

CNCC Final Conference

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Abstracts (tentative)

Session 1 - Subjects, others and objects

Organiser: Andreas Roepstorff (BASIC)

Gesture as thought?

Andy Clark, University of Edinburgh (CONTACT)

Is gesture all about the expression of fully-formed thoughts, and thus mainly a prop for inter-agent communication (listeners appreciating meanings through others' gestures) or might gesture function as part of the actual process of thinking? I shall argue, drawing on work by David McNeill and Susan Goldin-Meadow, for an understanding of gesture as partially constitutive of certain acts of thinking. The act of gesturing, I shall suggest, is part and parcel of a coupled neural-bodily unfolding that is itself best seen as an organismically-extended process of thought. In gesture we plausibly confront a pervasive and concrete example of a cognitive process whose implementation involves machinery that loops out beyond the purely neural realm. I end by examining various challenges to this radical view of gesture, some of which suggest possible avenues for future research and experiment.

Animal metacognition: the extended mind in self-interaction

John David Smith, University at Buffalo, the State University of New York (METACOGNITION)

Michael J. Beran, Georgia State University (METACOGNITION)

We will review the rapidly developing area of comparative metacognition research. First, we describe the Phase I perceptual studies that demonstrated animals' basic uncertainty responding. The metacognitive, self-reflective interpretation of these studies is debated given alternative interpretations. Second, we describe the Phase II studies that evaluated these alternative interpretations. These studies strengthen the evidence that animals and humans have functionally parallel uncertainty systems. These studies also recommend that this field let go its present emphasis on associative / behavioral interpretations of existing data. Third, we envision the Phase III studies that may best illuminate the cognitive organization and cognitive level of metacognitive processes in the animal mind. We will consider, by examining the emerging data from several pilot studies, how one might study whether uncertainty processes are executive, attentional, reflective, declarative, and imbued with conscious awareness. Researchers of animal metacognition have opened a new window on reflective mind in nonhuman animals. They may be close to demonstrating that metacognition shows an extended animal mind in self-interaction.

Interobjectivity: extended minds in interaction*Andreas Roepstorff, University of Aarhus (BASIC)*

In a canonical paper, *On Interobjectivity*, Bruno Latour argued for the importance of things in mediating and structuring human relationship. Recent social neuroscience highlights the interaction between individuals as an attempt at getting at “the social brain” or other markers of intersubjective behaviour. However, only few studies have attempted to look more systematically at interobjectivity as instances of materially mediated action, interaction and perception. In my paper, I will review some recent papers on “the social neuroscience of things” in order to explore links between the intersubjective and the interobjective brain.

Self-conscious emotions: shame and the exposed self*Dan Zahavi, University of Copenhagen (BASIC)*

What can an emotion like shame tell us about the nature of self? In my talk I will compare and contrast Sartre’s classical discussion of shame in *L’être et le néant* with some more recent empirical work on the relation between self-experience and self-conscious emotions that we can find in Lewis and Reddy. Ultimately, I wish to suggest that a closer study of complex emotions like shame can add important facets to our understanding of self and in particular help bridge the gap between two notions of self that have been discussed extensively in recent years, namely the basic notion of an experiential core self and the richer notion of a narratively extended self.

Session 2: Spatial and language processing for action

Organisers: Yann Coello and Angela Bartolo (CEWR)

About the session:

One of the classical views in cognitive science is that processing of visual stimuli for language comprehension and for goal-directed behaviour is based on different cognitive resources involving independent neuronal substrates. However, interacting with elements in the external world often requires processing visual information according to action possibilities and action-related information in a semantic or linguistic context. Recent data have indeed suggested strong interactions between motor representation, spatial perception and language processing. By bringing together neuroscientists and philosophers experts on embodied perception as well as on language and action interaction, the aim of this session is to deepen our understanding of the relation between the representations used for language production and understanding, and the representations used for controlling intentional behaviour.

Sensorimotor simulation and embodied cognition: the case of apraxia*Julian Kiverstein, PPLS, University of Edinburgh (CONTACT)*

Mounting evidence from cognitive neuroscience and experimental psychology seems to support a role for simulation of an agent’s sensorimotor interaction with the environment in conceptual thinking. This work seems to show that it is a mistake to think of conceptual thinking as something that is mediated by amodal, abstract, disembodied symbols. Instead, at least some of our concepts have a meaning that is grounded in sensory and motor simulation of our embodied interaction with the world. Despite this evidence it remains unclear in exactly what way sensorimotor simulation might contribute to a concept’s meaning. Is it necessary for a thinker to re-enact her past experience of sensorimotor engagement with the environment in order to grasp a concept’s meaning? Does this kind of sensorimotor simulation simply provide a kind of optional “colouring” to conceptual thinking that could well be lacking without this in any way compromising a person’s thinking? I will dip into some of the neuropsychological literature on apraxia in order to assess the extent to which it may help us to resolve this issue. Mahon & Caramazza (2008) have appealed to apraxia as an example of a disorder in which patients are impaired for using an object while being more or less normal in the naming of objects and in action recognition. What, if anything, can apraxics tell us about the relationship between concept-mediated recognition and sensorimotor behaviour? Do apraxics have a disembodied understanding of the objects they can name?

In what way, if any, is the apraxics understanding of concepts that name tools different from an agent with normal sensorimotor capacities?

Monitoring the emergence of shared neuronal circuits between action and language

Tatjana Nazir, ISC-CNRS, Bron (BASIC)

When listening to verbal descriptions of body movements or actions (e.g. a soccer game on the radio), areas of our brain that plan and program the execution of motor actions become active even though we do not perform the movements ourselves. By working with patients that suffer from Parkinson's disease (a neurological disorder that affects motor functions) and through the analysis of an electrophysiological marker that indexes semantic processing of words, our team could show that this motor activity contributes to language understanding. Here, we will show how such shared cortical networks between language and action emerge. For this we trained healthy participants to associate novel verbal stimuli with either images ("learning nouns") or with the execution of an action ("learning verbs") and monitored brain oscillations (mu rhythm in the EEG) throughout the learning period. Following few hours of training, clear differences in the evolution of brain oscillations to verbal stimuli associated with images and those associated with motor actions appeared. The ease with which such shared circuits evolve suggests a significant role of these circuits for language understanding and for higher cognition in general.

Motor representation and language for space and movement perception

Yann Coello & Angela Bartolo, University of Lille (CEWR)

Recent experimental works have provided converging arguments suggesting that space and movement perception can be influenced by motor representations. Motor representation can be viewed as a component of a predictive system, which includes a neural process that simulates the dynamic behaviour of the body in relation to the environment. The function of the predictive system is thus thought to provide the self with information on the feasibility of deployable actions and then to contribute to the perceptual organisation of external space in relation to body and action. Behavioural and fMRI studies that support this assumption will be presented. Motor representations are also involved in social interactions by providing a mean of interpreting actions performed by others and dynamically cooperating with them. In agreement with this, empirical data will be presented that show that the perception of human movement improves when motor representations are activated through priming effect of prior action observation, action production or language, in particular action words.

Session 3 - Externalising metacognition

Organiser: Joëlle Proust (METACOGNITION)

About the session:

The question is how our reflexive, self-monitoring abilities can depend on - be enhanced or diminished, or even made possible by - our technical, physical or social environments.

The externalist constraints on self-evaluation

Joëlle Proust & Anne Loussouarn, Institut Jean-Nicod, EHESS, Paris (METACOGNITION)

Change blindness consists in the cognitive difficulty of detecting change in a flickering paradigm, where two alternating stimuli are presented. Our research on retrospective metaperception in subjects confronted to this task suggests that detection, as well as feeling of feasibility, is modulated by the comparative difficulty of the order in which stimuli are presented, while self-evaluation depends, for its reliability, on the quality of the feedback delivered to the subject. We will argue that these results are coherent with an externalist view on control and monitoring, and their respective norms.

External and explicit: encouraging knowledge integration via explicit metacognitive prompting while learning complex tasks

Steve Fiore, University of Central Florida (BASIC)

A hallmark of the development of expertise involves moving from isolated and superficial understandings of concepts, to more structured and interrelated chunks of knowledge that are coherent and easily accessible. Exceptional learners often engage in metacognitive processes where they seek out and make connections amongst the concepts they are learning, thus facilitating their expertise development. I report findings from experiments designed to scaffold such processes by making explicit and external the knowledge integration process as learners work through complex training materials (e.g., understanding the principles of flight). The data suggest that learners prompted to externalize connections they see amongst concepts perform better on tasks requiring well-integrated and coherent knowledge structures.

The extended will

Till Vierkant, University of Edinburgh (CONTACT)

In this paper I will argue that the will consists in our ability to influence our mental attitudes by what has been called managerial control. If this is right then the will is a prime candidate for vehicle externalism.

Session 4 -The uncertain mind

Organiser: Tjeerd Jellema, University of Hull (Boundaries)

About the session:

Human (re-)conceptualization is continuously taking place through interaction with the environment, which is partly shaped by humans themselves as external resources for reasoning in the form of images etc., an idea stemming from the extended mind theory. When re-conceptualization is needed because of acute changes in the environment, or because the image (visual stimulus) we are presented with is ambiguous, the mind is basically thrown into a state of uncertainty. We ask: what are the processes that aim to solve this uncertainty, and what are the factors that facilitate or impede them (perceptual and mental)? Such factors may include the flexibility of our visual system in trading concepts and the presence of preconceptions. Further, we ask what is the range of individual abilities humans are endowed with to overcome the uncertainties, are there tendencies (preferences) for certain solutions/strategies above others (comparison of typical and autistic individuals)? In particular we are interested in different strategies in dealing with ambiguous (morphed) figures of biologically and culturally defined (man-made, inanimate) objects.

Intersubjectivity and the extended mind

Nivedita Gangopadhyay, University of Bristol (CONTACT)

This paper focuses on what grounds the extended mind hypothesis (Clark & Chalmers 1998, Clark 2008). The original motivation of the extended mind project, also called vehicle externalism (Hurley 1998), stems from a number of thought experiments, everyday use of artefacts, and recently as Clark (2008) shows some successful applications of the extended cognition intuition in the field of robotics and artificial intelligence. In this paper I explore the role of intersubjectivity as providing support for vehicle externalism. A main claim to be defended by way of defending vehicle externalism is the elimination of the boundary between perception and action (Chalmers 2008). I explore the possibility that intersubjectivity may supply the much needed interdependence of perception and action. Although Clark & Chalmers (1998) briefly hint at it and cognitive scientists have attempted to explore it (e.g. Hutchins 1995) the philosophical significance of intersubjectivity in the extended mind approach remains to be discussed.

Solving visual ambiguities in autism spectrum disorders

Tjeerd Jellema and Hollie Burnett, University of Hull (Boundaries)

The visual images that we daily experience are often ambiguous with respect to their interpretation. The human visual system seems adeptly tuned to resolving such ambiguities in order to create certainty. Remarkably, this ability to solve ambiguities differs greatly between individuals. Studying the range of these individual differences may yield important information about the underpinning mechanisms/strategies and the factors that facilitate or impede it.

In this study we discriminated between (1) the ability to identify an ambiguous image while its shape gradually morphed into a known object (i.e. concept-forming), and (2) the ability to trade one unambiguous concept for another unambiguous concept (i.e. concept-switching). We also investigated the influence of the nature of the concept by contrasting biological (animate) objects with culturally-defined (man-made, inanimate) objects. To cover a wide range of individual differences in ambiguity solving, we included the following four groups of participants: (i) typically developed individuals with a low score on the Autism Quotient (AQ) questionnaire, (ii) typically developed individuals with a high AQ score, (iii) individuals with Asperger Syndrome, and (iv) individuals with Autistic Disorder. These four groups represent a continuum ranging from none to many autistic traits.

The results indicated that the ability to solve visual ambiguities is particularly vulnerable when it involves trading an initial concept (whether animate or inanimate) for an animate concept. In contrast, switching to inanimate, man-made concepts seemed much more robust, as it remained intact even in the most severe autistic individuals. The concept-forming ability does not seem to be affected along the autistic continuum. I will discuss the findings in relation to the extended mind theory, which claims that human (re-)conceptualization is continuously taking place through interaction with the environment, which is partly shaped by humans themselves in the form of external resources for reasoning such as man-made objects and images.

Dealing with uncertainty in reaching

Jeroen Smeets, VU University Amsterdam (CEWR)

When reaching out to place for instance a cup on a saucer, we need to know how far the saucer is, and its orientation. We have several information sources (cues) available to determine these properties that can be divided in monocular and binocular information. Sometimes these cues are in conflict. For instance, when looking at a table that is depicted in a painting, binocular cues tell that objects are all in the vertical plane of the painting, whereas the monocular cues suggest a horizontal table. How do we resolve this? If the conflict is small, a weighted average is generally assumed, with weights depending on the uncertainty of the cues. We will show that this is not the complete story, but that our experience plays an important role too.

Perceptual ambiguities in the uncertain mind

Johan Wagemans, University of Leuven (Boundaries)

Uncertainty pervades the visual system throughout, from the incomplete and noisy information bombarded on the retinae to the final stage of conscious percepts or visually guided actions. A special case, which has interested philosophers, psychologists and neuroscientists alike, are so-called perceptual ambiguities in which the visual system switches from one interpretation to another, without any change in the visual input. A major reason why this phenomenon has sparked so much interest is that it demonstrates the subjective nature of visual perception and the stochastic and dynamic nature of the visual system. In this talk, I will try to distinguish and characterize a number of different cases of perceptual ambiguities. Perceptual ambiguities can arise because the stimulus underdetermines the percept. In the majority of cases, the underdetermination results from ambiguity or noise at the stimulus level. Sometimes the percept remains vague or ambiguous, but more often one possible interpretation dominates and enters consciousness. Switches can then occur because alternative interpretations of the same ambiguous or noisy information can arise when further processing takes place (e.g., re-iterating the disambiguation or noise removal processes). In other cases, the stimulus itself is in a sense well-defined and clear, but yet two or more alternative interpretations are possible, for instance, when the same two-dimensional line drawing can be interpreted as two different three-dimensional objects (e.g., the Necker cube) or as two different figure-ground organizations (e.g., the vase-face figure). The extent in which processes like adaptation (i.e., the fading of the current representation) and suppression (i.e., the active inhibition of one representation by another) are involved constitutes an important line of research. Some of the processes involved may be the same in these different cases but others will be

different. Hence, a systematic discussion of the different types of ambiguities may provide a first step towards a better understanding of the processes that are involved. In our discussion of these phenomena and the hypotheses about the underlying mechanisms, I will focus on cases that have been studied within our "Boundaries of Mind" projects, especially the switching between two percepts in cases of ambiguous figure-ground assignments and ambiguous figures resulting from morphing between pairs of images of existing objects.

Session 5 - What are the connections between social cognition and individual consciousness?

Organisers: Cristiano Castelfranchi and Fabio Paglieri (CONTACT)

Self-control as social interaction: metaphors, strategies, and problems

Cristiano Castelfranchi & Fabio Paglieri, Istituto di Scienze e Tecnologie della Cognizione (CONTACT)

Studies on self-control and willpower have often implicitly assumed or explicitly defended a *social view of the self* as a multitude of interacting agents, striving to negotiate the system's overall conduct as a form of temporary equilibrium. Depending on the approach considered, such agents are characterized at the personal or sub-personal level, and the relevant dimension of variation also changes: temporal, hierarchical, or motivational. The general structure of a self-control problem consists of (i) a conflict between incompatible goals, with (ii) one of them being dominant over the other, and yet (iii) being also considered, according to some criterion, sub-optimal by the decision maker. The dominant-but-suboptimal goal is often described as some kind of impulsive, emotional, "hot" drive, while the optimal-but-weaker goal is taken to indicate some kind of farsighted, rational, "cool" objective of the system. This reveals a widespread bias towards *lack* of self-control as the problematic phenomenon, but there are well-documented cases where *excess* of self-control is the real problem: optimal-but-weaker impulses may fail to overcome stronger-but-suboptimal rational concerns, e.g. missing out the pleasures of life due to self-abnegation.

In this talk we focus on self-control problems in *intertemporal decision-making*, with an emphasis on two main lines of research:

1. *Strategic interaction between subsequent temporal selves*: building on existing psychological evidence and economical models, we suggest several ways in which game theory can be used to capture important anomalies of self-control, as well as the implications of such models for philosophical theories of the will. Two main strategies for self-control will be considered: using external constraints to support the agent's self-control, be they physical boundaries limiting future options for action (e.g. Ulysses tying himself to the mast to survive the Sirens) or incentives/disincentives changing future payoffs (e.g. paying in advance a monthly fee to ensure one's own attendance to the gym); and setting internal policies that help overcoming present temptations by making us decide according to principles, i.e. following some personal rule.
2. *Self-directed mindreading, self-image, and self-control*: we argue that social cognition abilities directly affect the way in which we infer and conceptualize our past, present and future mental states, and that this self-interpretative effort is mainly aimed at (i) influencing our own conduct and (ii) strategically cooperating with our future selves. Here cooperation is a richer notion than mere coordination: the Present-Self is interested in the Future-Self's motives not only to factor them in the current decision, but also to evaluate what social attitude is warranted towards the Future-Self (trust, delegation, reliance, etc.). The role of self-image in these intrapersonal interactions is also discussed.

Social gaze and joint attention

Leonhard Schilbach, University of Cologne (BASIC)

Following a naturalistic approach, neural correlates of intersubjectivity can be explored on the basis of adequate empirical indicators employing functional magnetic resonance imaging (fMRI). Intersubjectivity

as the capacity to adequately ascribe/exchange mental states to/with others for the purpose of communicating and interacting with others can be reliably studied in the domain of “social gaze” that serves as indicator both of covert cognitive processes and also constitutes an important overt communicational social cue. “Social gaze” appears to be a particularly interesting empirical indicator for pre-reflexive social cognitive processes, both with respect to ascribing mental states to others (person perception) and interacting with others (joint attention). In a person perception task, we systematically varied the time with which participants were gazed at by a virtual character. We found increased neural activation with increasing gaze duration of directed gaze in the medial prefrontal cortex (MPFC) (Kuzmanovic et al., Neuroimage, in press). In a related study we operationalised joint attention by systematically varying the gaze responses of virtual characters depending on the gaze behaviour of participants. Results showed, first, increased neural activation in the MPFC as correlate of successfully established instantiations of joint attention, and, second, an activation of the ventral striatum (as part of the reward system) in cases in which the participant was the “leader”, but not “follower” of the joint attention event (Schilbach et al., in revision). These data corroborate the essential role of the MPFC in social cognition and shed light on the neural mechanisms of basic non-verbal communicative processes such as social gaze.

Overextended minds: social and institutional cognition

Shaun Gallagher, University of Central Florida (BASIC)

What can we learn from the extended mind hypothesis about social cognition, or vice versa? I will suggest that conscious processes involving problem solving and behaviour regulation can take advantage, not only of the kind of social interactions involved in intersubjective and group settings, but also through interactions with social institutions. Individual mental processes can supervene on social practices and institutions.