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PREFACE

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Discussions concerning metaphysical and epistemological problems have always occupied centre stage in traditional philosophy of mathematics. Indeed, given the fact that mathematics presents itself as a study of abstract entities, the questions of whether or not these entities somehow exist in the concrete world and – especially – how people can *in principle* obtain proper knowledge about them, have of old been puzzling ones. In answer to them, various foundational programs have proposed diverging philosophical theories about the nature of mathematics and mathematical knowledge.

While philosophical views concerning the metaphysics and epistemology of mathematics deviate however, there is an obviously much larger consensus in traditional philosophy of mathematics about what the core methodology of mathematics should consist of. Roughly, it says that the whole point of mathematics is to substantiate mathematical conjectures, turning them into established theorems, by means of a particular method that does not leave any room for doubt: mathematical proof. This received view has a long and respected history, its central claim having been the subject of several more specific areas of inquiry, such as mathematical logic, set theory, proof theory or model theory.

It is no coincidence we have explicitly opted for the term 'traditional' in the above brief description. From the second half of the twentieth century, interests in general philosophy of science gradually expanded from foundational concerns to questions about the growth of scientific knowledge and understanding. Imre Lakatos' *Proofs and Refutations* (1976) was one of the first and famous calls to arms for a similar shift of focus in the philosophy of mathematics. Ever since, the respectability of this approach has been on the rise, to the extent of even earning itself a separate label: the philosophy of mathematical practice.

On 10–11 December 2015, the Centre for Logic and Philosophy of Science (CLWF) of Vrije Universiteit Brussel (VUB) organized a workshop titled *Mathematical Aims beyond Justification*. The main objective of this workshop was to consider, evaluate and understand what mathematicians strive for besides 'merely' settling results by means of proof, given the shared hypothesis that working mathematicians are indeed not (always) just interested in the justification of mathematical results, but can (sometimes)

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also be driven by other goals. Without wanting to belittle the role justification plays in mathematics, it should be noted that traditional philosophy of mathematics often leaves the impression that there is nothing else to discuss, while it is our firm belief that, if philosophers of mathematics want to provide and discuss an account of mathematical practice in the fullest sense, it is essential to get a grip on topics that are situated ‘beyond’ the justificatory realm. Said topics include the nature and role of mathematical explanation, mathematical understanding, mathematical creativity, mathematical discovery, mathematical beauty and mathematical experimentation, among others.

The present issue of *Logique et Analyse* collects papers from some of the speakers at the *Mathematical Aims beyond Justification* workshop described above. In the introducing chapter 1 of this volume, guest editors Joachim Frans and Bart Van Kerkhove (Vrije Universiteit Brussel) reflect on its central theme in general terms. The objective of this paper is to explore where research into the aims of mathematicians might lead us. Chapters 2, 3 and 4 then all address aspects of one of the topics that has particularly been receiving increased attention in recent philosophy of mathematics, namely *mathematical explanation*. Josephine Salverda (University College London) focuses on Steiner’s model of mathematical explanation. Salverda analyses some examples of explanatory proofs, and proposes a new reading of Steiner’s use of generalizibility, highlighting an epistemic component, the purpose of which is to bypass problems with the original model. Victor Gijsbers (Leiden University) also proposes a revised reading of Steiner’s model of mathematical explanation. He draws inspiration from work on scientific explanation and causation, namely Woodward’s interventionism. The result is what Gijsbers labels as a quasi-interventionist theory of mathematical explanation. Flavio Baracco (State University of Milan), in his turn, discusses mathematical explanation in the light of the question whether no, some or all proofs are explanatory. He considers the first two views, including the model of mathematical explanation provided by Frans and Weber. After a critical assessment of this model and someist models of explanation in general, Baracco suggests and defends the view that all proofs are explanatory. In chapter 5, Jean Paul Van Bendegem and Ronny Desmet (Vrije Universiteit Brussel) focus on the notion of *mathematical beauty*. An account of mathematical beauty, the authors argue, has to do more than address the beauty of a mathematical theorem. It should tell us something about aesthetic features of mathematical proof and mathematical creation as well. Focussing on the work of Hardy, Poincaré, Birkhoff, Rota, Le Lionnais and Whitehead, the authors present insights in both product aesthetics and creation aesthetics in mathematics. In the final chapter 6 of this volume, Fiona Doherty (University of Cambridge) proposes a new reading of *Hilbert’s views on consistency and existence*. She argues the standard evaluation of

Hilbert's ideas fails to take into account the time period and textual context in which Hilbert stated these ideas. Doherty proposes a more careful reading, which leads to a new historicized perception on Hilbert's philosophical views.

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