenomena (e.g., acquisition, extinction, blocking, overshadowing) and some phenomena that elude current theory, including renewal, recovery from blocking, second-order conditioning, and retrospective revaluation.

The Myth of Semantic Features

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Many models of semantic cognition assume that words are represented using binary semantic features. For example, DOG may be represented by +<has_fur>, +<barks>, -<has_wings>, -<flies>, etc. Such representations have been used with considerable success in process models of semantic cognition. In addition, features predict word processing: words with many semantic features are processed more efficiently than words with fewer features (Pexman, Holyk, & Monfils, 2003). Modelling work suggests that the number of features is a causal variable behind concreteness effects in word processing (Plaut & Shallice, 1993). I argue that features are not a part of the semantic representation; rather, they are a convenient way to verbalize semantic similarity. Computational models trained on statistical regularities in language are able to reproduce empirical effects thought to favour semantic features, despite the fact that these models do not have feature-based representations. In fact, even statistical accumulators that learn only from the surface structure of language are sufficient to reproduce many of the empirical phenomena. Features are patterns that co-occur frequently with the target word in the environment; they may be learned and represented by the same mechanisms as other co-occurrence patterns.

Pexman, P.M., Holyk, G. G., Monfils, M-H (2003). Number-of-features effects and semantic processing. *Memory & Cognition*, 31, 842-855.

Plaut, D. C., & Shallice, T. (1993). Deep dyslexia: A case study of connectionist neuropsychology. *Cognitive Neuropsychology*, 10, 377-500.

Reflections on learning, memory, and language: A stitch in time saves nine or How a little computation could have saved us a lot of trouble

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Much of the computational work in science and engineering works out the consequences of basic principles for particular situations. I will review some examples of the same idea applied to learning and memory.

End of Symposium.

CSBBCS Hebb Distinguished Contribution Award Lecture

Attention and sensory memory in the visual, auditory, and tactile domains: Evidence from noninvasive brain imaging using EEG, MEG, and fMRI.

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In this talk I will present an overview of our recent work in visual, auditory, and tactile cognitive neuroscience. The focus will be on how we can use state-of-the-art noninvasive brain imaging methods to understand when, where, and how the brain processes information from sensory input to sensory memory, and beyond. I will discuss issues in multitasking, drawing on my work based on dual-task paradigms (e.g., the attentional blink, the psychological refractory period), visual spatial-attention, visual capture, and more recent work on visual, auditory, and tactile short-term memory. This latter work is guided by five general principles: i) measure brain activity during the retention interval; ii) isolate brain activity that increases when memory load increases; iii) use simple stimuli and procedures that engage only the targeted memory system; iv) find brain activity that reaches a plateau when the memory system is filled to capacity; v) isolate brain activity that explains individual differences in the targeted function. I will describe results from studies of visual, auditory, and tactile memory that emerge from the systematic application of these principles.

Lifespan aging and belief reasoning.

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Adult age declines on social cognitive skills, such as understanding the beliefs of other people, have been reported. There is little evidence as to which cognitive and perceptual processes which might influence these age differences in theory of mind (ToM). We developed novel measures of ToM (video clips and written vignettes), assessing true belief and false belief reasoning. The aims of the study were: (1) To investigate effects of adult aging across the life span on true and false belief reasoning. (2) To explore the role of processing simple social cues (biological motion) on performance. 165 adults aged from 18 to 86 completed verbal and visual (video-based) tasks. On the verbal theory of mind task middle-aged adults performed better than younger and older counterparts on true and false belief questions. On the video theory of mind task, there were no age differences in true belief reasoning, while older adults were poorest at false belief reasoning. These age differences in false belief reasoning were related to the ability to rapidly decode biological motion. Difficulties with rapid analysis of social cues may be key to understanding age differences in false belief reasoning from dynamic visual environments.

The interplay between colour vocabulary, attention to colour, and performance on a Theory of Mind-type task in typically developing preschoolers and children with autisms

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While several studies suggest that linguistic abilities rely on Theory of Mind (ToM) skills, recent literature reports that language can also facilitate Theory of Mind skills. The current study examined whether knowledge of the names for the objects used in experimental tasks helped children make inferences about another's mental state (preference). Furthermore, we investigated whether autistic children's preference for colourful objects, as known on an anecdotal level, might help perform on ToM-type tasks in which colour is a salient contextual feature. Children with and without autism were either taught or not taught 3 low frequency colour words by ostensive definition. Three low frequency colour objects were used in a game examining whether knowledge of the names for the colours facilitated inferring the experimenter's favourite colour. The same procedure was implemented with novel objects. Our results show that knowing the label of the objects of interest within context supports performance on a theory of mind type task (inferring another's preference). Furthermore, children with autism benefited from the use of colours, and were especially facilitated in this ToM-type task when taught the *label* for a target *colour*. Evidence of colour facilitation can be exploited to boost learning in children with autism.

Top-down modulation of visual attention to social cues

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From the emotional expression of a face, we make inferences about another person's mental state and intentions. Similarly, from the direction of eye gaze of another individual and by shifting eye gaze to the same location we have a good idea of their focus of interest. However, the information conveyed by a face can be complex but also ambiguous and it would make good adaptive sense for an observer to integrate these different sources of information when making inferences as to whether somebody is looking at something good or bad in the environment. Surprisingly, past research shows that this is not the case. Using the spatial cueing paradigm, we investigated whether the observed direction of eye-gaze and facial expression affect spatial attention, provided the presence of a contextual goal. Results showed evidence of a top-down modulation of visual attention to social cues when explicit instructions to evaluate incoming information were used. Importantly, similar findings were obtained also in a separate experiment as a result of stable individual differences in the implicit motivation to process social cues as assessed by the Empathising (EQ) and Systemizing Quotients (SQ). The implications of these findings for current theories are discussed.

Tracking eye movements proves informative for studying gaze detection in Williams syndrome and Autism

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Autism and Williams syndrome (WS) are neuro-developmental disorders associated with distinct socio-cognitive skills. The two populations show extreme differences when processing information from faces; for example gaze detection, processing expressions of emotion. Eye-tracking evidence presented here suggests that performance on gaze detection tasks is likely to relate to the way participants attend to stimuli and the amount of time available to process visual information. In a gaze detection task participants attended to pictures of an actor in a social scene under ‘cued’ and ‘uncued’ conditions. The ‘uncued’ condition represented free-viewing, whilst in the ‘cued’ condition participants were asked to detect the target of the actor’s gaze. Results emphasise that for participants in the autism group, level of functioning on the autistic spectrum was correlated with the amount of face gaze (including eye region gaze) and the number of target fixations following face gaze. Task instructions affected gaze behaviour in all groups; although atypicalities of gaze remained for individuals with neuro-developmental disorders. In WS, cueing increased the ‘typicality’ of gaze behaviour but this was not the case regarding autism. The results are discussed in terms of performance on gaze perception tasks in typical and atypical development.

Cues to word learning in autism spectrum disorders

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Cognitive theories of autistic spectrum disorder (ASD) predict difficulties in acquiring new words because of deficits in processing social cues, or deficits in using linguistic context to infer word meaning. We contrasted these theories in 39 7-year-old children; 13 with ASD, 13 language delay and 13 age-matched peers. Children were exposed to novel words in either a social or linguistic context. We assessed word learning using recognition, definition and naming tasks. All groups recognised more items and provided more detailed definitions for items presented in the social condition. In the naming task, there was an interaction between group and cue type such that participants with ASD were better than peers at recalling phonological information for words presented with social versus linguistic cues. We conclude that social cues such as eye gaze are particularly salient for word learning, even for participants with ASD. More semantic features were recalled in the social condition, suggesting that social cues are mapped quickly, leaving more time to encode features of novel objects. Notably, children with ASD were better than peers at phonological aspects of word learning. These findings suggest that children with ASD may succeed at acquiring vocabulary by relying on intact phonological skills.

Modeling decision-making processes in Autism Spectrum Disorders

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Mathematical models of complex cognitive tasks offer a powerful method for understanding atypical cognition and behaviour in clinical populations. In the current study, formal cognitive models of decision-making tasks (e.g., Iowa Gambling Task) were employed to examine the psychological and cognitive processes that underlie previously reported atypical decision-making performance in high-functioning children and adolescents with Autism Spectrum Disorders (ASD). Overall, task performance and mathematical modeling results converged to reveal a risk-averse decision-making pattern in the ASD group across tasks. These findings suggest a link between cognitive processes and core symptoms of ASD, including preference for sameness and aversion to change.

Analyses of accident records: Meaning of missing values

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Accident records are frequently used to learn about conditions and victim behavior before, during, and after accidents. However, accident records frequently do not mention the conditions and/or behavior of interest leading to missing values, which leads to uncertainty about the prevalence of conditions and behavior surrounding the accidents. The critical question arises: What is the meaning of these missing values? Do they mean absence of the relevant condition (e.g., icy road) or are they merely a by-product of some random process? To investigate the meaning of missing values in accident records, over 200 participants were shown video clips of car accidents, asked to write down as much information as they could remember about the accident, and then to fill out a standard checklist of conditions surrounding the accident. The results show that eyewitnesses recall conditions and behavior that is causally-related (e.g., icy road) but they are unlikely to mention conditions and behavior not believed to be causally related (e.g., dry road).

Adherence to and departures from time scale similarity in real world recall: An examination of retrieval rates, recency, and temporal contiguity

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A series of experiments examined the extent to which very long-term memory exhibits time scale similarity in retrieval, recency, and temporal contiguity. These experiments replicated and extended a procedure reported by Maylor, Chater, and Brown (2001). In each experiment, participants were given 4 minutes to recall either news events or autobiographical events from one of three widely varying temporal periods

(ranging from 7 days to 5 years). Following recall, participants were then asked to provide date of occurrence estimates for each of their events. Similar retrieval rates, recency effects, and temporal contiguity effects were found when participants were asked to recall autobiographical events from longer temporal periods (e.g., 5 weeks, 5 months, and 5 years). This was taken as support for models of long-term memory, which predict a degree of time scale similarity in recall, such as TCM-A (Sederberg, Kahana, and Howard, 2008) and SIMPLE (Brown, Neath, and Chater, 2007). However, evidence of time scale similarity was not universally found. Shorter temporal periods (e.g., 7 days) tended to produce lower retrieval rates and little or no recency, especially in the recall of news events. The meaning of these findings, as well as the latest data collected, will be discussed.

Brown, G. D. A., Neath, I., & Chater, N. (2007). A temporal ratio model of memory. *Psychological Review*, *114*, 539-576.

Maylor, E. A., Chater, N., & Brown, G. D. A. (2001). Scale invariance in the retrieval of retrospective and prospective memories. *Psychonomic Bulletin and Review*, *8*, 162-167.

Sederberg, P. B., Kahana, M. J., & Howard, M. W. (2008). A context-based theory of recency and contiguity in free recall. *Psychological Review*, *115*, 893-912.

Do older adults remember irrelevant information differently from younger adults?

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Memory for irrelevant information was examined in younger and older adults. During an incidental study phase, participants responded to the font colour of words and nonwords by pressing coloured buttons. Thus, reading the words was task-irrelevant. On a later implicit word-fragment completion test, older adults showed significantly more priming for the 'irrelevant' words than did younger adults. In sharp contrast, when the study-test connection was made explicit by informing participants that they could complete fragments with words from study, younger adults outperformed older adults. Aging influences how irrelevant information is processed and retained. Results will be discussed in the context of inhibitory theory.

When you don't have a clue about the cue: Costs associated with item-specific cued recall in a forced-response paradigm

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Cued recall usually is characterized as inherently superior to free recall. In our recall paradigm, participants produced studied and new items from cues, and then recognized those items as old or new. Recalls were defined as identifying studied items as "old" and intrusions as identifying new items as "old". Consistent with past work, we

found that cueing helped in the production of studied items during recall. However, cueing also impaired the recognition decision, actually consistently increasing intrusions despite little improvement in correct recall. We conclude that cueing produces a trade-off, and should be avoided when intrusions are problematic.

Top down constraint in recognition memory

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Individuals can constrain visual search such that they are better able to identify a specified target object than other objects. Jacoby and co-authors (e.g., Jacoby, Shimizu, Daniels, & Rhodes, 2005) proposed that recognition memory can likewise be constrained, such that individuals are better able to recognize items from a specified source of past experience than they are to recognize items from other sources of past experience. We are smitten with this idea, but in our view Jacoby et al.'s procedure cannot demonstrate constrained recognition. We report evidence suggesting that people can constrain recognition under some conditions but not under others.

Jacoby, L. L., Shimizu, Y., Daniels, K. A., & Rhodes, M. G. (2005). Modes of cognitive control in recognition and source memory: Depth of retrieval. *Psychonomic Bulletin & Review*, 12, 852-857

Production and generation: How distinct are the benefits in memory?

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The generation effect is the well-established finding that memory is better for words retrieved rather than read during study. The production effect—that words spoken aloud are better remembered than words read silently—may well be related. A series of experiments explored and compared these two phenomena, evaluating the extent of their processing overlap as well as the degree to which each relies on distinctiveness at encoding and retrieval. It appears that each instance of generation or production of an item makes a separable contribution to memory, presumably by offering alternative retrieval paths.

The influence of the immediate context on recognition judgments

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Some findings indicate that high fluency of a preceding item carries over to increase the familiarity of a test item (Rhodes & Kelley, 2003); however, the Revelation Effect suggests that low fluency in a preceding task enhances the familiarity of a test item (Westerman & Greene, 1996). We attempted to come to a better understanding of these

findings by manipulating the orientation of a context word that was presented simultaneously along with a target word at test. We expected that presenting a context word in a difficult-to-read orientation would increase the relative fluency and familiarity of the target word.

Rhodes, M. G., & Kelley, C. M. (2003). The ring of familiarity: False familiarity due to rhyming primes in item and associative recognition. *Journal of Memory and Language*, 48, 581-595.

Westerman, D. L., & Greene, R. L. (1996). On the generality of the revelation effect. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 22, 1147-1153.

The role of tempo on infant musical preferences for lullabies and playsongs

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Playsongs and lullabies are both popular types of songs used by caregivers to communicate affective states to infants. Recently, it was demonstrated that 6- and 7-month-old infants prefer to listen to lullabies sung in a lower pitch and playsongs sung in a higher pitch, suggesting that the affective context mediates infants' pitch preferences. The present study examined whether another structural element of music, the tempo, can also affect infants' musical preferences. Using a head-turn preference procedure, 6- and 7-month-old infants preferred slow tempo lullabies and fast tempo playsongs, further emphasizing pre-linguistic infants' sensitivity to the communicative nature of music.

An examination of the role of musical training on musical aptitude and literacy skills in children

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Musical aptitude is related to cognitive abilities, including reading skills. Studies examining these relationships have often failed to account for formal musical training, which can enhance performance on musical aptitude tests (Schellenberg & Peretz, 2008). We compared the relationship between specific music and reading skills in a broad age-range of 60 children with and without formal music training. Children with musical training outperformed children without formal music training on most reading and music tasks. Further, relationships between music skills and reading skills differed depending on the experience and age of children. Results provide a stepping stone to help develop empirically-based training studies to better understand this relationship.

Schellenberg, E. G., & Peretz, I. (2008). Music, language and cognition: Unresolved issues. *Trends in Cognitive Neuroscience*, 12, 45-46.

Comparing short-term memory for verbal and musical sequences: A tale of two paradigms.

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The purpose of this paper was to assess similarities in the way that verbal and musical sounds are processed in short-term memory. We compared serial recall of auditory letter and tone sequences in musician and nonmusician participants using a new visual grid response method. In the first paradigm we manipulated either the phonological similarity of letters or the pitch proximity of tones. Nonmusicians' (n=32) recall performance was detrimentally affected by phonological similarity and pitch proximity. Musicians (n=32) were also affected by phonological similarity, but not pitch proximity. In the second paradigm musicians (n=24) and nonmusicians (n=24) performed letter and tone sequence recall in conditions of whispered articulatory suppression, manual tapping or silence. The presence of suppression impaired both letter and tone recall in all participants. The combined findings suggest a degree of similarity in auditory short-term memory for verbal and musical pitch. However, differences in the results of the letter and tone tasks argue against a complete processing overlap in memory. The results are discussed in terms of the validity of the new visual grid response method, the unique demands of contrasting verbal and musical serial recall, and the future of comparative language/music research.

The structure of semantic person knowledge: Event-related potential correlates of non-strategic categorical and associative priming

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Two experiments examined the structure of semantic person knowledge by analysing both behavioural and event-related potential (ERP) correlates of associative priming (via co-occurrence and/or shared semantic information) versus purely categorical priming (via shared occupational information). Participants performed familiarity decisions for target faces, which were preceded by sandwich-masked prime names at either short (33 ms, Experiment 1) or long (1033 ms, Experiment 2) stimulus onset asynchronies (SOAs). Faster reaction times were generally observed for both associative and categorical priming (relative to an unrelated prime-target condition). In Experiment 1 both associatively and categorically primed targets elicited more positive going ERPs compared to unrelated targets in the N400 time range (N400 priming effect). By contrast, in Experiment 2 a typical N400 priming effect was observed for associative priming only, whereas the corresponding effect for categorical priming was restricted to a left parietal site. Additionally, the occipitotemporal P2 was enhanced for categorically primed targets only. N400 results suggest a fast spreading of activation to a wide range of related targets, which focuses to more closely associated people at longer SOAs. The P2 effect at the long SOA may point to at least partially different processes to mediate categorical and associative priming.

Everybody's beautiful: Intra- and inter-personal perceptions of attractiveness

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In everyday life we are familiar with the notion of good and bad photographs. Photos may be flattering or unflattering, good or bad likenesses. However, in psychological research, we tend to ignore such variation, instead concentrating on differences between faces (high or low attractiveness) or perceivers (who finds whom attractive). Here we explore variability between photos of the same person. We use Dutch celebrities, for whom many high quality images are readily available, but who are unknown to our British subjects. Attractiveness ratings show vastly greater variability between photos of the same person than between individuals. Furthermore, comparative judgements ('which of these two people is more attractive?') are easy to reverse by selection of particular photos. We conclude that photography is not necessarily a good way to capture facial characteristics. Instead, we argue that photos are samples of visual identity, which may be more usefully described by summary statistics.

Face identity aftereffects do not imply adaptation to facial identity.

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Face adaptation effects have become a popular tool for investigating face perception. One attractive prospect is that face identity aftereffects could uncover the dimensional structure of 'face space'. Previous studies have used computer generated stimuli, where subjects learn identities in a training phase. If the technique probes an observer's existing face space, it should work 'cold' (with no pre-training) using familiar faces. We tested this hypothesis following the method of Jiang et al (2007). In Experiment 1, we found no significant adaptation effects using familiar faces and cold testing. In Experiment 2, we found large effects when we reinstated the training and test procedures of Jiang et al. (2007). Subsequent studies showed that part of this difference was due to training (Experiment 3), and part of it was due to identity information in the test images (Experiment 4). These factors were necessary for reliable aftereffects to emerge. To establish whether they were sufficient, we replaced our intact faces with inverted negative faces, and found significant 'identity' aftereffects using these unidentifiable stimuli (Experiment 5). Standard face adaptation procedures tell us little about face space, and much more about the ability of experimental subjects to learn arbitrary stimulus sets.

Jiang, F. Blanz, V. & O'Toole (2007). The role of familiarity in three-dimensional view transferability of face identity adaptation. *Vision Research*, 47(4), 525-531.

Individual differences in face processing

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It has frequently been reported that recognition performance is impaired when faces are presented in an inverted rather than upright orientation, a phenomenon termed the face inversion effect (FIE). Extending previous work on this topic, the current investigation explored whether individual differences in global precedence — the propensity to process non-facial stimuli in a configural manner — impacts memory for faces. Based on performance on the Navon letter-classification task, two experimental groups were created that differed in relative global precedence (i.e., strong global precedence [SGP] & weak global precedence [WGP]). In a subsequent face-recognition task, results revealed that while both groups demonstrated a reliable FIE, this effect was attenuated among participants displaying WGP. These findings suggest that individual differences in general processing style modulate face recognition.

How do listeners react to different urban soundscapes? An fMRI study of perception and emotion

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This research is one part of the multi-disciplinary Positive Soundscapes Project investigating the perception of urban sound environments. The present study investigated the neural correlates of the perceptual and affective responses to such sounds using functional magnetic resonance imaging (fMRI). Sixteen participants were scanned whilst passively listening to a set of recordings made in urban spaces. In total, there were 150 recordings, each containing multiple sound sources. Soundscapes were matched in overall sound level (71 dB(A)), but differed in pleasantness rating along a 5-point scale. As expected, listening to urban soundscapes evoked a significant response in a number of auditory brain regions (inferior colliculus, medial geniculate body, and auditory cortex). Those soundscapes evoking a strong emotional response (either pleasant or unpleasant) activated the amygdala, one of the main emotional centers in the brain. The perceived emotional valence of the soundscape also modulated the auditory response to the sounds. Our results confirm that the subjective metric has physiological validity, and that soundscapes with similar loudness can have dramatically different effects on the brain.

Symposium : Music in mind and brain

Organiser: Dr Victoria Williamson (Goldsmiths University of London)

Is beat induction innate or learned?

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Music is present in some form in all human cultures. Sensitivity to various elements of music appears quite early on in infancy with understanding and appreciation of music emerging later through interaction between developing perceptual capabilities and cultural influence. Whereas there is already some information regarding spectral processing abilities of newborn infants, little is known about how they process rhythm.

The ability to sense beat (a regular pulse in an auditory signal); helps individuals to synchronize their movements with each other, such as necessary for dancing or producing music together. In order to understand how humans can learn to understand music, we need to discover what perceptual capabilities infants are born with. Theorists are divided on the issue whether the processing of beat is innate or learned. The goal of the current study was to test beat induction in sleeping newborn babies, by assessing whether or not the neonate auditory system forms expectation for the onset (downbeat) of the cycle in a regular rhythmic sound sequence. The results demonstrate that violating the beat of a rhythmic sound sequence is detected by the brain of newborn infants. So it appears that the capability of detecting beat in rhythmic sound sequences is already functional at birth (Honing et al., 2009; Winkler et al., 2009).

Honing, H., Ladinig, O., Winkler, I., & Haden, G. (in press). Is beat induction innate or learned? Probing emergent meter perception in adults and newborns using event-related brain potentials (ERP). *Annals of the New York Academy of Sciences*.

Winkler, I., Haden, G., Ladinig, O., Sziller, I., & Honing, H. (2009). Newborn infants detect the beat in music. *Proceedings of the National Academy of Sciences*, 106, 2468-2471.

Pitch expectations in musical and artificial tone structures: The influence of listeners' implicit knowledge

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Perceivers develop expectations for future upcoming events and these expectations influence event processing. For the auditory modality, adapting the priming paradigm to musical material allows investigating listeners' expectations on the pitch dimension. I will present experiments showing that expected tonal events are processed faster and more accurately than less-expected ones. More specifically, pitch discrimination is improved for tonally expected tones. These experiments provide evidence for non-musicians' implicit knowledge about the Western tonal musical system. This knowledge is acquired via mere exposure to music in everyday life thanks to implicit learning processes. In the laboratory, we can study implicit learning of artificial tone material aiming to further understand this cognitive capacity and notably to test whether newly acquired structure knowledge allows for auditory expectancy formation. For this aim, we combined implicit learning and priming paradigms and created a new tone system based on an artificial grammar. The findings suggest that the acquisition of new structure knowledge influences not only grammaticality judgments on entire sequences (as previously shown), but also single event processing. It further promotes the priming paradigm as an implicit access to acquired artificial structure knowledge studied in the lab.

Two filled duration illusions in psychophysics, but apparently only one in music

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Psychophysical research on time perception, usually of single intervals, has revealed two phenomena that are often referred to as “filled duration illusions”: An interval containing (1) discrete sounds or (2) continuous sound is perceived as longer than a silent interval of the same duration. In a series of experiments I investigated whether these illusions occur also in a rhythmic context and with musically trained participants. The experiments used synchronization-continuation, reproduction, and perceptual judgment tasks in which the effect of interval “filling” on perceived tempo was assessed. The results provide considerable evidence for the first type of illusion, but not (so far) for the second one. In other words, compared to a sequence of brief sounds marking beats, interval subdivision by additional brief sounds makes the beat tempo seem slower, but sustaining the sounds (as in *legato* playing) does not. One implication of the positive findings is that musicians may have to play busy passages of music slightly faster than sparse passages in order to be perceived, by themselves and others, as playing at the same tempo. The negative findings are problematic for some explanations that have been proposed for the second type of filled duration illusion.

Is auditory processing less domain-specific in autism than in typical development?

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Whilst perception of language and music have traditionally been considered as independent domains for systematic study, research is increasingly focusing attention on commonalities in the neural mechanisms involved in these two areas. Delayed language is a core diagnostic feature of classic autism, but evidence suggests that for some individuals with this disorder, early attention to music is either unaffected or increased. Findings from one study comparing absolute pitch possessors with and without autism suggested that sensitivity to musical pitch influences perception of speech in autism to a far greater extent than in typical development (Heaton, Davis & Happe, 2008). This was subsequently confirmed in a series of studies comparing music and speech perception in groups of musically untrained children with and without autism (Järvinen-Pasley & Heaton, 2007; Järvinen-Pasley, Pasley & Heaton, 2008; Heaton, Hudry, Ludlow & Hill, 2008). The findings from these studies will be discussed in the context of atypical specialisations and domain specificity in auditory processing.

Järvinen-Pasley A. & Heaton, P. (2007). Evidence for reduced domain-specificity in auditory processing in autism. *Developmental Science*, 10(6), 786-793.

Heaton, P., Davis, R.E., & Happe, F.G. (2008). Research note: Exceptional absolute pitch perception for spoken words in an able adult with autism. *Neuropsychologia*, 46(7), 2095-2098.

Järvinen-Pasley A, Pasley J, & Heaton P. (2008). Is the linguistic content of speech less salient than its perceptual features in autism? *Journal of Autism and Developmental Disorders*, 38(2), 239-248.

Heaton, P. Hudry, K. Ludlow, A. & Hill, E. (2008). Superior discrimination of speech pitch and its relationship to verbal ability in autism spectrum disorders. *Cognitive Neuropsychology*, 25(6), 771-782.

"It Don't Mean a Thing" . . . , or does it? Neural Processing of Polyrhythmic Structures in Music

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"Music is a universal language" (Miles Davis-saxophonist George Coleman), yet the meaning of music is of a far more abstract nature than speech. Musicologists agree that the creation of anticipatory structures modifying figure/ground relations is at the heart of what allows music to be meaningful and to convey emotion. In jazz, as in most other musical styles, rhythm is one of the major trajectories for communication and figure/ground tension created by polyrhythm/ polymeter is arguably one of the strongest rhythmic vehicles for this. The presentation explores the neural processing of different types of polyrhythm in musicians and non-musicians.

End of symposium

Sixteenth EPS Prize Lecture

Fractionating the Musical Mind: Insights from Congenital Amusia

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The ability to make sense of musical sound has been observed in every culture since the beginning of recorded history. But a few percent of the population fail to develop the ability to understand or engage with music. Individuals with congenital amusia (CA) cannot recognize familiar tunes, cannot tell one tune from another and frequently complain that music sounds like a "din". The disorder provides a unique opportunity to investigate how musical perception develops and the extent to which the subcomponents of music are independent of, or shared with other faculties such as language. In this talk I will present behavioural evidence that argues for a primary deficit in the perception of pitch direction - a building block for musical contour. While previous literature argues that amusia is a music-specific disorder, our data suggest that the perception of speech prosody is also impaired, when pitch contrasts in speech are subtle. The genetic and neuroanatomical basis of the disorder will also be discussed in the context of a recently identified family with multiple affected individuals and an MRI study examining structural differences between a large group of CA individuals and matched controls.

The time course of perceptual processing in absolute identification

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Current models of absolute identification emphasise different processes as the underlying cause of observed patterns of choices and response latencies in the task. According to one model, the Extended Generalized Context Model (EGCM; Kent & Lamberts, 2005), behavioural latency patterns are directly linked to stimulus sampling processes; all other models emphasise the response selection stage. In two tasks (one using visual stimuli and one using auditory stimuli) in which stimulus exposure duration was manipulated, we demonstrate that stimulus sampling is very rapid, but time to respond is long. This is contrary to the EGCM predictions and implicates response selection processes. In addition, analysis of the speed-accuracy relationship produced by manipulations of set size, stimulus spacing and exposure duration exhibited stable individual differences in not only magnitude, but direction. Overall, the results do not support the emphasis on stimulus sampling in the EGCM, but do suggest downstream influences of stimulus sampling that are neglected in other models.

Kent, C., & Lamberts, K. (2005). An exemplar account of the bow and set-size effects in absolute identification. *Journal of Experimental Psychology: Learning Memory and Cognition*, 31, 289-305.

Dimension averaging in visual arrays: The role of integral versus separable stimuli.

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Statistical processing of visual arrays has been demonstrated in a number of basic feature dimensions such as size and orientation. Research has suggested that observers compute the mean size of two different sets of circles concurrently after preattentive segregation by a separable dimension (e.g., colour). In the present research, we used integral and separable stimuli to examine whether this finding holds for two dimensions within a set of multidimensional objects. Results indicated that interference from an irrelevant dimension was present only for integral stimuli, suggesting both dimensions could be averaged, but for integral stimuli, could not be segregated preattentively.

Inhibitory tags following static but not fast dynamic search

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A post-search probe-detection task was used to explore for inhibitory tags (IOR) immediately following static and dynamic (Horowitz & Wolfe) search. IOR was observed following static search, but not following dynamic search unless the rate of identity exchange was slow and the screen was not blanked between frames. Search performance was more efficient when IOR was observed. The results suggest that a serial self-terminating search strategy is used in static but not fast dynamic search and that the serial strategy is facilitated by the reinspection-discouraging inhibitory tagging system proposed by Klein (1988).

Horowitz, T. S. & Wolfe, J. M. (1998). Visual search has no memory. *Nature*, 394, 575-577.

Klein, R. (1988) Inhibitory tagging system facilitates visual search. *Nature*, 334, 430-431.

The information theory of eye movements when viewing natural scenes: Effects of task and the role of spatial scale

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When viewing natural scenes, we make an average of three eye movements a second. Where we choose to fixate may be determined by either low level image salience, or high level, task based factors. What is the relative importance of these and what spatial scales do they operate at? We applied an information theory based analysis method to subjects fixations to 120 images viewed when performing various tasks. We find that there are three contributions to the total spatial fixation distribution information. The first and least important was image independent, but task based information. This operates at a very coarse scale (two cycles per image) and measures the effect of what has been called contextual priors (Torralba 2003). The next most important are task image interactions: this top down information measures how much task controls eye movements and operates at an intermediate spatial scale (four cycles per image). The last and largest contribution is task independent salience. This operates at a fine scale (6-7 cycles per image). This means that at a coarse scale, high and low level effects are about equal, but the fine scale of fixation distributions is dominated by task independent salience.

Torralba, A. (2003). Modelling global scene factors in attention, *Journal of the Optical Society of America A*, vol 20 (7), 1407-1418

Measuring the components of attention across the lifespan using the Attention Network Test (ANT)

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The Attention Network Test (ANT) measures the efficacy of the alerting, orienting, and executive networks. Ten sessions of the ANT (Fan et al., 2002, Callejas et al., 2005, or Rueda et al., 2004) were administered to younger children, younger adults, and older adults. Participants indicated the direction of a target (e.g., arrow), accompanied by congruent or incongruent distractors. The targets were preceded by visual or auditory cues. Despite some practice effects, all network scores remained highly significant even after nine previous sessions. The relatively poor reliability of network scores with one session of data rises to respectable levels as more data is added.

Callejas, A., Lupianez, J., Funes, M. J., & Tudela, P. (2005). Modulations among the alerting, orienting and executive control networks. *Experimental Brain Research*, 167(1), 27-37.

Fan, J., McCandliss, B. D., Sommer, T., Raz, A., & Posner, M. I. (2002). Testing the efficiency and independence of attentional networks. *Journal of Cognitive Neuroscience*, 14(3), 340-347.

Rueda, M. R., Fan, J., McCandliss, B. D., Halparin, J. D., Gruber, D. B., Lercari, L. P., et al. (2004). Development of attentional networks in childhood. *Neuropsychologia*, 42(8), 1029-1040.

Spontaneous task switching

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We developed a paradigm in which subjects switched between tasks spontaneously, without any task cue or directions to switch tasks “voluntarily.” Subjects were presented with a univalent stimulus from one of two stimulus-response sets. At varying SOAs, a stimulus from the alternative set was added to the display. An analysis of the response time distributions indicated that subjects sometimes switched tasks spontaneously on the following trial. We conjecture that the change in the stimulus provided a cue that elicited a task switch with some probability.

Children's inversion and associativity concepts: Can brief instruction improve conceptual knowledge?

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Few children apply their knowledge of the inverse relation between multiplication and division or of the associative nature of multiplication and division during problem solving (Robinson & Dubé, in press). Grade 6, 7, and 8 students solved inversion problems (e.g., $6 \times 18 \div 18$, the answer is simply the first number) and associativity problems (e.g., $6 \times 18 \div 9$, the problem is easier if the division part is solved first). Half of the participants then received brief instruction of the inversion and associativity shortcuts and then solved more problems. The other half solved more problems and then received instruction. Participants who received instruction before the second set of problems used conceptually-based shortcuts more frequently.

Robinson, K. M. & Dubé, A. K. (in press). The multiplication and division inversion concept: Relationships between procedural, conceptual, and factual knowledge. *Cognitive Development*.

Adaptive training leads to sustained enhancement of poor working memory in children

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Working memory plays a crucial role in supporting learning, with poor progress in reading and mathematics characterizing children with low memory skills. This study investigated whether these problems can be overcome by a training program designed to boost working memory. Children with low working memory skills were assessed on measures of working memory, IQ and academic attainment before and after training on either adaptive or non-adaptive versions of the program. Adaptive training that taxed working memory to its limits was associated with substantial and sustained gains in working memory, with age-appropriate levels achieved by the majority of children. Mathematical ability also improved significantly six months following adaptive training. These findings indicate that common impairments in working memory and associated learning difficulties may be overcome with this behavioral treatment.

Object-based auditory memory: Effects of space, preparation and time

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Five short experiments are described in which the ability to employ object-based organisation for the memory of complex auditory scenes is assessed. Experiment 1 establishes the basic effect in which participants are better at retrieving multiple pieces of information from the same object relative to different objects. Experiment 2 demonstrates no modulation of this effect as a result of introducing additional spatial variation between objects. Experiment 3 shows that although cueing the to-be-remembered attributes facilitates responding, it does not abolish the within-object advantage. Experiment 4 supports the short-term delay of object-based auditory memory and points towards auditory object-based inhibition of return. Experiment 5 rules out an association account of the data. While the issue of verbal recoding remains to be addressed, the data provide modest links between senses in terms of memorial organisation and suggests one account of how the multimodal phenomenology of everyday life may be remembered.

No evidence for time-based forgetting in memory over the short term

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What drives forgetting in short-term (STM) and working memory (WM)? In STM tests, there is considerable evidence that prolonging retention while preventing rehearsal causes little time-based forgetting, thus challenging the notion of decay. The role of time in WM tests (e.g., the complex-span task in which irrelevant processing alternates with the memoranda) is less clear. We manipulated the duration of the processing component in a complex span task. Contrary to the decay notion, performance was unaffected by processing duration when other factors (e.g., post-error processing) were controlled. We conclude that WM tasks, just like STM tests, reveal no evidence for decay.

Cognitive-load effects in the complex span procedure: Global or local?

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In the complex span procedure, encoding a list for serial recall alternates with brief periods of an unrelated processing task, such as reading out numbers. Barrouillet and colleagues (2004) have established that memory depends on the “cognitive load” imposed by the processing task, defined as the rate at which processing operations are demanded. We manipulated cognitive load within trials, such that all items of the memory list except one was followed by low-load processing, and one item was followed by high-load processing, or one item was followed by low load whereas all others were followed by high load. The serial position of the item followed by the exceptional load was also varied. We found that cognitive load has its largest effect on memory for the immediately preceding item, and the effect decreased in strength with the distance from that list position. This finding rules out a combination of globally acting mechanisms of forgetting and of refreshing memories, such as the combination of time-based decay and cumulative rehearsal. Either the mechanism of forgetting or the mechanism of rehearsal must act locally, that is, on the last presented item only. A further experiment, currently under way, aims at distinguishing these possibilities.

Barrouillet, P., Bernardin, S., & Camos, V. (2004). Time constraints and resource sharing in adults' working memory spans. *Journal of Experimental Psychology: General*, 133, 83-100.

Serial position effects in a working memory task: An investigation on temporal distinctiveness and processing type

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In this experiment, we examined serial position effects within a working memory task. On each trial, a list of six words was presented, with an 18-second processing interval inserted before the words were presented, or after 1, 2, 3, 4, 5, or all 6 words were presented. Thus, seven conditions were devised in total. Additionally, type of processing (verbal or nonverbal) was manipulated between participants. In six of the conditions, the first word was shown at the same temporal distance from recall (i.e., at the beginning of the trial), but differed in terms of isolation from other words. For the verbal-processing group, first word recall improved linearly with the degree of its isolation. This temporal distinctiveness effect was less linear in the nonverbal-processing group. Further, where two to four items were presented prior to processing, the nonverbal-processing group produced significantly better recall for these items than did the verbal-processing group. Presumably, the nonverbal-processing group was able to maintain up to four memory items via phonological rehearsal during processing. Together, our findings suggest that temporal distinctiveness effects may only be clearly observed in working memory tasks when rehearsal has been blocked and recall is therefore achieved through retrieval from long-term memory.

More on the irrelevance of length to the word length effect

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The word length effect, better recall of lists of short words than lists of long words, is one of the core phenomena that led to the development of the phonological loop component of working memory. However, previous studies confounded word length with orthographic neighbourhood size. We report a series of studies that suggest that there is no detrimental effect for long words in immediate serial recall when short and long words are equated for linguistic factors including neighbourhood size. These results add to the growing literature showing problems for theories of memory based on decay offset by rehearsal.

Separating object- from spatial neglect resolves the neuroanatomy of visual attention

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This study investigates neuronal substrates of object-based versus spatial neglect in order to gain insights into organization of visual attention networks. We employed a newly developed test (Apple Cancellation) designed to distinguish spatial- and object-based neglect, and we used high-resolution T1scans and diffusion tensor imaging (DTI) to examine the underlying neural pathology. Two different methods were used to investigate the relationship between brain damage and neglect scores: voxel-base morphometry (VBM based on general linear model) and non-parametric lesion symptoms mapping (VLSM) combined with an automated lesion reconstruction procedure. Both VBM and VLSM revealed a striking dissociation with object-based neglect associated with relatively posterior grey matter damage (angular gyrus, middle temporal gyrus and middle occipital gyrus), and spatial neglect with more anterior damage (postcentral gyrus and supramarginal gyrus). Damage within superior temporal cortex (STG/spatial; STS/object) and TPJ was associated with both forms of neglect. The results of non-parametric analysis of white matter lesions and voxel-wise analysis of FA maps showed clear overlap between the white matter substrates of object and spatial neglect (SLF, IFO, ILF, thalamic radiation and corona radiata). Our results indicate distinct cortical regions controlling attention across space and within objects, along with common white matter pathways that support interactions across the different cortical regions.

The left intraparietal sulcus and its battle against saliency

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The human brain utilizes visual attention mechanisms both in enhancing target processing and in resolving competition between multiple items in a cluttered display. The control of attention mechanisms is typically attributed to a fronto-parietal network, however, its neuronal effects can also be seen in extrastriate visual cortex. We have previously shown (Mevorach et al., 2006, 2009) that the left IPS is particularly critical for attentional selection based on the relative saliency of the target and distractors. However, it is not known whether such salience-based attention is driven by increased competition attributed to high distractor saliency or to low target saliency. Here we compared activation patterns in the left IPS and in extrastriate visual cortex in two patients exhibiting distinct extrastriate visual cortex damage (affecting either target or distractor processing) and a group of healthy controls. Both attenuation of the signal in visual cortex and increase of the signal in the left IPS were evident in the controls as a result of high distractor saliency and low target saliency. For the patients, however, these patterns of activation were more pronounced when distractor processing was intact compared to when target processing was intact. We conclude that the left IPS is particularly important in biasing the competition against salient distracting information rather than in supporting the processing demands of low salient targets per se.

Mevorach, C., Humphreys, G. W., & Shalev, L. (2006). Opposite biases in salience-based selection for the left and right posterior parietal cortex. *Nature Neuroscience*, 9, 740-742.

Mevorach C, Shalev L, Allen HA, Humphreys GW. (2009). The Left Intraparietal Sulcus Modulates the Selection of Low Salient Stimuli. *Journal of Cognitive Neuroscience*. 21:2, 303-315.

Electrophysiological evidence for biased competition in V1 favoring motivationally significant stimuli

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We used event-related potentials (ERPs) to test whether stimuli of motivational significance are prioritized by the visual system when directly competing against contemporaneously displayed stimuli. Results across three experiments examining the C1 component demonstrated that facial displays of fear “win” this competition for neural representation in extrastriate cortex as early as 70 ms after stimulus onset. Results are discussed in terms of the biased competition model of neural selection.

The nature of visual deficits in dementia with Lewy bodies and Posterior Cortical Atrophy: How and where is vision going wrong?

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Dementia with Lewy bodies (DLB) and Posterior Cortical Atrophy (PCA) are neurodegenerative diseases that present with progressive deterioration in visual perception. However, little is known about the precise nature underlying the complex visual deficits associated with both conditions. The present study compared DLB, PCA, and healthy control participants, in four visual tasks designed to measure the efficiency of the visual system at different levels of processing. In ascending order of complexity there were tasks of visual acuity, line orientation, contour integration, and rotated object comparison. DLB patients did not differ from controls in visual acuity and line orientation, but were impaired in contour integration and object comparison. PCA patients were impaired in all tasks. Thus, in PCA all processing stages were affected, whereas DLB was only associated with deficits in the higher level processes associated with contour integration and object comparison. We conclude that low level impairments affecting processing stages before the dorsal-ventral distinction contribute to visual deficits in PCA. In contrast, visual deficits in DLB may reflect higher level impairments within the ventral visual pathway.

Anomalous parvocellular responses from the LGN in humans with amblyopia.

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Here we investigate LGN function in humans with amblyopia using fMRI with stimuli designed to selectively activate the magno-, parvo- and konio- cellular populations. Methods: MR images were acquired on a 4T Bruker MedSpec using flickering (8Hz), sinusoidal ring stimuli of 0.5c/deg. Results: For the fixing eye stimulation, activation is highest to the red/green modulation, intermediate for the luminance modulation and least for the blue/yellow (S-cone) modulation. When driven by the amblyopic eye, the pattern changes, showing a selective loss of activation for the red/green modulation. Conclusions: the deficit in LGN function in amblyopia is selective for parvocellular function.

Responses of the human visual cortex and LGN to temporal frequency (TF) for achromatic, L/M opponent and S-cone opponent stimuli measured with high-field fMRI.

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We compare the activation of the different areas of the human visual cortex and LGN to temporal frequency (2-16Hz) for stimulation of the two chromatic (L/M opponent and S-cone) and the achromatic system, using 4T-fMRI. Stimuli were sinewave counter-phasing rings (0.5cpd). Cortical areas V1, V2, V3, & V4 show a declining activation with increasing TF, whereas MT shows an increasing activation, with broadly similar results for achromatic and chromatic stimuli. Conclusion: Visual cortical response is lowpass for temporal frequency, except for MT, which is highpass. LGN activation is relatively flat across TF. These results differ from previous results for achromatic stimuli.

EPS/British Science Association Prize LectureAre phosphenes reliable measures of conduction time in the visual system?

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The present study investigated conduction latency in the visual system. Pattern-reversal visual evoked potential (VEP) is commonly used for this purpose. However, the present investigation examined the potential of phosphenes, generated by transcranial magnetic stimulation (TMS), as complementary measures of conduction time. Point of subjective simultaneity (PSS) was estimated by applying TMS to the visual cortex of subjects at various time-intervals relative to an externally presented optical stimulus (pattern-reversal). Results showed a significant difference in mean PSS compared with point of objective simultaneity, as well as a non-significant difference from the first main component of independently measured VEPs. This latency, estimated by the mean PSS, is consistent with previous accounts of conduction time (e.g., Di Russo et al., 2005). Findings indicated that whilst phosphenes may offer an independent confirmation of conduction time in the visual system, intra- and inter-individual variances were high, and results were not sufficiently reliable to support the use of phosphenes as a reasonable alternative to the classical measures. Studies with larger sample sizes are needed to provide more robust results.

Di Russo, F., Pitzalis, S., Spitoni, G., Aprile, T., Patria, F., Spinelli, D., & Hillyard, S. A. (2005). Identification of the neural sources of the pattern-reversal VEP. *NeuroImage*, 24, 874-886.

List length effects and output order in free recall: Implications for the relationship between immediate free recall and immediate serial recall.

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This study examined the relationship between free recall and immediate serial recall (ISR). We first report an experiment in which participants were presented with lists of up to 15 words for free recall. The length of the list was randomised and was unknown to the participants in advance of each trial. We found that at shorter list lengths, participants tended to start their recall with the first word on the list, but as the list length increased, so there was an increased tendency to start their recall with one of the last four list items. Critically, the start position heavily influenced the shape of the resultant serial position curves: when recall started at serial position 1, extended primacy effects were obtained; when recall started towards the end of the list, there were extended recency effects. We argue that these findings from free recall, which are interesting in their own right, have implications for the relationship between free recall and immediate serial recall. These findings are also found in variants of the reconstruction of order and ISR tasks.

New considerations for the cognitive locus of memory impairment in the Irrelevant Sound Effect

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Typically, irrelevant speech/sound effect (ISE) experiments show impaired serial recall performance for visually presented to-be-remembered items when these are presented concurrently with irrelevant speech/sounds relative to silence. Prominent models explain the ISE in terms of interference with rehearsal mechanisms or maintenance of order information. The present series of experiments uses irrelevant speech and changing-state auditory stimuli to demonstrate an ISE with a surprise recognition memory task, where rehearsal and active maintenance of order information are very unlikely to be present. Thus, models of the ISE that rely on rehearsal or seriation processes may need to be reconsidered.

Relating forward, probed and backward recall in architectures of serial recall

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The short-term memory literature has an abundance of models of forward serial recall, the classic short-term memory task. However, other memory tasks such as probed recall and backward recall have received relatively little theoretical attention. The patterns of latencies and accuracies that have been observed in backwards recall and probed recall suggest that these tasks may actually rely on successive forward recalls from the start of the list (e.g., Sanders & Willemsen, 1978; Thomas, Milner, & Haberlandt, 2003), which implies a straightforward extension of forward recall models to these cases (e.g., Page & Norris, 1998). We compare a series of computational models in their ability to account for accuracy and latency data from a number of probed and backward recall experiments. Model comparisons show that successive forward recalls can provide a reasonable account of backward and probed recall data, but that this forward scanning is not universal and is probably strategically deployed.

Page, M. P. A. & Norris, D. (1998). The primacy model: A new model of immediate serial recall. *Psychological Review*, *105*, 761-781.

Sanders, A. F. & Willemsen, E. M. (1978). Course of proactive interference in immediate probed recall. *Acta Psychologica*, *42*, 133-144.

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Attentional determinants of visual working memory capacity

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The capacity of visual working memory varies between individuals from one to six visual objects. In the current research we presented irrelevant visual distractors to subjects during a typical visual working memory task, and observed that individual differences in memory capacity could be predicted by the effect of the distractors. Further, when the timing and salience of the distractors was manipulated, the distractor effects predicted discrete components of variance in memory capacity. These results suggest that the ability to control attentional capture is a large determinant of visual working memory capacity.

Short-term and long-term memory in spatial exploration

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The strength of memory for spatial locations may govern habituation of exploration. Short-term and long-term memory processes may separately affect habituation. To test the contribution of short-term and long-term processes in exploration mice were given a series of exposure trials to a spatial location before being allowed to explore the previously exposed location and a novel location (novelty preference test). The preference for exploring the novel location was greater when the interval between the last exposure trial and the test was 1 min rather than 24 hr. The length of the interval between the exposure trials had no effect on the novelty preference when mice received only five training trials, however, a long inter-trial interval facilitated the novelty preference when mice received extended training (ten trials). The benefit of a long inter-trial interval on the novelty preference was dependent on the number of exposure trials under conditions that controlled for the total exposure time. Additional evidence suggests that long-term habituation of exploration may be due to a negative priming effect that occurs as a result of associations between spatial locations. These effects on spatial exploration are consistent with the theory that short-term and long-term memory may reflect qualitatively different processes.

When selecting a shortcut, men use path geometry and women use landmarks

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In a desk-top, computer-simulated environment, participants explored two sub-areas of an open kite-shaped pathway surrounded by prominent landmarks. Using this methodology, Stanton, Wilson & Foreman (2003) established that experience of a connecting path is required for efficient selection of a shortcut between sub-areas. Experiment 1 replicated this effect and found that the outcome is not due to experimental and control groups spending different amounts of time exploring the maze. Analyses suggested that participants remembered little about the large landmarks that were available to facilitate integration of the two sub-spaces. Experiment 2 demonstrated that, nonetheless, landmarks were necessary for efficient shortcut performance. While sex differences were not apparent in the requirement for landmark availability during learning, Experiment 3 found that men and women relied on different spatial cues to support shortcut choices in the test: Men used the relative directions between the target locations, while women relied on the arrangement of surrounding landmarks. Sex differences in the

use of spatial cues when shortcutting are difficult to reconcile with the theory that people form an integrated spatial ‘map’ during exploration.

Stanton, D. E. B., Wilson, P. N., & Foreman, N. (2003). Human shortcut performance in a computer-simulated maze: A comparative study. *Spatial Cognition and Computation*, 3, 315-329.

Timing of extrafoveal processing in multiple object naming: A test of serial and parallel processing

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Can two objects be processed in parallel in an object naming task? The general conclusion from studies by Morgan, Meyer and colleagues (Morgan & Meyer, 2005; Morgan, van Elswijk & Meyer, 2008) is that information is obtained from fixated and extrafoveal objects in parallel because a related (compared to unrelated) preview of the extrafoveal object speeds looking times when it is ultimately fixated. We further tested this hypothesis by determining whether processing of the extrafoveal object happens during the entire time the eyes fixate the previous object (a completely parallel process) or only shortly before the eyes move to the extrafoveal object (a serial process with temporal overlap). We found that a brief preview (200ms) of the extrafoveal object at any time during fixation of the previous object results in equal benefits of related over unrelated preview. These results indicate that, indeed, the two objects are processed in parallel. Predictions involving task relevance and multiple object processing will also be discussed.

Morgan, J., & Meyer, A. (2005). Processing of extrafoveal objects during multiple object naming. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 31, 428-442.

Morgan, J., van Elswijk, G. & Meyer, A. (2008). Extrafoveal processing of objects in a naming task: Evidence from word probe experiments. *Psychonomic Bulletin & Review*, 15, 561-565.

Effects of foveal and parafoveal distractors on object naming

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The goal of this study was to compare the effects of fixated vs. non- fixated distractors on object naming. On each trial, participants were presented with a target object (shown in green) and a phonologically related or unrelated distractor object (shown in red). In Experiment 1, target and distractor were presented as overlapping images in the same location. Replicating earlier findings, participants were faster to name targets accompanied by phonologically related than by unrelated distractors. In Experiments 2 and 3 the pictures appeared next to each other. In Experiment 2, the participants fixated and named the target and in Experiment 3, they were instructed to name the target but to fixate the distractor. Eye tracking was used to ensure that the

participants complied with the instructions. No phonological relatedness effect was seen in either experiment. The same pattern of results was obtained when Experiments 1 and 3 were repeated using unrelated or homophone distractors (e.g. “flower” for the target “flour”). These results imply that the object names may become activated when speakers attend to objects, but not when they merely look at them and attend elsewhere.

Visual word recognition: Spatial attention as a necessary preliminary to semantic processing

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We propose that spatial attention is necessary for semantic processing, and that prior conflicting reports in the literature reflect failures to optimally focus spatial attention. Participants read aloud a target word, and we examined the impact of a semantically related or unrelated distracter word present in the display. We manipulated the proportion of validly cued targets to encourage dispersed (Experiment 1) and focused (Experiment 2) spatial attention. Distracter effects were present in Experiment 1 but not Experiment 2, suggesting that: 1) allocation of attention is strongly context-dependent, and 2) spatial attention is a necessary preliminary for semantic processing.

Reading aloud: Strong evidence against context independent automatic lexical processing

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Two task cuing experiments are reported that assess whether mental set plays a role PRIOR to lexical processes involved in visual word recognition, or only AFTER a word has been lexically identified, as the received view of automaticity asserts. The results provide strong evidence against context independent automatic lexical processing.

Differences between children's and adults' learning and memory in a foreign-word repetition task

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We studied repetition of Korean words by Finnish participants to investigate word form learning during a single session in young adults and 8–9-year-old children. Recurring words occurred five times, non-recurring words only once. Learning was measured as correct repetitions scored by a native speaker of Korean. Repetition improved during the experiment, but only for recurring words. Adults and children performed similarly. In a surprise recognition task, recurring words were better recognized than non-recurring words and adults were clearly better. Age and recurrence

interacted, reflecting an increased recognition advantage for the adults for the recurring compared to the non-recurring words.

Offline consolidation facilitates access to novel word forms and meanings

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Encountering a new word involves learning different aspects of its use, including form and meaning. Some of these are acquired immediately, while others emerge after a delay (e.g., Clay, Bowers, Davis, & Hanley, 2007), suggesting a role for offline consolidation. We evaluated the time course of adult word learning, focusing on written form knowledge and access to meaning. Experiment 1 showed better cued recall of orthographic forms learned on the previous day, compared with those learned on the same day. Explicit recall of meanings however was poorer for words learned on the previous day. Experiment 2 further examined knowledge of meaning by evaluating online semantic access in primed lexical decision, with novel words used as semantic primes. Priming was found for words learned on both the previous day and the day of testing. Experiment 3 used masked semantic priming to examine solely the automatic component of semantic access. Priming was found one week after training, but not immediately or one day after training. We suggest that, firstly, recall of novel word forms benefits from offline consolidation within 24 hours. Secondly, observing automatic semantic access requires several days of consolidation, while more strategic online access is obtained immediately.

Clay, F., Bowers, J. S., Davis, C. J., & Hanley, D. A. (2007). Teaching adults new words: The role of practice and consolidation. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 33, 970–976.

Aging and flexible remembering: Contributions of conceptual span and fluid intelligenceAlaitz Aizpurua^{1,2} and Wilma Koutstaal¹

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Aging attenuates the capacity to adaptively and flexibly use episodic memory at different levels of specificity (“gist control”). First, in this research, we replicated previous findings showing decreased gist control in older compared with younger adults in episodic recognition of pictures of common objects using the flexible remembering task (Koutstaal, 2006). Second, we found that, across age groups, gist control positively correlated with conceptual span (an index of short-term semantic memory) and with level of fluid intelligence (assessed by Cattell’s Culture Fair and WAIS-R Blocks). However, when simultaneously considering each of four possible contributors (age, conceptual span, fluid intelligence, and frontal function), the only significant predictor of gist control was the composite fluid intelligence measure. Third, in a free recall autobiographical memory task, retrieval of event-specific information was negatively correlated both with age (Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002), and fluid intelligence. Reduced specificity in autobiographical event-memory recall was also related to greater (inappropriate) reliance on gist information on the item-specific trials in the flexible remembering task. Together, these findings suggest that interventions that facilitate flexible remembering may enhance the flexibility of thinking, and vice versa, in both older and younger adults.

Koutstaal, W. (2006). Flexible remembering. *Psychonomic Bulletin and Review*, 13, 84–91.

Levine, B., Svoboda, E., Hay, J.F., Winocur, G., & Moscovitch, M. (2002). Aging and autobiographical memories: Dissociating episodic from semantic retrieval. *Psychology and Aging*, 17, 677-589.

Spatial versus featural information in a tracking task

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Horowitz et al. (2007) investigated whether participants could internalise both featural and spatial information in a Multiple Object Tracking Task that used cartoon animals. After a period of motion they were overlaid by a 5 x 4 array of cacti previously in the background, and participants either had to indicate which cacti all the target animals were hiding behind or indicate where a specific animal was. Several issues arose from this work: firstly, the locations at which the animals could disappear were limited to just the 20 cacti always in view; secondly, for 200ms the animals were not completely occluded by the cacti; and, thirdly, the stimuli were sufficiently recognisable that labels as to their identity, rather than featural details, may have been encoded to perform the task. We report the findings of an experiment that addressed these issues by using butterfly stimuli, where either their internal pattern or external shape was the only discriminating feature. Further, completely-occluding discs only appeared at the trial’s end, which was unpredictable. No distracter discs were used. Results further endorse the notion that separate processes support spatial and featural information. Differences in

reaction times suggest the former accesses working memory, the latter long-term memory.

Horowitz, T., Klieger, S.B., Fencsik, D.E., Yang, K.K., Alvarez, G.A., & Wolfe, J.M., (2007). Tracking unique objects. *Perception & Psychophysics*, 69 (2), 172 - 184

Impaired recognition of emotions from body movements is associated with elevated motion coherence thresholds in autism spectrum disorders

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Recent research has confirmed that individuals with Autism Spectrum Disorder (ASD) have difficulties in recognizing emotions from body movements. Difficulties in perceiving coherent motion are also common in ASD. Yet it is unknown whether these two impairments are related. Thirteen adults with ASD and 16 age- and IQ-matched typically developing (TD) adults classified basic emotions from point-light and full-light displays of body movements and discriminated the direction of coherent motion in random-dot kinematograms. The ASD group was reliably less accurate in classifying emotions regardless of stimulus display type, and in perceiving coherent motion. As predicted, ASD individuals with higher motion coherence thresholds were less accurate in classifying emotions from body movements, especially in the point-light displays; this relationship was not evident for the TD group. The results are discussed in terms of the different visual cues for the identification of emotions and actions from body movements, as well as in relation to recent models of biological motion processing and known abnormalities in the neural substrates of motion and social perception in ASD.

Differential control of attention in aversive and appetitive conditioning

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It remains unclear in conditioning whether attention is driven by the emotionality of a stimulus or by how predictive that stimulus is of an outcome. We aimed to establish whether attention in appetitive conditioning is mediated by learning efficiency rules whilst mediated by emotionality in aversive conditioning. Sixty-four participants were presented with an aversive (high or low noise) or an appetitive (high or low money) conditioning task. Participants were presented with picture pairs which provided information for the likelihood of the reinforcer to occur with one of the following contingencies: 100%(S+), 50%(S+/-), or 0%(S-). The measures of attention were performed using an eye tracker and were dwell time, first fixation duration, and latency to first fixation. For both money conditions attention was highest for the S+/-, whilst increasing the value of the money led to a decrease in attention to all stimuli. In both noise conditions there was equal attentional bias to the S+ and S+/- over the S-. Increasing the value of the noise led to a greater increase over time in attentional bias for the S+. This suggests attention to appetitive stimuli is governed by learning efficiency mechanisms whilst attention to aversive stimuli is mediated by emotionality.

Memory is an unreliable marker for conflict detection in reasoning.

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Dual Process Theories suggest that reasoning is accomplished by two systems, one that is relatively automatic and gist-based and another that is more deliberate. An unresolved issue concerns how conflict between the two systems is detected and resolved. We tested the hypothesis that conflict detection results in additional problem processing, enhancing memory for problem content (De Neys & Glumicic, 2008). 563 participants completed conflict and no-conflict base-rate problems followed by an unannounced recall task. We did not find any recall advantage for conflict problems, suggesting that people do not alter their processing of the problem in response to conflict.

De Neys, W. & Glumicic, T. (2008). Conflict monitoring in dual process theories of thinking. *Cognition*, 106, 1248-1299

The effect of object rotation on the activation of hand action representations

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We show that hand action representations automatically elicited by passively viewed pictures of manipulable objects (e.g., stapler) are more strongly influenced by an individual's conceptual knowledge of an object than by the contours of the object as they appear in the display. A priming paradigm was used in which objects were presented in their typical orientation or under rotation, followed by a cue to make a reach and grasp response. Regardless of orientation, objects facilitated execution of hand actions associated with the canonical orientation of the object. These results suggest a strong interaction between ventral and dorsal visual processing streams.

To the left, to the left: Over-representation of the left side of space in an auditory-driven spatial working memory task.

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In Experiment 1 square patterns with a clearly defined left and right side were verbally described at a moderate speed to participants binaurally and monaurally. Participants were asked to rate on a certainty scale which pattern side contained the greatest number of squares. For the binaural condition there was no reliable difference between certainty judgements for each side. However, in the monaural condition there was a significant main effect of pattern side, with participants being more certain when judging the left side of patterns – this was particularly noticeable for left ear presentation. For Experiment 2, when the patterns were described at a very fast speed binaurally there was no reliable effect of pattern side. However, there was a significant main effect of starting side, with participants being more certain when pattern descriptions started on the left. Monaurally, there was a significant effect of pattern side with participants being

more certain when judging the left side of patterns – this was particularly evident for left ear presentation. There was also a significant interaction between starting side and pattern side with the greatest certainty seen for the left pattern side in a start left condition.

An emotional blink of attention elicited by anticipation of an aversive event

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The current study examines whether anticipation of an aversive event is sufficient to provoke an emotional blink of attention in the absence of actual experience with the aversive event. On each trial, participants searched for a neutral target embedded within a series of 17 rapidly presented images, having been informed that a distractor image, which might be paired with a startling noise, could appear before the target. In reality, the noise did not occur until the final block of trials. The detection of targets was significantly impaired when the anticipated/feared distractor occurred 200ms, but not 800ms, before the target.

Individual differences in diffusion of attention predict the attentional blink

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When identifying two targets in an RSVP stream, accuracy on the second target is reduced if presented shortly after the first target -- an attentional blink (AB). Recent studies suggest that when a broadened or diffused attentional state is induced, the AB can be attenuated. The current study examined individual differences in diffusion of attention and processing speed as assessed by a variety of cognitive tasks (e.g. global/local task). Task performance consistent with diffusion negatively correlated with AB magnitude, showing that dispositional diffusion of attention can reduce the AB. Additionally, task processing speed predicted target accuracy, but not AB magnitude.

The relationship between adults' conceptual understanding of inversion and associativity

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Children's understanding of the mathematical concepts of inversion and associativity are related, as measured by the use of conceptually-based shortcut strategies on three-term problems (e.g., inversion: $3 \times 26 \div 26$, 26s cancel each other out, therefore 3; associativity: $2 \times 24 \div 8$, $24 \div 8 = 3$, $3 \times 2 = 6$; Robinson & Dubé, 2009; Robinson & Ninowski, 2003). Siegler and Araya (2005) proposed that allocating attention to the right-most operation might be required to prime the inversion shortcut and the same could be true for the associativity strategy. Adults solved inversion and associativity problems in one of two conditions. In one condition, the participants' attention was drawn to the left-most operation and in the other condition their attention was drawn to the right-most operation. The adults' understanding of the mathematical concepts was related; also, it

was unexpectedly similar to children's understanding. The allocation of attention affected the execution of the inversion shortcut.

Robinson, K. M., & Dubé, A. K. (2009). Children's understanding of addition and subtraction concepts. *Journal of Experimental Child Psychology*, doi:10.1016/j.jecp.2008.12.002

Robinson, K. M., & Ninowski, J. E. (2003). Adults' understanding of inversion concepts: How does performance on addition and subtraction inversion problems compare to performance on multiplication and division inversion problems? *Canadian Journal of Experimental Psychology*, 57, 321-330.

Siegler, R. S., & Araya, R. (2005). A computational model of conscious and unconscious strategy discovery. In R. V. Kail (Ed.), *Advances in child development and behaviour*, 33.1-42. New York, NY: Elsevier.

Effects of attention on the neural processing of ambiguous speech

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Words such as "bark" have multiple meanings, and require extra processing to disambiguate in connected speech. In the current study we used functional MRI to investigate the degree to which these neural responses to ambiguity depend on directed attention. Participants were scanned whilst listening to spoken sentences containing ambiguous words, sentences without ambiguous words and signal correlated noise. We used a dual presentation paradigm: participants were instructed to either attend and respond to sentences, or to perform a simple visual-detection task. After scanning, participants completed word association and recognition memory tests to assess explicit and implicit memory for attended and unattended sentences. Behavioural results showed above-chance memory for both sets of sentences, though greater recognition memory and word meaning-bias was shown for attended sentences. The fMRI data, replicated the additional inferior frontal and posterior temporal responses to high ambiguity sentences seen previously. An ambiguity by attention interaction was observed in portions of this left frontal-temporal network including anterior left inferior frontal gyrus and left superior temporal gyrus. Together, our findings suggest that directed attention enhances neural activity during the processing of ambiguous words, though ambiguity resolution can proceed during divided attention with a simple distractor task.

Partitioning task switch costs with ERP: Lexical access is delayed by a switch.

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Response times are prolonged by a task-switch. Although this task switch cost can be reduced by an opportunity for preparation before the stimulus, there remains a substantial "residual" cost, usually attributed to interference with response selection due

to persistence or reactivation of the previous task-set. We report a task-cueing experiment using ERPs to explore which processing stages underlying RT are affected by a task switch. The stimuli were words whose letters were printed in two colours. The task was either to categorise the word semantically with one of two key presses, or to decide (go/nogo) whether the colours were distributed symmetrically across its letters. For the lexical task, both the onset and the maximum of the effect of word frequency on ERP were reliably delayed on switch trials. These results suggest that a task-switch substantially slows lexical access or earlier processes, not just response selection – a finding with implications also for the role of attention in lexical access. ERPs for the symmetry task trials also exhibited a frequency-sensitive ERP component, which was larger on switch trials, consistent with task-set competition contributing to the residual switch cost.

The modulation of inhibition of saccadic return by environmental statistics: Is there a role for predictive cues?

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Inhibition of Saccadic Return (ISR) refers to longer fixations that precede moving the eyes back to a previously visited location. In our lab we have found that the probability with which a target will appear at a new or return location can affect ISR: ISR is larger if a saccade to a previously visited location is unlikely, and much reduced when the environment favours revisiting "old" locations. The current experiments explored how ISR is tuned in response to the current statistics of the environment. In several experiments, observers were required to make sequences of two saccadic eye movements that were guided by the direction of a line or arrowhead, and in which the second saccade was guided towards or away from a previously visited location. The cue type (line or arrowhead) corresponded with probability of the second eye movement being directed to a return or non-return location. Larger ISR effects were observed when return saccades were unlikely to be required, but there was no evidence of cue learning. Instead, participants appeared to estimate environmental statistics from a short history of events, with cue changes apparently only being taken to signal changes in the environment.

Comparing item-method directed forgetting to the active suppression of rehearsal: Further evidence from reaction-time probes

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In an item-method directed forgetting task study words were presented, one at a time, each followed by an instruction to 'Rehearse' (R+), 'Not Rehearse' (R-) or 'Forget' (F). Reaction time (RT) was measured in response to visual (E1) or auditory (E2) detection probes presented 1400 ms, 1800 ms or 2600 ms following each instruction. RTs were longer following R- and F instructions than following R+ instructions; furthermore, participants subsequently exhibited greater yes-no recognition of R+ words than of R- or F words. These results support the notion that item-method directed forgetting is achieved by the active suppression of rehearsal.

Is it a letter? Is it a number?

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At the time of *Sesame Street* everything was easy: *w* was a letter and *8* was a number. However, as the popularity of sending messages electronically, e.g. via short message service (SMS), increased, so did the necessity of conveying messages more efficiently. One way of increasing efficiency is to abbreviate words and expressions by combining letters with numbers, as in “*w8*” for “wait”. The aim of the study was to investigate whether a digit appearing in a shortcut retains its numerosity. In Experiment 1, primes were letter-digit shortcuts (e.g., *w8*) and letter-digit non-shortcut (e.g., *v8*) and were presented simultaneously with a target, a set of dots, on which parity judgment (even/odd number of dots?) was required. Responses were faster when primes (shortcuts and non-shortcuts) and targets were matched in parity, than when they were mismatched. In Experiment 2, the primes appeared 250 ms before target onset. For non-shortcuts, the participants were again faster on match trials than mismatch trials. However, there was no match effect for shortcuts. These results indicate that a digit embedded in a shortcut is initially processed as a number, but as lexical access progresses, it becomes part of the lexical unit and its numerosity is weakened.

Attention in timing: A comparison of interference and break effects

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Introducing an interfering task or a break during an interval to be timed leads to temporal underestimation related to the duration preceding the interfering signal. In two experiments, interference and break conditions were contrasted in time reproduction with two control conditions: one in which no processing of the interfering signal was required, one without any interfering signal. Expected effects were found in both interference and break conditions and some similar trends were observed in control conditions. Results suggest that in addition to attention sharing, automatic attraction of attention and a Vierordt effect contributed to the shortening of temporal estimates.

Happy people are less accurate at face recognition than sad people

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Faces displaying a smile are more accurately recognised than those displaying a frown (D’Argembeau, Van den Linden, Etienne, & Comblain, 2003) by control participants, but not by social phobics (Lundh & Ost, 1996). Social phobics avoid looking at the eyes when processing faces, similar to sad people. Given the importance of eyes in face recognition (Emery, 2000), this suggests that mood may affect face recognition accuracy. Two experiments are presented that explored face recognition accuracy in

mood-induced participants. Experiment 1 demonstrated that happy-induced participants were less accurate and had a more conservative response bias than sad induced participants in a face recognition task. Experiment 2 explored whether this difference is observed in a remember/know/guess paradigm. The results are interpreted in terms of differential coding used by happy and sad participants during face recognition.

D'Argembeau, A., Van der Linden, M., Etienne, A., & Comblain, C. (2003). Identity and expression memory for happy and angry faces in social anxiety. *Acta Psychologica, 114*, 1–15.

Emery, N. J. (2000). The eyes have it: The neuroethology, function, and evolution of social gaze. *Neuroscience and Biobehavioral Reviews, 24*, 581–604.

Lundh, L. G. & Ost, L., G. (1996). Recognition bias for critical faces in social phobias. *Behavioral Research and Therapy, 34*, 787–794.

Examinations of the picture superiority effect for associative recognition

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The picture superiority effect (PSE) has been well documented in tests of item recognition and recall. Hockley (2008) recently showed that this memorial advantage extends to associative recognition for random pairs of line drawings versus concrete words. The present study (a) compared the PSE for item and associative recognition, (b) showed that the PSE is reduced, but not eliminated, for picture-word pairs, and (c) that the PSE for associations can be eliminated by increasing study time for word pairs. These results suggest that the PSE for associations is an encoding advantage due to the faster conceptual processing of line drawings.

Hockley, W.E. (2008). The picture superiority effect in associative recognition. *Memory & Cognition, 36*, 1351-1359.

Modelling grouping effects in verbal and spatial short-term order memory.

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Temporal grouping has been shown to induce a multiplicity of effects on verbal serial recall, relative to an ungrouped control. They include an elevation in recall accuracy and a change in recall latencies and order errors. It has been hypothesised these effects reflect a hierarchical coding of order information, with one level coding the positions of groups in sequence and the second coding the positions of items within-groups. Recent work by Parmentier, Andres, Elford, & Jones (2006) has shown that order memory for sequences of seen spatial locations exhibits some similar effects of temporal grouping suggesting spatial grouped sequences also benefit from a hierarchical organization. We report new experiments and computational modelling work, which show that despite these similarities positional information is organised differently for spatial and verbal grouped sequences. Our analyses indicate that spatial grouped

sequences are represented by a hierarchy in which one level represents the positions of groups in sequence, as for verbal sequences, whereas the second represents the positions of items in the sequence overall, as opposed to within-groups. The findings indicate a fundamental difference in the hierarchical organisation of positional information in verbal and spatial short-term order memory.

Parmentier, F. B. R., Andrés, P., Elford, G., & Jones, D. M. (2006). Organisation in visuo-spatial serial memory: Interaction of temporal order with spatial and temporal grouping. *Psychological Research*, 70, 200-217.

Differential effects of word frequency in adults and children during reading

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While word frequency effects are extremely robust in adult readers, less attention has been given to frequency effects in children in the eye movement literature. In two experiments, children's and adults' eye movements were monitored as they read sentences containing high and low frequency words as indexed by counts from either child or adult corpora. Words from the child corpus were also controlled for Age-of-Acquisition. Results showed that adults exhibited reliable frequency effects using adult norms but not using child norms, while children showed reliable effects using child norms. These results show that while word frequency is a fundamental characteristic in the organization of the lexicon for children as well as adults, frequency of encounter is cumulative and changes over time. Furthermore, in children, the frequency of a word affects the time required to process that word independent of the age at which it was acquired. Finally, word frequency counts derived from adult texts are not appropriate for use with developing populations.

fMRI of grouping effects in auditory-verbal short term memory

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Dividing auditory sequence into groups, or imposing rhythmic, tonal or spatial structure during presentation, improves recall performance (Ryan 1969). Several competing models have been proposed to account for these effects (Brown et al. 2000, Burgess & Hitch 2006, Page & Norris 1998), but very little is known about the neural basis of grouping. The present study used fMRI to compare the processing of grouped and ungrouped lists of six and nine letters in an immediate serial recall task. After presentation of each list, participants either recalled the list verbally or simply waited for the next presentation, as indicated by a visually presented recall cue. Auditory presentation and recall was used in order to maximize the potential grouping effects (Frankish 1985). Comparison of activation during encoding revealed that primary and secondary auditory areas and superior temporal gyrus was less active, and intraparietal sulcus (IPS) became more active, during grouped lists. IPS has previously been shown to be sensitive to grouping of visual stimuli (Bor et al. 2003). Our results suggest a multi-

modal role for IPS in detecting spatio-temporal structure in perceptual input. Bi-lateral deactivation of superior temporal gyrus, overlapping with areas previously associated with verbal echoic memory (Buchsbaum et al, 2005), suggests less reliance on echoic memory for grouped stimuli.

Brown, G. D., Preece, T., & Hulme, C. (2000). Oscillator-based memory for serial order. *Psychological Review* 107, 127-181.

Bor, D., Duncan, J., Wiseman, R. J., & Owen, A. M. (2003). Encoding strategies dissociate prefrontal activity from working memory demand. *Neuron*, 37, 361–367

Buchsbaum, B. R., Olsen, R. K., Koch, P., & Berman, K. F. (2005). Human dorsal and ventral auditory streams subserve rehearsal-based and echoic processes during verbal working memory. *Neuron*, 48, 687–697

Burgess, N., & Hitch, G. J. (2006). A revised model of short-term memory and long-term learning of verbal sequences. *Journal of Memory and Language*, 55, 627-652.

Frankish, C. (1985). Modality-specific grouping effects in short-term memory. *Journal of Memory and Language*, 24, 200-209.

Page, M. P., & Norris, D. (1998). The primacy model: A new model of immediate serial recall. *Psychological Review*, 105, 761-781.

Ryan, J. (1969). Grouping and short-term memory: Different means and patterns of grouping. *Quarterly Journal of Experimental Psychology*, 21, 137-147.

Perceptual style in children with Autism Spectrum Disorders (ASD) and Typically Developing (TD) children from Singapore and England: An examination of cultural influences on field-independence

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Recent cross-cultural studies indicate that adults from East Asia are more field-dependent than adults from Western cultures (Nisbett & Miyamoto, 2005). Individuals with ASD are known to be more field-independent than their TD counter-parts (Happé & Frith, 2006). Current zeitgeist suggests a physiological origin of field-independence in ASD, while cultural processes support the emergence of field-dependence in Eastern cultures. Evidence for field-independence in ASD comes mainly from data collected in Western nations, therefore the effects of culture on perceptual style in ASD remains unknown. In this study, perceptual style in children with ASD and TD children, from Singapore and England, was investigated. The cultural difference in perceptual style observed in adults was not found in the TD children from Singapore and England, suggesting that the cultural influence on perceptual style may have a protracted development across the life-span. Nevertheless, the English children with ASD were more field-independent than the English TD children. They performed better on the children's Embedded Figures Test, and showed reduced influence of context in the Frame and Line Task. The Singaporean children with ASD displayed no evidence of field-independence compared to the Singaporean TD children. The data suggests that field-independence in ASD is not culturally universal.

Happé, F., & Frith, U. (2006). The Weak Coherence Account: Detail-focused Cognitive Style in Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, 36(1), 5-25.

Nisbett, R. E., & Miyamoto, Y. (2005). The influence of culture: Holistic versus analytic perception. *Trends in Cognitive Sciences*, 9(10), 467-473.

Changing the spotlight of attention: The influence of emotion on visual attention

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‘Spotlight of attention’ theory suggests that positive affect broadens, while negative affect narrows, one’s aperture of attention. A digit parity task was used to index the influence of emotion on visual attention. Positive or negative images were displayed centrally with digits in the periphery. Participants were more accurate and faster at parity decisions when the image was positive, indicating a broadened spotlight of attention. However, this effect was only found for high arousal images, and reversed for low arousal images. Findings support spotlight theory, but show arousal level of stimuli modulates the influence of emotion on distribution of visual attention.

How do we maintain road position when steering a bend?

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Land and Lee (1994) suggested that steering around a bend is controlled by using the tangent point located on the inside road-edge, but to use this feature individuals need to judge their distance from that edge. The aim of this study was to examine how well participants could steer a bend whilst maintaining their distance from road edges under varying visual conditions. We recorded gaze and steering behaviors when driving along roadways where one or both of the edges were degraded and the participant could be initially positioned centrally, or .75m towards the inside or outside of the road. Results showed that participants were not very accurate at maintaining an offset position and tended to drift towards the middle of the road, however, they could at least keep on the correct side. The visibility of the road edges interacted with their performance, with the smallest steering errors occurring when both the inside and outside road edges were visible. Degradation of the outside, the inside or both edges resulted in a gradual increase in steering errors. These results suggest that individuals can use either road edge to aid steering, but perform optimally when both are available.

Land, M. F., & Lee, D. N. (1994). Where we look when we steer. *Nature*, 369, 742–744.

The impact of visuo-spatial working memory load on attention to eye gaze

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In a typical gaze-cueing paradigm, participants tend to respond more quickly to peripheral target stimuli that are being looked at by a centrally presented face, than to stimuli that are not being looked at. This effect was initially thought to reflect a reflexive shift in spatial attention towards the location cued by the gaze (e.g., Langton & Bruce, 1999). However, a few recent studies have raised the possibility that some form of voluntary attentional control may be responsible for the effect (e.g., Vecera & Rizzo, 2006). Therefore, the present investigation employed dual-task methodology to attempt to disrupt gaze-cueing. The secondary task (Logie, Zucco & Baddeley, 1990) involved auditory presentation of descriptions of matrix patterns, about which participants had to make verbal responses. During dual-task blocks, performance of a standard gaze-cueing primary task was slowed (relative to single-task blocks). However, there was no interaction with gaze validity – i.e., the reaction time advantage for validly-cued targets was maintained across both single and dual task conditions. This result suggests that gaze-cueing may be resistant to disruption by concurrent tasks requiring the manipulation and maintenance of information in visuo-spatial working memory.

Langton, S. R. H., & Bruce, V. (1999). Reflexive visual orienting in response to the social attention of others. *Visual Cognition*, 6, 541-567.

Logie, R. H., Zucco, G. M., & Baddeley, A. D. (1990). Interference with visual short-term memory. *Acta Psychologica*, 75, 55-74.

Vecera, S. P., & Rizzo, M. (2006). Eye gaze does not produce reflexive shifts of attention: Evidence from frontal-lobe damage. *Neuropsychologia*, 44, 150-159.

Do word spaces facilitate reading speed or reading comprehension? Evidence from Chinese children who are average and poor readers

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Word spaces play an important role in the cognitive processes underlying alphabetic reading. However, few studies have investigated how word spaces affect Chinese children's text comprehension and processing speed. The study included 22 fifth graders (10 were average and 12 were poor readers). We found that poor readers who received three 45-minute word spacing training sessions read significantly faster with the word-spaced format as compared to unspaced texts, but not for trained average readers. However, word-spaced texts did not facilitate text comprehension of trained average and poor readers. Implication for word spaces on children's reading speed was also discussed.

Reading comprehension in Chinese children: Contributions of vocabulary, semantic-syntax analysis, and sentence disambiguation

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Previous studies on Chinese children reading suggested that vocabulary and semantic-syntax analysis abilities strongly related to reading comprehension, whereas the roles of sentence disambiguation, word awareness and character recognition in reading comprehension were unclear. This study investigated the contribution of these cognitive components to reading comprehension among 166 Chinese fifth graders. The results showed that vocabulary was the strongest predictor of Chinese reading comprehension. Moreover, sentence disambiguation and semantic-syntax abilities account for small amount of variance in reading comprehension (2.5 % and 4.6 %, respectively). However, word awareness and character recognition do not account for unique variance.

Magnitude interference between number processing and response force planning

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The present study investigates the functional connection between number processing and the control of motor actions. In a series of experiments, participants were required to judge the magnitude (i.e., >5 or <5), parity status (i.e., odd or even) or colour (i.e., blue or yellow) of Arabic digits and to indicated their decisions by pressing a button with either a weak (<100 cN) or strong force (>600 cN). The RT analyses revealed that responses with a high force level were initiated faster if the numbers were relatively large, whereas responses with a low force level were initiated faster toward small numbers. The finding of a non-spatial number-response compatibility effect was also mirrored by the error rates and the applied peak motor forces. The observed linear interference between symbolic magnitude information and response force planning will be discussed in the context of an action-based embodied approach to mathematical cognition, which suggests that number processing and motor control are two processes that are linked by a common metric for magnitude information.

Self-reported affective state predicts the attentional blink

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When attending to two masked targets, accuracy on the second target is reduced if it is presented within 500 ms of the first target - an attentional blink (AB). Olivers and Nieuwenhuis (2006) demonstrated that manipulating diffusion of attention through an additional task or induction of positive affect attenuated the AB. We manipulated diffusion within participants using an additional task and diffusion instructions, but failed to replicate the finding that directly inducing diffusion reduced AB magnitude. However,

self-report measures of state affect did predict AB magnitude such that high negative affect predicted greater AB regardless of the manipulation of diffusion.

Olivers, C. N. L., & Nieuwenhuis, S. (2006). The beneficial effects of additional task load, positive affect, and instruction on the attentional blink. *Journal of Experimental Psychology: Human Perception and Performance*, 32(2), 364-379.

Vibrotactile short-term memory

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This research explored whether vibrotactile stimuli are processed in a component of WM separate from the phonological and visuospatial subsystems. Experiment 1 measured vibrotactile span for location, amplitude, duration and frequency coded strings as a function of distracter task (suppression, tapping, none). Spans for the location and amplitude stimuli were similar to established phonological and visual spans. However, span for duration and frequency coded stimuli was substantially lower; probably to the lower discriminability of these stimuli. In all cases, tapping led to a modest reduction in span compared to the substantial impact of suppression; thus suggesting phonological recoding of the tactile stimuli. Experiment 2 reduced the likelihood of a phonological recoding by using a same-different task to measure span for frequency, location, and amplitude coded vibrotactile strings. Again, tapping had a small effect on span compared to that of suppression. Finally, a binding experiment further explored this apparent phonologically recoding of vibrotactile stimuli. The data demonstrated phonological-visual binding, and, for the first time, visual-vibrotactile binding. However, no evidence of phonological-vibrotactile binding was found; again suggesting that the vibrotactile stimuli were phonologically encoded. Subsequent research will explore whether there are conditions other than those used here where vibrotactile stimuli are encoded in a non-phonological form.

A foraging task demonstrates an interaction between path integration and place learning

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Rats were trained to forage for food on a circular table with a home base located below the table at the periphery. We examined rats' errors on the return segment of the foraging excursion when the home base was fixed versus varied (one, three or eight holes), when the food was fixed versus varied (one, three or 16 locations), and when distal cues (many or few) were manipulated. The distribution of errors indicated that rats return home after foraging used both path integration and place learning, depending on training conditions and familiarity with the training environment.

No evidence for a prolonged attentional blink in developmental dyslexia

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When two targets are presented within 500msec of each other in rapid serial visual presentation (RSVP), the accuracy of second target identification is significantly reduced; a phenomenon termed the *attentional blink*. Recent studies have reported that children and adults with dyslexia exhibit deficits tied to attentional blink; however some ambiguity remains as to the nature of these impairments and how they relate to reading difficulties. The current study aimed to address these issues by examining attentional blink deficits in relation to different aspects of reading impairment. Twenty-two children with dyslexia were compared to 22 children with normally-developing reading skills on an attentional blink task with results indicating the dyslexia group exhibited impaired performance regardless of the temporal lag between targets. These deficits appeared tied to general dual-target RSVP performance rather than a prolonged attentional blink and differences between groups fell below significance when the influence of general performance factors were controlled for. A review of previous studies exploring the AB in dyslexia is consistent with this conclusion with no evidence (group-lag interaction) for a prolonged AB in dyslexia.

Cancelling intentions: A chronometric study

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The process of intending to act at a self-determined time slows reactions to an intervening stimulus cueing the same action. In the present study, participants heard two tones within a 3-10 second window and had to ignore the first tone but respond with a pre-instructed action to the second (SRT). In another condition, participants intended to make a pre-instructed action at a self-determined time within a 3-10 second window. They heard two tones, the first of which was a “cancellation” tone requiring cancellation of self-paced preparation. The second tone occurred 0-500 ms later and signalled participants to resurrect the action immediately. By comparing RTs in this condition to SRTs, we tracked the time required for cancellation. For both single finger actions and two finger actions, cancellation took 150-300 ms. We suggest that this type of cancellation involves cancelling a planned time of movement and is independent of specific movements.

Pre-instruction retrieval undermines directed forgetting

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Words retrieved from semantic memory via a generation cue do not show directed forgetting (DF) (MacLeod & Daniels, 2000). In a series of experiments, we examined

whether words retrieved from episodic memory are also resistant to DF. Rather than cueing items immediately as Remember or Forget, these cues were presented during an initial memory test (Experiment 1) or following one or more intervening words (Experiments 2 and 3). On a final recognition test, DF was eliminated except when retrieval was easy (Experiment 2). Our results indicate that an initial retrieval produces robust memory that is resistant to intentional forgetting.

MacLeod, C. M. & Daniels, K. A. (2000). Direct versus indirect tests of memory: Directed forgetting meets the generation effect. *Psychonomic Bulletin & Review*, 7(2), 354-359.

Overlapping cortical systems for reading and temporal processing

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Behavioural research indicates a link between reading and temporal processing ability in reading and in reading disability. The neural basis for this association has not been established empirically. We used functional MRI to measure cortical activation during reading (orthographic and phonological) and temporal processing (visual and auditory) tasks in normal readers. Common areas of activation were found in superior temporal regions (reading and auditory tasks), and in temporo-parietal and temporo-occipital regions (reading and visual tasks). Since children with reading disabilities have difficulty on temporal processing tasks, these results may assist in understanding the neurobiological basis of this learning disability.

Suppress to impress: Poor comprehenders show domain-specific deficits in the suppression of irrelevant information.

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Poor comprehenders are children who show significant deficits in their reading comprehension despite age-appropriate reading accuracy. Previous research has suggested that poor comprehenders have an impaired ability to suppress irrelevant information from working memory. It is believed that this detrimentally impacts on their working memory efficiency, and consequently on their reading comprehension performance. However, the extent to which the observed suppression deficits are specific to the verbal domain has not yet been explored; previous studies have used exclusively verbal materials. We compared a group of poor comprehenders with a group of matched controls on both verbal and non-verbal versions of a task designed to assess their ability to suppress no-longer-relevant information from working memory. The rate of intrusion of this to-be-forgotten verbal and non-verbal material was measured. The poor comprehenders showed domain-specific suppression deficits: They demonstrated higher rates of intrusion of material that they were instructed to forget than the controls, but only in the verbal version of the task. These findings suggest that rather than reflecting a central executive deficit that is causal in their reading comprehension difficulties, poor

comprehenders' suppression deficits may instead be a consequence of underlying, domain-specific weaknesses in the representation and processing of verbal information.

Right-hand man or the man upstairs? How does the concept of the divine influence visual attention?

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The concepts of God and Devil are well-known across many cultures and religions, and often involve spatial metaphors, but it is unknown if our mental representations of these concepts affect visual cognition. To examine if exposure to "divine" concepts produce shifts of attention, participants completed a target detection task in which they were first presented with God and Devil-related words. We found faster RTs when targets appeared at compatible locations with the concepts of God (up/right locations) or Devil (down/left locations). These results indicate that metaphors associated with the divine have strong spatial components that can produce shifts of attention

Understanding executive function skills in relation to movement in children diagnosed with DCD

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Previous research has indicated that children with DCD may experience problems with executive function related skills. Therefore, it is important to establish exactly where children with DCD struggle in relation to executive function, and how this may be related to other abilities. It may be that those children with DCD who have more effective executive function skills are able to use these skills to compensate for poor movement abilities. It is also important to understand whether or not the reported deficit is present across a wide variety of tasks that rely on executive function, or whether the deficit may actually be related to movement per se. The current research focussed on a group of children diagnosed with DCD aged 6-14 years (n = 34), and a matched group of typically developing children (n = 30), who were tested on a battery of tasks which focussed on testing executive functions with / without a motor component. Non-motor executive tasks and executive function tasks with an elevated motor component assessed inhibition, mental flexibility, working memory, and planning. Analysis of the data set highlighted differences between the two groups, and this will be discussed with regards to the implications for people diagnosed with DCD.

Literary language and technology: To scroll, or not to scroll

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In earlier research, text processing was affected by different elements of literary language (Robinson, Riegel, & Arbutnott, 2008). We now hypothesized that literary elements may aid in text processing and recall when text processing is constrained by displays with space limitations, such as handheld devices. Adults read brief passages that either did, or did not, include a literary element (e.g., alliteration, consonance). Half of the passages were presented as complete texts, and half in four segments on a small portion of the computer screen such that readers had to scroll to see the whole text. Reading speed and cued-recall were measured. Implications of the findings will be discussed.

Robinson, K. M., Riegel, C. E., & Arbutnott, K. D. (2008, June). Elements of literary language and their cognitive effects. Poster presented at the annual meeting of the Canadian Society for Brain, Behaviour, and Cognitive Science, London, ON.

The effect of lexical ambiguity on spoken word recognition using homographic and heterographic homophones: Neural and behavioural evidence

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Recent experiments have suggested two opposite effects of lexical ambiguity: polysemous words (*twist*) with multiple related senses show an ambiguity advantage whereas homographic homophones with multiple unrelated meanings (*bark*) delay word recognition due to semantic competition (Rodd et al., 2002). Assessing responses to spoken words allows us to use homographic (*bark*) as well as heterographic (*knight/night*) homophones for which separate representations exist. Behaviourally, subjects show significantly slowed responses for both groups of ambiguous words (homographic and heterographic homophones) versus single-meaning controls. No significant difference between the homographic and heterographic homophones suggests that this ambiguity disadvantage relates to semantic not orthographic competition. An fMRI study, using a semantic target detection task, revealed increased neural response in inferior frontal regions for single ambiguous words versus controls; regions implicated in comprehending and selecting contextually appropriate ambiguous words in sentences (Rodd et al., 2005). Left inferior frontal gyrus (LIFG) activation for ambiguous words may also support findings that the ventral aspect of LIFG (BA 47/45) is involved in semantic processing whilst dorsal regions relate to both semantic and phonological processing (BA 44/45) (Poldrack et al., 1999). Greater middle temporal gyrus activation for heterographic versus homographic homophones implicates this region in both semantic and orthographic processing.

Poldrack, R. A., Wagner, A. D., Prull, M., Desmond, J. E., Glover, G. H., & Gabrieli, J. D. E. (1999). Functional specialization for semantic and phonological processing in the left inferior prefrontal cortex. *NeuroImage*, 10, 15-35.

Rodd, J.M, Davis, M.H., Johnsrude, I.S. (2005). The neural mechanisms of speech comprehension: fMRI studies of semantic ambiguity. *Cerebral Cortex* 15(8), 1261-1269.

Rodd, J.M, Gaskell, M.G., & Marslen-Wilson, W.D. (2002) Making Sense of Semantic Ambiguity: Semantic Competition in Lexical Access. *Journal of Memory and Language*, 46, 245-266

Young without plastic surgery: Perceptual adaptation to facial age

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Adaptation has been shown to not only influence perception of simple stimulus qualities such as motion or colour, it also biases perception of complex stimuli such as faces. Here we investigate contrastive after-effects of adaptation to facial age. In Experiment 1, participants adapted to either young (20 ± 2 years) or older (70 ± 2 years) faces, and subsequently estimated the age of morphed test faces with interpolated ages of 30, 40, 50 or 60 years. Following adaptation to old adaptors, middle-aged test faces were classified as significantly younger ($M \approx 7$ Jahre) when compared to classifications of the same test faces following adaptation to young faces, which in turn caused subjective “aging” of test faces. These after-effects were significant even when facial gender changed between adaptor and test faces, despite a slight reduction of the effect compared to when adaptor and test faces were of the same gender. In Experiment 2, we successfully induced simultaneous opposite after-effects for female and male faces (following, for instance, simultaneous adaptation to young female and old male faces). Overall, these results demonstrate interactions in the perception of facial age and gender, and support distinct neuronal coding of male and female faces.

The embodied insult Stroop effect

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The purpose of this research was to examine whether knowledge gained through bodily experience influences the processing of insults. We presented embodied insults (e.g., bonehead), non-embodied insults (e.g., idiot), and non-insults (e.g., natal) in a Stroop task. In a hierarchical multiple regression analysis we observed that embodiment ratings accounted for a significant amount of colour naming latency variance, even when several control variables were included in the analysis. The effect was inhibitory such that colour naming was slower for the embodied insults. We propose that knowledge gained through bodily experience is an integral component of conceptual knowledge for insults.

The role of aggression in orphaned worker bumblebee (*Bombus impatiens*) reproduction

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A reproductive division of labour is the defining feature of eusocial insects such as the bumblebee. In worker bumblebees, aggression has been interpreted as a form of reproductive competition in orphaned workers because it is associated with ovarian

development. Little is known, however, about the association between aggression and egg-laying. Contrary to predictions, previous correlational research suggests that there is a negative association between the two variables. To experimentally test this association, workers were paired according to their levels of aggressiveness and their rates of egg-laying were measured. Preliminary analyses reveal reproductive differences that vary by levels of aggression.

Love is blindness: Superior likeability ratings for images following erotic distractors in an emotional blink of attention task

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In the emotional-blink-of-attention task, target detection is impaired if the target is presented soon after an emotional image. The current study examines whether items within this 'blink of attention' are encoded, and whether subsequent affective evaluations of these unattended items are influenced by the emotional distractors. Participants completed an emotional-blink task in which the critical distractors were images of erotica, clothed couples, or landscapes. Following this task, participants made likability ratings of the photographs that had appeared immediately after the critical distractors. Unattended items that had immediately followed erotic images were rated as being more likable than the other photographs.

The role of object and spatial working memory in inhibition of return

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Castel, Pratt, and Craik (2003) found that a concurrent spatial memory load (remembering arrow direction) disrupts inhibition of return (IOR, i.e., slowed responding to targets presented at previously attended vs. unattended locations). Their experiments, however, did not distinguish between visual working memory (WM) subsystems. The present study examined the role of object and spatial working memory in IOR using a dual-task procedure. Subjects performed an IOR task and a WM task (encoded the colour or the location of 4 items), alone or concurrently. Results are discussed with respect to the importance of object and spatial WM for observing IOR.

Castel, A. D., Pratt, J., & Craik, F. I. M. (2003). The role of spatial working memory in inhibition of return: Evidence from divided attention tasks. *Attention, Perception, & Psychophysics*, 65, 970-981.

The role of previous task relevance in time estimation

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Examples of time misestimation abound, ranging from students failing to complete college assignments on schedule to massive delays on large-scale projects such as the Channel Tunnel. Two accounts of time misestimation exist. The planning fallacy account (Kahneman & Tversky, 1979) states that misestimation occurs because previous task performance is neglected, whereas the memory bias account (Roy et al., 2005) states that misestimation occurs because previous task performance is misremembered. This experiment begins to test the competing predictions of these accounts by manipulating the relationship between previous and current tasks. Task relationship was manipulated by using two similar, identical or unrelated tasks, which were performed by participants (N = 60) on two occasions a three days apart. Consistent with the memory bias account, there was evidence of misestimation on the second task being less when the tasks were similar or identical rather than unrelated. The fact that misestimation differed according to task relationship runs counter to the planning fallacy account, which predicts that prior task performance is neglected and so does not influence estimates. The results suggest the need for an integrated model of task duration estimation and potential theoretical and practical implications of the results are discussed.

Kahneman, D., & Tversky, A. (1979). Intuitive prediction: Biases and corrective procedures. *TIMS Studies in the Management Sciences*, 12, 313-327.

What is on student minds when they rate their professors?

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Anonymous student evaluation of teaching (SETs) are used to measure teaching effectiveness of professors worldwide. Despite several decades of research and thousands of original research articles, the validity of SETs remains controversial. The best evidence cited for SETs' validity is a low to moderate 0.44 correlation between SETs and grades in multi-section courses indicating that SETs explain only 19% of variance in student learning. In contrast, numerous studies found that SETs correlate with various teaching effectiveness irrelevant factors (TEIFs) such as class size, field (e.g., English vs. Statistics), grading standards, course easiness, and professors' hotness/sexiness. We examined what is on student minds when they rate their professors by analyzing student comments, ratings, and their association on ratemyprofessor.com. Specifically, we coded several thousands of comments for occurrence of both strongly negative, negative, neutral, positive and strongly positive comments on various aspects of professor and course such as professor delivery of instruction (e.g., boring), professor characteristics (e.g., sexy, ethnicity), professor/student relationship (e.g., friendly, caring), course characteristics (e.g., syllabus, tests, test easiness), course management (e.g., organized), grading (e.g., fair, easy), outcomes (e.g., learned a lot), recommendation (e.g., professor, course), and course type (e.g., quantitative, level). Our results show that when students rate their professors they are primarily concerned with how friendly, helpful, engaging, and easy they are rather than with how much they learned.

Self-report measures of prospective memory are reliable but not valid

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Self-report measures of prospective memory (ProM) are said to be reliable and valid measures of prospective memory abilities. Surprisingly, our comprehensive review of the published literature on the development and psychometric properties of ProM questionnaires reveals that while these measures show sufficient reliability (internal consistency), evidence for their validity is lacking. To investigate the reliability and validity of self-report measures of prospective memory, over 200 participants completed several self-report measures of prospective (e.g., PRMQ, PMQ, CAPM, TCPM) and retrospective memory (e.g., EMQR), and objective measures of prospective (laboratory tasks) and retrospective memory (verbal learning tests). In addition, participants also completed a questionnaire on their use of memory aids, their involvement with various activities (busy-ness scale), a verbal intelligence test, and a personality questionnaire. Our results show that self-report measures of ProM are reliable but not valid. One possible explanation for the lack of validity is suggested by our finding that a substantial proportion of participants use external memory aids and that busy people are more frequent users of prospective memory aids.

Spatial frequency thresholds for configural and featural discriminations in upright and inverted faces

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Encoding the relative positions of face features (configural information) is more sensitive to stimulus orientation than encoding the appearance of individual face parts (featural information). Our study measured the range of spatial frequencies (SFs) needed for processing configural and featural information in upright and inverted faces using the method of constant stimuli. SF thresholds varied according to orientation for configural but not for featural processing. Our findings emphasize the importance of a mid-range band of frequencies in face perception and suggest configural information is extracted more effectively in upright faces.

The role of the ventromedial prefrontal cortex in facial expression processing

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Although some neuropsychological studies have implicated the ventromedial prefrontal cortex (VMPFC) region in facial expression recognition, other studies have failed to find evidence of facial expression recognition deficits in patients with lesions of the VMPFC. These inconsistencies most likely reflect the diverse range of tasks that previous studies have used to assess facial expression recognition performance. The aim of the current study was to establish the role of the VMPFC in facial expression recognition. We conducted a series of case studies of patients with lesions of the VMPFC using a range of tasks that were specifically designed to assess different stages in the process of recognising emotion from facial expressions. In general, we can conclude that VMPFC lesions result in deficits in the explicit recognition of facial expressions.

Importantly, we also clearly show that the type of task used to assess performance is crucial in order to reveal these deficits. These findings highlight the important role that the VMPFC plays in facial expression recognition and also emphasise the need to assess facial expression recognition performance using tasks that are sensitive enough to detect facial expression recognition deficits.

NOTES

YORK INFORMATION

A range of up-to-date information including Google map is provided at <http://www.york.ac.uk/conferences/eps2009/>.

Student Accommodation

Bed and breakfast may be booked at York St John University. York St John is not part of the University of York, but its campus is conveniently near to the conference venue (see map at <http://www.york.ac.uk/conferences/eps2009/>). A limited number of study bedrooms (no smoking, shared facilities) are available, and these are intended for students and others on a tight budget.

EPS Members can make reservations for accommodation and/or the conference dinner with the enclosed booking form, which should be returned to Louise Silk, before 17th June 2009. Cheques must be made payable to “University of York” and sent to Louise Silk (EPS Bookings), Department of Psychology, University of York, Heslington, York, YO10 5DD. Please ensure your envelope is clearly marked EPS Bookings.

Hotels and Guest Houses close to the Conference Venue

Rooms at a number of nearby hotels and guest houses can be booked at <https://www.conferencebookings.co.uk/delegate/YRKEPS09>. This accommodation has been selected to cover a range of different budgets; please check that the selected hotel meets your requirements before booking. A wider range of hotels and guest houses is available at the Visit York website (<http://www.visitork.org/accommodation/>) or other online booking services such as Expedia (<http://www.expedia.com/>). York is a very popular tourist destination, and accommodation is likely to fill up rapidly as Summer approaches – delegates are advised to book early.

Travel

By Plane

York can be reached from the following airports

<i>Airport (airport code)</i>	<i>Travel time to York</i>	<i>Approximate Cost (off-peak return)</i>
Birmingham (BHX)	2.5 -3 hr by train	£ 50
Edinburgh (EDI)	2.5 – 3 hr by train	£ 77
Leeds/Bradford (LBA)	1 hr by coach	£ 17
London Heathrow (LHR)	1 hr on the Tube + 2 hr by train	£ 90
London Gatwick (LGW)	3-4 hr by train, Tube& train	£ 90
London Stansted (STN)	2.5-3 hr by train	£ 70-100
Manchester (MAN)	~2 hr by train	£ 30

Further guidance for international travelers is available on the local conference website: www.york.ac.uk/conferences/eps2009.

YORK INFORMATION

By Rail

Getting to York by train is fairly straightforward as it is well connected with major cities in the UK. From London the journey time is under two hours; Edinburgh is only two and a half hours from York and there are also direct services from Liverpool, Manchester, Birmingham and the South West. Journeys can be planned using the National Rail Enquiries website (<http://www.nationalrail.co.uk/>).

By Coach

National Express (<http://www.nationalexpress.com/destinations>) operate services from York (Rail Station) to destinations throughout the UK and most airports. See their website for full details. For all further information on local bus timetables and other public transport, call traveline on 0871 200 22 33 or visit their website at <http://www.traveline.org.uk>

By Car

Situated midway between Edinburgh and London, just 20 minutes from the M1/M62 motorway network, York is within comfortable travelling times of most regions in the UK. Detailed route directions can be obtained through Google maps or transport direct (<http://www.transportdirect.info/Web2/JourneyPlanning/FindCarInput.aspx>). You should note that space for parking in York is limited, and the city centre is largely pedestrianized, so you may find public transport more convenient.

Local Taxis

Station Taxis - 01904 623332
Streamline Taxis Ltd 01904 638833
Fleetways Taxis (York) Ltd 01904 645333
Ebor Cars 01904 641441
Six Five Nine Taxis 01904 659659

Eating and Drinking

Ask and Pizza Express are reliable and convenient pizzerias immediately adjacent to the conference venue, while Gillygate and Petergate house some recommended restaurants and cafes and are within a short walk. For light bites a number of sandwich shops can also be found between Lendal Bridge and Gillygate. If exploring further afield in search of food, Walmgate (which leads onto Fossgate) is a good starting point with a number of good restaurants – some will require advanced booking. Swinegate is another area with a concentration of bars and bistros serving food, and for spicier, more international options, George Hudson St., off Micklegate offers a range of eastern flavours. The following list highlights some recommended eateries. Further details including map and descriptions will be available on the conference website: www.york.ac.uk/conferences/eps2009.

Restaurant Chains and International Options

Gourmet Burger Kitchen, 7 Lendal, 01904 639537
Ask, Assembly Rooms, Blake Street. 01904 637254
Pizza Express, River House, 17 Museum St, 01904 672904

YORK INFORMATION

The Viceroy of India, Monkgate 01904 622370
Akbar's, 6 - 8 George Hudson Street, 01904 679888.
Saffron Desi, 105-107 Micklegate, 01904 659999.
Indochine 9 King St, 633999.
Red Chilli, 21-25 George Hudson Street, 01904 733668.
Little Italy, 12 Goodramgate, York, 01904 623539
Mama Mia 20 Gillygate 01904 622020

Bars Serving Food and Drink

Oscar's Wine Bar, Little Stonegate 01904 652002
Evil Eye Lounge 42 Stonegate,
Ha Ha, New Street, 01904 655868.

Café, Grill, Bistro

Biltmore Bar & Grill Swinegate 01904 610075
Plunkets, High Petergate
Meltons Too, 25, Walmgate, York, 01904 629222
Cafe Concerto, High Petergate, York, 01904 610478
Café No 8 8 Gillygate 01904 653074

More formal (booking essential)

Masons, 13 Fossgate, 01904 611919.
Melton's Restaurant, 6 Scarcroft Rd, 01904 634341
Vanilla Black, 26 Swinegate, 01904 676750
J Baker's. 7 Fossgate, 01904 622688
Middlethorpe Hall, Bishopthorpe Road, 01904 641241

Pubs

York has hundreds of pubs, many of which are ancient and many of them serve food. Here's a selected sample.

The Minster Inn, 24 Marygate
The Maltings, Tanners Moat.
Three-Legged Mare, 15 High Petergate.
Black Swan, Peasholme Green.
Blue Bell, Fossgate.
King's Arms, King's Staithe.
Golden Slipper and **The Royal Oak**, Goodramgate.

Conference Dinner

The conference dinner will be held at the Merchant Taylors' Hall, Aldwark on Thursday 9th July at 8.15pm. The cost will be £35, for three courses including wine and coffee. EPS members please book and indicate any dietary requirements on the enclosed form which should be returned to Louise Silk (EPS Bookings), Department of Psychology, University of York, Heslington, York, YO10 5DD. Please ensure your envelope is clearly marked EPS Bookings.

YORK INFORMATION

Places of Interest

York is a historic riverside city and home to several major tourist attractions, museums and galleries. A walk round the city walls is highly recommended (and free). The world famous York Minster (<http://www.yorkminster.org/>), built between the 1220s and the 1470s is within yards of the Museum Gardens, and should probably be on any new visitors itinerary – sightseers are expected to pay an entrance fee (between £4 and £9.50 depending on which parts of the building you visit).

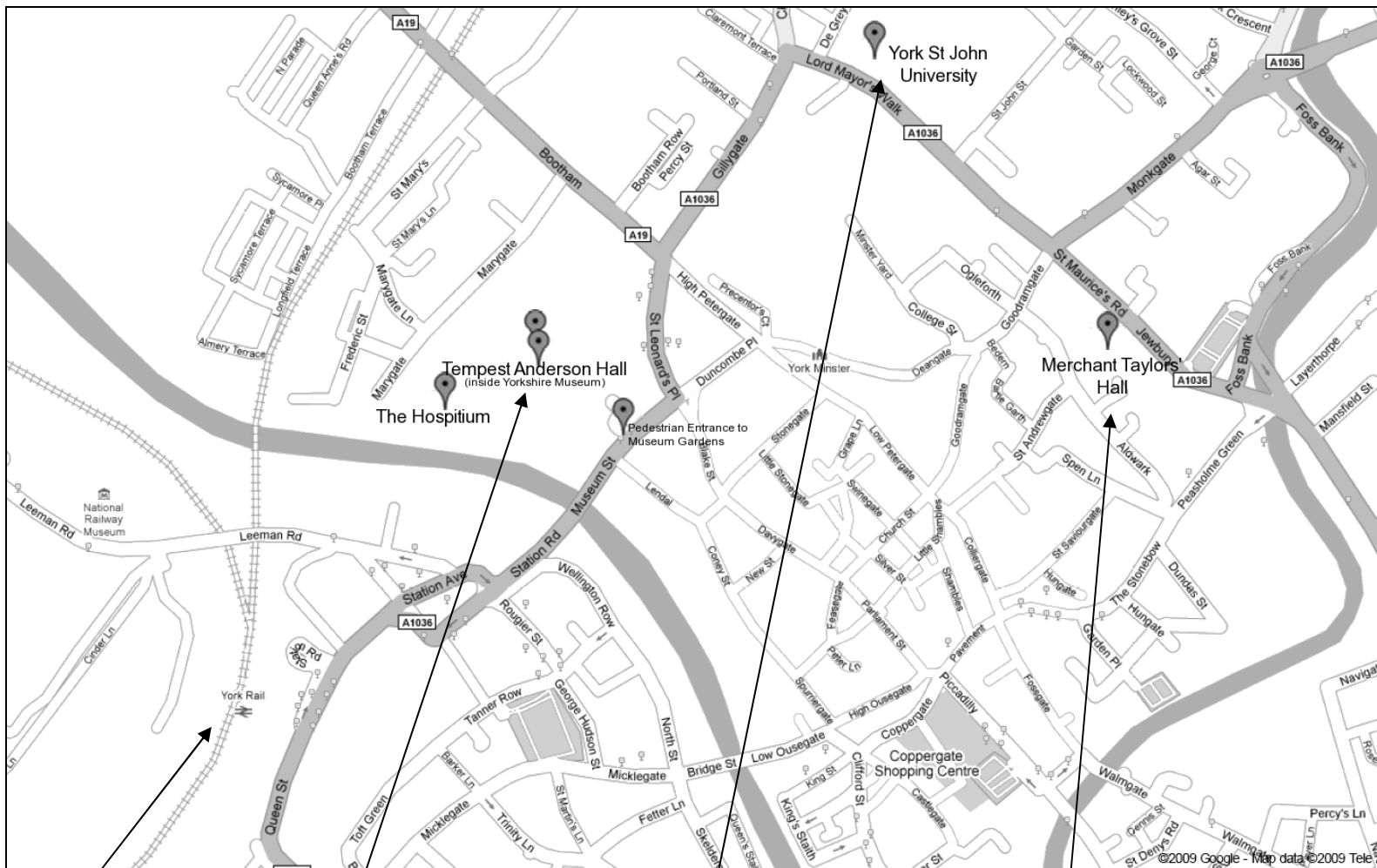
The narrow, bending, cobbled streets around the Shambles (<http://www.insideyork.co.uk/shambles>) are particularly picturesque, lined with medieval buildings still used as busy shops. According to the website, the Shambles is Europe's most visited street!

If you are in need of refreshment, Betty's Tea Rooms (<http://www.bettys.co.uk/>) is not just a café, more a Yorkshire institution, and should be experienced at least once in your life. No bookings; join the queue (which moves reasonably quickly).

A good way to have an entertaining and vaguely educational tour of the city is to take a "ghost tour" one evening (these normally start at around 7.30 to 8.00 at various points in the city see e.g., <http://www.ghosthunt.co.uk/>).

Other sights well worth seeing include Clifford's Tower (<http://www.cliffordstower.com/>) and the nearby Castle Museum which presents a quirky and fascinating take on social history, including accurate reconstructions of historic streetscapes. Entry to the Yorkshire Museum (which focuses on local archaeology <http://www.yorkshireremuseum.org.uk/Page/About.aspx>) is free to conference delegates. For those wishing to travel further back in time, the Jorvik Viking Centre (<http://www.jorvik-viking-centre.co.uk/>) unearths York's Viking roots with the aid of animatronics and memorable recreations of the smells of history! York has long held a central place in Britain's rail network, and a visit to the National Railway Museum (<http://www.nrm.org.uk/>) will not disappoint train enthusiasts and is free.

For more information on these and other activities, visit: <http://www.visit-york.org/>



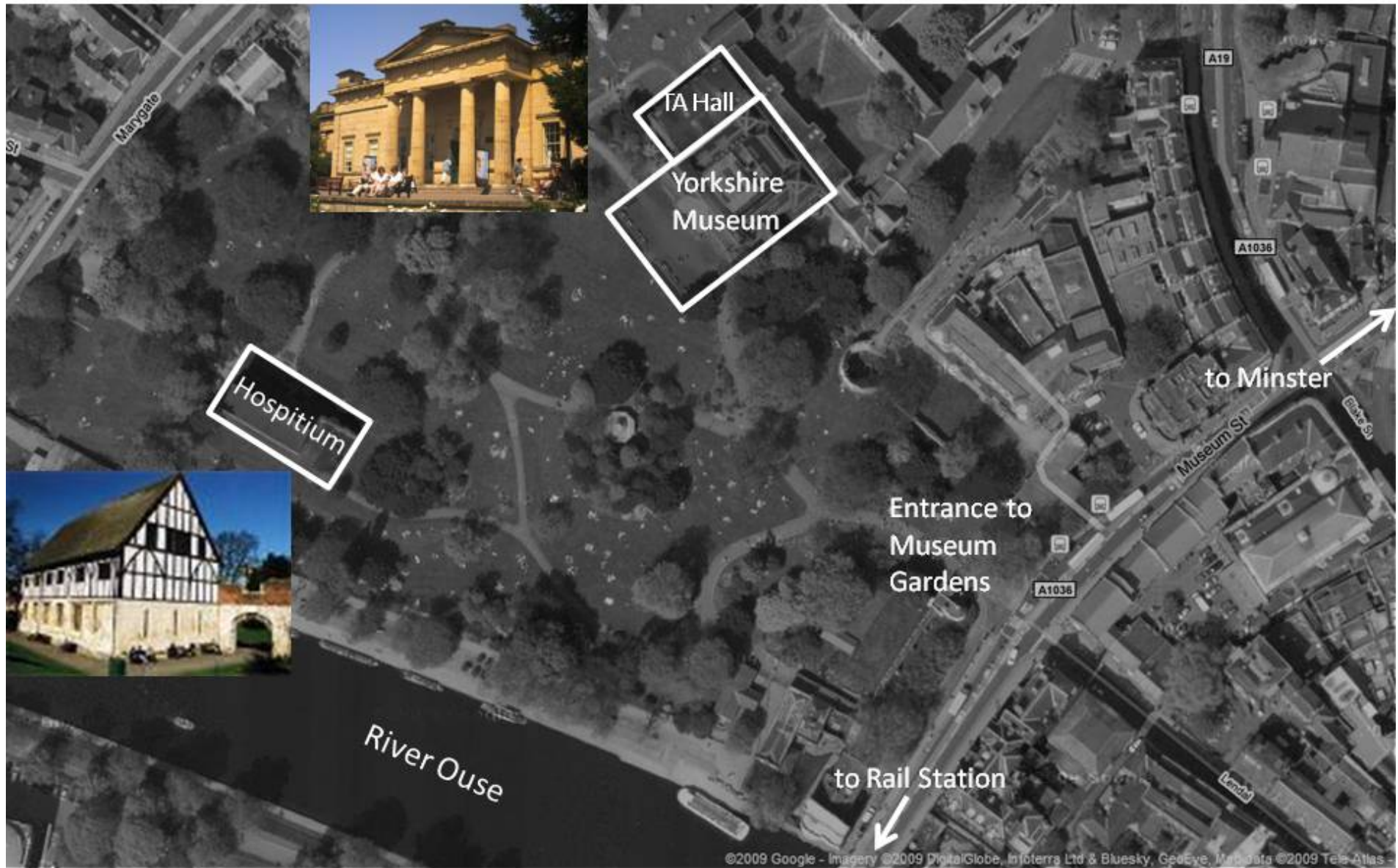
Rail Station

Conference

**Accommodation
(study bedrooms)**

Dinner

See interactive Google map with hotels, eating places at: <http://www.york.ac.uk/conferences/eps2009/>



TA Hall

Yorkshire
Museum

Hospitium

to Minster

Entrance to
Museum
Gardens

to Rail Station

River Ouse