INTERACTING MINDS IN COLLABORATION

28 – 30 September 2016

AARHUS UNIVERSITY

IMC

The Interacting Minds Centre for the Study of Cognition, Communication and Choice.

In 2012, The Interacting Minds Centre was established at Aarhus University as part of a strategic initiative to foster interdisciplinary and cross-faculty collaborations. The first five years are coming to an end, it has been a wonderful, inquisitive, and fun journey; and it is set for continuation; the Faculty of Arts has decided to support the Centre 2017-19 with a generous core grant. This event also marks 10 years of collaboration with Chris and Uta Frith. Since 2007 they have been visiting professors at Aarhus University, closely following and nurturing a whole generation of researchers.

The Interacting Minds Centre (IMC) provides a transdisciplinary platform to study human interaction. It involves researchers from the humanities, social sciences, cognitive sciences, biology and clinical research. This is necessary, because through interactions, humans construct worlds that are at once physical, economic, symbolic and normative. This workshop is dedicated to the three themes: cognition, communication, and choice.

Wednesday 28 September

Auditorium 1 – 1441-012, Tåsingegade

COGNITION

9.00-9.30 Welcome by Vice-Dean **Anne Marie Pahuus**, Faculty of Arts.
Head of the IMC Board **Armin W. Geertz** and Director **Andreas Roepstorff**

9.30-10.15 **Uta Frith**, UCL & **Chris Frith**, Wellcome Trust Centre for Neuroimaging

Interacting Minds - a brief history

10.15-11.00 **Jakob Hohwy**, Cognition & Philosophy Lab, Monash University, Melbourne

Better believe the free energy principle
Many believe that an important part of brain function is to form predictions of sensory input. Fewer believe the free energy principle, which is an extreme version of the idea that the brain is predictive. So it ought to be reasonable to believe that prediction is an important part of brain function while not believing the free energy principle. Using simple considerations from philosophy of science, I argue that if one begins with the idea that prediction is an important part of brain function, then it is reasonable to also believe the free energy principle.

11.00-11.30 Coffee

11.30-12.15 **Micah Allen,** University College London

Towards a Computational Embodied Mind: How Interoceptive Predictions Shape Visual Awareness
The subjective feeling of confidence is a core element of successful decision making, and is an common behavioural marker of conscious awareness. How does this feeling arise; what are it's constitutive elements? While predominant approaches emphasise the role of feed-forward sensory processing, predictive coding instead views confidence as a higher-order belief incorporating the precision of both sensory (exteroceptive) and bodily (interoceptive) states. I will present a series of empirical studies using psychophysical, model-based, and physiological measures, to suggest that metacognitive awareness is best described as a form of embodied active inference.

12.15-13.30 Lunch break

13.30-14.15 **Andy Clark**, University of Edinburgh

Control and Coordination for the Predictive Mind
Recent work in computational and cognitive neuroscience depicts the brain as an ever-active hierarchical prediction machine. This vision turns out to dissolve the once-stark opposition between efficient, slimline ('model-free') and flexible, knowledge- rich ('model-based') mechanisms , while enabling the use of multiple fast and frugal routes to adaptive success. This delicate balancing act is made possible by variable estimations of the preci-

sion (inverse variance) of different aspects of the predictive regime. In this talk, I describe this emerging picture of context-variable control. I end by raising some questions concerning variable precision estimation in social and collaborative contexts - contexts where each agent's estimates depend upon, and sensitively implicate, those of the other agents.

14.15-15.00 **Julian Kiverstein**, University of Amsterdam

A Role for Affective processes in Top-Top Control

When two or more people engage in interaction in collaborating on a joint task or in having a conversation their actions must coordinate. My talk will start from the increasingly well-confirmed hypothesis that coordination requires mutual prediction – each interaction partner must be able to accurately and precisely anticipate what the other is going to do, and respond accordingly. I'll argue that this type of mutual prediction depends upon cultural consensus – patterns of relatively stable and regular activities found in social groups. Social perception informed by extensive cultural experience, and values acquired in practice allows me to coordinate my actions with the other person. Chris Frith has argued that culture influences individual behaviour through mechanisms of top-down control. At the highest levels of hierarchical organisation in the brain, we find models of action control that are the product of the unique human ability to reflect upon and talk about their experiences. I will argue that affective processing in the form of patterns of action readiness may also play a key role in mutual prediction. People learn from others the regular ways of going on found within their social groups. They come to embody affective states of anticipatory action readiness that are the result of instructional and observational social learning. Affective processing is often taken to be automatic and implicit, a distinct mode of processing from the reflective and deliberative mode of processing Frith associates with top-top control. If one takes this view of affective processing it would follow that Frith is wrong to equate mutual prediction with top-top control. I will argue for a different conclusion that affective processing has a central role to play in top-top control, and thus it would be a mistake to equate affective processes with implicit and automatic modes of information processing.

15.00-15.30 Coffee

Thursday 29 September

Meeting Room 2, AU Conference Centre, Fredrik Nielsens Vej

COMMUNICATION

9.00-9.45 **Joanna Rączaszek-Leonardi**, Polish Academy of Sciences and University of Warsaw

Coordination through language on two time-scales: The impact of spontaneous conversation and sommelier cards on wine recognition and description

In research on distributed and collective nature of cognition the coordinative role of language comes to the fore. Language acts as control in interaction, constraining individual dynamics to form functional collective systems. Such influence is observed on several timescales. The most obvious is the timescale of on-line communication where language contributes to making interactions functional for a given task. Yet this influence is also seen on a slower time-scale, where the selection of vocabulary and language structures in 'social' and cultural time, constrains the modes of interaction and sensitivity to important dimensions. Operationalization of language's influence in terms of exerting constraints on a system allows for comparing its effects for various systems and across tasks and situations.

In this study we experimentally investigate the impact of two types of language-based coordination on the recognition and description of wine. Participants were asked to taste, remember and successively recognize samples of wines within a larger set of wines. They did it either individually or in (spontaneously conversing) pairs, and with or without the support of a sommelier card (a cultural linguistic tool designed for wine description). Both the effectiveness of recognition, the quality of descriptions, and the kinds of errors in the four conditions were analyzed. While our experimental manipulations did not impact recognition accuracy, bias-variance decomposition of error revealed that pairs generally displayed reduced bias and increased variance compared to individuals, however the variance dropped significantly when they used the sommelier card. This effect of card reducing the variance was not observed for individuals. Subsequent analysis of descriptions generated with the aid of card by individuals and pairs showed that they were more consistent and discriminative in the case of pairs. These findings are discussed in terms of global properties and dynamics of collective systems when constrained by different types of cultural practices.

9.45-10.30 **Dan Bang**, Wellcome Trust Centre for Neuroimaging

Diversity and miscommunication

Groups make bad decisions when there is too little diversity among its members – for example, when individual knowledge is partly redundant, individual preferences are all biased in the same direction or a too narrow part of the problem space is searched. On the other hand, if group members have no shared frames of reference, or common priors, then interaction may be difficult and miscommunication may arise. In this talk, I will discuss the tension between diversity and communication in groups, drawing on the vast literature on group decision-making as well as my own work which has leveraged psychophysics and computational modelling to study how pairs of individuals solve communication problems.

10.30-11.00 Coffee

11.00-11.45 **Guillaume Dumas**, Human Genetics and Cognitive Functions Laboratory, Institut Pasteur

Interacting with others, a challenge for theories & methods in neuroscience
Neuroscience has studied social cognition mostly from a single subject perspective. While this paradox can be explained by the methodological and the financial constrains of neuroimaging, the theoretical grounding of experimental designs seems to have played a role too. We will first review how social neuroscience is currently taking an interactive turn by combining human-human and human-machine real-time interactions with brain recordings. Then, we will discuss the relevance of related results and how they fit in the previous "single subject" cognitive neuroscience literature. This will bring us to introduce social computational neuroscience and how modeling represent an important tool to interpret and glue together different scales of observation and their associated theories. We will finish by presenting ongoing work on autism spectrum disorders, illustrating how a key challenge for cognitive science is to integrate inter-individual heterogeneity and systems biology, not only through innovation at the technical level (e.g. large-scale simulations, machine learning, big data) but also through open science and theoretical plurality (e.g. citizen science, large consortium with data sharing and collaborative developments).

11.45-12.30 Lunch break

12.30-13.15 **Glenda Satne**, Universidad Alberto Hurtado and University of Wollongong

Shared Intentionality and the Cooperative Evolutionary Thesis
One important application of theories of collective intentionality is contributing to explain the evolution of social understanding - and even of human thinking (Tomasello 2014). A promising idea that underlies Tomasello's and others' approach to human evolution is what I will label: The cooperative evolutionary thesis (CET), namely, the idea that human's capacity for social cooperation is at the heart of the capacity of the species to understand other's mental states and behavior leading to an explanation of how humans came to share thoughts and language. However, Tomasello's special attempt to pursue the cooperative evolutionary thesis (CET) faces several problems. In this presentation I will focus on one of these problems: Tomasello et al. understanding of help and cooperation (Tomasello 2014, Warneken & Tomasello, 2006, 2007). I will argue that Tomasello's analysis of cooperation and spontaneous help is problematic. Problems result from assuming that the right account of joint action and simple forms of shared intentionality is given by Bratman's theory of shared intentions. I will end by proposing an alternative framework for understanding shared intentionality that has the resources for overcoming the difficulties and one that can help substantiate CET, a framework that can be productively put to empirical testing.

13.15-14.00 **John Michael**, Central European University

Coordination Creates Commitment
Previous research has shown that interpersonal coordination enhances pro-social attitudes and behavior. Here, we extend this research by investigating whether the degree of coordination observed in a joint action enhances the perception of individuals' commitment to the joint action. In four experiments, participants viewed videos of joint actions. In the low coordination condition, two agents made independent individual contributions to a joint action. In the high coordination condition, the individual contributions were tightly linked. Participants judged whether and for how long the observed agents would resist a tempting outside option and remain engaged in the joint action. The results showed that participants were more likely to expect agents to resist outside options when observing joint actions with

a high degree of coordination. This indicates that observing interpersonal coordination is sufficient to enhance the perception of commitment to joint action.

14.00-14.30 Coffee

14.30-15.15 **Johanna Seibt**, Research Unit for Robophilosophy, Aarhus University

Social Robotics: New Forms of Collective Intentionality, New Types of Responsibility?
'Social robots' are artificial systems that are designed to afford processes of human social cognition. According to recent predictions, social robots will be the central drivers of a particularly disruptive technological revolution of possibly unprecedented socio-economic and socio-cultural impact. In order to address the challenges of the impending "robot revolution" proactively, philosophers need to move from "roboethics" to the new stance of "robophilosophy". Robophilosophy is part of Integrative Social Robotics, a wide-scope interdisciplinary approach to developing culturally sustainable human-robot interaction scenarios. Speaking from the methodological perspective of robophilosophy I will explore in this talk the interplay between theoretical work in social ontology, empirical social cognition research, and social robotics. On the one hand, we need new concepts of sociality in order to understand which types of plural actions we are engaged in when we interact with 'social' robots. On the other hand, social robots also have been used as investigative tools in social cognition research. I shall raise the question of whether and how artificial social agents can shed light on the complex relationship between concepts, phenomenal experiences, and (neuro-)psychological foundations of social interactions.

15.15-16.00 **Simon DeDeo**, Laboratory for Social Minds, Santa Fe Institute, Indiana University

Play: from String Theory and Lyric Poetry to post-war Serbia
From scientific creativity to sociable conversation, some of our most important activities are conducted in the absence of externally-imposed goals. We believe that releasing individuals from constraints will drive long-term social evolution and give meaning to our lives through the creation of unexpected ideas, new needs to satisfy, and further questions to answer. Yet we lack a common language to discuss these activities, which cover a vast range of timescales and population sizes, from the dinner party to the global scientific Enlightenment. This makes it hard to see the similarities that tie them together, the commonalities between the problems they face, or the ways in which we might intervene to assist their flourishing. To help remedy this, I present a new framework for the quantitative study of play, and apply it to a collaborative analysis of three new databases of human behavior: twenty thousand papers in high-energy physics from the arXiv preprint server, eighty years of poetry from a major American poetry magazine, and the collaborative work of fifty thousand editors on Wikipedia. Our methods allow us to see how these different activities confront, and solve, the challenges of perpetual innovation. And they show us how these forms of play lie on a continuum with, and can help inform, more "serious", goal-directed activities such as parliamentary debate in emerging democracies.

Friday 30th September

Meeting Room 2, AU Conference Centre, Fredrik Nielsens Vej

CHOICE

9.30-10.15 **Barry Smith**, Centre for the Study of the Senses, University of London

The Experience of Wine: Experts and Expectations
There is considerable evidence that there is little difference in discriminative powers between wine experts and novices. Both groups perform well when asked to carry out discrimination tasks with the key difference being that experts know they are able to do so while novices believe that they won't be able to do the task and don't know that they have done well. If confidence makes the difference, in what way are expert tasters able to take advantage of their better understanding of their performance to organize their knowledge and build on it? I shall consider the role of meta-cognition in wine tasting and perceptual learning, and how it mediates the interplay between knowledge and sensory sampling.

10.15-10.45 Coffee

10.45-11.30 **Anthony Jack**, Case Western Reserve University

Orthogonal Factor theory: Combining insights from neuroscience and psychology to understand human reasoning and decision making
Despite the growth of research in cognitive neuroscience, in particular brain imaging, it is unclear to what degree work in neuroscience has contributed to psychological theory. One problem is that, historically, neuroimaging predominantly employed a localization of function approach, which relies on forward inference. Two problems with forward inference are: (i) its dependence on pre-existing psychological theory (ii) violation of the assumption that increases in neural activity can be attributed to increased cognitive demands ('cognitive subtraction'). Building off point (i), it is noted that early claims that neuroimaging findings validate psychology's best known theory of human reasoning and decision making, Dual Process Theory, turn out to be false. Reverse inference reveals that otherwise similar controlled and autonomous processes tend to be mediated by the same cortical areas. On the other hand, reverse inference does reveal a clear division of the cortex by domain, such that social and emotional processing is conducted in distinct regions from regions that support non-social general reasoning. Building off point (ii), network approaches support the Opposing Domains hypothesis, which holds that analytic and empathetic thinking suppress each other. Synthesizing these insights from neuroscience with prior research in psychology yields a new two-factor theory of human reasoning and decision making. Orthogonal Factor Theory has yet to be fully validated. Nonetheless, Orthogonal Factor Theory compares favorably to its predecessor, Dual Process Theory. First, it makes more precise empirical predictions, and is therefore more falsifiable. Second, it can accommodate prior findings previously explained by different, and often incompatible, versions of Dual Process Theory. Third, it demonstrates promise for explaining a variety of psychological phenomena, including ethical judgments, supernatural beliefs, economic behavior, normative reasoning and behavior change.

11.30-12.30 Lunch break

12.30-13.15 **Dorthe Døjbak Håkonsson**, Aarhus University

Exploration versus exploitation: Emotions and performance as antecedents and consequences of team decisions

The last decade has witnessed a development in the understanding of emotions in organizations. With the increased acknowledgement of emotions in organizational life, there has been a growing recognition of the importance of team emotions for understanding team dynamics. Most organizational research focuses on team emotions as static 'end states'. This is unfortunate, as we thereby do not gain an understanding of the dynamics of team emotions, and how emotional interactions form and shape team members' decision making behaviors.

We examine team emotions as antecedents and consequences of team strategic decisions to explore a new routine versus exploiting an existing one. In one study, we examine team decision making over time and draw causal inferences about the relationships among team emotions, team performance, and explore-exploit decisions. This study uses self-report data to measure team emotions, and validates results with psychophysiological data. Team emotions are measured at the 'mid-point', i.e. before and after team decision making. In another study, we build on data from the first study to investigate the coordination dynamics of multiple psychophysiological measures and their utility in capturing emotional dynamics in teams. We conclude that team-level measures of synchrony offer new and complementary information compared to measures of individual levels of physiological activity.

13.15-14.00 **Michael Bang Petersen**, Aarhus University

Committing to Collaborate in The Face of Conflict: Intergroup Conflict and Preferences for Dominant Leaders

Conflict is one of the most collaborative of all endeavors and often the best coordinated group wins in intergroup conflict. In a series of studies, we show that intergroup conflict seemingly make people commit to collaboration by following dominant and aggressive leaders who can enforce collective action. In the talk, I will show how this perspective not only sheds light on behavior in the laboratory but also on the differences between conservatives and liberals, how votes are cast in general elections and how the Ukrainians reacted when Russians annexed Chimera.

14.00-14.30 Coffee

14.30-15.15 **Mattia Gallotti**, School of Advanced Study, University of London

Top-Down We-Mode
Talk of the 'we-mode' marks a kind of sociality, people's acceptance of a shared perspective on things that each finds sympathetic. Historically, theories of the we-mode have sought to specify the features, which suffice to make this commonality of vision shared, in ways that make the group prominent and the individual perspective diminished, if not compromised. In this talk, I review the philosophical motives and contributions of current discussions of the we-mode. My goal is to put forward a constructive view in which the positive effects of operating in a we-mode of thought, and narration, are emphasised; and to suggest a framework for developing considerations about the meaning of we-mode claims in the context of scientific explanation.

15.15 - 15.30 Concluding remarks

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