MATHEMATICS WITH A HUMAN FACE (II). UNIV. OF BERGEN, 21-22 MAY 2024

Titles and abstracts

Ben Martin (Padova): Modelling with Derivations (Joint work with Andreas Fjellstad)

It is not uncommon now to conceive of logics as models of some target system, whether validity, grammaticality, or something else. What hasn't been similarly considered is the extent to which the proof systems which logicians construct are also models of a certain type. In this talk, we propose an understanding of proof systems as models, with a range of possible targets, including deductive practices and logics themselves. Using a selection of examples, we show how different proof systems are valued for fulfilling differing theoretical goals, such as possessing structural tractability, being faithful to the target system, and unification.

Carolin Antos (Konstanz): Exploring exemplary reasoning in mathematics

Exemplary and instance-based reasoning in mathematics has not received a lot of attention from philosophy until now. It is often seen as irrelevant for philosophical considerations: Examples may give rise to abstraction and generalization or even lead to proof ideas, but they are then dispensable as the relevant insights can be gained from the abstractions, generalizations and proofs alone. This stands in stark contrast to the way examples are used in mathematics, be it in informal, oral discussions or in printed publications. This talk therefore aims to explore different ways in which exemplary reasoning is relevant to the philosophical study of mathematics. It studies exemplary reasoning in three contexts, namely understanding and explanation, concepts and naturalness, and justification and proof. I will present some first insights that indicate that exemplary reasoning does contribute substantially to all of these areas, therefore making exemplary reasoning an important topic for further philosophical studies.

Line Edslev Andersen (Vrije Univ. Brussels): Can mathematics tell us about the nature of collective knowledge? (Joint work with Yacin Hamami (ETH Zurich))

We address a common thesis in social epistemology, the thesis that group knowledge supervenes on the mental states of the individual group members. We argue that the thesis is hard to maintain in the face of mathematical knowledge.

David Waszek (Paris): Structure-preservation and notations in applications of mathematics to mathematics

Similarities between applications of mathematics to empirical sciences and applications of mathematics to mathematics—i.e., cases in which mathematical tools developed in one mathematical context are deployed in another and bring substantial benefits there—have regularly been noticed in the literature, but have not been discussed very closely. What philosophical questions do applications of mathematics to mathematics actually raise, and can they be answered using the tools that have been developed to account for applications of mathematics to empirical sciences? To approach these problems, I will revisit what has often been seen as a paradigmatic case of application of mathematics to mathematics, namely the use of algebra in geometrical problem-solving.

Otávio Bueno (Miami): Why a Mathematical Fictionalist Should Be a Structuralist about Mathematics

Both structuralism and fictionalism in the philosophy of mathematics come in various forms. Some structuralist views are platonist (Shapiro [1997] and Resnik [1997]), others are nominalist (Hellman [1989]). Some fictionalist views take mathematical claims to be false, and a fictional operator is added to secure verbal agreement with platonism (Field [1980] and [1989]). Other fictionalist views take mathematical objects themselves to be fictional (Leng [2010]). One can treat mathematical objects in a fictionalist way from a structuralist perspective (Hellman [1989]). One can treat mathematical objects in a structuralist way from a fictionalist perspective (Bueno [2009]). But one cannot treat mathematical objects in a fictionalist way from a fictionalist perspective—as long as one aims to accommodate mathematical practice. A structuralist treatment is needed for that. Given the way in which mathematical objects are introduced in mathematical practice, structuralist features are ultimately required at the core of fictionalism (see also Carter [2023], although she draws a different conclusion than I do). Or so I shall argue.

Marianna Antonutti Marfori (IHPST/University of Paris 1 Panthéon-Sorbonne): Mathematical Naturalism and Revisionism About Mathematics

Anti-revisionism is a key component of all naturalistic approaches to science and mathematics. According to it, any revision to a scientific practice should come autonomously from within the practice itself, excluding ideological influences on scientific practices, but also philosophical ones. In this paper, I focus on anti-revisionism about mathematics. Recent versions of mathematical naturalism have argued that the only legitimate revisions to mathematics are those prescribed on purely mathematical, rather than scientific, grounds. After clarifying the reasons why naturalists should be anti-revisionists, I examine the proposed criterion for mathematical anti-revisionism, and I argue on the basis of case studies that this criterion is not supported by a sufficiently sharp distinction between revisions prescribed on purely mathematical grounds and other kinds of revisions. I then examine a second criterion, which maintains that we should not countenance philosophical accounts of mathematics which involve abandoning accepted theorems. I argue that while in line with naturalistic tenets, this criterion does not fully capture what is important to the mathematical naturalist. This leads to the formulation of a third criterion, which adds to the second criterion the clause that we should not abandon established mathematical methodology, and which I argue overcomes the objections to the previous two criteria.

Gabriel Sandu (Helsinki): Ramsey and the notion of arbitrary function

F. P. Ramsey (1925) criticized Russell's notion of predicative function for not doing justice to the extensional attitude of modern mathematics. Ramsey thought that mathematical truths are tautologies in Wittgenstein' sense, and in order to show that, he introduced the notion of propositional function in extension, a close relative of the notion of arbitrary function. The latter notion has been heavily criticized by Frege, Wittgenstein, Carnap, and more recently by P. Sullivan, among others. In my presentation I will look at some terms of the debate and its significance for foundational discussions.

Georg Schiemer (Vienna): Hilbert's conservativity program and the method of ideal elements

The talk will focus on the mathematical roots of Hilbert's "conservativity program", i.e., the attempt of showing the conservativity of ideal over real mathematics. It is well established in the scholarly literature that his foundational work from the 1920s and 1930s is influenced by preceding developments in nineteenth-century mathematics. Specifically, his program is clearly inspired by the "method of ideal methods" in mathematics (cf. Hilbert 1926, 1928). In the present talk, I will argue that Hilbert's discussion of the usefulness and eliminability of "ideal constructs" in his proof-theoretic work was directly motivated by a particular understanding of ideal elements in nineteenth-theory projective geometry. Moreover, I will show that a closer comparison with different accounts of ideal elements, as discussed by different geometers at the period in question, will allow us to reassess Hilbert's reductive instrumentalism underling his proof-theoretic program.

Jamie Tappenden (U. Michigan Ann Arbor): Definition, vagueness and conceptual development in mathematical practice

This paper studies mathematical concepts whose definitions are in some way or other incomplete, requiring additional development before they are entirely grasped. I briefly revisit two previous studies of this phenomenon – Lakatos' study of theorems on regular polyhedra and Peacocke's discussion of what he called the "partial grasp" of the derivative possessed by Newton and Leibniz, and then consider a few additional examples, particularly the concept of the genus of a surface, in which definitions that are provably equivalent in a certain context nonetheless differ in their potential for development and generalization. I consider some ramifications of such examples for the philosophy of language.

Benedict Eastaugh (Warwick): Mathematical premises in philosophical arguments: some considerations from reverse mathematics

Many arguments in contemporary philosophy rely on mathematical theorems to establish substantive philosophical views. For example, Dutch book theorems are used to argue that our degrees of belief should obey the probability axioms, while Arrow's theorem has been used to argue that genuine democracy is impossible. In this talk I will explore the use of computability theory and reverse mathematics to analyse the roles that mathematical premises play in philosophical arguments. These tools allow us to more clearly understand the idealisations embedded in these arguments, and ways in which those idealisations are problematic, because they impose unrealistic demands on what is required e.g. in order to be a rational agent or a democratic social planner.