Birkbeck
UNIVERSITY OF LONDON

Symposium Organizers
Professor Valerie Thompson (University of Saskatchewan, Canada)
Professor Ulrike Hahn (Birkbeck College, University of London)
Professor David Over (Durham University, UK)

Location:
Birkbeck College, University of London
Malet Street, Bloomsbury
London WC1E 7HX
Location: Room B20

The 13th London Reasoning Workshop: July 25-26, 2022 - Rm. B20 (talks)

The 13th London Reasoning Workshop
Monday, July 25, 2022

10:30 – 10:50	**Tea and Coffee**
10:50	**Welcome by David Over**
11:00-11:30	**Ruth M.J. Byrne, Sunny Khemlani, and Phil Johnson-Laird** Verification, truth, and counterfactual situation
11:30-12:00	**Annika M. Svedholm-Häkkinen, Mika Hietanen, and Jonathan Baron** A novel measure of the ability to distinguish the strength of everyday arguments
12:00-12:30	**Robert Mackiewicz, Monica Bucciarelli, Sangeet Khemlani, and Phil Johnson-Laird** Informal algorithms for the arithmetic of natural numbers
12:30-13:45	**Lunch**
13:45-14:15	**Niki Pfeifer and Leon Schöppl** Reasoning About Connexive Principles: An Experimental Study
14:15-14:45	**David E. Over** Independence conditionals, raccoon conditionals, and inferentialism
14:45-15:15	**Tea and Coffee**
15:15-15:45	**Paolo Cherubini, Carlo Reverberi, Marco Mantovani and Anna Maria Cherubini** Probability thresholds between risk attitudes in Cumulative Prospect Theory
15:45-16:15	**Niki Pfeifer and Romina Schmid** Early experimental research on deductive reasoning
16:15-16:45	

The 13th London Reasoning Workshop
Tuesday, 26 of July, 2022

BBK, University of London, Malet Street, Bloomsbury, London WC1E 7HX
Location: Room B20

9:10-9:30	**Tea & Coffee**
9:30-10:00	**Shira Elqayam, Igor Douven, Kinga Morsanyi, and Valerie Thompson (Remote)** Conditionals, fluency, and affect
10:00-10:30	**Cillian McHugh and Eric R. Igou (Remote)** The Moral Dilution Effect: Irrelevant Information Influences Judgments of Moral Character
10:30-11:00	**Nicki Morley and Valerie Thompson (Remote)** Making sustainable choices: Using reasoning research to understand how people choose products
11:00-11:30	**Tea & Coffee**
11:30-12:00	**Sunny Khemlani (remote)** Tracking spatial relations in the real world with mReasoner
12:00-12:30	**Nicole Cruz (remote)** Measuring coherence in uncertain reasoning
12:30-13:45	**Lunch**
13:45-14:15	**Igor Douven (Remote)** Bayesian Stopping
14:15-14:45	**Vinod Goel (Remote)** Feeling the Coherence
14:45-15:15	**Tea & Coffee**
15:15-15:45	**Matthieu Raoelison & Esther Boissin (Remote)** Logical Intuitions, Development, and Training
15:45-16:15	**Niels Skovgaard-Olsen and Karl Christoph Klauer (Remote)** Invariance violations and the CNI model of moral judgments
16:15-16:45	
17:15	**Pub!**

Ruth M.J. Byrne, Sunny Khemlani, and Phil Johnson-Laird
Verification, truth, and counterfactual situation

Psychological theory treats the verification of assertions as straightforward: if an assertion matches the relevant situation, it's true; otherwise, it's false. As in standard logics, this account implies that if you arrived in Perth then the disjunction: "You arrived in Perth or Exeter," is true. We report two studies that refute this claim. Participants used pictures of journeys to verify such disjunctions. Given that you arrived at one of the two destinations, if the other destination was once possible, participants in the first study verified the disjunction as: true and it couldn't have been false, whereas if the other destination was impossible they verified it as: true but it could have been false. The second study showed that participants spontaneously evaluated counterfactual alternatives to verify the disjunctions, and therefore verified some disjunctions as possibly true and possibly false. These special sorts of "truth value" are outside the semantics of disjunctions in standard logics.

Annika M. Svedholm-Häkkinen, Mika Hietanen, and Jonathan Baron
An Argument Strength Discrimination Task to cover all types of everyday arguments

Being able to discriminate poorly justified from well justified arguments is necessary for informed citizenship. To assess this ability, we report on the theoretical rationale, development and validation of an easy-to-use assessment method, the Argument Strength Discrimination Task (ASDT). Grounded in the theory of argument schemes, the ASDT contains arguments from consequence, analogy, symptoms, and authority. Scores are based on how well participant ratings match those of an expert panel. We present an overall ASDT scale, scheme-specific scales, and a short and quick 16-item version. A study (N = 278) in Finland supported the discriminant and convergent validity of these scales. ASDT scores correlated positively with analytic thinking dispositions and slightly positively with education, and negatively with overconfidence. They were unrelated to an intuitive thinking style, and to self-rated mental effort. However, evaluating arguments from consequence was unrelated to analytic thinking dispositions, indicating that evaluating these arguments may draw on different cognitive processes than evaluating other arguments. Despite efforts to make the items general, some items are dependent on the culture of the subjects we tested. The method we present can easily be used to adapt the scale for different cultural contexts.

Nicki Morley and Valerie Thompson
Making sustainable choices: Using reasoning research to understand how people choose products

As the climate crisis evolves encouraging people to reduce consumption of non-sustainable products is going to be increasingly important to reduce the impact of humans on the planet. We adapted Thompson et al. (2011) two factor response procedure to study meta reasoning processes in sustainable product choices. Understanding how feeling of rightness is affected by the presence of preferred brand options and sustainable alternatives and its subsequent impact on choice will give us important clues as to what is driving choice. Then we can start to understand whether new sustainable product innovations will be likely to drive a change towards more sustainable behaviours before they are launched and ultimately how to encourage the adoption of more sustainable products. In the study we found FoR did in fact determine whether or not someone put their preferred brand or an non-sustainable alternative in their basket. High feeling of rightness made consumers 3x more likely to put something in their basket. Not only is this a real-world validation of Ackerman and Thompson (2017) meta reasoning theory it also points to an important clue to how to unpack what is determining choice and what ultimately must be influenced. The session will end with a discussion of how else reasoning can help in understand and encourage people to adopt more pro-social choices using our theories of reasoning.

Valerie Thompson
What makes us think?

Maya Bar Hillel
Viewing stumpers through central ideas in cognition

I will present a mostly successful attempt to classify all stumpers as belonging to one of two categories. Roschian stumpers, in which the solution violates Rosch's central tenet of cognitive economy. And Gricean stumpers, in which the solution violates Gricean maxims. Riddles are explicitly non standard communications, hence allowed to violate these principles. But habits of comprehension die hard, thus stumping some respondents.

Shira Elqayam, Igor Douven, Kinga Morsanyi, and Valerie Thompson
Conditionals, fluency, and affect

According to the philosophical theory of Inferentialism, and its psychological counterpart Hypothetical Inferential Theory, the meaning of a conditional centrally involves the strength of inference from antecedent to consequent, thus providing an essential linchpin connecting conditionals to inference more generally. In this talk, we explore the psychological mechanisms underlying the way we gauge the strength of this inference. Drawing on work in meta-reasoning, we hypothesised an inference heuristic, cued by fluency and experienced as positive affect. We predicted, and found, that positive affect, measured by liking, was a significant positive predictor of inference strength, as well as the percentage of conditionals evaluated as true.

David E. Over
Independence conditionals, raccoon conditionals, and inferentialism

The type specimen for a raccoon conditional is "If raccoons have no wings, they cannot breathe under water". Such a conditional has a true antecedent and consequent, but it is hard to see what its use could coherently contribute to discourse. Some supporters of truth condition inferentialism, the theory that a "standard" conditional if p then q can only be true if there is a compelling argument from p to q, have used raccoon conditionals to try to argue for their theory. There are examples of true conditionals in which p and q are independent, e.g., "If your children get the MMR vaccine, they will not develop autism." Some inferentialists have tried to dismiss such uses as "non-standard". It is, however, circular to claim that a theory only applies to "standard" cases, and that the "standard" cases are the ones the theory applies to. Conditionals if p then q, in which p is independent of q, can be called independence conditionals. Explicit and implicit uses of independence conditionals are perfectly standard in any reasonable sense of the word, and they have a significant role to play in human reasoning. Accounting for this role, and explaining how they differ from raccoon conditionals, is a challenging problem for inferentialism and an important question for further research by us all.

Meghna Bhadra
A comprehensive overview and applications of the Weak Completion Semantics

 It might be admissible to say that logic programming and logic-based knowledge-based systems have largely ignored experimental findings in cognitive science. Two-valued classical logic which by now is considered an old paradigm, seems inadequate to truly model human reasoning. At the same time, it might also be admissible to say that the cognitive science community too has largely ignored modern developments within logic programming, logic-based knowledge-based systems, and machine learning, which provide alternative solutions to the inadequacy posed by classical, two-valued logic.

An attempt to bridge the gap between the two worlds led to the conception of the Weak Completion Semantics (WCS). It is a novel formal cognitive theory that is multi-valued, non-monotonic, knowledge-rich, allows learning, can handle inconsistent background knowledge, and can be applied to model the average as well as the sceptical reasoner in multiple areas of human reasoning, such as the selection task, human syllogistic reasoning and the suppression task to name a few. In this talk we will present a comprehensive overview of the WCS and go through some of its application areas, in particular human conditional reasoning in the context of recent experimental findings, and the identification of noise variables in a system using counterfactual reasoning. Finally, we will also discuss how the WCS compares with the well-known informal cognitive theory, the Mental Model Theory, in light of our results.

Robert Mackiewicz, Monica Bucciarelli, Sangeet Khemlani, and Phil Johnson-Laird
Informal algorithms for the arithmetic of natural numbers

The ability to devise algorithms relies on everyday thinking, and the model theory implies it depends on kinematic mental models that unfold in time to represent temporal sequences of events. Previous studies examined how children and adults used such models to devise algorithms to rearrange the order of items. We report two preliminary studies to examine the heart of computation: algorithms for computing functions of natural numbers (0, 1, 2, …). Experiment 1 tested how 12-year-old children devised algorithms for such functions without necessarily having to count. It used a simple environment analogous to an "infinite abacus", which suffices for any computable function (according to the Church-Turing hypothesis). It consists of a factory that manufactures pieces of wood, various locations where they can be stored, and a location for the output of the computation. A vehicle moves between these locations and can load and unload the pieces. The task was difficult for the children, but more than half of them were able to create an informal algorithm for computing simple arithmetic functions. Experiment 2 used the same environment and examined adults' ability to deduce the consequences of four sorts of algorithm that differed in their complexity (according to Kolmogorov's measure). The participants carried out the tasks correctly, and the simpler the K-complexity of an algorithm, the less time it took them to deduce its consequences.

Sunny Khemlani
Tracking spatial relations in the real world with mReasoner

I describe a novel visual reasoning system that perceives the world by dynamically constructing and updating spatial mental models. These models represent the iconic spatial structure of observations encoded in images and streaming video. The system can be queried with natural language spatial relations, "e.g., focus on what is to the left of the ___" to focus attention on portions of the input imagery in real-time. The system is built on mReasoner, a computational cognitive model of thinking and reasoning. I describe how it can be used to investigate dynamic spatial thinking, and how it's been used for recent applications on an embodied robotic platform.

Paolo Cherubini, Carlo Reverberi, Marco Mantovani, and Anna Maria Cherubini
Probability thresholds between risk attitudes in Cumulative Prospect Theory

In Cumulative Prospect Theory, risk attitudes follow from the integration of the value function and of the probability distortions caused by the probability weighting function. However, textbooks and popular science books discuss the two functions separately, emphasize the role of the value function on risk attitudes, and exemplify the role of the probability distortions only for very low probabilities. In this paper, we calculate the probability thresholds that determine risk attitude inversions – with respect to those expected from the value function alone. Those thresholds were never reported explicitly in previous literature. We show that risk attitudes inversions can occur for simple prospects with quite high probabilities of the outcome (in some instances, up to 70%). A survey circulated to university teachers of prospect theory showed that risk attitudes inversions at those levels of probability are considered surprising and counter intuitive.

Niki Pfeifer and Romina Schmid
Early experimental research on deductive reasoning

The philosophers and psychologists Gustav Wilhelm Störring (1860–1946) and Johannes Lindworsky (1875–1939) were pioneers in the experimental psychology of deductive reasoning. One observation, which for example Störring made, was that his participants drew conclusions from the given premises with the help of a process of insertion. Störring's and Lindworsky's work has not been paid a lot of attention to. The aim of our talk, which is based on work-in-progress, is two-fold: (1) We want to raise more awareness of their important groundwork and (2) and aim to trace the work of precursors and their role for later developments in the psychology of reasoning. After a brief overview of Störring's and Lindworsky's lives and contributions in philosophy and psychology, we will focus on their experiments on deductive reasoning. In particular, we will discuss Störring's (1908) and (1909) papers, as well as Lindworsky's dissertation, which was published in the first experimental-psychological book on deductive reasoning in 1916. The latter was also inspired by Störring's work. We will illustrate the pioneering experiments with task materials on simple argument forms including syllogistic, spatial, and temporal inferences. Moreover, we will provide insight into Störring's and Lindworsky's connections and positions within the scientific community of the time. We will discuss their positioning towards psychologism, because both of them worked at the intersection of psychology and philosophy at a time when the psychologism debate was at its peak. They were also both significantly influenced by members of the Würzburg School. Their importance within the history of psychology will be assessed by the contributions they made, which can be seen as precursors to later developments in psychology (e.g., meta-cognitive concepts like the feeling of rightness, mental models, or ideas from embodied cognition). Our contribution aims to shed light on the almost forgotten early history of the experimental psychology of deductive reasoning.

Niki Pfeifer and Leon Schöppl
Reasoning About Connexive Principles: An Experimental Study

Conditionals whose antecedent and consequent contradict each other (e.g., if A, then not-A) are intuitively false. From a classical logic point of view, however, such self-contradicting conditionals (SCC) are rendered contingent due to the material conditional interpretation of conditionals (-->).

In response, so-called "connexive logics" were developed to validate the basic intuition that SCCs are necessarily false. Examples of well-known valid connexive principles include Aristotle's thesis (not (not A --> A)), Boethius thesis ((A --> B) --> not (A --> not B)) and Abelard's first principle (not((A --> B) & (A --> not B))). However, these are non-theorems in classical logic.

Although these connexive principles are psychologically plausible, only few experimental studies have previously investigated them. In our talk, we give a brief overview of this previous empirical work and the coherence-based probability semantics for connexive principles. Then, we present two new experiments, focusing systematically on key connexive principles featuring conjunctions (n=26) and implications (n=46).

Despite some of these principles being psychologically hard to process, we observed good agreement between human responses and our predictions. The results support the psychological plausibility of coherence-based probability logic and shed new light on how people reason about SCCs.

Nicole Cruz
Measuring coherence in uncertain reasoning

A basic foundation of our ability to draw inferences and make decisions in accordance with our beliefs and goals is for our beliefs to be logically consistent. And when our beliefs are uncertain, as is often the case in real world situations, this criterion of consistency generalises to coherence. The degrees of belief we assign to two statements are coherent iff they follow the axioms of probability theory. For example, if we believe it is 80% likely that the glass had juice, then to retain coherence our degree of belief that the glass had juice, wine, or

mezcal must be 80% or greater. But measuring the coherence of people's uncertain reasoning is not straightforward, especially in situations in which the information available is uncertain, incomplete, and changeable. To make such measurements, we must account for how logical constraints between probabilities shift when new information becomes available; define and adjust for the probability of making a coherent response just by chance; and ascertain which patterns of statement probabilities would allow us to make plausibly falsifiable, and thus informative, assessments of sensitivity to coherence. I describe some of these challenges and discuss how we might be able to tackle them in the quest to increase our understanding of reasoning under uncertainty.

Igor Douven
Bayesian Stopping

Stopping rules are rules for determining when the process of data collection can or should be terminated and an inference can be made. Such rules have been mostly discussed in classical statistics, but lately Bayesians have started considering the matter of stopping as well. A popular Bayesian stopping rule uses the concept of Highest Density Interval, the core idea being that one is licensed to stop and make an inference as soon as enough probability mass (or density) has accumulated in a small enough region of parameter space. This paper presents an alternative stopping criterion, which builds on the new concept of Relative Importance Interval and takes into consideration also how the probability mass is distributed in parameter space. The two proposals are compared using computer simulations. The outcome of the simulations is not that one proposal is superior to the other but rather that they may be called for under different circumstances.

Vinod Goel
Feeling the Coherence

Reasoning is about determining coherence relations between propositions. After thousands of years of formally studying reasoning, we should be humbled and embarrassed by the fact we cannot tie it back to neurobiology or evolutionary biology. It happily floats in midair as if powered by Angel dust.

I want to make a proposal of how we might drive reasoning back into the biology, where it belongs.

1. I begin with the proposition that feelings (not to be confused with emotions) are the solution evolution has come up with to solve the two primal problems of selecting and initiating behavior. Feelings are generated in old brain stem, diencephalon, and subcortical systems that have been widely conserved across large parts of the phylogenetic tree, meaning that they are available to both human and nonhuman minds. We know a great deal about the underlying neurobiology from animal models.

2. Feelings enter the cognitive mind through beliefs, desires, and coherence relations. Let me just deal with the latter. Can we feel coherence? I think so. An argument or a set of beliefs is coherent if it feels right. If it is incoherent or inconsistent it feels wrong. Consider the following example: "Either Socrates is mortal or it is not the case that Socrates is mortal." This statement must be true (law of excluded middle). But suppose you refuse to accept its truth and ask me to prove it. What do I do? How can I possibly prove it to you? I can't. Such simple, intuitive, self-evident notions serve the same role in logic as Euclidean postulates do in geometry. They cannot be proved but we accept them because they feel right (and reject them if they feel wrong). (As logician Clarence Irving Lewis reportedly noted, when a point of logic is in question, the only thing we can do is appeal to intuition.)

3. Why should there be a feeling associated with coherence relations? For the same reason as there are feelings associated with lust and the taste of chocolate cake: the feelings are fitness enhancing. Coherency feels good because representations that are internally consistent and veridical will enhance survival. Incoherency/inconsistency feels unpleasant because it can be harmful.

Matthieu Raoelison & Ester Boissin
Logical Intuitions, Development, and Training

Decades of research into heuristics and biases have shown that people are often biased by their intuitions. Sound reasoning was assumed to require deliberation to overcome and correct those misleading, heuristic intuitions.

It has been recently posited that, in addition to heuristic intuitions, people also have accurate, so-called logical intuitions (De Neys, 2012, 2014, 2017). These intuitions would develop through experience, from repeatedly applying logical principles until they become automatized (Stanovich, 2018).

Indeed, findings from the past 5 years indicate that reasoners can intuitively solve reasoning problems (Bago & De Neys, 2017) and that logical principles could be processed faster than previously assumed (e.g., Newman et al, 2017; Handley & Trippas, 2017).
We present a series of experiments from our lab supporting those claims. First, we compare 7th graders and 12th graders. We observed that the older students, who had more time to practice logico-mathematical principles, had more correct intuitions than their younger counterparts. Then, we report findings from training interventions that helped reasoners de-bias themselves. After training, reasoners had more correct intuitions, and sustained those correct intuitions after several weeks.

Niels Skovgaard-Olsen and Karl Christoph Klauer
Invariance violations and the CNI model of moral judgments

A number of papers have applied the CNI model of moral judgments to investigate deontological and consequentialist response tendencies (Gawronski et al., 2017). A controversy has emerged concerning the methodological assumptions of the CNI model (Baron & Goodwin, 2020, 2021; Gawronski et al., 2020). In this paper, we contribute to this debate by extending the CNI model with a skip option. This allows us to test an invariance assumption that the CNI model shares with prominent process-dissociation models in cognitive and social psychology (Klauer et al., 2015). Like for these process-dissociation models, the present experiment found violations of the invariance assumption for the CNI model. In addition, we show via structural equation modelling that previous findings for the relationship between gender and the CNI parameters are completely mediated by the association of gender with primary psychopathy. This analysis thereby extends several studies that have used the CNI model to investigate the relationship between psychopathy and moral judgments. Finally, we present recommendations for future use of the CNI model in light of our results.

Cillian McHugh and Eric R. Igou
The Moral Dilution Effect: Irrelevant Information Influences Judgments of Moral Character

The dilution effect occurs when the presence of non-diagnostic information leads to judgments that are less extreme than they would have been in the absence of non-diagnostic information. The effect has been observed for a range of judgments, including judging products, probability judgments, and predictions relating to people's behavior. The dilution effect has been explained as emerging as consequence of the representativeness heuristic, such that the inclusion of non-diagnostic information reduces the match between the target and a typical member of the category. A categorization approach to moral judgment predicts the dilution effect should be observed for judgments about morality. Across five studies (total N = 5101) we tested for the dilution effect on judgments of morally bad characters and morally good characters. Overall our results showed a dilution effect for judgments of both good and bad characters. People's moral evaluations of both good and bad characters were less extreme when the descriptions included non-diagnostic information. The presence and strength of the effect appeared to depend on a combination of additional factors (e.g., contrast effects, valence of judgment). We recommend future research should test these as moderating factors.

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Alarm tests involve intermittent bursts of sound of only a few seconds duration.

The main fire alarm is a *continuous* ringing bell or *continuous* siren in all Birkbeck buildings. When a *continuous* alarm sounds you must leave the building immediately.

There will be no other warning messages!

If you hear a continuous fire alarm

1. Leave the building immediately by the nearest exit. Do not delay to collect your belongings.
2. Do not use the lifts or the phone.
3. Follow the instructions of your tutor, course leader and/or fire marshals.
4. Move well away (100 metres) from the exits once outside
5. Do not stand in the road/street.
6. Do not re-enter the building unless told it is safe to do so

If you discover a fire

1. Operate the nearest fire alarm (red "break-glass" boxes on walls)
2. The Duty Attendant at Malet Street will be automatically contacted in every case and will immediately call the Fire Brigade.
3. Do not try to fight a fire unless you have been trained to use fire extinguishers.
4. Leave the building by the nearest exit

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Thank you,
Birkbeck Fire Officer