Formal Methods and Science in Philosophy

Introduction to the Special Issue

Blackburn, Patrick Rowan; Kovač, Srećko ; Świętorzecka, Kordula

Published in:
Bulletin of the Section of Logic

DOI:
10.18778/0138-0680.2020.06

Publication date:
2020

Document Version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Blackburn, P. R., Kovač, S., & Świętorzecka, K. (2020). Formal Methods and Science in Philosophy: Introduction to the Special Issue. *Bulletin of the Section of Logic*, *49*(2), 105-107. https://doi.org/10.18778/0138-0680.2020.06

Bulletin of the **S**ection of **L**ogic
Volume 49/2 (2020), pp. 105–107
http://dx.doi.org/10.18778/0138-0680.2020.06

Formal Methods and Science in Philosophy: Introduction to the Special Issue

This special issue of the *Bulletin of the Section of Logic* contains five papers, which were originally presented at the *Formal Methods and Science in Philosophy III* conference, which was held at the Inter-University Centre, Dubrovnik, Croatia, 11–13 April 2019. The two previous editions of this meetings were held at the same location in 2015 and 2017, and as the third call for papers made clear, the Dubrovnik meeting again emphasized:

> *Problems of philosophical ontology, epistemology, philosophy of science, and philosophy of mind that are formulated or solved using formal methods (as defined in logic, mathematics, formal linguistics, theoretical computer science, information science, AI) and/or with references to the results of natural and social sciences.*

The 2019 edition drew participants from Europe and further afield, and during the three-day event, a total of 46 talks were presented. The keynote talks were given by Christoph Benzmüller (Freie Universität Berlin), María Manzano (Universidad de Salamanca), and Edward Zalta (Stanford University), and plenary session talks were given by Patrick Blackburn (Roskilde University), Elena Dragalina-Chernaya (National Research University, Moscow), Robert Piłat (Cardinal S. Wyszyński University, Warsaw), and Georg Schiemer (University of Vienna). Twenty four other submitted talks were presented across (sometimes two, sometimes three) parallel sessions, and in addition there were fifteen talks spread over three special parallel sessions for PhD students. The conference committee members were Gianfranco Basti (Pontifical Lateran University, Vatican City), Grzegorz Bugajak (Cardinal S. Wyszyński University, Warsaw), Filip Grgić (Institute of Philosophy, Zagreb), Srećko Kovač (Institute of Philosophy, Zagreb), and Kordula Świętorzecka (Cardinal S. Wyszyński University, Warsaw). The

institutions coordinating the event were the Institute of Philosophy (Zagreb) and the Cardinal Stefan Wyszyński University (Warsaw).

The event was intense and lively, marked by spirited discussion: it has clearly found its niche and its voice. On the last day of the meeting, participants were offered the chance to submit a new version of their work for a further round of refereeing. We hoped, in this way, to attract submissions for a special issue that would convey something of the variety and flavour of the Dubrovnik meeting, and we believe that we have succeeded. Here you will find five papers drawing on mathematics, computer science, philosophy, and linguistics, with approaches ranging technical, historical, conceptual, or computational explanation. But as well as variety, there is coherence: the coherence provided by the core of logic. Let us briefly note what the five papers in this special issue discuss.

Víctor Aranda (Universidad Autónoma de Madrid): *Completeness, categoricity and imaginary numbers: the debate on Husserl.*

This paper explores Husserl's two notions of "definiteness", notions which had enabled him to clarify the extension of the number concept through the realm of the imaginary. However the exact meaning of these notions remains controversial. A "definite" axiom system has been interpreted as a syntactically complete theory, but also as a categorical one. Do either of these readings successfully capture Husserl's goal of elucidating the status of imaginary numbers? The author raises objections to both approaches, and then suggests an interpretation of "absolute definiteness" as semantic completeness – an approach, he argues, that does not suffice to explain Husserl's solution.

Christoph Benzmüller and David Fuenmayor (Freie Universität Berlin): *Computer-supported analysis of positive properties, ultrafilters and modal collapse in variants of Gödel's ontological argument.*

This paper reports the result of using the Isabelle/HOL proof-assistant, coupled with shallow semantic embeddings of various logical embeddings, to rigorously assess three versions of Gödel's ontological argument. Two of these versions prove the existence of a Godlike being, and avoid modal collapse, but superficially they appear very different. This computational experiments discussed in this paper, however, reveal an intriguing correspondence between the two: both link the positive properties of Gödel's argument to the mathematical notion of a principal modal ultrafilter on intensional properties.

Piotr Błaszczyk and Marlena Fila (Pedagogical University of Cracow): *Cantor on infinitesmals. Historical and modern perspective.*

This paper discusses in detail Cantor's attempt to prove that infinitesmal numbers are inconsistent. Much of the paper is historical, reaching back to Book V of Euclid's *Elements*, covering the theory of magnitudes in the late 19th century, and drawing attention to Cantor and Dedekind's mutual uncertainty as to whether their accounts of continuity for the real numbers were equivalent. The paper concludes with a counterexample to Cantor's hypothesis about products of ordinal and infinitesmal numbers that makes use of Conway numbers.

Zvonimir Šikić (University of Zagreb): *Compounding objects.*

Forming complex structures by building objects component-wise from elements of simple structures (for example, to define $\mathbb{R}^3$ from $\mathbb{R}$) is an important technique. But this compounding process may destroy desirable first-order properties (for example, when component-wise combined, the total order on $\mathbb{R}$ yields a partial order on $\mathbb{R}^3$). In this short paper, the author proves "a kind of converse" to the Łos Theorem, that characterizes the properties of component-wise defined equality in terms of filters, proper filters and ultrafilters.

Urszula Wybraniec-Skardowska (Cardinal Stefan Wyszyński University, Warsaw): *What is the sense in logic and philosophy of language?*

This paper characterizes and formalizes various notions of logical and philosophical sense. The author distinguishes between syntactic, intensional, and *extensional* sense. The approach is categorial, with functor-argument syntactic structure linked to intensional and extensional meanings of appropriate semantic categories. Three principles of compositionality are derived and, together with generalized version of Ajdukiewicz-style cancellation rules, are applied to the problem of determining the categories of first-order quantifiers.

Acknowledgements. The special issue editors would like the thank the participants and referees of the Dubrovnik 2019 meeting for providing inspiration, the authors and referees of this special issue for all their hard work, and Andrzej Indrzejczak for saying "yes" to this project in the first place.

Patrick Blackburn, Srećko Kovač, and Kordula Świętorzecka
Editors of the Special Issue