

2024 SPRING MEETING
OF THE ASSOCIATION FOR SYMBOLIC LOGIC

The Sheraton Times Square, New York, NY
Eastern APA Meeting
January 15–18, 2024

The 2024 Spring Meeting of the Association for Symbolic Logic was held on January 15-18, 2024 at the Sheraton Times Square in New York, NY in conjunction with the 2024 Eastern Division Meeting of the American Philosophical Association. The Program Committee was chaired by Sergei Artemov. The program consisted of six invited talks.

Corine Besson and Anandi Hattiangadi, (University of Sussex and Stockholm University), *Deductive reasoning without rule following*.

Melvin Fitting, (The Graduate Center, CUNY), *Bilattices and Kripke's theory of truth*.

Joel David Hamkins, (University of Notre Dame), *Pluralism in the foundations of mathematics*.

Barbara Partee (University of Massachusetts), *Language and logic: ideas and controversies in the history of formal semantics*.

Sonja Smets (University of Amsterdam), *Logic meets Wigner's friend(s): the epistemology of quantum observers*.

Thomas Studer (University of Bern), *Justification logic*.

Abstracts of the invited talks as well as of the contributed talks by members of the Association for Symbolic Logic follow.

For the Program Committee
SERGEI ARTEMOV

Abstracts of invited plenary lectures

- ▶ CORINE BESSON AND ANANDI HATTIANGADI, *Deductive reasoning without rule following*.

Department of Philosophy, University of Sussex, Brighton BN1 9RH, United Kingdom.

E-mail: c.besson@sussex.ac.uk

Department of Philosophy, Stockholm University, 10691 Stockholm, Sweden.

E-mail: anandi.hattiangadi@philosophy.su.se

This paper provides a novel account of the psychology and epistemology of deductive reasoning, according to which the capacity to perform inferences in particular cases is prior to the capacity to follow any general rule. Inspired by the central argument of Kripke's paper, 'The Question of Logic', to the effect that logical rules cannot be adopted, we show that the widespread view that deductive reasoning requires rule following must be abandoned.

© The Association for Symbolic Logic, 2024. Published by Cambridge University Press on behalf of The Association for Symbolic Logic.

1079-8986/24/3001-0009

DOI: [10.1017/bsl.2024.19](https://doi.org/10.1017/bsl.2024.19)



We explain what it is to reason deductively without following a rule, how such reasoning is justified, and how we can come to know the general rules of logic.

► MELVIN FITTING, *Bilattices and Kripke's theory of truth.*

Departments of Philosophy, Computer Science, Mathematics (all emeritus), City University of New York Graduate Center, 365 Fifth Avenue, New York, USA.

E-mail: melvin.fitting@gmail.com

In his famous 1975 paper, *Outline of a Theory of Truth*, Saul Kripke provided a semantics (or rather, a family of them) for self-referential languages, using a fixed point construction. This has been immensely influential. His presentation was somewhat sketchy, and since then there has been much subsequent work by others. Kripke, in his paper, briefly described a modal version, applying a fixpoint construction world by world within a modal frame. This can certainly be carried out, and doubtless has been somewhere. Others have suggested a variety of extensions such as using the unit interval as the underlying space of truth values, or using a four valued logic instead of Kripke's three, or various combinations of these. When many similar formal constructions have been proposed, one naturally asks what is the common core. Is there some setting in which things can be proved once and for all, with the various specific proposals seen as applications of this common core. In fact this is the case, with bilattices providing the desired structure. In this talk I'll sketch the bilattice idea, and discuss how it provides a natural setting for Kripke style semantics for self referential languages. Fortunately this does not make things more complicated, since the underlying proofs are essentially the same as they have always been. It is just that they are being carried out in generality rather than in specificity.

► JOEL DAVID HAMKINS, *Pluralism in the foundations of mathematics.*

O'Hara Professor of Logic, University of Notre Dame, Notre Dame, IN, USA, and Associated Faculty, Philosophy, University of Oxford, Oxford, UK.

E-mail: jdhamkins@nd.edu

I shall give an account of the debate on set-theoretic pluralism and pluralism generally in the foundations of mathematics, including arithmetic. Is there ultimately just one mathematical universe, the final background context, in which every mathematical question has an absolute, determinate answer? Or do we have rather a multiverse of mathematical foundations? Some mathematicians and philosophers favor a hybrid notion, with pluralism at the higher realms of set theory, but absoluteness for arithmetic. What grounds are there for these various positions? How are we to adjudicate between them? What ultimately is the purpose of a foundation of mathematics?

► BARBARA H. PARTEE, *Language and logic: ideas and controversies in the history of formal semantics.*

Department of Linguistics, 650 North Pleasant Street, University of Massachusetts, Amherst, MA 01003-1100.

E-mail: partee@linguist.umass.edu

The history of formal semantics and pragmatics over the last 50 or so years is a story of collaboration among linguists, logicians, and philosophers. Since this talk is for the ASL, and I'm a linguist, I'll emphasize aspects of the pre-history and history of formal semantics that concern the relation between language and logic, not presupposing knowledge of linguistics.

Logicians have often been concerned with language in a "negative" way: the development of formal logical languages has often been motivated by perceived inadequacies in natural language for purposes of argumentation. Russell and Strawson, who had many disagreements

about language, did express agreement on the statement that “natural language has no logic.” But logicians and philosophers of language, even those who regarded natural language as “illogical” in various ways, made crucial advances in semantic analysis that paved the way for contemporary formal semantics.

Chomsky, from a very different angle, considered the invented languages of logic to be so different from any natural language that he doubted that logicians’ work on the formal syntax and semantics of logical languages could possibly be of any interest or usefulness for linguistics, and he therefore rejected Bar-Hillel’s exhortation in the early 1950’s for greater cooperation between logicians and linguists in syntax and semantics.

It was the logician and philosopher Richard Montague, a student of Tarski’s, who had the greatest direct impact on the development of contemporary formal semantics, with his theory of “universal grammar” that encompassed both formal and natural languages, constructed in part on the basis of his own typed intensional logic. From his seminal works in the late 1960’s and early 1970’s, as well as work by David Lewis, Terry Parsons, Richmond Thomason, Max Cresswell, and linguists Partee, Lauri Karttunen, Ed Keenan, David Dowty, Emmon Bach and others, interdisciplinary collaboration led to a rapid expansion of the field.

In this talk, I’ll review some of this background and reflect on key ideas and controversies in the development of formal semantics. I’ll talk about some of the pivotal contributions by logicians as formal semantics and pragmatics developed after Montague’s untimely death in 1971, and I’ll also discuss the “naturalizing” influence that linguists have had on the field as it has become more and more a branch of linguistics. At the end I’ll discuss the apparent incompatibility of Chomsky’s view of linguistics as a branch of psychology and the anti-psychologistic Fregean tradition viewing meanings as abstract objects, a foundational tension that has not hindered progress but is still not fully resolved.

- ▶ SONJA SMETS, *Logic meets Wigner’s friend(s): the epistemology of quantum observers*. Institute for Logic, Language and Computation, University of Amsterdam, Netherlands. E-mail: s.j.l.smet@uva.nl

In this presentation I focus on Wigner’s Friend thought-experiment [4], and the proposed variations [2] and extensions such as the Frauchiger-Renner (FR) Paradox [3], that have recently shaken-up the debates in the foundations of quantum theory. Such thought experiments seem to indicate that, if quantum theory is assumed to be universally valid (and hence can be applied to complex systems that are composed of quantum systems as well as their classical observers), the different agents are rationally entitled to ascribe different (pure) states to the same system, and as a result they cannot share their information in a consistent manner. More precisely, the result in [3] is stated in the format of a no-go theorem. To analyze the problem, I will focus on a few questions: what is the correct epistemic interpretation of the multiplicity of state assignments in these scenarios; under which conditions can one include classical observers into the quantum state descriptions, in a way that is still compatible with traditional Quantum Mechanics?; under which conditions can one system be admitted as an additional ‘observer’ from the perspective of another background observer?; when can the standard axioms of multi-agent Epistemic Logic (that allow “knowledge transfer” between agents) be applied to quantum-physical observers? In the last part of the presentation, I will propose a new answer to these questions, sketch a particular formal implementation of this answer, and apply it to obtain a principled solution to Wigner Friend-type paradoxes. The presentation is based on recent joint work with A. Baltag in [1].

[1] A. BALTAG AND S. SMETS, *Logic meets Wigner’s friend (and their friends)*, 2023, [arXiv:2307.01713](https://arxiv.org/abs/2307.01713).

[2] D. DEUTSCH, *Quantum theory as a universal physical theory*, *International Journal of Theoretical Physics*, vol. 24 (1985), pp. 1–41.

[3] D. FRAUCHIGER AND R. RENNER, *Quantum theory cannot consistently describe the use of itself*, *Nature Communications*, vol. 9 (2018), 3711.

[4] E.P. WIGNER, *Remarks on the mind-body question*, *The Scientist Speculates* (I.J. Good, editor), Heinemann, London, 1961, pp. 284–302.

► THOMAS STUDER, *Justification Logic*.

Institute of Computer Science, University of Bern, Neubrückestrasse 10, 3012 Bern, Switzerland.

E-mail: thomas.studer@unibe.ch

Justification logic [1, 2, 3] is closely related to modal logic and can be viewed as a refinement of the latter with machinery for justification manipulation. Justifications are represented directly in the language by terms, which can be interpreted as formal proofs in a deductive system, evidence for knowledge, and so on. This more expressive language proved beneficial in both proof theory and epistemology and helped investigate problems ranging from a classical provability semantics for intuitionistic logic to the logical omniscience problem.

In this talk, we will give an introduction to justification logic and present recent developments in the field, such as conflict-tolerant logic and formalizations of zero-knowledge proofs.

[1] SERGEI ARTEMOV, *Explicit provability and constructive semantics*, *Bulletin of Symbolic Logic*, vol. 7 (2001), no. 1, pp. 1–36.

[2] SERGEI ARTEMOV AND MELVIN FITTING, *Justification Logic: Reasoning with Reasons*, Cambridge University Press, 2019.

[3] ROMAN KUZNETS AND THOMAS STUDER, *Logics of Proofs and Justifications*, College Publications, 2019.