ABSTRACTS

A2.14 Philosophical Logic

Modal Logics of Abstract Explanation Frameworks
Igor Sedlar, Dept. of Logic and Methodology of Science, Comenius University in Bratislava, Bratislava, SLOVAKIA
Juraj Halas, Dept. of Logic and Methodology of Science, Comenius University in Bratislava, Bratislava, SLOVAKIA

A common feature of the many theoretical accounts of scientific explanation is that explanation is taken to be a relation between the explanandum and the explanans: the explanans explains the explanandum. However, with a few notable exceptions, the topic of explanation has scarcely been explored from the abstract point of view of the explanation relation and its relata. In this talk, we discuss the possibility and merits of such an approach and develop formal tools for reasoning about explanations on an abstract level. Firstly, simple explanation frameworks are introduced as a representation of the core structure of explanation. Simple explanation frameworks are directed graphs where an edge between x and y represents the assumption that x explains y. Secondly, a multi-dimensional version of simple explanation frameworks, called abstract explanation frameworks, is discussed. The multiplicity of dimensions (‘kinds of edges’) represents the multiplicity of criteria for admissibility of explanations. Thirdly, a multi-dimensional normal modal logic for reasoning about such structures is introduced. The logic uses a temporal language with ‘forward’ and ‘backward-looking’ modalities, but interpreted in terms of explanation. Several applications of this formalism to formalizing specific explanation-scenarios are discussed. Finally, a non-classical modal logic for reasoning about ‘strong negation’ in the context of explanation is briefly discussed.

The Import of Formal Logic with Respect to Knowledge – The Fundamental Question of the “Critique of Pure Reason”
Max Gottschlich, Department of Philosophy, University of Warwick, Coventry, UNITED KINGDOM

Engaging with Kant’s transcendental logic seems to be a question of mere scholarly historical interest today. It is most commonly regarded a strange mixture between logic and psychology or epistemology, and by that, not a serious form of logic. Transcendental logic seems to be of no systematical impact on the concept of logic. My paper aims to
disclose a different account on the endeavour of Kant’s transcendental logic in particular and of the “Critique of Pure Reason” (CPR) in general. Kant’s fundamental question is in a revolutionary way aiming to ground the character of necessity of knowledge, which means to justify the claim that thinking in accordance with the forms and principles of formal logic does not lead to sheer tautologies or an unsolved contradiction, but to knowledge that is objectively valid. I shall proceed in three steps:

In a first part, I shall demonstrate the necessity and the significance of this new fundamental question of the CPR with respect to its genesis out of pre-Kantian metaphysics. This question will lead to a consistent way of understanding the determinations that are unfolded in the CPR, which differs from the prevailing readings. A second part shall give a brief outline of Kant’s answer to this question, with special emphasis on his revolutionary new comprehension of logical form.

A third part will answer the question: What knowledge do we achieve about being or actuality by means of formal logic? I will argue that Kant shows (a) that formal logic is the logic of all technical-practical conduct but also, at least indirectly, (b) the limitation of the technical-practical knowledge and its legitimate sphere of application.

The Rules of Definition: a Logical and Pragmatic Perspective

Michel Paquette, Philosophy, Collège de Maisonneuve, Montreal, CANADA

We offer a formulation of a set of rules for definitions that is informed by modern logic and pragmatics. We aim to be as precise as possible in formulating the extensional, intensional and pragmatic features of each rule. We discuss a set of rules that derives from Aristotle’s treatise on the art of dialectic, Topics. The concern with logical requirements for definitions can be traced back at least to Socrates as represented in Plato’s early dialogues. From our standpoint, the rules of definition belong to scientific methodology but also to the pragmatics of argumentative practices. Our prescriptions for definitional practices try to steer clear from controversial issues in semantics. We point out some philosophical difficulties in our minimalist program as we proceed. We will proceed as follows: First, we will distinguish three components in a definition rule: a principle, a criterion and a motivation. Secondly, we discuss the logical form of definition sentences and the properties of the relation “...=df ...”. Thirdly, we account for six classical rules, highlighting the components for each rule. The rules address issues about extensional equality, essential predication, circularity, negative definitions, synonymous expressions and metaphorical language. Our formulation will make it apparent that the principles of definition are either logical requirements or pragmatic rules, and we will insist on the importance of the latter.
First steps towards non-classical logic of informal provability

Pawel Pawlowski, Department of Philosophy, University of Gent, Gent, BELGIUM
Rafal Urbaniak, Gent, BELGIUM

Mathematicians prove theorems. They don’t do that in any particular axiomatic system. Rather, they reason in a semi-formal setting, providing what we’ll call informal proofs. There are quite a few reasons not to reduce informal provability to formal provability within some appropriate axiomatic theory (Marfori, 2010; Leitgeb, 2009). The main worry about identifying informal provability with formal provability starts with the following observation. We have a strong intuition that whatever is informally provable is true. Thus, we are committed to all instances of the so-called reflection schema P (φ) → φ (where φ is the number coding formula φ and P is the informal provability predicate). Yet, not all such instances for formal provability (in standard Peano Arithmetic, henceforth PA) are provable in PA. Even worse, a sufficiently strong arithmetical theory T resulting from adding to PA (or any sufficiently strong arithmetic) all instances of the reflection schema for provability in T will be inconsistent (assuming derivability conditions for provability in T are provable in T). Thus, something else has to be done. The main idea behind most of the current approaches (Shapiro, 1985; Horsten, 1994, 1996) is to extend the language with a new informal provability predicate or operator, and include all instances of the reflection schema for it. Contradiction is avoided at the price of dropping one of the derivability conditions. Thus, various options regarding trade-offs between various principles which all seem convincing are studied. In order to overcome some of the resulting difficulties and arbitrariness we investigate the strategy which changes the underlying logic and treats informal provability as a partial notion, just like Kripke’s theory of truth (Kripke, 1975) treats truth as a partial notion (one that clearly applies to some sentences, clearly doesn’t apply to some other sentences, but is undecided about the remaining ones). The intuition is that at a given stage, certain claims are clearly informally provable, some are clearly informally disprovable, whereas the status of the remaining ones is undecided. In Kripke-style truth theories strong Kleene three-valued logic is usually used – which seems adequate for interpreting truth as a partial notion. Yet, we will argue that no well-known three-valued logic can do a similar job for informal provability. The main reason is that the value of a complex formula in those logics is always a function of the values of its components. This fails to capture the fact that, for instance, some informally provable disjunctions of mathematical claims have informally provable disjuncts, while some other don’t. We develop a non-functional many-valued logic which avoids this problem and captures our intuitions about informal provability. The logic is inspired by paraconsistent logic CLoN (see e.g. Diderik Batens, 2004), in whose standard semantics the value of a negation is not determined by the value of its argument. We describe the semantics of our logic and some of its properties. We argue that it does a much better job when it comes to reasoning with informal provability predicate in formalized theories built over arithmetic.

References