Matching faces across rotations in view and lighting

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Abstract
It is important to look at the combined effects of lighting and view direction on face recognition, as both depend on the three dimensional shape of the face and are in some ways analogous. For example, both pitch rotations and the change between top and bottom lighting involve rotations about the left-right axis, just as yaw and left/right lighting involved rotations about the vertical axis. We investigated identity matching performance across 45° rotations of the light source or the face about pitch or yaw with all images shown either upright or inverted. Upright images were better matched than inverted images, showing that image differences are not sufficient to explain performance. This is consistent with the idea that the use of class-based knowledge of upright faces is important for this task. The effects of face and light rotation interacted and depended on the axis of rotation. Overall, rotations about pitch impaired performance more than rotations about yaw, and changes in view impaired performance more than changes in light. The interaction between face and light rotation was such that if both rotated in the same direction, equivalent to a rotation of the camera in the opposite direction, performance was as good or better than if the face alone rotated. This was particularly pronounced for pitch rotations, with a clear pitch up advantage but only when the light rotated in the same direction. The results are interpreted in terms of image, surface and three-dimensional models based accounts of face matching.

Keywords
faces, matching, across, lighting, rotations, view

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ABSTRACTS: Paper presentations

Choreography on the couch: The role of psychological intervention in the choreographic process of Incarna

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Thursday 2.10-2.30 Room #1 Dance and Cognitive Science

This paper will discuss the transactional nature and creative outcomes of the psychological intervention in the choreographic process of Incarna.

The making of Incarna employed a number of strategies deliberately designed to disrupt and modify aspects of my choreographic process that I deemed to have become entrenched, and which were likely to produce predictable choreographic outcomes as regards my oeuvre. One key strategy was the psychological intervention into the process carried out by psychologist and dance artist Dr. Beth Shelton.

The intervention aimed to analyse the emergent choreographic materials and the participants' understanding of the generative imagery and ideas driving the process. It was anticipated that the intervention would productively deepen all the participants' understandings of their relationship with the imagistic basis and emerging form of the work. Dr. Shelton's intervention was designed to act as a change-agent within the choreographic process.

The intervention encompassed observation of emergent form and content, discursive analysis and interpretation of the materials and process, feedback sessions and interviews, and improvisational workshops based on the imagistic realm of the work. During the process great care was taken to focus the intervention on the nature of the work and not on the individual participants' psychological profiles.

Incarna (2005) was presented as the folio component of my Ph.D. candidature, Victorian College of the Arts, University of Melbourne.

This paper was prepared in consultation with Dr. Shelton and is presented with her permission.

Simplest minds

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Thursday 2.50-3.10 Room #3 Navigation and Representation

Do primitive animals like earthworms or insects have minds or a form of language? They obviously don’t have minds or language like humans do, but perhaps they have some minimal form of mind and language of mind, if not a verbal language.

There is a long history of creating simple machines with simple "nervous" systems that respond to their environment, e.g. [Braitenberg]. But what is the minimum requirement for such a machine to have a mind, and what does that exactly mean. The computational theory of mind [Fodor, Pylyshyn] proposes clearly what is required of a system to have a mind, particularly, the existence of a physical and non-trivial symbolic and semantic levels of description.

This paper considers what may be the "simplest minds" by describing from the ground up what would be the simplest wiring and functionality to enable a creature, animal, robot, system, whatever you wish to call it, to have a computational mind. Although the terms "awareness," "self-awareness," and "consciousness" have a long history in philosophical discourse, this paper gives them pragmatic definitions in relation to these simplest machines and possibly simplest minds.

The machines that are described herein aren’t executable and don’t run. The paper more precisely defines the simplest class of machines that it is argued could be claimed to have some sort of simple computational mind. Although this paper doesn’t provide the functions necessary to produce a mind (although we see no theoretical reason why they could not be proposed), it does attempt to set some lower limits on what physical systems could have a mind.

One result relates to the fact that to have a non-trivial semantic level requires at least eight physical states (e.g. eight physical sensory states, that can be within one sensor or spread across multiple sensors). Similar results are explained for the motor states of a simple machine and for the internal states that relate more closely to mental states and the language of mind (with the added requirement of the combinatorial nature of language).

The conclusion of the paper is that the continuum of minds that naturally exists within the class of computational systems starts with some very simple systems, systems that perhaps we wouldn't have attributed minds and language (of the mind) previously.
Relational processing underpins higher cognitive functions including reasoning and problem solving, which are important in many contexts. Prefrontal brain regions have been implicated in relational processing and their involvement increases as task complexity increases. We examined relational processing in 47 persons with brain damage due to stroke and 41 control participants of comparable age and education. We assessed relational processing using four tasks (Card sorting, Sentence comprehension, Latin Square, N-Back) each with items at two or three levels of complexity. These complexity manipulations were based on Relational Complexity Theory, in which binary-, ternary-, and quaternary-relational tasks require integration of two, three and four variables respectively. The stroke group was impaired relative to control group at all three complexity levels. Within the stroke group, persons with frontal lobe lesions were more impaired than those with lesions to other brain regions, especially at higher (ternary- and quaternary-relational) complexity levels. Multiple regression analyses showed that working memory capacity (letter-number sequencing) predicted complex relational processing after controlling for less complex relational processing and group (stroke, control). Complex relational processing appears to demand working memory resources and to depend on the integrity of the frontal lobes. The findings are consistent with previous research in cognitive development, cognitive aging and neuro-imaging. They demonstrate the usefulness of theoretically based manipulations of task complexity.

Prior sensitivity in Bayesian model selection techniques

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Wednesday 3.20-3.40 Room #1 Computational models of cognition

One of the primary aims of cognitive psychology is to select which, of several competing models, best characterises a particular cognitive process. Ideally the selected model is able to generalise to as yet unseen data from either individuals within the study (sample based inference) or to new participants (population based inference) with the particular focus being determined by the research objectives (Spiegelhalter, Best, Carlin & van der Linde, 2002). Recently, Bayesian analysis along with Bayesian model selection techniques have been favoured over traditional maximum likelihood techniques because the Bayesian techniques offer complexity penalties which can improve generalization. However, Bayesian model selection techniques can be sensitive to the choice of prior distributions (Sinharay & Stern, 2002), an issue that has largely been ignored thus far in cognitive science (c.f. Liu & Alkkin, 2001). Here we present the results of a prior sensitivity analysis in model selection of forgetting data. We address both individual and population focus using posterior deviance based selection criteria (Liu & Altkin, Spiegelhalter et al., Raftery, Newton, Satagopam, & Krivitsky (2007)). The priors used are typical of those used in current research and range from moderately informative to quite vague. We find that in some cases results depend on focus, choice of priors and criteria. Possible solutions to this problem are discussed.

Perceiving musical change: Nothing more than a response to physical sound intensity?

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Thursday 3.30-3.50 Room #3

A strong positive real-time relationship between loudness and tension in music (Krumhansl, 1996) and loudness and arousal (e.g. Schubert, 2001) has been claimed. Given that intensity is a dominant determinant of perceived loudness (e.g. Geringer, 1993, 1995), we use physical measures of intensity to study, in greater detail, listeners' real-time perceptions of change in music. The primary aim of the study was to determine the relationship between physical measures of music and listeners' continuous measures of structure using time series analyses. Thirty-two participants, ranging in musical experience (16 non-musicians and 16 musicians), listened to musical works of approximately three minutes duration. They were instructed to indicate when the music seemed to change by moving the mouse for the duration of the change, and at the rate of change. No definition of change was provided to the participants, as the study aimed to explore how this instruction might be interpreted. Mouse velocity every 500 ms was sampled for comparison with the intensity profile of each piece (dB). Detailed time series analyses were conducted using ARIMAX and VARX models. The intensity profile of the stimuli was found to significantly influence listeners' perceptions of change in the music. Determining Granger causality and cross-correlations between intensity and perceived change provided additional support for this relationship. In conclusion, detailed time-series analyses provide supporting evidence that physical intensity significantly influences the perceived structural changes that listeners report during listening. The importance of sound intensity with respect to the perceived affect of the same musical material will also be discussed.
In humans, several cortical and subcortical circuits have been implicated in object-location memory and navigation, but it remains unclear how these areas contribute to the distinct processes of encoding and retrieval of object-locations in three-dimensional space. We used functional magnetic resonance imaging (fMRI) to measure neural responses during active navigation within an immersive virtual environment. Healthy male volunteers were asked to encode the location of a single target object relative to a small set of landmarks and, following a delay period, to retrieve that location from memory by navigating back to the target’s original position. The relative and absolute locations of landmarks and the target object were changed on every trial, and no feedback on accuracy was provided. Within subjects, encoding related activity within the right hippocampus and the parahippocampal gyrus bilaterally predicted more accurate navigation, suggesting a link to the hidden target object. By contrast, during the retrieval phase, more accurate performance was associated with increased activity in the left hippocampus and the striatum bilaterally. Between subjects, average accuracy and consistency of responses was associated with higher levels of retrieval related activity in the striatum and parietal cortex. Stronger striatal activity in good navigators might reflect a procedural component of the learning and retrieval process that is predominantly active in good navigators. Whereby greater parietal activity in good navigators might indicate a more effective spatial updating process present in these individuals. In summary, our findings suggest separate neural substrates for the encoding and retrieval stages, which are further modulated by participants’ overall navigational ability.

The two experiments in this study investigate the accuracy of the feeling-of-knowing (FOK) ratings as a prediction for information available in memory to be retrieved. FOK is the relative belief that the correct answer or information necessary for a response is available in memory and will be recalled once a question is posed (James, 1890).

The results confirm both the accuracy of FOK as a prediction of information available in memory retrieval and the cue familiarity hypothesis. The cue familiarity hypothesis describes the process of memory retrieval as a cue recognition process.

The methodologies for the first and second experiment are identical with the exception of the initial priming task. During memory encoding, subjects were instructed to read a list of word pairs (e.g., sun - fun) out loud; in the second phase, subjects were given one half of the word pair from the previous list (e.g., sun) and asked to recall the other word from memory (e.g., fun). If the subject was unable to recall the correct response, then they were instructed to provide an FOK rating; a number representing a percentage between 0 and 100 as to what they believed their chances of recalling the correct response were if given a multiple choice recognition test. Finally in the third phase subjects were given a recognition memory test.

Not only antisocial individuals who do not feel empathy, guilt or remorse are able to commit horrible and deeply immoral acts towards others. Normal individuals with a well-developed sense of morality are also able to commit such acts. Furthermore, many people are able to (at least to some extent) justify their immoral or offensive acts towards others and by doing so they sustain a view of themselves as morally good people. Admitting to oneself that one is a bad person constitutes damage to the self concept that is hard to bear and the perpetrator therefore looks incessantly for alternative paths to resolve this internal inconsistency. The aim of this paper is to empirically investigate how this state of cognitive dissonance is overcome in real world-settings: an open-ended interview conducted in March 2008 to a retired police officer who served during the 1976-1983 dictatorship in Argentina.

The construction of the moral self is closely associated with a positive self-representation. This representation is sustained by a coherent autobiographical memory. It is created in accordance with a cognitive representation of the context that controls the ways of representing oneself in relation to the environment.
A relation is a binding between elements in working memory (WM). According to relational complexity (RC) theory, one way cognitive demand of a task can be reduced is through segmentation, the decomposition of a relation into multiple less complex relations that are integrated in series. Instantiation of a relation can be seen as synonymous with a processing step. Because segmentation entails serial processing where earlier processing steps must be maintained in WM to be used in subsequent steps, it implicates cognitive functions outside the scope of RC theory (e.g., strategic maintenance). However, given RC theory formalises the processing demand of tasks, it provides a basis for investigation of processing capacity separated from other fluid cognitive functions, such as controlled attention and memory. Study 1 (N=46) investigated segmentation in two tasks. In the Latin Square task, the requirement for segmentation was manipulated across three levels of RC. In the Letter Swaps task, RC was held constant and five levels of segmentation were considered. Fluid cognitive function (GF) was assessed using Raven’s matrices test. Increases in task complexity and segmentation were expected to lead to more errors and longer decision times; and to performance differences that would be predicted by individual differences in GF. Results indicated processes underlying segmentation were a significant source of individual differences over and above RC. Study 2 (N=86) explored the controlled attention/maintenance aspect of segmentation from an alternative perspective. Explicit memory load was manipulated in the Greco-Latin Square task across three levels of RC. Either 0, 1 or 3 cells in the square were highlighted. The elements from the highlighted cells were then removed and the target cell was identified. Because removed elements were a) critical to solution, and b) could not be re-instantiated if lost, it was hypothesised that memory load would interact with RC to the extent that strategic maintenance of the elements would draw on processing capacity required to instantiate relations to solve the task. Results showed no such interaction. Implications for controlled attention, relational processing, and WM frameworks are discussed.

On criticality and perception in the human brain

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Wednesday 10.30-10.50  Room #2

In studies of auditory and visual word processing, a negative deflection in the event-related potential, the N400, is observed between 300 and 500 msecs after the word onset. The N400 is reliably associated with the word’s predictability based on preceding sentence context. However, its neural generators remain obscure. In this study, we used magnetoencephalography (MEG) to investigate the N400m – the magnetic counterpart of the N400. Participants listened to semantically congruent sentences in which the predictability of the final word was manipulated (e.g., “The little girl cuddled her doll” versus “Miss Black knew about the doll”). As expected, the N400m was considerably larger for low- than for high-predictability words. Spectral analyses also revealed an event-related desynchronization (ERD) in the beta frequency band (13-30 Hz) during the same time window as the N400m that was specific to the low predictability condition. Both the N400m and the beta desynchronization were localized to the left superior temporal lobe by co-registering MEG data with structural MRI scans for each participant. Ongoing coherence analyses aim to identify the brain regions that interact with superior temporal lobe to produce these context effects. Future studies will investigate the neural basis of impaired context-processing deficits in individuals with developmental language difficulties and autism.
Heuristic vs Bayesian Models of Decision-Making

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Wednesday  3:00-3:20  Room #1  Computational models of cognition

Most decision-making research has focused on choices between two alternatives. For choices between many alternatives, the primary result is Hick’s Law - that mean response time increases logarithmically with the number of alternatives. Various models for this result exist within specific paradigms, and there are some more general theoretical results, but none of those have been tested stringently against data. We present an experimental paradigm that supports detailed examination of multi-choice data, and analyze predictions from a Bayesian ideal-observer model for this paradigm. Data from the experiment deviate from the predictions of the Bayesian model in interesting ways. A simple heuristic model based on evidence accumulation provides a good account for the data, and has attractive properties as a limit case of the Bayesian model.

Expression processing is identity-dependent and identity-independent

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Wednesday  11:40-12:00  Room #2

Major cognitive and neural models of face perception maintain that the mechanisms underlying the extraction of facial expression and facial identity information involve separable visual systems. Using the visual adaptation paradigm, we explored the sensitivity of happy, sad, angry, disgusted and fearful facial expressions to changes in identity. Contrary to what would be predicted by traditional face perception models, larger expression aftereffects were produced when the identity of the adapting and test stimuli was the same compared to when the identity differed, suggesting the involvement of identity-dependent neurons in processing these expressions. However, for all five expressions, the aftereffects remained significant when the adapting and test stimuli differed in identity, suggesting the involvement of identity-independent neural populations. The extent to which the aftereffect transferred across changes in identity was the same for all emotional expressions. Consequently, there is no evidence that the processing of different facial expressions depends on facial identity differentially.

Homophone vs. cohort competitors in predictive sentences: Time-course of language-mediated eye movements.

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Friday  11:10-11:30  Room #2

This study used eyetracking to measure the effects of sentence context on the unfolding process of spoken word identification. It is unclear from previous research whether sentence context affects the processing of spoken words and whether the effect is immediate or delayed. Huettig and Altmann (2004) presented sentences containing a homophone (e.g. pen). Participants tended to look at objects corresponding to both meanings of the homograph (writing pen, pig pen), even when the sentence context was biased towards one interpretation. This suggests that both meanings of a homophone are activated, regardless of context. However, other studies show that on hearing a target word (e.g. button) the tendency to look at a cohort competitor (e.g. butter) disappears if the competitor does not fit the sentence context (Brock & Nation, 2009; Dahan & Tanenhaus, 2004). The discrepancy between these findings may reflect differences in the way homophones are processed compared with other words, or may simply reflect differences in sentence context used across studies. In the present study, we directly compare the effect of the same sentence context on eye-movements directed at homophone and cohort competitors. Participants hear sentences such as ‘When Mark coughed he felt a pain in his chest so he decided to call the doctor’ while viewing a display containing either a homophone competitor (e.g. a treasure chest) or a cohort competitor (e.g. a cheque). Results will shed light on the process of spoken word identification in typical populations and will provide reference for future studies investigating developmental disorders such as autism that are associated with difficulties processing language in context.
A comparison of fortunes: The comparator and multifactorial weighting model of the sense of agency

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Wednesday 12.20-12.40 Room #3

The sense of agency over bodily actions is the feeling that one is the agent of one’s actions. It is to be distinguished from the sense of acting intentionally in that it is about oneself qua agent of action not one’s mental states which seem to lead to the action. Those suffering from delusions of alien control have a deficit in eliciting this sense. In this paper I examine the prospects of Frith and colleagues’ influential comparator account of how the sense of agency over one’s bodily actions is elicited, in comparison to the multifactorial weighting model advocated by Synofzik and colleagues in response to some problems with this account. Here I provide the strongest argument possible for a version of the comparator model. I take it that these models aim to explain the sense of agency over one’s bodily actions and the deficit’s in delusions of control. I defend the comparator model from the common objection that the actual sensory consequences of action aren’t needed to elicit the sense of agency. Following this I argue that the comparator model is able to provide an explanation of the sense of agency and the behavioural deficits displayed by those who have a deficit in this sense.

However, there are considerable case-by-case modifications that need to be made to the model for this to work. Following this I argue that there is some confirmatory evidence for the p model in the behaviour of normal subjects when sensory feedback is unexpectedly altered and examine how this model may account for the findings of the ‘helping hands’, ‘I-spy’ and ‘wheel of fortune’ studies which some take to be problematic for this model. Again, from these arguments it appears that the comparator model needs case by case adjustment to deal with problematic data. In the end we get several versions of the comparator model with no principled way of distinguishing between them or predicting when one will hold. To deal with this the multifactorial weighting model of Synofzik and colleagues is introduced. Although this model is incomplete a single version can be offered which is naturally constrained by the cases which are problematic for the comparator model. However, it is not clear what, if anything, could count as evidence against the multifactorial weighting model. Despite being generated with the data in mind it may be untestable. I conclude that currently the comparator model has stronger support than the multifactorial weighting model.

The influence of alignment on object-location memory within a virtual environment

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Thursday 2.10-2.30 Room #3

An enduring question in research on human navigation is whether memory for object locations in the environment is viewpoint-dependent or viewpoint-independent. One line of research has shown evidence to suggest that cues from the external environment (e.g., room geometry) can play a significant role in how an array of objects is encoded and retrieved. Specifically, retrieval of object-location information tends to be faster and more accurate when the retrieved orientation of the array is aligned with an axis defined by the external cue than when it is misaligned with this axis, even for orientations that were not presented during encoding. Here we investigated the role of alignment cues on object-location memory within a novel virtual environment. Participants were shown an image of a circular arena containing seven distinct target objects, and were required to learn the locations of the objects to a criterion level of performance. A uniquely coloured square mat was placed on the floor of the arena, the purpose of which was to provide a cue to the intrinsic axis of the object array. To test their spatial knowledge of the array, participants were instructed to imagine themselves standing at a particular object location facing another object, and to point to the location of a third object. We found that participants responded faster and more accurately when the imagined heading was aligned as opposed to misaligned with the axis defined by the mat. We also found that the alignment effect is an enduring property of object-location memory, as it remains evident after a 24 hour delay; and that it can occur in the absence of any external visual cues. Further studies are being conducted to investigate the influence of active navigation and visual cueing on the alignment effect.

A comparison of the fortunes: The comparator and multifactorial weighting model of the sense of agency

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Thursday 12.10-12.30 Room #1

Agency, skills and embodiment in a cultural context

We currently lack a conceptual framework for understanding agency that adequately captures the interplay of top-down and bottom-up factors. Using a dual process conception of cognition Haidt (e.g. 2001) and Camerer, Loewenstein and Prelec (2005) have each argued that traditional approaches overemphasize reasoning. However they may in turn be underemphasizing reasoning, and the dual process framework itself is unhelpfully simplistic, particularly in casting reasoning as slow and serial. This paper uses skilled action as a test case for developing a more nuanced conceptual framework. It is argued that efficient, model-based representation makes high order agency possible in fast, fluid action. We offer some proposals for conceptualizing this control, together with some initial suggestions for operational measures, and the framework is applied to examples from sports, therapy and music performance.


Contemporary scientific investigations of the mind have increasingly looked towards the brain to answer questions about cognition. This approach can lead to a better, more complete, cognitive science. We conclude by providing some guidelines for integrating different levels of explanation, from neuroscience to the study of social interaction, and suggest that this can lead to a better, more complete, cognitive science.

In the first section, we present the traditional computationalist–functionalist viewpoint that has relied on the multiple realizability of computational function to argue for the independence of cognitive science from neuroscience. Although not a necessary part of the computationalist–functionalist viewpoint, multiple realizability has been presented as a compelling argument for cognitive scientists to ignore neuroscience. We present a critique of multiple realizability, which regards the physical realisation of a mental state as irrelevant to the understanding of that mental state. Contrary to this proposal, we suggest investigating the causally relevant physical properties of realisers can inform our understanding of mental states and cognition in at least two ways: first, it can inform theories about what type of computational system the mind is—for example, should cognition be understood as symbolic manipulation or pattern completion; second, it can inform our understanding of representation—for example, as action-centred and based on simulation as opposed to abstract and symbolic representational formats.

In the second section, we critique the proposition that the mind is what the brain does. Instead of focussing solely on the brain, we suggest that the proper object of study in cognitive science is the brain-body-environment system. An understanding of intelligent behaviour can only be gained by examining how the biological constraints inherent in an organism’s body both constrain and scaffold information-processing. Furthermore, using examples from the social recall of autobiographical memory, we will examine how a proper understanding of certain cognitive functions can only be achieved by studying how organisms interact with each other. And we will also examine how, through manipulation of the environment, information-processing can be “off-loaded” onto the environment, thus making aspects of the environment part of the cognitive system.

We conclude by providing some guidelines for integrating different levels of explanation, from neuroscience to the study of social interaction, and suggest that this can lead to a better, more complete, cognitive science.
Is the mind the software of the brain?

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I subscribe to Ned Block’s view that the mind is the software of the brain: thus the mind includes a suite of programs such as the Face Recognition Program, the Episodic Memory Program, the Speech Production program, etc. The aim of cognitive psychology is to discover the architecture of these programs. At present, nothing we know about the hardware on which these programs run (the brain) is informative about what a program’s architecture might be.

(Q1a) Are the explanations provided by cognitive psychology and cognitive science indispensable, or are they replaceable in principle by explanations in neuroscience? If not, why not?

Cognitive psychology could discover everything there is to know about the Face Recognition Program without having discovered anything about the brain systems used for recognizing faces. Neuroscience could discover everything there is to know about the brain systems used for recognizing faces without ever referring to quantum physics.

(Q2a) Are the phenomena referred to in explanations in cognitive science realizable or implementable in many different ways at the neurophysiological level?
Yes. The Face Recognition Program is platform-independent. It runs on the brain, but if we know enough about its architecture to actually write it, it would run on various computers too.

(Q2b) If so, is this why these explanations are irreplaceable?
Yes. See also Q4a

(Q3) How do mental or psychological states relate to neural states? For example, are they identical to neural states?
I believe that philosophers of mind believe that cognitive psychology is devoted to the study of mental states like ‘being hungry’. But that isn’t so. Cognitive psychology is devoted to the study of mental abilities, such as Face Recognition, Episodic Memory or Speech Production. Hence this question needs to be recast as: how do mental abilities relate to brain processes, to which I would answer: As software relates to hardware.

(Q4a) Is it possible or likely that cognitive psychology will reduce to neuroscience?
Not possible. You can't figure out what information-processing job a part of the brain does from studying its structure. No matter how much you knew about the wiring of the brain, you could never say: Ah, this must be the bit that does Face Recognition! And this must be the bit that does nonsense-word reading.

Max Coltheart has recently challenged the claim that neuroimaging has been informative for cognitive theory.

(Q5) Is the challenge successful?
So far

(Q6) If so, does it signal that neuroimaging is conceptually misconceived? Or is the putative failure just a symptom of immaturity of the discipline?
There’s no way of telling which. But I am inclined to take the former of these positions, at least until there is a clear counter-example in the neuroimaging literature that makes this position untenable. I mean of course that neuroimaging is conceptually misconceived when considered as a way of investigating cognition. It is obviously an appropriate way of investigating the brain.
Impaired face recognition and the mirrored-self misidentification delusion: Recreating the delusion using hypnosis

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Thursday 11.30-11.50 Room #2 Using hypnosis to explore theoretical predictions and clinical phenomena from a cognitive neuropsychological perspective

Confabulation during an hypnotic erotomania delusion

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Thursday 12.10-12.30 Room #2 Using hypnosis to explore theoretical predictions and clinical phenomena from a cognitive neuropsychological perspective

Clinical confabulations involve the production of fabricated, distorted, or misinterpreted memories about oneself and the world without the conscious intention to deceive. They occur in both neuropsychological and psychiatric disorders and are commonly seen in the context of delusions. Although there is no single theory to account for confabulation, one theory suggests that confabulators have a source-monitoring deficit where they misattribute never-experienced events as real. Some researchers have also argued that motivation may combine with this source monitoring deficit to influence the content of confabulations. There is currently no viable experimental method for investigating clinical confabulation in the laboratory. However, because confabulation often occurs in the context of delusion, we used hypnosis to re-create a delusion in the laboratory and subsequently attempted to elicit confabulations. We selected an erotomania delusion which is the delusional belief that one is loved from afar by another person. This is a functional or motivated delusion characterised by extensive confabulations that support the delusional belief. To re-create the erotomania delusion, we gave high and low hypnotisable individuals a hypnotic suggestion that a factional character - Jo Pearson - was in love with them. After the delusion suggest was cancelled and after hypnosis, we asked participants who described seeing a stranger in the mirror to touch their nose while looking in the mirror and explain why the stranger was copying them. Results support the idea that hypnotic suggestions can create a compelling mirrored-self misidentification delusion that is resistant to challenge. Results are discussed in terms of current theories of delusions.

Impaired self-misidentification is the delusional belief that one's reflection in the mirror is a stranger. Current theories suggest that the delusion may result from two factors: a deficit in face processing that is responsible for the content of the delusion (Factor 1) and a deficit in belief evaluation which accounts for the failure to reject the delusional belief (Factor 2). Due to the extensive neurolegal and cognitive deterioration in clinical patients, the mirrored-self misidentification delusion is particularly difficult to study. Previous research, however, has found that instrumental hypnosis can effectively model the delusion so as to allow empirical study. Barnier et al. (2008) and Cox et al. (in preparation), for example, gave highly hypnotisable participants a hypnotic suggestion to see a stranger in the mirror (a fully-formed suggestion for the delusional experience). They found that the majority of participants did not recognise their reflection in the mirror, described the person in the mirror as having different physical characteristics to themselves, and maintained their delusion when challenged. These features were strikingly similar to the clinical condition. Connors et al. (in preparation) built upon this work by attempting to recreate the delusion from its component factors. Connors et al. gave hypnotic suggestions for either the Factor 1 impairment alone (impaired face recognition) or for both Factor 1 and Factor 2 impairments (impaired face recognition plus impaired belief evaluation). Suggestions for these component factors were administered either during hypnosis or in the normal, waking state. Participants who received suggestions for both component factors during hypnosis developed the delusional belief that their reflection in the mirror was a stranger and exhibited behaviour very similar to the clinical condition. Notably, a suggestion for Factor 1 alone in hypnosis was equally effective at producing the delusion as when participants were given suggestions for both Factor 1 and Factor 2, suggesting that the hypnotic state, which itself disrupts belief evaluation, may act as a Factor 2. To explore this possibility, the present study directly compared a Factor 1 suggestion for impaired face recognition with a fully formed suggestion to see a stranger in the mirror. High hypnotisable participants received a hypnotic suggestion to either not recognise faces (Factor 1 alone) or to see a stranger in the mirror (fully formed). Half of the participants received the suggestion while hypnotised and the other half received the suggestion in their normal waking state. Following the suggestion, we asked participants to look into a mirror and describe what they could see. We then indexed participants' responses to a series of clinically inspired challenges. In one challenge, for example, we asked participants who described seeing a stranger in the mirror to touch their nose while looking in the mirror and explain why the stranger was copying them. Results support the idea that hypnotic suggestions can create a compelling mirrored-self misidentification delusion that is resistant to challenge. Results are discussed in terms of current theories of delusions.
What are core linguistic properties?

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There are two views about the distinction between core versus peripheral linguistic properties. Advocates of a Universal Grammar contend that the difference between core and periphery is significant, with core properties having several defining characteristics that are not shared by peripheral constructions of individual human languages. By contrast, advocates of usage-based accounts contend that the distinction between core and periphery is vacuous, since individual human languages differ so extensively, and the same learning mechanisms that language learners exploit in acquiring peripheral constructions also suffice in acquiring more general ‘core’ properties. I will discuss the major differences between these viewpoints, focusing on one property of human languages -- downward entailment. One question is whether or not downward entailing expressions are universal, and a second question is whether downward entailing expressions can be acquired using the same mechanisms that are recruited in the acquisition of peripheral constructions.

The danger of the extended mind

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This paper accepts three claims of the Extended Mind Hypothesis (EMH): 1) External elements form part of the machinery of cognition, insofar as they causally interact with mental states. 2) The meaning of our thoughts is partly explained by reference to the external world (content externalism) and 3) Objects outside the physical brain can operate in functionally equivalent ways to many brain-based processes. I reject criticisms of EMH by Adams & Aizawa including 1) that cognition should be restricted to the domain studied by cognitive psychologists 2) that the processes of cognition are defined by the production of intrinsic or original content. Instead of engaging with these claims, I ask: What difference does it make to include external epistemic artifacts as part of the mind? I consider philosophical issues specifically relating to EMH, thus avoid issues relating to piecemeal replacement and functionalism generally. In one sense it does not matter whether we include external elements as part of cognitive processing. It does not matter if our beliefs are stored in our brains or on a notepad as long as we can access them when needed, just as it does not matter if a person’s leg is made of wood or flesh if it helps them walk.

However, in another sense it might matter a great deal to obviate differences between peripheral (e.g. edge detection in early vision, night vision goggles) and central processing. By ‘central processing’ I mean processes that lie at the core of mental life such as analyzing, understanding and evaluating, henceforth summarized by the term ‘thinking’. Thinking is a skill. Like any skill, thinking requires practice. A virtuoso thinker needs a strong capacity to concentrate and an excellent working memory. Thinking practice is internally generated and executed, even when influenced by a variety of inputs. If thinking is a skill, then failure to practice leads to cognitive atrophy. Increasing our peripheral access to data, whether via iPhones or iPlants increases the availability of information and opportunity for distraction, but not our ability to centrally process that information. Even worse, the more access we get to data, the less we bother to memorize for any particular task. This loss of mnemonic practice in turn decreases our ability to hold many ideas simultaneously and thus further decreasing our ability to think. This is the real danger of saying it doesn’t matter if external epistemic artifacts are included in the ‘mind’. By obfuscating the difference between peripheral and central processes, we risk confusing data for thinking.
Neuroanthropology is a humanistic science that brings together theory and methods from anthropology and neuroscience to study the little-understood relationship between culture and the brain. The neural structures and mechanisms that underpin the production and reproduction of culture are central to neuroanthropological enquiry. This paper puts forward a model of such structures and mechanisms based on theory and evidence from cultural anthropology, primatology, and cognitive, social and cultural neuroscience, among other fields. While the model distinguishes between animal and human forms of culture, these are both conceived as corresponding to repertoires of socially generated behaviors that are common within groups of interacting individuals. Animal culture is characterized in this model as depending on associative and/or mimetic mechanisms. Human beings are regarded as also being endowed with these mechanisms; however, human enculturation is posited to fundamentally rely on a relational mechanism. The present model proposes that an action recognition system (in macaques composed of areas F5, PF and superior temporal sulcus, and in humans of homologue structures Brodmann area 44, inferior parietal lobe and STS) underlies associative and mimetic forms of culture. The relational mechanism, in turn, is suggested to be realized in the prefrontal cortex (PFC). The model stipulates that this mechanism operates by establishing relationships between things and events represented in different areas distributed across the brain. Fully developed, the relational PFC mechanism manifests itself as intersubjective and symbolic capacities, long recognized in anthropology as making possible the generation and transmission of the webs of meaning that make up human culture. According to the model, the relational mechanism occurs in a heterogeneous manner across the PFC owing to a segregation of activity defined by the dimensions of modality (with sensorimotor, emotional and motivational levels varying along a lateral-ventral-medial axis) and temporal context (with immediate, on-going and pending levels varying along a posterior-anterior axis). Finally, the model takes into account the links between the relational PFC mechanism and other systems and structures including the action recognition and limbic systems.

Cultural variation in elite athletes

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Thursday 11.50-12.10 Room #1 Agency, skills and embodiment in a cultural context

Much of the research on elite performance and cognitive-perceptual learning assumes that skill-specific cognitive refinement is similar across individuals, sometimes even across different sports. The more expertise an athlete gains, the more he or she is assumed to have converged on a single best strategy for accomplishing demanding athletic tasks. Depending upon the type of sport, however, secondary evidence suggests that the ways in which athletes develop complex skills may not lead to elite-level convergence. That is, highly accomplished athletes playing the same role or engaged in the same activity may have distinctive configurations of perceptual-cognitive adaptation. This preliminary discussion outlines potential applications for understanding patterns of cognitive variation, including how culturally distinctive regimens of training and development might produce varied profiles in perceptual-cognitive skills and high-speed decision-making. Demonstrating culturally based variation in skill acquisition also better integrates observations of psychological variability from anthropology and cross-cultural neurosciences.

Re-thinking through remembered perspectives: experiential memory as cognitive know-how

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Friday 3.50-4.10 Room #3

Insofar as philosophers and psychologists have evaluated experiential (or 'autobiographical') memory as a source of knowledge, they have by and large construed this knowledge as representational. Most commonly, experiential memory has been thought to represent past events in the rememberer's life, with discussion centering on the question of how reliably memory represents those past events. In counterpoint to this dominant research paradigm, others have observed that, even when that which is remembered is not exactly that which actually happened, these 'misperrepresentations' may in themselves represent that which is personally meaningful in the rememberer's experience. Experiential memory may thus represent either the past as it was experienced, or the meaning this experience has come to hold for the rememberer. I suggest that memory's claims to knowledge extend further, looking beyond the facts or meaning of the experiences represented, to the cognitive know-how contained in their mental re-enactment. By mentally re-enacting (experientially remembering) scenes from their past, rememberers can think through their present situation from the perspective of their remembered past selves. In this way, memory can show us how to think about the present in ways we might not otherwise think. In this brief paper, I will outline a few examples to show what this form of cognitive know-how consists in, and how it resides in the perspective of our remembered experiences. By illustrating how rememberers rely on the cognitive know-how contained in experiential remembering, I also hope to show why it is deserving of more attention from memory researchers.
The components of working memory updating

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Wednesday 1.40-2.00 Room #1 Computational models of cognition

Working memory updating (WMU) - the ability to maintain accurate representations of information that changes or is transformed over time - has long been recognized as an important topic of study in cognitive psychology. For example, in individual differences research, it has been claimed that WMU specifically predicts fluid intelligence and reading comprehension skills. However, little is known about the underlying component processes of WMU. An intuitive decomposition of working memory updating (WMU) into at least three distinct components - retrieval, transformation, and substitution - was implemented into a standard WMU paradigm. Experimental conditions featured every possible combination of these three components. Their contributions were modeled with multilevel linear regression. Results suggest that the proposed sub-processes make distinct and independent contributions to WMU performance. Furthermore, both the view that WMU and WMU are strongly related and the view that they are dissociable dimensions of mental ability have been proposed. Hence, the decomposition of WMU was used to analyze the relationship between WMU sub-components and working memory capacity (WMC), employing structural equation modeling (SEM). This study presents a novel utilization of SEM inasmuch as both interindividual variability and experimental effects on mean performance measures (RT and accuracy) were accounted for concurrently. We found that WMC reliably predicts WMU in general, but we also found that some sub-components of WMU - in particular substitution skills - are independent of WMC. Hence, WMU and WMC may make independent contributions in predicting higher mental abilities.

The gambler’s illusion of control: Its structure, prevalence and determinants in a laboratory setting

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Friday 10.50-11.10 Room #3

Gamblers' behaviours and game-related thought patterns have often been found to reflect an ‘illusion of control’ - the perception of a causal relation between strategic or superstitious actions taken during the game and successful game outcomes. Attempts to elicit, measure and, subsequently, examine the predictors of the illusion in laboratory gambling tasks have been hampered by the use of overly trivial gambling tasks and overly brief outcome measures. Thus, a study was needed to unify existing findings and hypotheses using a more engaging experimental task and detailed measures that captured both the strategic (primary) and superstitious (secondary) elements of the illusion of control construct. In the present study participants played 100 rounds of a specially-designed sports-themed gambling game, before answering questions of varying subtlety about the degree of control they perceived over the game's outcomes. The patterns of participants' responses to these questions suggested that the illusion of control has a three-dimensional structure, involving perceptions primary control, perceptions of secondary control, and, independently of these, an outward admission that game outcomes were nevertheless 'all due to chance'. Whether a participant reported experiencing primary control was determined by his or her extant beliefs about games of chance, but, also, by the number of times he or she experienced three wins in a row. The experience of secondary control was mediated solely by existing beliefs. The preliminary results of a follow-up study concerned with a particular determinant of the illusion - the sequence in which wins and losses are experienced - will be discussed.

Matching faces across rotations in view and lighting.

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Wednesday 12.00-12.20 Room #2

It is important to look at the combined effects of lighting and view direction on face recognition, as both depend on the three-dimensional shape of the face and are in some ways analogous. For example, both pitch rotations and the change between top and bottom lighting involve rotations about the left-right axis, just as yaw and left/right lighting involved rotations about the vertical axis. We investigated identity matching performance across 45° rotations of the light source or the face about pitch or yaw with all images shown either upright or inverted. Upright images were better matched than inverted images, showing that image differences are not sufficient to explain performance. This is consistent with the idea that the use of class-based knowledge of upright faces is important for this task. The effects of face and light rotation interacted and depended on the axis of rotation. Overall, rotations about pitch impaired performance more than rotations about yaw, and changes in view impaired performance more than changes in light. The interaction between face and light rotation was such that if both rotated in the same direction, equivalent to a rotation of the camera in the opposite direction, performance was as good or better than if the face alone rotated. This was particularly pronounced for pitch rotations, with a clear pitch up advantage but only when the light rotated in the same direction. The results are interpreted in terms of image, surface and three-dimensional models based accounts of face matching.
Temporal dynamics of masked congruence priming: Evidence from reaching trajectories

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Friday 2.30-2.50 Room #2

The masked congruence priming effect (MCE) has proven valuable in the investigation of nonconscious cognitive processes. Typically, studies of the MCE use mean reaction times (RT) as the dependent measure. While mean RTs certainly reveal an MCE, they are relatively insensitive to the temporal properties of this effect. To investigate the temporal dynamics of the MCE, we have participants perform a reaching-to-touch response and we sample the position of their hand multiple times during their response. The advantage of this continuous measure is that it reveals the MCE as it emerges during the response. In this talk, I will report the time course of the MCE from three experiments in which we manipulate the prime type (repeated primes [also appear as targets] versus novel primes [do not appear as targets]), spatial attention (prime attended versus prime unattended), and prime duration (16.7ms – 66.7ms).

Relational complexity in the context of processing speed

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Wednesday 4.40-5.00 Room #1 Applications of relational complexity theory to the study of fluid cognitive functions

Research suggests that the relationship between fluid intelligence and processing speed is moderated by task complexity. However there is still no universally accepted view of what constitutes complexity in processing speed tasks. Perhaps the most well elucidated position is based on stimulus-response compatibility. Research adopting this view has consistently shown that as the stimulus-response compatibility of a processing speed task decreases, its correlation with measures of fluid intelligence increases. Despite this success, the stimulus-response compatibility view is hamstrung by its inability to generalise beyond a relatively small subset of tasks. In contrast, compelling views, such as the number of steps required for solution can generalise quite easily to a range of tasks.

However it is possible to show that the findings from the stimulus-response compatibility view can be accounted for through relational complexity theory, which is concerned with the number of variables that must be integrated to solve a task. Critically, unlike the stimulus-response compatibility view, relational complexity theory can be applied to a broad range of tasks. In the current research (N = 110) we used a modified version of the Latin Square Task (LST) to investigate two different views of complexity in the context of processing speed: relational complexity and number of steps. Complexity manipulations of the LST according to relational complexity theory produced systematic effects on its correlations with the Raven’s Progressive Matrices (a measure of fluid intelligence). Specifically, greater relational complexity was associated with a stronger correlation with the Raven’s, mirroring the results derived from the stimulus-response compatibility view. However complexity manipulations of the LST via the number of steps required for solution did not have a systematic effect on its correlation with the Raven’s Progressive Matrices. We discuss the implications of these findings on relational complexity theory and processing speed. In particular, it seems that relational complexity theory may offer a fruitful way to view complexity in processing speed tasks.

Seeing double: Perceptual illusions of identity

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Wednesday 12.00-12.20 Room #3

Metaphysics recognise a distinction* between intrinsic objects (things in themselves independent of any properties they bear) and relational objects (objects constituted out of properties: the bundle theory of objects). Intrinsic objects survive changes in their properties, relational objects do not. This distinction might seem arcane to cognitive science but it turns out to be interestingly relevant to understanding delusions of misidentification.

I argue that the face recognition system represents persons as intrinsic objects but that standard theories of delusional misidentification assume the relational conception in their model of face recognition. I discuss the consequences for the understanding of these disorders.

The argument has two aspects. The first is that visual perception exploits the intrinsic conception. Face recognition and other more central/abstract processes inherit the architecture of intrinsic representation. Here I side with Zanot Pylyshyn and Mohan Mathen against John Campbell who thinks that we perceive not objects but located properties so that a perceived object is nothing more than a set of properties at a location.

Secondly if we treat the face recognition system as representing intrinsic objects delusions of misidentification are more easily explained. In particular we can understand a distinction between representing two identical people (e.g. identical twins, clones or duplicates) and two different people who appear identical (e.g someone in perfect disguise or who has had plastic surgery to resemble the subject of an impersonation). This distinction is not available to the relational conception but the experience of delusional subjects suggests that it is computed within face and object recognition systems.

I close with some speculative suggestions on the sixty four thousand dollar question: ‘How is the distinction represented?’ and some comments on how the intrinsic object idea fits with theories which give affective responses an essential role in identifying persons.
Literary texts, in particular novels, provide unique ways of representing and exploring the workings of the human mind. Through an analysis of Ian McEwan's novel *Atonement* (2001) I explore the role of narrative as a basic constituent of consciousness, critical to an understanding of our selves in time, and to comprehending and communicating with others. McEwan is deeply interested in consciousness and the capacity of the novel to convey what he describes as 'an unruly sense of what the mind is'. *Atonement* is a self-reflexive exploration of the power of narrative to shape and be shaped by what the mind perceives and understands. Narrative is shown to be essential to the ways we make sense of our selves: we gain pleasure from narratives and deeply desire to tell as well as to be told stories, to view our lives in terms of story. Our capacity and willingness to be immersed in an alternative world through the power of narrative suggests our peculiar sensitivity to this form of communication and its capacity to structure our experience. But our hunger for narrative suggests a desire for knowledge as well as a desire for the â€˜right' story: when this desiring in the imagination motivates behaviour and affects decisions, narrative can become dangerous. The paper explores narrative imagination as an asset as well as an affliction, the role of confabulation and the destructive power of narrative in terms of what these phenomena, when represented in fiction, can tell us about the human mind.
To date, few studies have directly investigated the facial cues that lead to the perception of racial origin. Past research has shown that people are more accurate at recognising faces belonging to their own racial group than they are for other race faces: a phenomenon known as the other race effect. This effect can be produced by simply changing a face’s skin tone, even when all other facial characteristics remain unchanged, suggesting that skin lightness has a substantial involvement in perceived race. The aim of the current experiment was to explore the possibility that people’s perceptions of race could be altered using a traditional perceptual effect: the lightness contrast illusion. In this illusion, a neutral grey figure appears darker when surrounded by a light area, and lighter when surrounded by a dark area. To test for similar effects in the context of faces and perceived race, we morphed together faces of African and European descent (henceforth referred to as ‘black’ and ‘white’ respectively). By controlling the degree of input from each original face in the morphing process, we created 5 sets of faces at evenly spaced intervals on an objective continuum of racial origin. These morphed faces were presented amongst a surround of either black or white faces in separate conditions. Participants were asked to rate the perceived race of the central face using a visual scale ranging from ‘stereotypically black’ to ‘stereotypically white’. While participants’ ratings appropriately reflected the degree of input from the original faces (or ‘morph levels’), these ratings were entirely independent of whether they were presented within a white or a black surround. A second experiment consisting of two parts was conducted to establish why no effect of surround was found for face stimuli. In experiment 2a, the features of each face were eradicated by averaging all pixel luminance values within each individual face outline. This meant that participants could only base their ratings - this time of perceived lightness - on skin tone alone without the influence of morphological characteristics. In experiment 2b the average luminance of each face was made equal such that participants would base their racial stereotypicality ratings on the morphological characteristics of the faces, without significant influence of skin tone. An effect of surround was found in experiment 2a, with featureless faces in general appearing lighter when surrounded by black featureless faces and vice versa, in line with the traditional lightness contrast illusion. However, no such effect was found in experiment 2b. Trend analyses based on participants’ ratings and the faces’ morph levels revealed similarities between experiments 1 and 2b. The trend of results of each of these experiments differed from the trend shown in experiment 2a. These findings are consistent with the idea that the morphological aspects of faces dominate judgements of race, while perceived skin tone is less influential.

A Face in the Crowd: Race Perception and the Lightness Contrast Illusion

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Wednesday 12.20-12.40 Room #2

Applications of relational complexity theory to the study of fluid cognitive functions

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Wednesday 5.00-5.20 Room #1
**Collaborative remembering: When are can remembering with others be beneficial?**

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**Wednesday 3.00-3.20 Room #2**

Experimental memory research has traditionally focused on the individual, and viewed social influence as a source of error or inhibition. However, in everyday life, remembering is often a social activity, and theories from philosophy and psychology predict benefits of shared remembering. In a series of studies, both experimental and more qualitative, we attempted to bridge this gap by examining the effects of collaboration on memory in a variety of situations and in a variety of groups. We discuss our results in terms of a functional view of collaborative remembering, and consider when and in what ways remembering with others might help or hinder memory.

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**Unifying models of memory and reasoning**

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**Wednesday 11.10-11.30 Room #3**

Four studies examined the relationship between induction and recognition memory using a paradigm which makes these two tasks as comparable as possible. During study participants were asked to memorise or learn about a novel property of a common set of study items (pictures of dogs). At test old and new pictures were presented and participants made recognition decisions (“have you seen this animal before?”) or property inferences (e.g., “does this animal have beta cells?”). People doing induction were more likely to make positive responses to old and new test stimuli than those doing recognition. However, there was a strong positive correlation between the probability of making a positive response to test items in induction and recognition conditions. Manipulations of duration of exposure of study items (Experiment 1), frequency of exposure (Experiment 2), and decision-load at retrieval (Experiment 3) had parallel effects on recognition and induction. A control study (Experiment 4) showed that the strong empirical relationship between induction and recognition was maintained even when old stimuli remained in view while inductive inferences were made. A modified version of the Generalised Context Model (Nosofsky, 1986), assuming a common generalisation process based on exemplar similarity, produced a good fit to both recognition and induction data.
The Hypothesis-Testing Brain
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Friday 11.40-12.55 The Atrium Keynote

According to one theory, the brain is a sophisticated hypothesis tester: perception is Bayesian unconscious inference where the brain actively uses predictions to test, and then refine, hypotheses about what the causes of its sensory input might be. The brain’s task is simply continually to minimise prediction error. This increasingly popular theory holds great explanatory promise for a number of central areas of research at the intersection of philosophy and cognitive neuroscience. I show how the theory can help us understand striking phenomena at three cognitive levels: vision, sensory integration, and belief. First, I illustrate central aspects of the theory by showing how it provides a nice explanation of why binocular rivalry occurs. Then I suggest how the theory may explain the role of the unified sense of self in autoscopic illusions driven by visuotactile conflict. Finally, I show how it provides an approach to delusion formation that integrates one-deficit and two-deficit accounts. To illustrate and support some of these claims, I present our findings from a study of autoscopic phenomena.

Why don’t apes point but we do? A recognition-theoretical approach
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Friday 2.30-2.50 Room #3

The phenomenological tradition in philosophy has for some while been acknowledged as a respectable voice in cognitive science. Many of the insights that the phenomenological tradition offers have to do with the role of intersubjective relations and attitudes in the genesis and constitution of the cognitive structures of normally functioning human persons. Within philosophy, the phenomenologists were however not the first people to put a strong emphasis on intersubjective relations and attitudes. About one hundred years earlier, the German philosophers Fichte, Schelling and especially Hegel already conceived of particular kinds of interpersonal attitudes as fundamental for having the kind of psychological structure that distinguishes humans from animals. They called these attitudes with the term ‘Anerkennung’. I translate this German term with ‘recognition’ (which is not to be confused with ‘identification’, as in talk of ‘face-’ or ‘speech-recognition/identification’).

Today the concept of recognition is much discussed in social and political philosophy, but very rarely applied to the questions in the context of which it originally appeared: the genesis and constitution of human cognitive structures. In this paper I argue that the concept of recognition, as I define it more exactly, may help us understand what is at stake in what according to Michael Tomasello is a fundamental difference between apes and human infants – that apes, in contrast to human infants, do not point things to each other. If Tomasello is right, this difference is the crossroads at which human infants part company with apes and embark on a developmental journey in which they will normally develop the full-fledged mind of a person. Tomasello’s question is why is it that apes never point anything to each other. Is it that they lack an innate capacity, or is it that they lack the appropriate motivation? Importantly, having the required capacities would not be enough for pointing to become stabilized into a practice if appropriate motivations and mutual expectations regarding the other’s motivation were lacking.

An important clue here is that two of the ‘proto-speech-acts’ that human infants perform according to Tomasello involve either helping the other by pointing, or requesting help from the other by pointing. I argue that in the pre-linguistic stage this most likely involves one of two basic attitudes of interpersonal recognition as they have been articulated in recognition-theory – being non-instrumentally moved be an experience of the other having authority on one, or being non-instrumentally moved by the perceived needs of the other. The competing proposal that instrumental motives having to do with expected rewards would do the job looks weaker in comparison to the recognition-theoretical one. Weighing costs and benefits is cognitively more demanding than being ‘directly’ moved to help by the authority or needs of the other, and if such weighing requires language-based thinking then it is simply impossible at the pre-linguistic stages at stake.

Perhaps Hegel was right that what fundamentally distinguishes humans from animals is intersubjective recognition.
The spatial and temporal dynamics of anticipatory preparation in task-switching

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The stone tool record of human evolution reveals a number of stages in the sophistication of tool manufacture and the deployment of tools. Mode 1 tools from 2 to 1.8 million years ago seem to be simple ad hoc responses to immediate needs (Jeffares 2008). With mode 2 tools, associated with Homo erectus from 1.8 to 1 million years ago, the classic Acheulean biface tradition (Sterelny 2003; Jeffares 2007). But it is not until mode 3 tools, characterised by new manufacturing techniques and associated with Homo Heidelbergensis (the ‘Archaic sapiens’) that we see the emergence of tool diversity and the first signs of tool specialisation (Klein and Edgar 2002; Coolidge and Wynn 2009). Coolidge and Wynn argue that this shows the development of increased working memory (Coolidge and Wynn 2005; Coolidge and Wynn 2009). I argue from the adaptive significance of these developments, and suggest that the transition from mode 2 to mode 3 tools shows increased strategic awareness. As archaic hominins began inhabiting increasingly diverse environments, and start exploiting new resources, the ability to manufacture reliable and specialised tools becomes adaptively salient (Odell 1996; Hiscock 2006). Tool manufacturers had to be ‘mindful’ of scarce raw materials (raw material transportation becomes a significant factor in the archaeological record by this time (Marwick 2003)) and just as aware of the eventual deployment options for a tool. Consequently, mode 3 tools demonstrate the first evidence for the integration into the tool-making act of strategic awareness: an awareness of scarce raw materials, and eventual specialised deployment of tools.

Philosophical and socio-cognitive foundations for collaborative approaches to student learning in higher education

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This paper considers the implications for higher education of recent work on narrative theory, distributed cognition and artificial intelligence. These perspectives are contrasted with the educational implications of Heidegger’s existentialist phenomenology and with classical foundations of education which Heidegger and Gadamer once criticised. The aim is to prompt discussion of what teaching might become if psychological insights (about collective minds let loose to learn) are associated with higher education.
Neural correlates and temporal dynamics of task-switching in normal aging

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ABSTRACTS: Paper presentations

Does the visual complexity of animated-virtual actors in virtual reality applications affect learning?

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ABSTRACTS: Paper presentations

We explore the application of Cognitive Theory of Multimedia Learning (CTML) in Virtual Reality (VR) applications. CTML suggests that complex visuals hinder novice learners to attend the lesson properly. However, VR applications favour the use of complex visuals as the technology in computer graphics allows it. So, how much of visual complexity is too much? This study specifically investigates into the visual complexity of Animated Virtual Actors' (AVAs) for learning. A series of VR simulations were created to teach second-year psychology students about the navigational capabilities of Cataglyphis ants with flat, cartoon, or life-like AVAs. Regarding learning outcomes, we predicted that visually more complex AVA would increase the perception of learning and the cognitive load, and decrease retention and transfer scores. The results did not reveal any significant differences between AVA’s visual complexity and learning outcomes, contradicting our predictions. Nevertheless, our methodology significantly improved retention and transfer scores in all conditions. Possible explanations and future research direction are discussed.
In defence of nativism

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Wednesday 4.40-5.00 Room #2

Can Nativism be defended from charges of empirical and conceptual inadequacy? Evidence from animal cognition, developmental psychology and language acquisition studies seems to point to the existence of innate knowledge. Yet many cognitive scientists remain sceptical. Some question the need to posit pre-wired stored knowledge when, they contend, general learning mechanisms can acquire the same information from the input. Others reject nativism on broad methodological grounds such as those to do with simplicity or parsimony. Finally some claim to detect conceptual incoherence of some sort or other in all the varieties of innateness hypotheses: some alleging that the nativist’s case requires a flawed model of genetic encoding, others that it rests upon a mistaken conception of knowledge.

I explain why the empirical and methodological arguments against nativism are unconvincing and argue that the a priori arguments are also unsound. A nativist model of innate knowledge is advanced which challenges one of the central tenets of a dominant theory of propositional knowledge but which seems to have independent empirical support. I conclude by reviewing some recent psycholinguistic evidence concerning young childrens’ acquisition of logical words. Along with Stephen Crain and others, I argue that this evidence can be seen to provide good reason to believe in a quite specific form of innate knowledge: logic nativism.
The central executive is specialised to process relational information, which is integral to higher cognitive processes such as planning and goal-directed activities (Halford et al., 2007), such as solving arithmetic word problems. Word problem solving requires a mental model of task structure that represents variables and relations between them (i.e., the sets and operators). In arithmetic addition, three sets; augend, addend, sum; are related by the addition operation (English & Halford, 1995). This is a ternary relation. According to relational complexity theory (Halford, Wilson, & Phillips, 1998), once developed, relational processing (RP) capacity engenders flexibility allowing all components of a relation to be accessed. Thus, given the relation, addition (5,3,8), each of the following variations can be solved, 5 + 3 = ?; 5 + ? = 3; and ? + 3 = 8. In arithmetic addition, flexible access to the relation between sets is required when position of the missing set is varied, so individual differences in RP capacity should explain task performance. The effect of position in word problems has previously been investigated with Preschool to Grade 2 children, showing that accuracy decreased as the missing set was moved closer to the start of a problem (Riley, Greeno, & Heller, 1983). This also holds for older children, for example, 9-year-olds solved word problems with the sum missing significantly more accurately than problems with the missing number in addend position, which were solved more accurately than problems with augend missing (Gilmore, 2006). Thus existing evidence shows a position effect on accuracy but has not examined other performance measures or whether individual differences in RP explain the effect. The present research addressed this by examining position effects and investigating how RP resources explain age-related performance on word problems. A sample of 166 children aged 6- to 9-years attending Queensland primary schools completed two measures of relational processing ability and an arithmetic word problem task. The 12 word problems were varied in the position of the missing set. Working memory and reading demands were controlled by presenting the task visually on a computer and reading each item aloud to the participant. Accuracy and response time data were analysed. Mixed ANOVAs showed significant position effects in the expected direction, such that missing sets in Augend and Addend position were solved with lower accuracy and longer response times than those in Sum position. Multiple regression analyses showed that RP capacity explained 58-68% of the age-related variance in accuracy and a further 4-6% unique age-independent variance in performance. These findings demonstrate the importance of individual differences in central executive functions defined as RP capacity in development of children’s arithmetic addition, and have potential implications for designing effective word problem teaching strategies and interventions for children experiencing arithmetic difficulties.

A cognitive neuropsychiatric case-study of a circumscribed somatic delusion

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Wednesday 2.20-2.40 Room #3

We present a 30-year-old male (GC) with delusional disorder to illustrate the cognitive-neuropsychiatric approach to studying delusions. At the time of testing, GC believed that his mouth and gums were rotting. He had held this delusion with conviction for 10 years. GC used ‘visual’ evidence to support his belief; he claimed to see the rotting skin and diseased gums. Neuropsychological assessment revealed that GC’s attention and memory were impaired. He was relatively intact in all other domains. There was little evidence of a basic visual processing deficit. Visual imagery played no part in GC’s delusion; he was just as capable as controls of discriminating between imagined and real events. While GC discriminated between pictures of normal and diseased gums as well as controls, he judged the diseased gums to be more abnormal, more distressing and more like his own gums. GC also showed delusion-related attentional biases. We found no evidence that cognitive factors implicated in delusions in schizophrenia (biases of probabilistic reasoning and attributional style and poor ‘theory of mind’) contributed to GC’s failure to reject his delusional belief. In sum, excessive ruminations and associated interpretative and attentional biases appeared to sustain GC’s delusion.
Evaluation of a model of expert decision making in air traffic control

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Wednesday 3.00-3.20 Room #3

Experts are capable of performing complex tasks using relatively simple strategies that are adapted to fit the constraints of the problem at hand. The resolution of conflicts between aircraft, for example, is regarded as a very complex optimisation problem, yet air traffic controllers are able to perform the task using a small set of simple strategies. Much of the expertise of the air traffic controller lies in the ability to select the appropriate strategy for the problem. In this project, we are developing a model of expert decision making for the air traffic control conflict resolution task. This is part of a broader project that is developing a new approach for simulating the tasks that a human operator performs, and the workload that the human experiences while carrying out those tasks.

We model expert decision making as a serial search process in a hierarchical tree, in which the selection of a decision option for further evaluation is constrained by the situation. In this paper, we will present an analysis of the behaviour of an initial version of this model. The key aim of this analysis is to compare the model’s behaviour against the behaviour of expert controllers under varying scenario complexity. The analysis relies on both data from our model simulation runs and recordings of the activities of 14 air traffic Controllers. It is based on the frequencies of different intervention classes in four different static aircraft scenarios of varying complexity.

This paper is structured as follows: We will first present a functional overview of our conflict resolution model, including its underlying operational concepts. Both the aims and the general methodology underlying the analysis of the model will then be described. Results will be presented, identifying both the behavioural similarities and discrepancies between the model and human air traffic controllers. There is close agreement between the model and the humans in the selection of aircraft for intervention, although the humans are more variable than the model. Human controllers are also more variable in the solutions that they generate, and have a tendency to prefer vertical solutions, unlike the model which has a preference for lateral solutions. The results suggest that the modelling approach that we are taking has promise, and that it is possible to simulate expert decision making in complex dynamic tasks using relatively simple models of the decision process.

A dynamic distributed model of short-term memory

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Wednesday 2.00-2.20 Room #1 Computational models of cognition

Human cognition would be unthinkable without a “short-term” or “working” memory that provides ready access to task-relevant information. For example, mental arithmetic would be impossible without memory for intermediate sums. I present a dynamic distributed model of short-term memory that is derived from the “brain-state-in-a-box” attractor network. The model encodes order among memoranda via item-to-context associations that are encoded by Hebbian learning. The model relies on four core architectural principles: (1) Encoding is energy-gated, such that novel information is encoded more strongly than familiar information. (2) Retrieval is followed by response suppression (modeled by Hebbian anti-learning). (3) Response disambiguation is performed using attractor dynamics. (4) The passage of time per se does not causally determine the state of memory. I present the model and then show that many of the predictions derived from its core architectural principles have been experimentally confirmed.

Hemispheric asymmetries in feature integration during visual word recognition

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Friday 10.50-11.10 Room #2

Although the definitive source of the left hemisphere’s superiority for visual word recognition remains illusive, some argue that the left (LH) and right (RH) hemispheres engage different strategies during early perceptual processes involved in stimulus encoding. In particular, it is proposed that the LH treats a word as a unitary perceptual group whereas the RH processes the letters comprising a word as a series of individual perceptual units. Support for this processing distinction was assessed by examining hemispheric strategies for temporal integration using Primrmental and Millis-Wright’s (1984) feature-binding paradigm. Participants identified the colour and identity of a target letter, presented within a three-letter word (e.g., ART) or nonword (e.g., HRF), directed to their left or right visual field. Errors were classified on the basis of whether they involved substitution of a colour present within the stimulus but at a different location (ON error), or the substitution of a colour not present within the stimulus (OFF error). As anticipated, for word stimuli there was a higher proportion of OFF errors associated with trials directed to the RH, consistent with the notion that the LH treats words as single perceptual units and is hence biased toward miscombination of perceptual information present within the stimulus. The pattern of ON errors across stimulus type provided clear evidence of RH sequential encoding effects, with the number of errors increasing markedly across the ordinal position of the letters comprising the stimulus string. As such, these data provide new evidence that the LH’s advantage for visual word recognition arises, at least in part, from the ability to encode verbal stimuli as single perceptual units.
In this study we show that there is a significant difference in the pace at which Chinese-speaking children and English-speaking children acquire the ability to name, manipulate and perform abstract functions on the days of the week (DOW). This occurs because the Chinese system relies on a numeric-based set of time-related terms, while the English system uses entirely arbitrary names for the same concepts. This, we claim, is a fundamental property of human learning: complex, abstract systems are acquired constructionally on the basis of previously-acquired, more concrete systems of knowledge.

Pollmann (2003) argues that principles involved in the acquisition of number words also apply in the acquisition of time words. This, we argue, follows from the larger claim that acquisition of abstract systems is built on already-acquired, less abstract systems. If this is correct then we would expect children acquiring a language which labels time-terms with (already-acquired) numbers (e.g. Chinese) to be at an advantage over children acquiring a language which uses entirely arbitrary terms for time (e.g., English): Unlike the arbitrary words for the DOW in English, Chinese DOW are based upon the number system (e.g. Monday = 星期一, day-one; Tuesday = 星期二, day-two, etc.). This predicts that Chinese-speaking children should acquire the ability to name, manipulate and perform functions on the DOW earlier than English-speaking children.

Results show that Chinese children reach advanced levels of mastery at an earlier age than English-speaking children, t (58) = 2.86, p = 0.01. More specifically, Chinese children achieved a higher complexity-level at each corresponding chronological age than the English-speaking children, with the Chinese-speaking children reaching the highest level (level 5) by age 6.0, while the English-speakers only reached level 3 by 6.0. This apparent rapid development on the part of the Chinese speakers and the acquisition-differential between these two languages is because Chinese children have the benefit of a temporal system that is based on an already-acquired numeric system. English children, on the other hand, have no earlier system on which to base the acquisition of time concepts.

Thus, we have shown that there is a strong link between the early mastery of specific nomenclature systems, such as simple numeric sequences and the subsequent acquisition of more cognitively complex systems, such as time-related schema. This research sheds light on the constructional nature of human knowledge, where more complex abstract systems are acquired on the basis of less complex, more concrete systems.

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Dissociating the effects of automatic facilitation and event expectancy on the control of attention and performance.

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Many cognitive experiments that measure performance across multiple trials use a trial sequence that is unsystematic or random. Performance in these experiments is known to fluctuate according to the sequence of events leading up to any given trial. The current experiments examined how these changes relate to a) explicit anticipation of the events on the next trial, and b) automatic facilitation based on recent event history. A reverse dissociation was consistently found between trends in expectancy and trends in performance. This effect manifests in response biases in choice reaction time tasks, and spatial biases in attention under dual-stream rapid serial visual presentation. The results indicate automatic facilitation of controlled cognitive processes which is clearly dissociable from conscious anticipation.
Elite sportspeople rely upon highly refined visual-motor skills which are developed over many years of extensive practice. Theories of motor learning have commonly relied upon the role of cognitive effort to explain the facilitation of skill acquisition across different training paradigms. Cognitive effort is assumed to play a key role in skill learning, particularly considering that expert athletes are consistently demonstrated to possess superior perceptual-cognitive skills such as movement anticipation and pattern recall (Williams, Davids & Williams, 1999). In contrast, more recent evidence suggests that the minimisation of cognitive effort may in fact be beneficial for skill learning.

When compared to conventional practice structures involving the repetition of single skills in a blocked design, contextual interference – where practice involves the random sequencing of a combination of different motor skills – is consistently shown to enhance long-term learning and retention (Shea & Morgan, 1979). This training effect is often explained to be a result of increased cognitive effort required for the reorganisation of different movements across successive practice trials. In contrast, blocked practice designs involve high degrees of repetition with little demand of cognitive processing (Magill, 2007). It is beneficial for attentional resources to be allocated to the execution of novel skills in novice athletes, though as the motor skill develops there is a decrease in the cognitive effort required (Bellock, Carr, MacMahon & Starkes, 2002). Indeed for skilled athletes, cognition is most likely to be detrimental to the execution of well-learned skills.

An alternate and more recent body of work has examined the acquisition of skills through the avoidance of cognitive effort in the motor learning process. Implicit learning – through methods such as analogy learning and dual-task paradigms – is reported to provide a superior means of skill acquisition facilitating more robust learning which is resistant to emotional and physiological stress (Masters, 1992; Liao & Masters, 2001). These learning methods aim to minimise conscious awareness of how the skill is executed. Such an outcome may prevent reinvestment in well-learned skills, potentially advantageous in the avoidance of ‘choking’ or the ‘yips’.

This presentation will address this incongruence and present these issues as a background for new emerging experimental work focusing on the role of cognitive effort in sporting skills.

**Autobiographical memory across the life span: Brain imaging and neuropsychology**

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Wednesday 14:00-15:00 Room #2

Numerous data from developmental psychology to neuropsychology point to a hierarchy of memory systems in which autobiographical memory develops latest and is ranked on the top of the memory systems. In Tulving’s recent definition it is largely congruent with the episodic memory system which he defines as the conjunction of subjective time, autonoetic consciousness and the experiencing self. Usually, autobiographical memories are affect-related.

We have studied autobiographical memory in four different groups of normal individuals ranging in age from 15 to 72 years by using a semi-structured interview (modified German-language version of the Autobiographical Memory Interview) in which it is asked for episodes from all life epochs. Usually two specific episodes from each decade – or for the young age – from each five-year epoch of life are requested. These events should be remembered as realistically as possible; they should have a direct reference to the place where they happened and to the time at which they occurred. Furthermore, they should be evaluated with respect to the feeling the interviewed had at the time of their occurrence. The episodes were coded so that they could easily be re-evoked at a later time, that is under conditions of brain scanning. This was done by using certain stimulus words that were characteristic for the event (e.g., “marathon” for an episode where an individual was among the winners of a marathon run in Salonik). Subjects were then scanned with functional magnetic resonance imaging to reveal a network of brain regions active during retrieval of such episodes. Furthermore, brain activations during autobiographical episodes were compared with those to semantic memories. It was found that there are differences (a) between age groups of subjects, (b) between time epochs within a given age group, and (c) between autobiographical and semantic memory retrieval. Overall, the young subjects had the clearest and most distinct activations. These were in limbic and paralimbic brain regions (including retrosplenial and precuneate regions) as well as in lateral temporal and prefrontal areas. Especially for the oldest group of subjects, events from childhood and youth resulted in the more and more limbic system-related activations, compared to recent events. Semantic knowledge led to more restricted and more neocortical activations, compared to autobiographical episodes.

These results emphasize the importance of emotional connotations for autobiographical events and indicate that – in accordance with Ribot’s law – the remote events still have a higher significance for the present life than the recent ones.
An information-theoretic measure of representation

Marstaller, Lars  Arend Hintze, Chris Adami

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Thursday  2.30-2.50  Room #3

We give a conceptual definition of representation and argue that informally, representation can be understood as the excess of information an artificial neural network has about its environment. From this, we develop a formal measure of representation based on information theory, viz. mutual information. Empirically, our measure is then tested by evolving a neurocontroller and measuring its representation. The results of our study shows that representation correlates with fitness in evolution, i.e. evolved neurocontrollers have a higher representation. And due to the information theoretic nature of this measure we can show how to apply and generalize it to other controller implementations. Finally, we discuss the relevance of our measure in the context of more recent debates about representation.

The mysterious disorder of unilateral spatial neglect

Mattingley, Jason

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The syndrome of unilateral spatial neglect is a common outcome of acquired lesions of the right parietal lobe. Individuals with neglect display a range of bizarre behaviours, which taken together imply that the left side of the patients’ perceptual world has ceased to exist. Twenty years ago debate raged over whether neglect should be explained as a disorder of attentional processes, or whether it should more properly be considered as a problem in constructing stable representations of contralesional space. Looking back, that debate seems largely to have missed the point. In this talk, I will provide a contemporary overview of the neglect syndrome, focusing in particular on what it has revealed about mechanisms of selective attention, spatial working memory and dynamic updating of sensory and motor representations. I will also consider what research on neglect has revealed about unconscious cognitive processing, and how it might be explained in terms of brain anatomy and physiology.
Fullness of feeling: Reflection, rumination and autobiographical memories

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Wednesday 2.20-2.40 Room #2

Remembering in a way that is saturated with the feelings of the past seems to be a bad thing. Rumination has strong links to depression. Yet blues songs are full of richly immersed emotional experiences, and many of us listen to such songs, enjoying experiences from that past that might be sad. What makes the difference? Is it possible to fully have one’s feelings about sad past experiences, without this sadness tainting the present by promoting mood-congruent memory recall? We suggest that we can revisit the past in a way that enables us to contextualise that feeling then in the feelings we have in the present moment and that having full feeling is not necessarily rumination.

People have many motivations for directing attention to processes going on within. You might be distressed and want to sort things out (but get trapped in unproductive remembering), or be curious. Not surprisingly there are big differences in the consequences for coping and mood repair depending on just how you attend to inner processes. Reflection produces mood-incongruent memories, while ruminative focus produces mood-congruent recollections (McFarland & Buehler, 1997). However, existing psychological research on reflection and rumination (Trapnell & Campbell, 1997) does not measure the two equally well. In each case, we need to maintain distinctions between what you attend to, with what emotions, how fully you experience the emotions, and how they are attended to.

In the case of rumination, Nolen-Hoeksema’s experimental work and other factor-analytic studies suggest that rumination has two sub-components – a focus on symptoms and other aspects of self-experience (self-focus), and an analytical, evaluative cognitive style. The latter has been found to be associated with the over-general memory style linked to depression (and its subclinical variant dysphoria), which persists even when people are not currently depressed (Watkins, & Teasdale, 2001; Watkins & Baracaia (2002) and Watkins & Teasdale (2004)).

But the parallel distinctions have not yet been made in research on reflection. Alternative, non-ruminative ways of accessing the past that have been studied often measure reflection in ways that make it synonymous with either the mere absence of rumination, or with distraction. Instead, we offer a positive account of reflection, situating reflection in an emotion theory (Lambie & Marcel, 2002) which suggests that emotion experience is underdetermined by bodily clout. We suggest that true reflection entails a richness of emotional experience as well as a capacity to know what emotion one is experiencing. This positive account of reflection distinguishes it from variants of emotional avoidance (like distraction and intellectualisation). We offer preliminary results of a scale assessing reflection (McIlwain & Galati, 2005), showing its links to and differences from rumination and its links to features of autobiographical memory like valence, specificity and generality. We explore the implications for depression and PTSD of a capacity for reflecting on feelings.

Representational intentionality and motor intentionality: What are their respective roles in skilled activity?

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Thursday 11.10-11.30 Room #1 Agency, skills and embodiment in a cultural context

This paper argues that there are important roles for both motor intentionality and representational intentionality to play in real-time skilled activity. The paper begins with the kinds of expert skilled activities that Dreyfus and Dreyfus (1986) have outlined. On their account, the transition from novice, to competence and proficiency, to genuine expertise involves the move from reliance on explicit rules and conscious deliberation, to a situation specific perception and a flexible, adaptive responsiveness to the situation. While it provides a valuable antidote to purely intellectualist accounts of cognition, the Dreyfusian model tends to present the expert as unreflective and unmotivated, merely expressing their embodied skills. This seems to be implausible in many cases. In particular, Dreyfus’ account of skill development relies only upon the idea of motor intentionality and leaves no room for the influence of representational intentionality. This paper argues for a limited role for representational intentionality in the deployment of skills.

The indispensability of cognitive explanations

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Friday 1.50-2.10 Room #1 Integrating Perspectives on the Relation between Mind and Brain

In this paper I argue that the explanations provided by cognitive psychology and cognitive science are indispensable and cannot be replaced by explanations in neuroscience. The principal reason for this lies in the fact that cognitive phenomena are multiply realizable at the neural level. Given the plausible constraint that explanations involving cognitive phenomena are insensitive to the manner of their neural realization, I argue that cognitive explanations cannot, even in principle, be replaced by neural explanations.
What is the Simplest Form of Self-Consciousness? Levels of embodiment and minimal phenomenal selfhood

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Wednesday 10.00-11.15 The Atrium Keynote

As a philosopher, I am interested in the relationship between consciousness, the phenomenal self, and the first-person perspective. Conceptually, I will defend the claim that agency and minimal bodily self-consciousness are independent. On the level of new empirical data, I show how out-of-body experiences (OBEs) and full-body illusions (FBI) provide an interesting new entry point for investigating the nature of the conscious self. In conclusion I sketch a new research program and advertise a new research target: "Minimal Phenomenal Selfhood". I ask - What is the simplest form of self-consciousness?

Visual paradox and cognition

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Wednesday 4.00-4.20 Room #2

Visual paradoxes such as the Penrose triangle present us with the problem of how to describe them mathematically. Only if we can describe them mathematically do we have a hope of proving rigorously (a) that they are really paradoxical, i.e. contradictory (the "proof of paradox"), and (b) that two examples of paradoxes are of the same kind or of different kinds (the "classification problem"). I propose that there are three components to analysing them. First, there is a cognitive component, concerning which mental mechanisms give us the impression that we are seeing something impossible. This is best addressed by psychologists, who have done some work on this problem. Second, there is a logical problem, best addressed by logicians informed by the psychological results. Here the aim is to construct a logical theory which is internalised by the cognitive system, and from which a formal contradiction can be rigorously proved. Logicians are only just scratching at this problem these days. Third, there is a mathematical problem, best addressed by mathematicians informed by the above results, of providing mathematical modellings of inconsistent theories which show that certain propositions do not follow from the logical theory. This sort of result provides the basis for classification into different basic kinds. Mathematicians have done very little work on visual paradoxes, and none at all utilising the techniques of the theory of inconsistency.

This synthesis of disciplines should yield novel directions for collaboration.

What minds tell us about the brain, and why it might not help much

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Friday 2.30-2.50 Room #1 Integrating Perspectives on the Relation between Mind and Brain

Historically, the explanations provided by cognitive psychology have been indispensable to the development of neuroscience. However, as John Campbell has recently suggested, it is an open question whether or not this is because we have a built-in psychological bias towards explanations that cite cognitive processes. It may be that we have unexamined a priori assumptions to the effect that some phenomena must have certain causes. We may only find explanations of cognitive phenomena satisfying if they appeal to cognitive processes, but that may not reflect the way the world actually works. It may be a brute fact that low-level phenomena have complicated cognitive and rational effects.

The extent to which cognitive science explanations are multiply realizable is also unknown. Connections across levels may be much tighter than we have thought. We may learn things about the relations between cognitive phenomena from the way the flow of information in the brain is organized, but imaging studies alone cannot tell us very much. Imaging studies alone cannot uncover the relevant neural systems, which can be done by a patient mix of anatomical and experimental studies.

Mental states are probably not neural states, because they may better be thought of as states of the person rather than states of parts of the person; the mind is not a thing, and we probably go astray if we ask where it is, or where its parts are. But reduction to brain science is unlikely on epistemic grounds, whatever the underlying metaphysics may be.

However, although outright reduction is unlikely, the future for cognitive theory may be difficult. We may be moving towards a situation in which traditional cognitive theory is squeezed out by a two-level cognitive neuroscience. Such a theory is currently being developed by some neuroeconomists. In its mature form, it would incorporate systems neuroscience at the bottom level and a formal rational choice or decision-theoretic picture of human psychology at the top level, but no intervening cognitive level. In a scientific world dominated by neuroeconomics or something like it, cognitive psychologists would continue to discover important effects, but would not offer computational theories to explain them.
The cognitive science of mathematics: A case study

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Wednesday 4.20-4.40 Room #2

How does the mind comprehend and represent the infinite structures used in higher mathematics? After all, a finite mind cannot perceptually survey in a sequential manner infinitely many objects. The concept of the infinite therefore poses a challenge to empiricism about concept acquisition. In cognitive science terms, there can be no mere image or visual sensation with an infinitely complex structure. Nonetheless, the brain is able to think about infinite structures in mathematics. How is this feat possible? We examine Marcus Giaquinto’s work on this topic in ‘Visual Thinking in Mathematics’, and situate it within the historic debate between rationalist and empiricist approaches to concept acquisition.

Connectionist representations and dynamical systems

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Friday 10.50-11.10 Room #1

This paper critically evaluates Spivey’s radical reconstruction of the idea of mental representation, comparing it with alternative approaches; and discusses the relationship between connectionist and dynamical systems perspectives in cognitive science.

The facilitative effects of goal orientation on the speech convergence of partners’ mean vocal intensity

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Friday 4.30-4.50 Room #2

Speech convergence is the phenomena of interlocutors’ speech becoming more similar to one another over a period of conversation. With regards to the variable of amplitude (or more precisely, mean vocal intensity), prior research has shown the tendency for speakers to converge on this variable. However, past studies have shown this effect to be an extremely gradual process, requiring hours of conversation (perhaps in part due to methodological measurement problems). This has then called into question it’s usefulness as either a social signalling tool or an automatic mechanism to aid fluency (as the literature has variously accounted for the phenomena of convergence). Furthermore, recent evidence from the convergence literature suggests that having a conversational goal dramatically enhances the degree of convergence (Reitter, Moore & Keller, 2006). As such, the current study aimed to rectify methodological problems in past studies as well as introducing a degree of goal orientation with a view to demonstrating amplitude convergence over a much shorter time period (minutes rather than hours).

The present experiment examined the speech from dyads engaged in goal orientated and non-goal orientated conversations for convergence of mean vocal intensity. Participants discussed the relative importance that they attached to 13 issue statements relating to a plagiarism scenario and were either told to simply discuss their views (non-goal orientated) or to come to a consensus (goal orientated). While both groups converged, greater convergence was observed in dyads where their conversations had a goal, compared to those that didn’t.

Furthermore, for the goal-orientated condition, but not for the non-goal-orientated condition, the degree of convergence was significantly correlated to the similarity with which participants ranked the issues in order of importance prior to the discussion. This suggests that perhaps it is not the presence of a conversational goal per se, but rather a change brought about as a result of goal orientation; with increased attention being the obvious candidate. Results suggest that speakers do indeed converge on mean vocal intensity and that this convergence can occur far more rapidly than previously thought, especially when speakers share a conversational goal. Results are further discussed in relation to Communication Accommodation Theory (Giles, 1973) and the Interactive Alignment Model (Pickering & Garrod, 2004).

Levels and explanations

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Friday 2.50-3.10 Room #2

It is a mainstay of the philosophy of science that inter-theoretic reduction concerns the relationship between explanations pitched at different levels of nature. But the relevant sense of “level” is notoriously difficult to pin down. A promising recent analysis links the notion of level to the compositional relations associated with mechanistic explanation. Such relations do not order objects according to their scale or physical type — one and the same kind of entity can occur at several levels in a single mechanism. I will sketch this approach to levels and consider some of its implications for the relationship between cognitive psychology and neuroscience.
## Williams Syndrome: Dissociation and mental structure

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**Thursday 3.50-4.10 Room #2**

Williams syndrome is a genetic disorder with a unique cognitive profile. People with WS have specific difficulties with arithmetic, spatial reasoning, planning and problem solving, while auditory and music skills, language, face recognition and social abilities appear to remain relatively spared. This unique pattern of spared and impaired abilities has seen WS recruited as evidence for mental modularity, particularly for language and social skills. But emerging evidence suggests the claims of modularity been premature. Social skills appear to have been overstated: individuals with WS tend to be inappropriately sociable, hyperactive and socially anxious, overly friendly and demonstrate abnormal social approach behaviour. Language abilities once thought to be intact are now thought to be either significantly delayed or to follow atypical developmental trajectories. The preserved music and face recognition abilities of the WS population are served by different cognitive and neural resources than in the typically developmental brain. Thus the evidence suggests that the WS brain is developmentally atypical and, as such, it is wrong to characterise the WS brain as a normal brain with a pattern of specific preservation and deficits. Thus arguments from WS to specific modules fail. Indeed, rather than being a rigidly encapsulated system, the new evidence suggests the WS brain is an extremely flexible organ that co-opts available neural resource in a highly dynamic manner to cope in the world.

## Remembering with dance

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**Thursday 3.50-4.10 Room #3**

When considering the relation of dance and memory the first question that people think to ask is “how is it that dancers can remember (how to perform) a given dance?” In other instances, dance appears as the object or locus of some remembering activity: the commemoration of the past, the stabilisation of identity, and as a means of overcoming the past, to name a few. But less explicit in the literature is the more general question of just how we remember with dance. What is it about dance that lends itself (in its many forms – we are best inclined to speak here of dance and dance-like practices) to a variety of different mnemonic applications and ends?

With reference to distributed cognition, embodied cognition, the role of motility in thinking, and institutional theories of dance, I explore some of the ways in which dance works as a mnemonic technology. It would seem that the kind of role that dance is required to play in a given social or collective memory event exploits different aspects of our ability to remember dance in general. Furthermore, it would seem that different mnemonic practices that involve dance require different kinds of dance or dance-like practices. I examine these points in particular reference to the lack of employment of modern art dance as a technology of the collective memory.

## Longitudinal evidence on theory-of-mind development in children with deafness or autism

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**Thursday 3.30-3.50 Room #2**

Key questions for the interface of developmental psychology with cognitive science are bound up with the growth of a theory of mind (ToM). A wealth of cross-sectional studies show that ToM, as assessed using inferential false belief tests, is mastered by most hearing children by age 5 but is often seriously delayed in children with atypical development owing to autism, blindness of deafness. However questions about the causal basis for delayed ToM growth in children with sensory or neuro-cognitive impairments cannot be fully answered either with use of a single ToM indicator (e.g., false belief) or with cross-sectional data alone. This paper will briefly review published longitudinal studies of false belief understanding by children with deafness or autism and will then present original research on the longitudinal progressions of children with autism or with deafness through five sequential steps of a novel ToM scale (Wellman & Liu, 2004).
Measuring the sense of agency in hypnosis

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Thursday 11.10-11.30 Room #2

Using hypnosis to explore theoretical predictions and clinical phenomena from a cognitive neuropsychological perspective

A compelling feature of hypnosis is that highly hypnotisable people often describe their actions during hypnosis as occurring without effort. This sense of a shift in personal agency has influenced theories of motor control, thought and consciousness. However the phenomenology of this experience, that is, what it is like to act without a sense of agency, is poorly defined. I report here on the development of a scale for indexing subjective experiences of agency during hypnosis. Scale items were derived by analysis of the terminology used to describe agency in the psychological and philosophical literatures. The final scale consisted of 17 items which participants are asked to endorse on a 5-point Likert scale, e.g. "I was responsible for what I experienced" and "My experiences and actions were under my control". Factor analysis of responses from 370 participants of varying levels of hypnotisability revealed two underlying factors that account for the subjective sense of agency in hypnosis – perceived involuntariness and perceived effortlessness. This scale was then used in a series of studies to investigate a) participant’s retrospective evaluations of their overall sense of agency during an entire hypnosis session, b) changes in moment to moment sense of agency during different phases of a hypnotic task (i.e., before a hypnotic suggestion, immediately after the suggestion and after cancellation of the suggestion) and c) variations in participants’ sense of agency in response to different types of hypnotic tasks (eg motor vs. cognitive tasks). I will conclude by outlining the implications of these findings for competing theories of agency and theoretical accounts of hypnotic responding.

Bridging cognitive modeling and human behavior representation engineering

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Wednesday 1.40-2.00 Room #3

The research presented here endeavors to integrate human factors models and other cognitive/behavioral modeling efforts, focusing on knowledge representation (KR hereafter), as well as on linking theoretical and applied research issues. On the issue of knowledge representation, the aim is to establish necessary and sufficient conditions for (i) satisfying the constraints of known design and processes concerning brain, cognition, and behavior on the one hand, and (ii) for satisfying the integration of such KR with other types of representations used in modeling and simulation (M&S) practices. The second focus is on linking theoretical issues with applied issues, with an emphasis on what features of models of individual agents are necessary to model their interactions with technologies, environments, and other agents, and what additional requirements are needed to make them scalable to such larger complexities. Two interrelated solutions that are currently in development to address the aforementioned objectives are presented in this paper: the first is the development of a concept for the integration of scalable cognitive models (where scalability is meant as an architecture design bridging micro- and macro-level cognition and behavior) with human behavior representation (HBR) models, which are engineering models designed for M&S products and services. There have been numerous attempts to link low-level cognitive architectures to human-technology interaction (HTI) and multi-agent interaction models – all such models now generally fall under the label of sociotechnical systems (STS) modeling. We propose SoHBeR (SOciotechnical Human BEhavior Representation), a tripartite model combining the ACT-R cognitive architecture, a sociotechnical systems model bridging ACT-R with a macro-cognitive framework, and task network models obtained from human factors best practices used in discrete-event simulations of performance and workload. The second solution is the automated re-use of human factors models in HBR. This second research interest stems from the idea of reusing human factors models generated via all sorts of task analyses, to be translated as direct extensions of HBR models of synthetic agents. This amounts to transferring the knowledge gathered from human factors analyses into working models of intelligent agents. Some compromises have to be made by the concerned subject matter experts, such as in the way human factors analyses are conducted and data is compiled, as well as how HBR-specific programming is conducted. On the human factors side, KR and representations of goals, tasks, functions, etc. will have to follow a strict language to satisfy formalism constraints such as explicitness, completeness, and decidability, while on the HBR programming side, extensions will have to be created to accommodate higher-level constructs such as goals, operators to reach such goals, selection rules, planning schemas for networks of subgoals and subtasks, etc. The end product would be an automated human factors model-to-HBR script to generate on-the-fly intelligent agents in synthetic environments, fulfilling roles, functions, and goals gathered from human factors analyses. The extensions for HBR modeling would be a candidate choice for inclusion in the Common Databases (CDB) standards in the M&S community, such as XML metadata files to be seamlessly accessed via CDB development and use.
An Hypnotic Analogue of Somatoparaphrenia: Recreating the Delusion, Testing the Proposed Factors, and Challenging Experiences

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Thursday 11.50-12.10 Room #2

Using hypnosis to explore theoretical predictions and clinical phenomena from a cognitive neuropsychological perspective

Many aspects of delusional beliefs, particularly the factors that cause and maintain them, remain a mystery to psychology. Despite theoretical and clinical imperatives for studying clinical delusions, there is currently no practical way to investigate them in the laboratory. Hypnosis offers a powerful means to do this. This study used hypnosis for the first time to: (1) recreate the delusion of somatoparaphrenia – the delusion that one’s arm belongs to someone else; (2) test the predictions of Langdon and Coltheart’s (2000) influential two-factor theory of delusions; and (3) explore the impact of multiple, progressively harder challenges to the delusion. To do this, 85 high, medium and low hypnotizable participants were hypnotised and given a suggestion to create a temporary delusion of somatoparaphrenia. Half were given a “Factor 1 + Factor 2” suggestion, which suggested the proposed components of somatoparaphrenia (arm paralysis, anosognosia and a belief evaluation deficit), and half were given a “Fully Formed” suggestion, which suggested the full blown delusional experience (“your arm belongs to someone else”). Participants’ responses were tested by five tests of paralysis and an ownership of arm test. Also, participants’ responses were challenged with contradiction, confrontation and peer-model procedures. The majority of highs, some mediums, and a few lows experienced components of somatoparaphrenia (paralysis and anosognosia), and approximately 50% of highs given the Fully Formed suggestion showed the full blown delusion; these highs reported compelling experiences with features strikingly similar to clinical cases of somatoparaphrenia. Notably, the Factor 1 + Factor 2 suggestion, intended to model the proposed components of somatoparaphrenia, failed to recreate the full blown delusion. Whereas some participants’ responses were breached in the face of challenge, others maintained their experiences. Together, these novel findings highlight the value of hypnosis for modelling clinical delusions, in particular, for testing theories of delusion and for exploring clinically relevant techniques for challenging and resolving them.

The Paradoxical Role of Cognitive Effort in Motor Skill Learning

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Cognitive effort and skill learning in sport

Thursday 4.10-4.30 Room #1

A considerable body of empirical and theoretical literature has investigated the role of practice variables in the acquisition of motor skills (e.g., Guadagnoli & Lee, 2004). The current paper examines the notion of cognitive effort, specifically as it relates to two practice variables that suggest conflicting implications for cognitive effort: the scheduling of practice conditions (contextual interference) and the accrual of task-relevant knowledge during practice (implicit/explicit motor learning). First, research on contextual interference is examined and the implications of its two major theoretical explanations are discussed from the viewpoint of cognitive effort. Second, an overview of the implicit motor learning literature is used to discuss the implications of working memory resources and their relationship to practice and subsequent learning. Finally, the practical implications of the contextual interference and implicit motor learning research perspectives are discussed, particularly with regard to how the skill level of a learner, the complexity of the to-be-learned tasks, and the ability of the learner to effectively perform under psychological pressure interact with learning. It is hoped that these practical implications also inspire researchers to seek more applied outcomes from their research.

References

A Neurocomputational Instructional Indicator of Working Memory Load in Cognitive Load Theory

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Wednesday 2.40-3.00 Room #3

This work is based on an earlier neurocomputational study of learning-performance aspects of human behaviour in automated learning environments. It expands the scope of the latter study by applying metrics of instructional efficiency within the conceptual framework of cognitive load theory.

The test bed of the proposed approach is a simulated learning environment, in which the organisation of the learning content is represented as a dependency graph of learning components (i.e. topics). The human learning behaviour in the specified environment is neurocomputationally recorded per learning component in terms of externally-assessed performance and introspective mental effort. The behavioural instances monitored from both knowledge spaces (i.e. performance space and mental-effort space) are assumed to be statistically representative, and are respectively mapped within the patterns of two Kohonen self-organising map (SOM) neural networks. Each network, due to the standard-SOM properties, is a topologically ordered set of patterns, which constitutes a highly compressed version of its corresponding behavioural space; P-SOM is a compressed version of the human performance space and E-SOM is a compressed version of the human introspective mental-effort space, both based on the behavioural instances recorded within a given period of time in the specified learning environment, in relation to the learning content.

P-SOM and E-SOM are, in essence, models of learning behaviour for the specified learning environment, and can be used to pinpoint instructional design weaknesses associated with the dependency graph of the learning content. Furthermore, this dual-SOM neural network can indicate working memory load levels and cognitive load characteristics associated with the instructional design of the specified learning environment (and of its learning content); this is achieved by combining mental effort and performance behavioural patterns, an established dual-data metric in the field of educational psychology, within the interpretational framework of cognitive load theory. Specifically, germane and extraneous cognitive load levels are indicated in relation to performance and mental effort values.

Lexical content and the expressive/descriptive distinction

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Friday 3.30-3.50 Room #2

Standard linguistic accounts of lexical knowledge acknowledge a fundamental distinction between ‘descriptive’ terms like ‘triangle’, ‘over’ or ‘hit’ and ‘expressive’ ones like ‘hurray’, ‘damn’ and ‘yuck’. Neither the nature nor the extent of this distinction, however, has been articulated precisely, and there are many cases where a single expression can receive either an expressive or a descriptive analysis, or, indeed, both. For example, the meaning of exclamations like ‘bravo’, ‘yippee’ or ‘hurray’ appears to be susceptible to descriptive, propositional representation, even though these words are usually treated as canonical expressives. At the same time, canonical descriptive terms, in particular evaluative ones such as ‘good’, are often endowed with an expressive value which seems to preempt their descriptive one in actual discourse, at least from the phenomenological point of view. Given the very different psychological mechanisms taken to characterize expressive and descriptive semantic content, the grounds on which an expression’s meaning is classed as principally one or the other has major consequences for our understanding of the cognitive processes underlying speech, and is in need of clarification. Recently, Potts (2007) has suggested the following criteria for expressive content:

1. Independence: Expressive content contributes a dimension of meaning that is separate from the regular descriptive content.
2. Nondisplaceability: Expressives predicate something of the utterance situation.
3. Immediacy: Like performatives, expressives achieve their intended act simply by being uttered; they do not offer content so much as inflict it.
4. Repeatability: If a speaker repeatedly uses an expressive item, the effect is generally one of strengthening the emotive content, rather than one of redundancy.
5. Descriptive ineffability: Speakers are never fully satisfied when they paraphrase expressive content using descriptive, i.e., nonexpressive, terms. (Potts 2007: 166-7, reordered)

As part of a broader investigation into the role of non-conceptual content in lexical representation, I suggest in this paper that, in fact, none of Potts’ characteristics can serve as a reliable criterion of expressive content. As a result, some other way of identifying expressive meaning is needed if the expressive/descriptive distinction is to be fruitfully maintained as a hypothesis about the nature of semantic content found in the lexicon.

Reference

Quantitative brain dynamics and natural cognition
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Wednesday 12.00-12.20 Room #1 Computational Neuroscience: Modelling brain structure and function

Natural cognition is chiefly underpinned by neural activity in the brain, which is commonly probed via the EEG, electrocorticogram, depth electrodes, functional MRI, and other measures. Published connections between stimuli, physiology, information processing, and measurements have been based mostly on phenomenological correlations, but quantitative mathematical models of brain stimulus-activity-measurement dynamics now exist. These include key features of physiology and anatomy from synapses to the whole brain and are constrained by multiple independent physiological measurements. Such models successfully predict and/or quantify a wide range of aspects of normal and abnormal brain function. These include evoked responses to stimuli in cognitive experiments, visual gamma (40 Hz) correlations during perception, and some abnormal cognitive states. Quantitative brain modeling thus provides a framework within which to interrelate, predict, and interpret diverse cognitive and other phenomena, especially where multiple scales and levels of description are involved.

Assessing cognitive effort in an applied sports contexts
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Thursday 4.30-4.50 Room #1 Cognitive effort and skill learning in sport

Elite athletes’ performance is not only based on excellent perceptual motor abilities, but also on outstanding perceptual cognitive ability. Fast and effective decision-making under time-pressured and physically demanding competitive environments can provide a great advantage, even between competitors at similar motor skill levels. Being able to evaluate an athlete’s cognitive demand during performance can provide both athletes and coaches with an additional tool to support talent identification and targeted skills development.

However, assessing the cognitive demand is difficult. Traditional methods for cognitive load monitoring include the use of physiological sensors, e.g. EEG, fMRI, as well as performance measures and subjective feedback. More often than not, these are not practical or feasible in the sports domain, mainly due to complex instrumentation, and specific mobility requirements. Performance measures offer too coarse a granularity to assess the level of cognitive load being experienced by the athlete, and cannot detect the gradual improvement in sports performance that often occurs over time – learning actually reduces the level of cognitive load incrementally, but may not initially translate into increased performance.

Behavioural-based measures such as speech, gesture or eye-gaze analysis can provide an objective and non-intrusive method for monitoring cognitive load. The literature published in other domains suggests that various types of behavioural features can be severely affected by cognitive overload, e.g. the fundamental frequency and pauses of speech, the fluency and rate of gesture, and the type of visual search strategies used etc. Gradual reduction in mental load due to learning can cause changes in load-symptomatic behaviours, allowing the use of such implicit features as a proxy for the athlete’s experience of cognitive load, and providing insights into the level of cognitive skill and strategic decision-making. Moreover, they can be collected while the athlete completes routine training, and be assessed against the athlete’s own baseline.

Our research, while still in its early stages, is grounded in cognitive and educational psychology. Our first attempt at applying our technology to the sport domain has been carried out through a Netball cognitive decision-making study using video-based stimulus, where we collected speech, eye gaze and gesture data. We found that these assessment techniques have a great potential for real-world deployment, in particular as a support tool for coaches in the construction of individualised training schedules, and in the diagnosis of underdeveloped perceptual-cognitive abilities, independently of perceptual motor ability.
The categorisation of objects into numeral classifier categories: A discrimination task using Malay

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Thursday 11.50-12.10 Room #3

Categorisation is an essential process in human cognition and language development. It has been proposed that children’s ability to categorise objects into categories proceeds through a differentiation from broader to finer distinctions (Mandler, Bauer, & McDonough, 1991). It has also been claimed that children learn first to categorise typical exemplars prior to more atypical members of the same category (Markman, 1989; Mervis & Pani, 1980; Rosch & Mervis, 1975).

By studying numeral classifier acquisition we are able to examine how children learn to categorise and label objects in their environment using a constrained system or framework. The current study aimed at investigating how children categorise objects into Malay shape-based numeral classifier categories using a discrimination task. Specifically, it was aimed at examining if categorising pairs of numeral classifier exemplars that have a greater number of differing features, a strong contrast (two features differ: in dimensionality and rigidity, or in dimensionality and size) is an easier task than categorising those that differ in just one feature, a weak contrast (difference in dimensionality only). In addition, this study aimed at investigating if degree of typicality of numeral classifier exemplars has an effect on children’s performance in categorising the objects. A categorisation discrimination task was conducted on 140 6- to 9-year-old Malay children using e-Prime. The objects for categorisation in this experiment were pictures of eight Malay shape-based numeral classifier exemplars, which were paired based on number of contrasts (strong vs. weak) of the numeral classifier categories they are members of, and degree of typicality of exemplars (typical vs. atypical). Children were required to select the object from the picture pair that matched the numeral classifier category. It was found that children categorised objects more readily when there was a strong than weak contrast between exemplars of the shape-based numeral classifiers. Typical exemplars were categorised more readily than atypical exemplars. There was no interaction effect between the number of contrasts and typicality, which suggests that there are separate mechanisms operating in the categorisation process. This supports a mixed representational model of categorisation.

References


It is a basic tenet of ontology-based linguistics (ontolinguistics, Schalley & Zaefferer 2007) that the perceivable shapes of linguistic signs are concept activators of a special kind and that the activated concepts are always embedded in a rich network of interconceptual relations, called an ontology. Related concepts are another kind of concept activators when they are active, whereas the first and basic kind of concept activator is of course whatever falls under the given concept. Thus we agree with Lakoff and Johnson's (1980, 1999) insight that linguistic metaphor and metonymy is based on interconceptual relations and arise whenever an instance is conceptualized not only in terms of its most appropriate concept (BLOND-HAIRED or SKINNY PERSON), but also via related ones (BLOND or BEANPOLE). On the other hand we side with Casasanto (2008) when he warns: "We must be cautious when trying to infer conceptual structure from patterns in language and to discover conceptual universals on the basis of linguistic universals." We therefore separate conceptual and linguistic analysis, do the former first and use it as a reference frame for the latter.

Two kinds of relations form the backbone of ontologies: Taxonomic relations are to do with feature sharing and conceptual subordination, meronomic relations are to do with part-whole relations. The former give rise to metaphorical, the latter to metonymic transfer. Due to each concept's embeddedness in the ontology ('No concept is an island') it is safe to assume that activation of a concept always entails to a certain degree the coactivation of taxo- and meronomically related concepts. Then, the possibility of polysemy (the same form has the lexicalized potential of activating different, but metaphorically and/or metonymically related concepts) is built into the very setup of ontolinguistics, which thus predicts what is generally observed, namely that polysemy is rather the rule than an exception in lexical items. Against this background, the question of what allows polysemy is replaced by the question of what constrains it.

In this paper, we concentrate on the polysemy constraints provided by an underlying ontology and on the resulting structured multiplicity of possible meanings. Thereby, a cognitive motivation of what has been called 'regular' or 'systematic' polysemy is proposed. In particular, the readings of the English syllable /lir/ are analyzed in detail with regards to (i) possible polysemies (ex ante motivation: which formations of multiple meanings are conceivable?) and (ii) realized polysemies (ex post motivation: which readings are actually present, and how coherent are they with regards to the underlying ontology?). Our analysis shows that the prediction both overgenerates (predicted possible readings are not lexicalized) and undergenerates (lexicalized readings are not predicted). We propose explanations which in the former case draw on competition with closely related lexical units (cf. /reiz/), and in the latter on the fact that far-fetched connections may ex post be mnemonically helpful, but cannot be anticipated. Overall we claim that the comparison of predicted with realized polysemy patterns yields interesting insights into the nature of lexical meaning representations in the human mind.
The explicable emergence of the mind

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Friday 3:30-3:50 Room #1 Integrating Perspectives on the Relation between Mind and Brain

It is standard in philosophy to base the irreducibility of mental states in the fact that they are multiply realisable. However there are a number of philosophers of science (most notably Bunge and Auyang) who have argued that mental states are emergent because they are identical only to particular organizations of the brain. Just as water is identical to one way of organizing H2O molecules and ice is identical to another set of structured H2O molecules, so to are mental states identical to particular set of structured brain states. In this paper I sketch how this approach to the mind-body problem differs from the standard approach.

1) Explanations in cognitive Psychology are indispensable because there are new properties that emerge at the cognitive level which will require new causal explanations. The whole can do things that the unstructured parts can’t and so explanations that refer to the whole will be necessary.

2) Often mental phenomena will be multiply realisable, but this is not why explanations referring to them are irreplaceable. Rather, the explanations are irreplaceable because of the emergence of new properties

3) Mental states are identical to neural states in the same way as water is identical to H2O. What is important about this form of identity is that it is not eliminative. Just as water can do things that H2O molecules in different organizations can’t (would you want to jump off a diving board into a pool full of steam) so too can particular mental states do things that their neural constituents in a different organization cannot.

4) What we can obtain is a reduction without leveling (Bunge). In particular we can explain the nature of the whole in terms of its parts but this does not mean that the whole is nothing more than its parts nor does it mean that explanations referring to the whole are unnecessary.

5) I have yet to see a case that meets Max’s criteria. So it seems fair to say that currently the challenge has succeeded

6) I suspect that the challenge will ultimately be met because I hold that non-eliminative reductive explanations can be obtained. Because of the denial of radical multiple realisability and the acceptance of an identity between mental and neural states, studying the brain should prove to be theoretically informative. The only caveat I would offer is that neuroimaging may not be informative because of the gap between blood flow and the neural activity that is the representing vehicles.

Using with and without music conditions in a dance to provide insight into temporal cognition

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Thursday 2:30-2:50 Room #1 Dance and Cognitive Science

This paper outlines techniques to investigate cognitive mechanisms that mediate the recall of a dance work. A dancer, in a small ensemble, performed an original contemporary piece in two conditions: with-music and with no-music. His movements were motion captured. Under the assumption that the with-music condition provided a time-locked version of the performance, we examined the types of ‘errors’ that occurred in the absence of music when compared to the with-music performance. The presence of two temporally manipulative cognitive mechanisms were investigated: (1) Scaling, where timings in the no-music condition were compressed or expanded (performed consistently faster or slower respectively) and (2) Lapsing, where short fragments of material were inserted or deleted in the no-music condition. Applying findings from studies from performance of memorised music and speech predicted that lapsing would be the dominating mechanism. Two analytic techniques were applied and developed to compare the motion-capture data across the two conditions: A time domain based sliding window of cross correlation functions and a frequency domain based modification of dynamic time warping (used in speech recognition software). Both techniques had a range of strengths and weaknesses, but produced, on the whole, consistent results. Specifically, while lapsing was found to be the dominant mechanism explaining differences in timing between with-music and no-music conditions (consistent with expectations compared with literature in other domains), a repeated performance of the same work in both conditions and by the same dancers produce a more complex picture: Scaling was found to explain some of the variation in timing. Given that the dance work under investigation was ‘in progress’ we assert that the (A) memory errors manifesting themselves as lapses can be reduced with practice and, contrary to intuition and previous research (B) scaling errors (the production of an accurate internal time-keeping clock) can also be improved with practice. The theoretical implications of scrutinizing or explaining dance memory in terms of lapsing and scaling are discussed.
Models based on signal detection theory accurately characterize psychophysical performance on a wide variety of tasks. Notwithstanding these successes, a central question of performance is unaddressed by detection theory. What computational processes give rise to observed behavior? We address this question in the context of visual signal detection. In the simplest such task – detection of a single stimulus in an otherwise empty display – a comprehensive account of performance has been provided by the visual short term memory (VSTM) model of Smith and Ratcliff (2009). The model relates detection performance to the rate at which a VSTM trace of the stimulus is formed. Strong traces result in fast, accurate performance, whereas weak traces are associated with slower, error-prone performance. We propose an extension of the VSTM model that is applicable to visual displays comprising multiple stimuli. The extensions to the model are based on three key principles: 1) Stimulus inputs interact competitively for access to VSTM. 2) Competitive interaction is facilitated by recurrent feedback, and 3) Attentional resources are dynamically reallocated across inputs over the course of a trial. These three principles are readily incorporated into the theoretical framework of the VSTM model. We demonstrate that the extended model provides a very natural processing account of a number of qualitative aspects of detection performance. These include biased recruitment of target-like stimuli into VSTM, performance costs imposed by the presence of redundant targets, and reduced encoding rates as a function of the number of display elements.

Ryle, skill, and embodiment

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Thursday 11.30-11.50 Room #1 Agency, skills and embodiment in a cultural context

The re-emergence and re-evaluation of Gilbert Ryle’s work has provided valuable frameworks for recent developments in the cognitive sciences. Ryle’s assertion of the primacy of know-how, his emphasis of the connection between thought and action, his rejection of the ‘intellectualist legend’, and his anti-representationalism, are just four aspects of The Concept of Mind (1949) that prefigure recent debates about the mind.

Ryle’s account of know-how, the ability to do something (1949, Ch. 2), will be the main focus of my discussion. Crucially this account denies that there are any accompanying ‘internal’ mental processes that are the cause of skilled behaviour (Ryle, 1949). The distinction between knowing how and knowing that is simply that between the ability to do something – ride a bike for example – and the ability to state a fact – that a bicycle has two wheels. Furthermore, knowing that in this formulation is dependent on knowing how. The distinction is important for Ryle in his understanding of expert skills: “Cleverness at fighting is exhibited in the giving and parrying of blows, not in the acceptance and rejection of propositions about blows, just as ability at reasoning is exhibited in the construction of valid arguments and the detection of fallacies, not in the avowal of logician’s formulae. Nor does the surgeon’s skill function in his tongue uttering medical truths but only in his hands making the correct movements” (Ryle 1949, p. 48). Therefore, what counts when one knows how to do something is the evidence of one’s competence in action.

I will explicate and defend Ryle’s distinction. However, as valuable as Ryle’s distinction is, he did not have the resources to explain how we embody and exercise these abilities. I hope to show how recent developments in cognitive science provide these resources.

Externalism and intuition

Slezak, Peter

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Wednesday 5.00-5.20 Room #2 Multielement visual signal detection: Three principles and a model

A decade ago, Egan (1999) described externalism regarding mental content as “clearly in the ascendency” while “Individualism seems passé.” Segal (2000) remarked that “Putnam’s Twin Earth example has become a sort of paradigm in the philosophies of language and mind” and Farkas (2003) describes externalism as “almost an orthodoxy.” Fodor (1987) has noted that the Twin-Earth Problem “isn’t a problem; it’s just a handful of intuitions together with a commentary on some immediate implications of accepting them” (1987). However, Fodor doesn’t question or analyse the intuitions themselves. In support of the dissident internalist position, I take up the matter of intuitions mentioned by Farkas (2003) and also by Boghossian (1998) as being at the heart of externalism. Farkas characterizes this “deeply rooted” intuition as “baffling” and a “vexatious problem” that “poses a serious challenge for any attempts to give an internalist analysis” of the familiar thought experiments such as Putnam’s (1975) Twin Earth scenario. I focus attention directly on theorists’ “intuitive responses to a certain kind of thought-experiment” that “appear to leave them little choice” (Boghossian, 1998).

The internalist or individualist accounts can be strengthened if this compelling intuition can be given a diagnosis in the way that one might show that the Müller-Lyer illusion is deceptive in spite of its subjective force. That is, the externalist position may be undermined by attending to its aetiology and demonstrating how the intuition arises from explicable mechanisms. Instead of defending internalism directly I ask: if internalism is true, why does it seem to be so implausible?
Modelling the neural basis of memory representations and decision making

Smith, Philip

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Wednesday 2.40-3.00 Room #2

ABSTRACTS: Paper presentations

Recent single-cell recording studies have investigated decision-making in awake, behaving monkeys performing simple perceptual tasks. These studies have yielded evidence for a model of decision-making much like the sequential-sampling models developed in mathematical psychology over the last 40 years. In these models, noisy information is accumulated over time until there is enough evidence for a response. These models predict response time (RT) distributions and choice probabilities from simple decision tasks in precise, quantitative detail. Recently we have shown that model parameters estimated from a monkey's choice probabilities and RT distributions also predict the neural firing rates in cells in the oculomotor control circuit in the period prior to the response. This provides evidence for the neural reality of the hypothesized information accumulation processes. In this talk I provide an overview of these recent developments. I then discuss problems in how to link the mass-action properties of populations of neurons to behavioural-level information accumulation functions. I also discuss how the persistence of stimulus information in visual short term memory after stimulus offset can be represented computationally using a simple feedback model.

The continuity of mind: Experimental and theoretical considerations

Spivey, Michael

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Friday 10.30-10.50 Room #1

Recent single-cell recording studies have investigated decision-making in awake, behaving monkeys performing simple perceptual tasks. These studies have yielded evidence for a model of decision-making much like the sequential-sampling models developed in mathematical psychology over the last 40 years. In these models, noisy information is accumulated over time until there is enough evidence for a response. These models predict response time (RT) distributions and choice probabilities from simple decision tasks in precise, quantitative detail. Recently we have shown that model parameters estimated from a monkey's choice probabilities and RT distributions also predict the neural firing rates in cells in the oculomotor control circuit in the period prior to the response. This provides evidence for the neural reality of the hypothesized information accumulation processes. In this talk I provide an overview of these recent developments. I then discuss problems in how to link the mass-action properties of populations of neurons to behavioural-level information accumulation functions. I also discuss how the persistence of stimulus information in visual short term memory after stimulus offset can be represented computationally using a simple feedback model.

Dissociative memory disorders and immigration

Staniloiu, Angelica

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Wednesday 2.40-3.00 Room #2

Studies of immigrant populations have shown that the stresses associated with the process of immigration and acculturation could lead to significant psychological, psychiatric or somatic symptoms. The mechanisms by which they trigger the psychiatric pathology in immigrants are still incompletely defined and understood, but some studies have found that acculturative stress could alter the function of the hypothalamic pituitary adrenal axis. The risk for developing certain psychiatric conditions might increase with the duration of residence in the new country, which raises the hypothesis that at least in the case of certain psychiatric conditions, chronic stress related to immigration and acculturation might play a role. Among the psychiatric symptoms, the dissociative ones have extensively been studied as part of Posttraumatic Stress Disorder in immigrant populations or refugees who were victims of torture or war or as part of the Culture-Bound Syndromes. Although, since long time ago, several psychoanalytical writings pointed to a connection between immigration and dissociation, by noting that the immigration process might pose a significant threat to feelings of identity and self-cohesiveness, little has so far been published in the psychiatric or psychological literature about the occurrence and characteristics of other dissociative conditions in immigrants, in particular the ones which belong to the DSM-IV-TR category of Dissociative Disorders (such as Dissociative Amnesia and Dissociative Disorders Not Otherwise Specified-Ganser Syndrome).

In the current presentation, we aim to review four cases of patients who developed Dissociative Disorders (Dissociative Amnesia and Ganser Syndrome, respectively) on a background of stresses related to immigration. The patients were investigated psychiatrically, medically, neurologically and by neuropsychological methods. These patients were adult males, who had Eastern or Central European backgrounds and no known previous psychiatric or medical illness and no known family psychiatric history. They immigrated to Germany or Canada and encountered several difficulties in the process of migration and/or adaptation to the new country. All four patients developed severe psychiatric dissociative symptoms after objectively minor stresses that involved accidents (physical injuries) of mild severity, which occurred several years after the patients had immigrated to the new country of residence. In spite of adequate treatment, their symptoms followed a chronic, unremitting course. The neuropsychological profile of these patients revealed certain similar characteristics, such as executive functioning deficits (such as limited cognitive flexibility) and impairments of emotional processing. Although no firm conclusions can be drawn based on the limited number of case reports, we propose that psycho-social stresses related to immigration and acculturation could lead to Dissociative Disorders in certain immigrant populations via a dysregulation of the hormonal stress responses associated with the hypothalamic pituitary adrenal axis, which is mediated by factors related to pre-migration experiences, ethnic features and individual characteristics, such as cognitive flexibility, emotional processing abilities, language skills and competence and explanatory model of illness.
The effect of causal strength on the use of causal and similarity-based information in feature inference

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Thursday 2.50-3.10 Room #1 Dance and Cognitive Science

Category-based feature generalisations are affected by similarity relationships between objects and by knowledge of causal relationships between features. However, it is unclear whether people will simultaneously consider both relationships. Some recent experiments have suggested that people use only one or the other types of information, and that causal knowledge may draw attention away from similarity information. However, other studies suggest that people do incorporate both relationships. To help resolve these seemingly contradictory results, the current study addresses an important difference between past experimental designs: the strength of causal relationships between features. Participants were trained on a set of four different kinds of artificial alien animals (with a known perceptual similarity structure), and were taught about three features that the animals can have. In a between-participants design, participants were taught that either: 1) there were no relationships between the three features; 2) the features shared weak causal relationships; or 3) the features shared strong causal relationships. After training, all participants then made some feature predictions about the four kinds of animals, to test which type/s of information were used by participants in each condition. Three probabilistic graphical models were fit to the participants’ predictions: one that considers only the tree-structured similarities between objects, one that considers only the causal chain relationships between features, and one that combines knowledge of both relationships. It was found that the strength of the causal relationships influenced the degree to which participants’ feature generalisations were affected by causal and similarity considerations.

Implicit learning of structured contemporary dance movement

Stevens, Kate
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Thursday 11.30-11.50 Room #3

The sequencing of dance movements may be thought of as a grammar. We investigate implicit learning of regularities that govern sequences of unfamiliar, discrete dance movements. It was hypothesized that observers without prior experience with contemporary dance are able to learn regularities that underpin structured human movement. Thirty-one adults were assigned to either an exposure or control group. Exposure consisted of 22 grammatical three-, four- and five-movement sequences presented twice in random order; sequence duration ranged from 9-19 s. In a test phase, exposure and control groups identified previously-unseen sequences as grammatical or ungrammatical, and rated confidence of judgment. The exposure group selected significantly more new grammatical sequences in the test phase than the control group. In addition, for the exposure group, the zero correlation criterion, wherein no relation between confidence and accuracy indicates unconscious knowledge, was satisfied. Through exposure, novice observers can learn a grammar that governs the sequencing of dance movements. This has implications for implicit learning of long sequences, working memory, and the development of expectations through exposure to contemporary dance.
Max Coltheart has recently challenged the claim that neuroimaging has been informative for cognitive theory.

(5) Is the challenge successful?

As an onlooker in these debates, I find Coltheart’s papers on this largely convincing. But I also find it very striking how his discussion is (intentionally) limited in scope. For example, in his discussion (2006, p.326) of the subsequent memory paradigm, the issue turned on the fact that one neuroimaging study supported the structural theory, while another supported the competing procedural theory. This raises the concern that had a particular study not been carried out (e.g. for irrelevant reasons), Coltheart’s conclusion would have been quite different!

(6) If so, does it signal that neuroimaging is conceptually misconceived? Or is the putative failure just a symptom of immaturity of the discipline?

Coltheart (2006, p.422) draws a three-way distinction between (a) a view which says that neuroimaging studies do currently provide evidence to distinguish psychological theories; (b) a view which says that the do not currently provide such evidence but they might do so in the future; and (c) a view which says that they could not in principle provide such evidence. If his arguments are correct, Coltheart seems to have ruled out (a), but he has left it open which of (b) or (c) is true. I am inclined to option (b) mainly because I worry about what ‘in principle’ is supposed to mean.

1) Are the explanations provided by cognitive psychology and cognitive science indispensable? Or are they replaceable in principle by explanations in neuroscience? If not, why not?

If ‘indispensable’ means ‘the best available’ the answer seems to be yes. On the question of ‘replaceable in principle by neuroscience’ one would need here to have some clarification (at least) of what ‘in principle’ and ‘neuroscience’ means. For example, there seems to be sense in which cognitive psychology might be replaceable in principle by explanations in physics (at least the physics that scientists will adopt in the ideal limit of inquiry), but this would be true of neuroscientific theories as well. Likewise it is not completely clear to me why the systems postulated currently by cognitive psychology are not already properties of the brain in some sense, and so come under the subject matter of neuroscience broadly construed.

(2) Are the phenomena referred to in explanations in cognitive science realizable or implementable in many different ways at the neurophysiological level? If so, is this why these explanations are irreplaceable?

Mostly (scientific) psychological theories seem to postulate computational or representational systems of various sorts that can indeed by implemented or realized in the brain in various ways. But this isn’t what makes such theories irreplaceable (at least if this means ‘indispensable’ as per question 1). What makes them indispensable is that they are the best available theories.

(3) How do mental or psychological states relate to neural states? For example, are they identical to neural states?

If it is true that psychological theories postulate things that are multiply realizable then these things will not be identical to any particular neural states (at least if by ‘neural state’ we mean the sort of thing that multiply realizes the system postulated by the psychological theory). This follows simply from the fact that multiple realization is a one-many relation, while identity is a one-one relation. I think it is therefore more reasonable to say that the things in question will be realized by neural states, but of course the notion of realization can be explained in various ways.

(4) Is it possible or likely that cognitive psychology will reduce to neuroscience? If so, what is the relevant sense of reduction? If so, will a successful reduction mean that phenomena (the entities/properties/processes) at the cognitive level do not exist?

The idea that one theory can be reduced to another may be clarified or explained in various ways. One thing that might be meant is that the characteristic claims of cognitive psychology follow logically from the characteristic claims of neuroscience together with bridge laws. If that is what is meant it does not follow from a successful reduction that the phenomena at the cognitive level do not exist. Another thing that might be meant is that the data that the cognitive psychological theory was advanced to explain are better explained by some neuro-scientific theory. If that is what is meant, then it does seem reasonable to think that that the items required for the truth of the cognitive psychological theory do not exist if there is a successful reduction. There are also other possibilities.

Contribution to mind-brain symposium
Stoljar, Daniel
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Friday 2.10-2.30 Integrating Perspectives on the Relation between Mind and Brain

ABSTRACTS: Paper presentations

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When discussing the past with others, people often leave things unsaid that they are capable of remembering. Silences about the past are ubiquitous, from the failure of leaders to state all that they know about a national crisis, through the erasure of public figures from historical records to totalitarian governments, to the embarrassed hesitancy to talk about a socially taboo topic or the lies (sometimes white) that permeate everyday conversation. Here we are concerned with the role silences play on subsequent memory, what we call mnemonic silences, between a speaker and a listener. We outline four types of mnemonic silences: covertly remembered, intentional silence; covertly remembered, unintentional silence; not remembered (covert or overt), unintentional silence; and no remembering (covert or overt), intentional silence. We discuss current psychological literature demonstrating the role these mnemonic silences play on the subsequent memory of both speakers and listeners. In particular, it will be argued that Cuc, Koppel, and Hirst’s (2007) socially-shared retrieval-induced forgetting (SS-RIF) provides a novel and systematic means of investigating the effects of mnemonic silences on both the speaker and the listener. We conclude by discussing the importance of mnemonic silences in both future individual and collective memory research.


The group mind thesis (GMT) — i.e. the idea that groups can have emergent cognitive properties in their own right — was a fixture in the intellectual landscape of the late 19th and early 20th century (Wegner 1986). But traditional expressions of GMT were riddled with serious problems that eventually led to its demise. First, it remained unclear how the group mind was supposed to be physically embodied. Second, it was unclear how we could measure it. However, despite its historical ballast, appeals to group cognition have recently gained new ascendancy in a wide range of disciplines concerned with collective behavior, such as historiography (Le Goff 1992, Nora & Kritzman 1996), social decision theory (Pettit 2003, List 2008), social psychology (Larsen & Christensen 1993, Hinsz et al. 1997, Mohammed & Dumville 2001), organizational memory and learning (Sandelands & Stablein 1987, Walsh & Ungson 1991, Argote 1999), group-selection theory (D.S. Wilson 2002), distributed cognition (Hutchins 1995, Tollefsen 2006), and philosophy (Goldman 2004). Against this revival, Rob Wilson (2001, 2005) has argued that contemporary versions of GMT remain fraught with precarious ontological commitments that have no real explanatory value. From a methodological perspective, Cooke et al. (2000) have argued that the measurement of genuine team-level cognitive constructs would require the development of hitherto unavailable “holistic” methods.

In this paper, I argue that these pessimistic assessments are mistaken, based on an understanding of group cognition as an emergent form of socially distributed cognition. To that end, I first break down the notion of cognition into a graded cluster concept which subsumes a more or less loosely knit family of capacities, and use Wimsatt’s (1986) notion of emergence as a failure of “aggregativity” to classify the organization-dependence of cognitive activities performed by groups. In the resulting two-dimensional space, we can distinguish three different types of socially distributed cognitive systems (swarms, aggregates, and teams). Then I use our conceptual framework to reconstruct appeals to team-level cognition in the theory of transactive memory systems (Wegner 1986, 1995). A TMS consists of two components: (i) a representational component which is the distribution of individual and transactive (“who knows what”) memories in a group, and (ii) a procedural component which includes all communication processes (“transactions”) by which members cooperatively allocate, encode, retrieve, elaborate, and integrate information. Focusing on the assembly-task paradigm (Liang et al. 1995, Moreland et al. 1996), Moreland & Myaskovsky (2000), Lewis et al. (2005), Lewis et al. (2007), I show how the notion of a TMS can be operationalized, and what cognitive benefits it confers on groups. Based on my analysis, I argue that groups can function as adaptive information-processors in their own right which display collective forms of intentionality. Our multi-level framework reveals that the relationship between individual and group cognition is not a zero-sum game, and that the causal mechanisms in virtue of which group-level cognition influences group behavior involves the cognitive abilities, motivations, and opportunities for social interactions at the individual level.
Automatic cognitive processes in eating behaviour implicated in obesity: Application of the implicit association paradigm

Todorov, Kamelia

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Friday 10.30-10.50 Room #3

In light of the unprecedented increase in the prevalence of overweight and obesity, considerable efforts are being made towards understanding regulatory processes implicated on food choice and eating behaviour.

The observation that obeseogenic eating exhibits features of addictive behaviour has prompted a focus on the automatic cognitive processes underlying individual differences in responsiveness to environmental food cues.

Based on conditioning models in addiction, food-cue responsiveness is framed in terms of its representation in the associative network whereby exposure to the cue triggers relational connections corresponding to approach or avoidance behaviour. The nature and strength of these associations are presumed to determine the accessibility (automaticity) of the corresponding behavioural tendency. In the context of obeseogenic eating, strong associations reflecting an enhanced motivation for the rewarding properties of food in particular may automatically trigger approach behaviour, ultimately undermining regulatory control.

The present research reports on two studies examining automatic associations implicated in food-cue responsiveness as a function of BMI status and various eating behaviour tendencies. The Implicit Association paradigm (Greenwald et al., 1998; 2003); a computerised latency response-based measure of associative strength used extensively in cognition research, was adapted to examine (1) the nature and strength of associations between high and low-fat foods and anticipatory enjoyment of consumption as well as (2) the accessibility of eating enjoyment relative to eating control constructs upon exposure to palatable food cues. Relationships with self-reported food-intake, habitual eating tendencies, explicit attitudes and behavioural intentions were additionally examined.

In both investigations, the nature and strength of automatic associations were reflected in corresponding self-report indices, eating behaviour and BMI status. Specifically, results from Study 1 indicated that obese participants automatically associated high-fat foods with positive anticipatory outcomes relative to low-fat foods, while normal-weight and (to a lesser degree) overweight participants exhibited the opposite association pattern. Furthermore, the automatic response tendency exhibited by obese participants was significantly associated with obeseogenic eating in addition to self-reported difficulty in inhibiting food craving, and demonstrated greater predictive utility than self-reported behavioural intention. Results from Study 2 indicated that while palatable food was more readily associated with eating enjoyment relative to eating control constructs across comparison groups, reaction time differences were significantly more pronounced in overweight and obese participants, chronic (unsuccessful) dieters, and participants scoring high on disinhibited eating and non-homeostatic consumption indices. Again, associative strength as assessed by the latency-response paradigm demonstrated unique predictive utility.

Results of the research provide support for the notion that heightened food-cue responsiveness is a function of conditioned, associative processes reflecting enhanced motivation for palatable food which may undermine deliberate efforts to regulate food intake. These findings point to the significance of potential differences in the cognitive structuring and processing of food-related information in the development of targeted therapeutic interventions. Additionally, the findings add to a growing body of research emphasising the importance of considering automatic processes in understanding and predicting self-regulatory behaviour. Methodological considerations relevant to the assessment of automatic associative processes are also highlighted.

Literature, culture, cognition: New models

Tribble, Evelyn

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Wednesday 4.00-4.20 Room #3

Cognitive approaches to literature and literary theory have gained increasing ground in the past decade, but remain decidedly a minority approach within the discipline. Most advocates of cognitive approaches to literature draw from an limited repertoire of research in the broader field of cognitive science, with much work taking its inspiration from the work of Stephen Pinker (so-called Darwinian literary criticism); the cognitive linguistics of George Lakoff (the so-called “embodied mind”); neuro-imaging; and research on Theory of Mind. The assumptions governing this work remain decidedly “brainbound” or, at best, “embodied” in a rather restricted and inert sense. In this paper I will survey recent approaches to literature and cognition and argue that a more promising approach is to view cognition not as intra-cranial, but instead as extended across brain, body, and world, as has been argued by philosophers such as Andy Clark, Michael Wheeler, and John Sutton, as well as social scientists such as Ed Hutchins. Such distributed models provide a key mechanism for linking cognition and culture, and point the way to a model of cognition with genuine historical purchase. Such models also permit reciprocity between the disciplines, since historically nuanced accounts of cognition stand to contribute accounts of such cognitive processes as memory, skill, and perception. I will demonstrate the utility of such approaches with examples drawn from theatrical history, especially evidence about the complex patterns of skill and memory that underpinned the practices of early modern playing companies during William Shakespeare’s lifetime.
We engage in spatial cognition from the first moments of life: where to look, where to reach, where to go. Each of these acts entails a different space and a different set of behaviors. Spatial knowledge derives from many sense modalities, is essential for survival, and is a basis for other knowledge. Our conceptions of space derive from our perceptions of space and our behavior in space. Both our bodies and the world have natural asymmetries that affect perception of and behavior in these spaces, yielding mental or external representations of them that systematically differ from space as measured by geographers or physicists. Perception and behavior are different for the different spaces we inhabit: the space of our bodies, the space immediately surrounding us, the space we navigate, and the spaces we create to augment our own thinking.

Two approaches have emerged as the most relevant and empirically supported, although they offer quite different perspectives: a perspective focusing on Language (or “Language-bound” perspective) and a perspective focusing on Cognition (or “Cognition-bound” perspective).

The “Language-bound” perspective proposes that certain parts of speech (prepositions, e.g., “at”, “behind”, “on”) are the main carriers of “geometrical” information, limited to orientation, distance and inclusion (Landau & Jackendoff (1993)). Look at (1):

(1) The book is behind the table

In (1), the preposition “behind” only expresses the geometrical relation between the book and the table, reduced however to a minimal notion of orientation and inclusion (or lack thereof). Other pieces of visual information are claimed to be “filtered” out. The “Cognition-bound” perspective proposes that other aspects are equally relevant (Coventry & Garrod (2004)). Look at (2) and (3):

(2) The hand is in the glove
(3) Mario sits at the piano

In (2), mechanical aspects are relevant, as the hand and glove form a “joint unit”: if we also say that hand touch an apple, the glove will touch the apple too. In (3), more abstract notions (loosely definable as “affordances”) also play a part: Mario may potentially interact in various ways with the piano, but it is not specified how.

Landau & Jackendoff (1993) offer a more fine-grained perspective on which parts of speech convey spatial information, but a quite coarse-grained perspective on their content. Conversely, Coventry & Garrod (2004) offer a fine-grained perspective on meaning, but a quite coarse-grained perspective on which parts capture such meaning.

Both theories, however, fall silent on how the relation of two objects can change over time, as a sentence like (4) conveys:

(4) Mario goes to the store

Intuitively, (4) informs us that Mario is currently moving and, as a consequence, he will reach the store afterwards, but neither theory can explain us how this is so.

In this talk I will offer a novel approach to this dilemma. I will first show that we can have a dynamic perspective on “Space” by analyzing how we keep track of objects and the events they partake in, over time (Pylyshyn (1989, 2003), Zacks et al. (2001,2008)), and thus capture how we can keep track of Mario and his journey to the store.

I will then use Discourse Representation Theory (Kamp et al. (2005) and show how such information is captured by the single parts of speech (verbs like “goes”, prepositions like “to”) when they are combined together to form a sentence. I will then argue that, by offering a fine-grained (and dynamic) approach to the syntax and semantics of linguistic expressions, informed by dynamic theories of cognition, I will also offer a more viable answer to the dilemma of “Space”.

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**How space gets into language? A novel approach**

Ursini, Francesco-Alessio

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fursini@maccs.mq.edu.au

Friday 4.10-4.30 Room #2

The dilemma regarding the relation between Cognition and Language has always been subject of intense study, and one topic which has received intense scrutiny is that of “Space”: how we determine the position of objects in the world and how we express such information in everyday language.

The “Language-bound” perspective proposes that certain parts of speech (prepositions, e.g., “at”, “behind”, “on”) are the main carriers of “geometrical” information, limited to orientation, distance and inclusion (Landau & Jackendoff (1993)). Look at (1):

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**ABSTRACTS: Paper presentations**
Structured methods for intelligence analysis

van Gelder, Tim
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Wednesday 3.20-3.40 Room #3

Intelligence analysis is a very rich and demanding cognitive process. There is often also a great deal at stake. Improving intelligence analysis is one place where cognitive science can potentially make a very practical contribution to high-level knowledge work. In this talk I will focus on hypothesis investigation, a central aspect of intelligence analysis. Hypothesis investigation is attempting to determine what is most probably happening in some situation by assessing hypotheses in the light of available or obtainable evidence. Hypothesis investigation is typically done in an intuitive, informal manner. Common problems are intelligence analysis include (a) failing to canvass an adequate range of hypotheses; (b) neglecting or mis-rating evidence when judging the plausibility of hypotheses; and (c) inefficiency in seeking additional evidence. To help deal with these problems, various structured methodologies have been proposed. The canonical technique is the Analysis of Competing Hypotheses (ACH) method, developed by Richards Heuer at the CIA’s Kent School and widely taught in analytical training at intelligence agencies. ACH has a superficially compelling logic and a number of important advantages over informal or unstructured analysis. However it also has a number of intrinsic limitations and practical difficulties. I will describe five very serious problems with ACH, concluding that ACH grievously distorts the both the logic of the relationship between evidence and hypotheses and the analyst’s intuitive cognitive processes, i.e. her capacity to make sense of a situation. I will also briefly describe an alternative to ACH, hypothesis mapping (HM). HM is an application of argument mapping, a.k.a structured argumentation to the specific context of hypothesis investigation. Hypothesis mapping addresses the major problems of ACH, and it may well be more “user friendly” than ACH, and fit better into the analyst’s overall workflow.

Computation and representation in dynamical cognitive science: Revision or replacement?

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Friday 11.10-11.30 Room #1

Spivey argues that instead of fighting the use of the word ‘representation’ in dynamical cognitive science, we should ‘merely allow it to naturally shed that albatross of “symbolizing” something’. This paper critically evaluates Spivey’s reconstruction of the idea of representation within a dynamical systems perspective.

Agent-based modeling, situated cognition & emergence

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Wednesday 4.40-5.00 Room #3

The presentation will introduce a connectionist Agent-based model (cABM) that incorporates detailed, micro-level understanding of social influence processes derived from laboratory studies and that aims to contextualize these processes in such a way that it becomes possible to model multidirectional, dynamic influences in extended social networks. At the micro-level, agent processes are simulated by recurrent auto-associative networks, an architecture that has a proven ability to simulate a variety of individual psychological and memory processes. At the macro-level, these individual networks are combined into a “community of networks” so that they can exchange their individual information with each other by transmitting information from one net to another. This essentially creates a network structure that reflects a social system in which (a collection of) nodes represent individual agents and the links between agents the mutual social influences that connect them. The network structure itself is dynamic and shaped by the interactions between the individual agents through simple processes of social adaptation. The process of theory building and testing is implemented through a tight coupling of simulations and empirical research, in which the cABM is validated against data obtained from neuroscientific research, psychological experiments and the analysis of large collectives. This process should allow to determine parameters of cABM to simulate larger groups, providing a bridge between individual processes, small group interaction and large social collectives. In this talk, I will report on the current state of this program.
The cognitive plausibility of algorithms for referring expression generation

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Friday 3.50-4.10 Room #2

Over the last two decades, referring expression generation has become one of the most popular research topics within Natural Language Generation. Arguably, describing objects is a central task for any computational system engaged in producing natural language. There are two distinct exercises we might be undertaking when we develop algorithms to determine the content for referring expression. One would be an exercise in engineering, where we attempt to develop algorithms that are able to effectively identify intended referents for hearers, for use in sophisticated applications of natural language generation. Alternatively, we might be engaged in an exercise in computational psycholinguistics, where we attempt to model what it is that speakers do when they refer to an entity. Our interest in the present paper is in the second of these exercises: how might we develop algorithms that emulate the referring behaviour of humans, and in so doing, perhaps begin to explain how humans carry out this task?

We present an analysis of a corpus of experimentally collected referring expressions in which humans describe simple target objects surrounded by a few distractor objects with the aim of shedding some light on the processes that might be at play. We show that popular algorithms for the generation of referring expressions are not able to produce the full range of variation displayed in the human-produced data and are therefore unlikely candidates for cognitive models. This shortcoming is in large parts due to the serial fashion in which these algorithms consider properties for inclusion in a referring expression, where each decision is dependent on what has been included so far. One important finding from our analysis is that the data vastly underspecifies what might be involved algorithmically in the generation of referring expressions in physical scenes such as the ones from our corpus. However, it does allow a number of conclusions to be drawn that lead us to propose to replace serial dependency with a parallel gestalt model that considers visually salient properties independently of each other. We conclude with a list of questions that need to be addressed experimentally before a full algorithmic account of human referring expression generation is possible.

Audience response to dance structure: Effects of observer experience and soundscape on continuous measures of engagement with a contemporary dance work

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Thursday 1.50-2.10 Room #1 Dance and Cognitive Science

Measuring ‘real time’ or continuous responses to dance performance offers a means of investigating how observers respond to structure in dance. In order to comprehend dance, observers must parse dance movement into a series ‘legible’ choreographic frameworks. While post-performance measurement tools probe audiences’ responses to a dance work as a whole, moment-by-moment responses to choreographic form and structure are more difficult to investigate because they are necessarily subsumed in the process of generating a cohesive response to a dance work at its conclusion. However, understanding how responses to dance are generated by specific choreographic structures and devices throughout a dance is critical to understanding how dance elicits the kinds of cognitive and emotional responses that make it culturally valuable.

In previously reported work, we have used the portable Audience Response Facility (pARF) – PDAs that record audience response continuously, – to measure audiences’ ‘levels of engagement’ with a dance work, sampling the responses of up to 20 observers and plotting the average response time series and standard deviation time series of the levels of engagement. We have identified what we term ‘gem moments’ in the observers’ responses to dance, in which average engagement increases fairly suddenly across a group of observers. We have also analysed the agreement between observers, and found that a ‘gem moment’ is often associated with a drop in agreement between observers. By analysing what kinds of choreographic structures coincide with these kinds of responses, we have hypothesized that periods of high engagement often follow choreographic ‘disjunctures’ or surprises, and that periods of high agreement tend to be associated with more predictable dance structures.

In the experiment reported here, we compared continuous responses recorded from two distinct kinds of dance observers, dance experts and tertiary dance students, to a solo work by a professional contemporary dance artist. The aim was to see whether there were any distinctions between the two responses that would indicate how dance artists’ approaches to apprehending dance change over the course of their transition from student to professional artists. To this end, the presence and absence of an accompanying soundscape was systematically manipulated. Additionally, we used video recordings of the performances to correlate the kinds of choreographic structures that were associated with specific aspects of the responses, and motion capture to determine the dynamic characteristics of movement passages associated with areas of increased engagement.

Preliminary analyses indicate striking similarity between the responses of students and experts to this dance work. We will discuss the kinds of choreographic structures and the movement dynamics, as determined using video and motion capture, that elicit engagement of and agreement between observers watching a professional contemporary dance work, as well as the subtle differences that emerge in the response between the two groups.
Cognitive neuroscience: Spanning the void between cognitive science and neuroscience

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ABSTRACTS: Paper presentations

Friday 3.50-4.10 Room #1 Integrating Perspectives on the Relation between Mind and Brain

Throughout history there has always been debates about the worth of one method over another. The invention of the combustion engine had carriage designers and engineers up in arms about the worth of such a noisy, expensive machine. Yet eventually, they conceived of a new carriage that made their lives more exciting: the car. Today, there are those who have no interest in the brain and continue to create models based purely on behavioural data. Their questions relate to how the mind works (independent of the brain; Cognitive Scientists). Then there are those who are interested in how the brain works (Neuroscientists). Are the questions different? Yes, of course. I would like to suggest that Cognitive Neuroscience is a way of bridging the gap between these two disciplines, and neuroimaging is the main (but not only) tool. Cognitive neuroscientists see the mind as an intrinsic part of the brain: they take cognitive models and attempt to test them and develop new hypotheses using neuroscience methods. The big issue is that cognitive models do not refer to the brain, but the methods used in neuroscience are exclusively about the brain. It is the necessary re-interpretation of the cognitive models to fit with the neuroscience methods that creates the misunderstandings. How can a theory be informed by a method if the questions are different? I will discuss cognitive neural modelling as a way to span this void and hopefully convince you that the void is worth looking across.

Linguistic relativity: From chasing frogs to eating spaghetti.

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Thursday 2.10-2.30 Room #2

There is ongoing interest and debate on whether the language we speak influences the way we think or perceive of the world. Indeed, there are considerable differences in how languages segment and package events or actions into sentences (Talmy, 2001). An intriguing question is whether these linguistic differences affect how speakers attend to different aspects of the visual world when speaking. According to Slobin’s (1996) thinking-for-speaking formulation, the grammatical categories of the language that one speaks shape or filter the way that aspects of the world are expressed. It is argued that obligatory, grammaticalized categories have a special channeling effect on the attention of the speaker towards particular functions of these forms (Berman & Slobin, 1994; Slobin, 1996; Strömqvist & Verhoeven, 2004).

Winskel and Luksaneeyanawin (2009) investigated if obligatoryness of grammatical categories in Thai and English affects the expression of temporal events depicted in short animations in children and adults. Thai and English differ in the degree of obligatoryness of grammatical categories of imperfective aspect and the expression of deictic motion events. English has obligatory grammaticalized imperfective aspectual marking on the verb, whereas Thai has verb final deictic-path verbs that form a closed class set. The speech produced by participants was analysed in terms of explicit expression of ongoiness of the two events and entrance and exit of protagonists depicted in the animations. Results supported the notion that obligatory grammatical categories shape how Thai and English speakers express temporal events or actions. English speakers explicitly expressed the ongoingness of the events more than Thai speakers, whereas Thai speakers expressed the entrance and exit of protagonists deployed in the animations significantly more than English speakers.

However, this type of research has its methodological limitations as linguistic behaviour is being used as evidence to support the ‘channeling of attention’ hypothesis. An innovative approach to empirically test this claim that obligatory categories have a channeling effect on ‘attention’, is to monitor eye movements while participants observe animations, as the pattern of eye fixations and the trajectory of the eye are an indicator of visual attention (Rayner, 1998). In the current study participants watched short animations depicting two overlapping actions in a linguistic and a non-linguistic condition and their eye movements were recorded using the latest eye tracking technology (EyeLink 2000). In the linguistic task participants were required to describe what happens in the animations. In the memory task participants were required to select the matching picture to the animation out of a set of three. If event perception is channeling effect on the attention of the speaker towards particular functions of these forms (Berman & Slobin, 1994; Slobin, 1996; Strömqvist & Verhoeven, 2004).

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References
The social brain

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Wednesday 5.00-5.20 Room #3

The concept of ‘social brain’ is a hybrid, located somewhere in between politically motivated philosophical speculation about the mind and its place in the social world, and recently emerged inquiries into cognition, selfhood, development, etc., returning to some of the founding insights of social psychology but embedding them in a neuroscientific framework. In this paper I try to reconstruct a philosophical tradition for the social brain, a ‘Spinozist’ tradition which locates the brain within the broader network of relations, including social relations. This tradition runs from Spinoza to Lev Vygotski in the early 20th century, and on to Gilles Deleuze, Toni Negri and Paolo Virno in recent European philosophy, as a new perspective on the brain. The concept of social brain that is articulated in this reconstruction overcomes distinctions between Continental thought and the philosophy of mind, and possibly gives a new metaphysical framework for social cognition.

Eating and drinking in Mandarin and Shanghainese

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Thursday 2.30-2.50 Room #2

There are many activities that human cannot do without. Eating and drinking are two of them. But, do people conceptualise these ‘basic’ human activities in the same way or differently? Do languages encode them similarly or differently? This paper provides a perspective from two varieties of Chinese—Mandarin Chinese and Shanghainese Wu, which is spoken in the Shanghai area with approximately 14 million native speakers. Both of these forms of Chinese suggest two different ways of conceptualization. In Mandarin Chinese, a lexical distinction is made between chi and hē, comparable to eat and drink in English (but not exactly the same); whereas in Shanghainese Wu one single lexical item ēhyq is used to describe any activity involving the intake of things. In this paper, I will conduct a detailed contrastive semantic analysis of these concepts in question. I will compare the range of use of Mandarin chī and hē with English eat and drink, and discuss the conceptualisation reflected in ēhyq, including its figurative use. The findings of this paper are consistent with those emerging from cross-linguistic investigation of less familiar languages in recent times, in that there are variations in linguistic coding of eating and drinking (e.g. Newman, in press). However, this paper also illustrates that one perhaps should not underestimate the variations of conceptualisation within one ethnic group.

(*Transcription convention follows Sherard’s 1972 thesis.)

Visual perception of emotions

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Thursday 4.10-4.30 Room #2

Some philosophers think that perception is a perfectly good source of knowledge about other people’s mental states. In particular, they think it is possible to know that others have emotions by perceiving that they have emotions. In this view, there is such a thing as perceiving that someone has an emotion. Does this mean that we cannot perceive emotions themselves, but only that people have emotions? Although only a few philosophers explicitly argue for this view, most are likely to say that it’s not at all clear what it means to say that we see emotions. On the other hand, those who think that we do see emotions hardly provide any positive argument for their view and confine themselves to explaining why some philosophers deny that we see emotions.

In this paper, I provide a positive argument for the view that we see emotions. I develop my approach by running two separate but interdependent arguments. The first shows that facial expressions of emotions are dynamic patterns of changes that carry information about the emotions that produce them. The second shows that the visual system functions to extract the information that expressions carry. I develop this argument by drawing on empirical data from psychology and brain lesion studies. The conjunction of the two arguments provides an explanation of what it means to say that we see emotions.
ABSTRACTS: Posters

Gorilla watching: Effects of exposure and expectations on inattentional blindness

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Inattentional blindness (IB) occurs when an individual fails to notice an obvious but unexpected object when their attention is engaged by another task. Previous research has shown that expectations can significantly influence IB rates, specifically through determining attentional set. Most research has excluded participants with IB knowledge on the belief that any knowledge of IB would invalidate experiments by causing participants to “expect the unexpected”. We conducted a series of experiments using dynamic stimuli to determine whether knowledge of and exposure to IB research had any effect on expectations and rates of IB. Experiment 1 investigated the effect of limited pre-existing IB knowledge in a sample of 72 undergraduates (71% female; age M = 21.4 years, SD = 4.6). Participants had not previously participated in any IB research and had either no knowledge (n = 25) or minimal knowledge of IB research and terminology (n = 47). There was no between-groups difference in IB rates, X²(1) = .008, p > .05. Primary task accuracy on critical trials did not vary with IB knowledge, nor did accuracy differ between those who noticed the critical stimulus and those who did not. Experiment 2 investigated the effect of varied knowledge levels in 36 undergraduates (78% female; age M = 23.2 years, SD = 8.7). All had recently participated in a similar IB experiment and were either first years with no knowledge (n = 16), first years with limited IB knowledge (n = 11) or later year students who had studied IB in their psychology coursework (n = 9). Rates of IB did not vary with knowledge (p > .05, Fisher’s Exact Test). Primary task accuracy also did not vary with knowledge, F(2,33) = 1.503, p > .05, nor between noticers and non-noticers on the critical IB trial, t(34) = -1.745, p > .05. Experiment 3 manipulated IB knowledge in 46 undergraduate students (85% female; age M = 19.5 years, SD = 2.9), immediately following a similar IB experiment. High knowledge participants (n = 23) were given detailed information on IB research paradigms. Low knowledge participants (n = 23) were given comparable information on eye movement research. Rates of IB differed significantly between groups, X²(1) = 4.847, p < .05, with nearly three times as many high knowledge participants noticing the unexpected stimulus (48% vs 17%). There were no differences in primary task accuracy between high and low knowledge groups, however accuracy was significantly lower for noticers compared to non-noticers, t(44) = -3.527, p < .01. This suggests that noticers in experiment 3 may have adopted a dual task strategy and been “watching” for the unexpected stimulus. Overall these results suggest that pre-existing knowledge of IB does not affect the incidence of IB in experimental settings unless the participants have detailed information about the specific paradigm and are given the information immediately prior to the experiment.

The use of dynamic cues in self and familiar face recognition

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Familiarity plays an important role in facial processing - generally, familiar faces are processed faster and more accurately than unfamiliar faces, and familiar face processing involves additional neural substrates when compared to general face processing. The importance of familiarity is highlighted when facial form cues are degraded, so that a person must rely primarily on movement (dynamic) information to identify someone (O’Toole, Roarke and Abdi, 2002). It is, however, unclear what dynamic cues are used for facial recognition of both familiar and unfamiliar faces. Self-face recognition also recruits differing neural substrates when compared to unfamiliar and familiar face processing (Platek et al, 2006). However, little work has been done on dynamic self-face recognition, and none has focussed on the type of movement that facilitates this process. The current study used motion capture cameras to record the facial movement of participants. This motion was then animated into point-light-displays, with either the rigid (eg nodding/shaking), non-rigid (eg mouth/eyebrow motion) or combined motion displayed. Participants completed a recognition task involving point-light animations of themselves, a person familiar to them, and a person unfamiliar to them to determine whether differences in familiarity resulted in the use of different movement cues. Results will be discussed in relation to previous research on dynamic facial recognition, and possible implications for current facial processing models.
Cognitive web search model as multitasking, cognitive coordination, and cognitive shifts

Amanda Spink

Web search is a complex behaviour involving users’ cognitive efforts. Studies show that people often conduct Web searches including more than one related or unrelated topic and switch between them. Web searchers also allocate and coordinate cognitive resources among tasks, and experience shifts in cognitive, problem and knowledge states. This paper reports preliminary results from a study conducted three Web searches on personal information problems. Data collection techniques included pre- and post-search questionnaires; think-aloud protocols, Web search logs, observation, and post-search interviews. Key findings include: (1) users Web searches included multitasking, cognitive shifting, and cognitive coordination processes, (2) cognitive coordination is the hinge linking multitasking and cognitive shifting that enables Web search construction, (3) cognitive shift levels determine the process of cognitive coordination, and (4) cognitive coordination is interplay of task, mechanism and strategy levels that underpin multitasking and task switching. An initial model depicts the interplay between multitasking, cognitive coordination, and cognitive shifts during Web search. This study highlights the nexus role of human cognitive coordination processes during Web searching. Without cognitive coordination, neither multitasking Web search nor cognitive shifting can occur, and information retrieval interaction has not been effective. This study is important for understanding and modelling the cognitive processes during Web searching. Increased understanding of Web search behaviour is significant for the development of theoretical Web search models. Implications of the findings and further research are also discussed.
Biases in truth judgments of disjunctions and conjunctions: Testing the universal density of measurement theory

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The present study investigated whether the idiosyncratic bias towards inclusive disjunction (‘A or B, even both’) or exclusive disjunction (‘A or B, not both’), reported in studies such as Chevalier et al. (2008), is the result of speakers’ allowing or rejecting logical inference rules. A second goal of the study was to determine whether the domain of application for these rules is discrete or dense. What was found is that research participants biased towards an inclusive interpretation were also allowing the inference rules ‘A, therefore A or B’, ‘A, therefore A and B’, ‘A and B, therefore A and C and B and D’ and ‘A or B, therefore A and C or B and D’; the participants who rejected them, all favoured an exclusive interpretation. Moreover, participants who allowed or rejected inference rules in the discrete domain, as above (containing individual terms like ‘A’ or ‘B’), were also found to respectively allow or reject the following rules in the dense domain, targeting part-whole relations: ‘some A, therefore all A’, ‘some A and some B, therefore all A and all B’ and ‘some A or some B, therefore all A or all B’. Based on these findings, the conclusion is reached that speakers apply inference rules in both the discrete and the dense domains, suggesting that the corresponding semantic scales and their implications (‘A or B, but not both’ and ‘some A, but not all A’) are activated together, in keeping with the Universal Density of Measurement theory (Fox & Hackl, 2006). The results also confirm Braine & Rumain (1981)’s prediction that speakers use inference rules rather than truth tables in interpreting disjunction; ‘inclusivity’ and ‘exclusivity’ may be epiphenomenal.

The utility of different object properties in change detection.

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It is important to look at the combined effects of lighting and view direction on face recognition, as both depend on the three-dimensional shape of the face and are in some ways analogous. For example, both pitch rotations and the change between top and bottom lighting involve rotations about the left-right axis, just as yaw and left/right lighting involved rotations about the vertical axis. We investigated identity matching performance across 45° rotations of the light source or the face about pitch or yaw with all images shown either upright or inverted. Upright images were better matched than inverted images, showing that image differences are not sufficient to explain performance. This is consistent with the idea that the use of class-based knowledge of upright faces is important for this task. The effects of face and light rotation interacted and depended on the axis of rotation. Overall, rotations about pitch impaired performance more than rotations about yaw, and changes in view impaired performance more than changes in light. The interaction between face and light rotation was such that if both rotated in the same direction, equivalent to a rotation of the camera in the opposite direction, performance was as good or better than if the face alone rotated. This was particularly pronounced for pitch rotations, with a clear pitch up advantage but only when the light rotated in the same direction. The results are interpreted in terms of image, surface and three-dimensional models based accounts of face matching.

Reconceptualising expertise: How an investigation into the experience of music performance for the expert musician can enrich current understandings of expertise in cognitive science.

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At first glance, an investigation into the experience of music performance for the expert musician may not appear to hold relevance for the domain of cognitive science. This is not the case. Attempting to understand what the experience of music performance is like for an expert musician sheds light on a number of key areas in cognitive science. This paper will illustrate how examining an expert musician’s experience of music performance has the potential to enrich current understandings of expertise in cognitive science.

What is the experience of music performance like for an expert musician? How are some expert musicians able to communicate powerful emotion so effectively and what is this like for the musician at the level of phenomenology? Some theorists (Beilock, 2003; Csikszentmihaly, 1991; Dejours, 2004; Dreyfus, 2002; Sudnow, 1978) suggest that expert performance is an embodied process whereby the expert is completely absorbed in ‘smooth coping’, guided entirely by their body to respond in a flow-like manner to all situational demands. Other theorists (Chaffin, Imreh & Crawford, 2002; Ericsson & Kintsch, 1995) accord much more importance to top-down processes, overarching cognitive structures and highly refined retrieval strategies when attempting to explain the execution of expertise in a performance domain.

As will be demonstrated, a more complex understanding of expertise is sorely needed. In line with the paradigm of Embodied Cognition (Clark, 1997; Gallagher, 2005; Hutchins, 1998; Lakoff & Johnson, 1999; Rowlands, 1999), this understanding needs to integrate and dynamise the mind-body dichotomy that has plagued past understandings of expertise, therefore leaving room for both higher-order planning structures AND bodily guided action in expert performance. Drawing specific inspiration from Leman’s (2008) work in Embodied Music Cognition, Hochshild’s (1983) research into emotional labour and preliminary data from interviews carried out by the author of this paper, possible components of a new conceptualisation of expertise, richer than that which cognitive science currently has to offer, will be outlined and explored.
Expertise and the own-age bias in face recognition: Evidence for the enhanced configural processing of own age faces

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Recent research has shown that we recognise faces similar in age to ourselves better than older or younger faces (e.g. Anastasi & Rhodes, 2006). Harrison and Hole (2009) suggest that this effect may be mediated by contact with the different age groups and thus may be the result of differential expertise. Two studies examined whether perceptual expertise, reflected in enhanced configural processing for own-age faces, is involved in this own-age bias. Experiment 1 investigated the ability of children, and two groups of young adults with different amounts of contact to children, to remember upright and inverted facial photographs of 7-10 and 18-25 year olds. While the children and low-contact adults showed greater accuracy and more inversion impairment for own-age faces, the high-contact adults exhibited the opposite pattern. Experiment 2 tested undergraduates' sensitivity to small configural changes to both own- and other age faces. Participants were most accurate at identifying alterations made to faces belonging to their own age group. These results support a perceptual expertise explanation of the own-age bias.

Acquiring expertise in the mental manipulation of visual images: Visual brain activity associated with extensive practice in a mental rotation task.

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We examined the effects of practice on event-related brain responses measured during performance of a Shepard-Metzler mental rotation task. 64 channel event-related potentials and 160 channel event-related magnetic fields were measured concurrently from 12 participants before practice, and again after a week of intensive daily practice with the mental rotation task. T1-weighted magnetic resonance imaging structural brain scans were obtained from all participants in a separate session. Pre-practice reaction times increased monotonically as a function of angular misorientation of the visual stimuli, confirming that participants were performing a mental rotation of the images. Post-practice reaction times were flatter, indicating that subjects were no longer using a mental rotation strategy. Practice-related changes in late-latency cognitive brain responses are described in a companion report at this meeting (Provoet et al., 2009). An unexpected finding was that an index of relatively early visual cortical processing, the P100 component was markedly enhanced in the post-practice ERPs. These results suggest that extensive practice with a visual imagery task involves plastic changes in visual cortex at quite early stages of visual processing. These changes may facilitate subsequent attentional and cognitive processing of visual features. We conclude that the acquisition of expertise in spatial imagery is supported by changes to multiple stages of brain processing.

As time goes by: Temporal construal moderates the effects of category variability on belief revision

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Two experiments examined the effect of category variability on updating of category beliefs. In Experiment 1, participants learned about categories via exposure to numerical distributions of category attributes. These distributions had the same mean value, but had either high or low levels of variability around the mean. After category learning participants were shown new category exemplars that contradicted the acquired beliefs (i.e. drawn from a sample with higher or lower means) and were asked to re-estimate the category central tendency. Importantly, this new data was purportedly sampled ten years after the original sample. Beliefs about the attributes of low variable categories were more strongly influenced by disconfirming information than beliefs about the attributes of high variable categories. In Experiment 2, the same procedure was followed except that half the participants were told that the training data and the new, contradictory exemplars were drawn from the same sample (i.e. no ten year interval between training and test exemplars). Under these conditions, beliefs about the attributes of the categories were still influenced by disconfirming information, but the effect of variability was attenuated. This suggests that temporal construal is an important factor in determining responses to disconfirming information. The results are discussed in terms of Bayesian models of belief revision.

Does looking down influence our mood?

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Meier and Robinson (2004, 2006) had subjects evaluate affectively toned words that were shown to them either at the top or the bottom of a computer monitor. Reaction time to evaluate positively toned words was faster when they appeared at the top of the screen and slower when at the bottom. Negatively toned words were evaluated faster when they appeared at the bottom of the screen. The present study was an attempt to extend this finding to non-verbal stimuli i.e. scenes taken from the International Affective Picture System (IAPS). A between group design had three groups of subjects affectively evaluate previously normed neutral words appearing either at the top only, middle only, or bottom only, of a computer screen. At the conclusion of the study subjects evaluated their own mood. There was no difference in the overall affective evaluation of the stimuli as a function of screen position but those subjects evaluating stimuli at the bottom of the screen rated their mood at completion as being lower than those evaluating stimuli at the middle or the top of the screen. The results lend partial support to a theory of embodied cognition in general and to embodied emotions in particular.
No 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 inferior performance on attentional blink tasks; however, some ambiguity remains as to the nature of these deficits 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.

Neuro-motor coordination in developmental disorders: new research directions

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Developmental disorders including attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorder (ASD), and dyspraxia adversely affect the normal development of a growing child. The anomalies during ontogeny are characterized by a heterogeneous combination of cognitive, affective, and motor dysfunction, of which the latter appears to be the common denominator. Research into the development of motor function in these disorders reveals a central poverty of neuro-motor coordination. The neuro-motor deficit, namely ‘clumsiness’, may be among the earliest symptoms of the disorders but very little is known about the neurological bases of the problem. We investigated the mechanisms that underlie this problem by measuring brain activity from seven healthy subjects with magnetoencephalography (MEG) and electroencephalography (EEG) in a bimanual load-lifting task. Subjects were asked to maintain the elbow joint at a desired angle when a weight was placed on the forearm. In an imposed condition, the experimenter lifted the weight unexpectedly and an upward deflection of the forearm occurred as a result. In a voluntary condition, the subject lifted the weight with the other hand and forearm deflection was attenuated. Current analyses are aimed at elucidating the system of motor control mechanisms involved in anticipatory postural adjustments by comparing brain activation patterns elicited in the two conditions. Future work will compare these anticipatory control systems in normal and autistic samples. This program of work will establish a rigorous experimental paradigm for studying neural mechanisms of high-level motor control in clinical populations.

Acquiring expertise in the mental manipulation of visual images: Cognitive brain activity associated with extensive practice in a mental rotation task.

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The ability to imagine the rotation of an object, referred to as mental rotation, is fundamental to many aspects of cognitive functioning. The capacity to improve this skill through training is important for education in a range of disciplines. Theories from both cognitive science and brain sciences propose that when participants repeatedly practice with the same stimuli improvements in mental rotation occur not by developing this specific spatial ability but result from a shift in strategy to categorisation. This change in strategy corresponds to the development of automaticity, whereby responses are difficult to inhibit and resistant to distraction. We examined the effects of practice on the development of automaticity by collecting reaction time (RT) and event-related brain responses during performance of a Shepard-Metzler mental rotation task. Brain activity was measured with concurrent electroencephalography (EEG) and Magnetoencephalography (MEG), from 12 participants before and again after practice with the same stimuli. Analysis of pre-practice RT showed a monotonic increase as a function of angular mismatch between a constant standard and the test image, consistent with participants mentally rotating the images. Every participant’s mean RT and variability in RT showed a marked decrease with practice, while accuracy remained high, and their performance quickly became insensitive to rotation angle. Brain responses measured prior to training showed an orientation-sensitive component over the parietal cortex at approx. 300-500 ms post stimulus, an established electrophysiological marker of mental rotation. Post-practice brain responses lacked this component and had an enhanced and earlier latency P300 component compared to pre-practice responses. These results show that practice-related changes in cognitive strategy are associated with robust changes in measures of cognitive brain activity.
Mathematics and reasoning are often assumed to be dependent, however, little research has directly examined whether task performance in these domains is comparable. Further, the ability to detect errors is important in both mathematics and reasoning tasks, as correct problem-solving involves monitoring of performance. The current study aimed to explore the relationship between error detection in these two domains and the factors which influence error detection performance. It was hypothesized that performance on the two domains would be related and that confidence would positively correlate with performance, particularly for mathematical error detection. The reasoning task used was the Wason card task. Despite being well-researched, the actual mechanisms used when solving the Wason are still debated. Hence, task manipulations were included to determine whether matching of the rule and cards was likely to be occurring and whether the two forms of the task, social and abstract, interact. Mathematical stimuli were from four areas of mathematics; algebraic calculation, mathematical statements, fractions and power calculations.

Undergraduate students (N = 74, Mean age = 18.94) were instructed to detect errors in a series of randomly presented correct and erroneous stimuli. Stimuli were presented in three randomly-ordered blocks; abstract Wason, social Wason and mathematical. Contrary to predictions, performance on the Wason and mathematical tasks was not related. Ratings of confidence, ability and enjoyment of mathematical and logic tasks were related to each other and formed a single factor through factor analysis. Similarly, as hypothesised confidence predicted performance for the mathematical tasks but not for the Wason. For mathematical error detection tasks the area of mathematics was found to interact with the stimulotype (correct vs. erroneous), such that for the harder areas participants were more accurate at detecting erroneous stimuli than correct. For the Wason the form of the rule had an effect on ability to detect errors: rules of the form "If P then not-Q" had the greatest success rate and "If P then Q" the worst, suggesting that matching may be occurring. Wording also interacted with the context of the task and the stimuli type.

Finally following from previous research the scores for the social contract version of the Wason were greater than those for the abstract version. Further, it was found that block presentation order did not influence performance, suggesting that simply completing the social task does not facilitate performance in the abstract task. Overall, these results suggest that mathematical problems and deductive reasoning as measured by the Wason are not related even though confidence on mathematics and logic/reasoning is. Further confidence predicts error detection in mathematics while the task type, context and wording are important for the Wason.

In a bind! What do change detection tasks tell us about visual working memory representations?

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Cognitive psychologists investigating the nature of visual working memory (VWM) representations can roughly be divided into two camps: some propose VWM representations to be integrated wholes that store all the relevant visual features associated with a remembered item (e.g. Luck and Vogel, 1997), while others posit the existence of parallel visual feature stores, each specific to a different visual feature dimension (e.g. Wheeler and Treisman, 2001). A common paradigm used to study this question is the change detection task (CDT), which requires participants, after being presented with two images separated by a delay period, to determine if a change has occurred. A striking feature of this task is the effect the nature of the second display — whether it is a single item or a multi-item display — has on the pattern of results. Namely, when presenting multiple items in the second display, participants are worse at detecting binding changes (the swapping of visual features between items) than novel changes (the addition of novel visual features to the second display). This "binding deficit" is, however, absent when presenting a single item in the second display.

Given these differential effects, it is difficult to determine whether performance in a CDT is due to the nature of VWM representations or to the effect the second display has on VWM storage. One way to circumvent this potential confound is to present a retro-active cue — an informative cue which allows participants to orient attention to a single item in VWM — between the first and second display in a CDT. Using such a modified CDT, I present results which provide evidence against an “integrated wholes” account of VWM representations. Instead, the results are explained well by accounts of VWM storage involving independent visual feature stores, with additional processes or representations responsible for maintaining binding information in VWM.
How space gets into language: Evidence from language acquisition

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There is a dearth of research regarding expressions of space in language, or prepositions (e.g. “in”, “at”, “from”, “to”). Some theoretical proposals offer evidence that their “core” function is to express inclusion between two or more objects, which can be stable or changing over time. In this latter case, it can be a consequence or a premise of the change (Cresswell 1978, Parsons 1990, Kracht 2002, Zwarts 2005). In English, four prepositions capture these notions, as the examples (1)-(4) show:

(1) All the trains are in the shed (necessary inclusion; stable)
(2) All the trains are at the shed (possible inclusion; stable)
(3) All the trains walk to the shed (possible inclusion; consequence)
(4) All the trains move from the shed (necessary inclusion; premise)

In Language acquisition, there is a dearth of research on the acquisition of prepositions, with some works claiming that children access an adult-like reading once they learn these words (Stringer 2005,2006) while others claim that children interpret prepositions in a substantially non-adult way, since they are assumed not to understand such notions (Tomasello 1992, Bowerman & Choi 2005).

In this poster I present evidence that children, can properly interpret sentences (1)-(4) once they learn the meaning of “in”, “at”, “to” and “from”, hence offering an argument in favour of the continuum hypothesis (Pinker 1984).

I present data from one longitudinal study (August 2008-June 2009) focused on one Australian-speaking child, Terrence P. (age 3;1-3;11), who has been interviewed and recorded on videotape on a fortnightly basis, in 1-hour long sessions, for a total of 18 sessions (except for holiday periods). This child has been tested by using two tasks: the act-out task and the truth-value judgment task (Crain & Thornton (1999)).

In the act-out task, reserved to “dynamic” prepositions, the experimenter used a puppet (Godzilla) to ask the child to carry out a task, e.g. Godzilla asked the child to take the trains to the shed.

In the truth-value judgment task, Godzilla asked instead whether it was true or not that trains went to the shed, once the task was over. For the act-out task, the task is considered “complete” when the child complies to the request, “fail” when the child claimed to have completed the sentence before time, and “other” when the child got distracted.

For the truth-value judgment task, the task is considered “true” when the child accepted a sentence as a true description of the events, or rejected it when it is not. It is considered “false” when the child accepted a sentence which is not a correct description of the events, and “other” when the child did not answer or got distracted.

I present the results of the study, which suggest that children understand the “core” prepositions in an adult-like way, offering support to the continuity hypothesis.

(Numbers are in percentages. Act Out task: “in”: 84; “at”: 80/6/14; “to”: 78,29,2/11,8; “from”: 77,6/7/18,4; “from”: 77,7/4,4/17,7.)
Enduring knowledge structures about oneself (e.g., whether one is lovable) and one’s world (e.g., whether others can be trusted) begin to develop very early in life. Apart from providing a framework through which to view events in one’s life, these schemas, when triggered, provide a cognitive shortcut that allows rapid (and often automatic) processing of familiar information and the production of linked action tendencies. Such schemas become maladaptive when they elicit automatic responses that consistently lead to undesirable outcomes. These ‘early maladaptive schemas’ are linked to a range of negative life outcomes including low self-regard, relationship difficulties, depression, suicide, personality disorders, and other forms of mental illness. Therapies based on changing early maladaptive schemas have assumed an origin in harsh and punitive early parenting, but there has been little research that has examined this proposition directly. In the first study, 443 students provided recollections of their early parenting experiences and were then tested for various maladaptive schemas. It was found that (1) participants who recollected having experienced one type of harsh or abusive behaviour in their early home usually remembered having experienced many, (2) participants who had one maladaptive schema tended to have many, and (3) harsh and abusive behaviour from the mother had a stronger effect on schema development than similar levels of harsh and abusive behaviour from the father. In the second study, a subset of 71 participants was tested for a specific schema that links aggressive responding to a perceived loss of control over one’s environment. Each participant was exposed to an aversive noise over which they had no control and measured for aggressive responding using the hot sauce paradigm of Lieberman et al., 1999. The strength of the ‘control-aggression schema’ robustly predicted the degree of aggressive responding. Interestingly, recollections of harsh and abusive parenting by the mother but not the father predicted the degree of aggression, even though harsh and abusive parenting by both predicted the strength of the schema. The implications for theories of schema development are discussed.