Preface

The 20th Workshop and International Conference on Representations of Algebras (ICRA 2022) was held from August 3 to 12, 2022, across two locations: Montevideo, Uruguay, and Buenos Aires, Argentina. The workshop was hosted by the Universidad de la República in Montevideo, while the conference took place at the Universidad de Buenos Aires. Following the online ICRA 2020 hosted by the Norwegian University of Science and Technology (NTNU) in Trondheim, Norway, ICRA 2022 marked the first in-person edition since the onset of the Covid-19 pandemic, though it also included some online lectures and a parallel Zoom broadcast of the plenary lectures.

The workshop featured five lecture series, some at an introductory level and others focused on current research topics like tame symmetric algebras, stability conditions, and silting theory. The conference included sixteen plenary lectures – four delivered online and two by the ICRA Award recipients – as well as fifty-three contributed talks presented in parallel sessions.

The scientific committee for ICRA 2022 consisted of: Lidia Angeleri Hügel, Aslak Bakke Buan,Claude Cibils,Bernhard Keller,Henning Krause, Eduardo Marcos, Octavio Mendoza, Manuel Saorín, Sibylle Schroll, Andrea Solotar, Gordana Todorov, Michael Wemyss and Pu Zhang.

The organizing committee consisted of: Marcelo Lanzilotta (Chair for the workshop), Ana González, Gustavo Mata, Marco Pérez, Andrea Solotar (Chair for the conference), Claudia Chaio, Elsa Fernández, María Julia Redondo, Mariano Suárez-Álvarez, Sonia Trepode and Hipolito Treffinger.

Two outstanding young mathematicians were honoured for their contributions to representation theory of finite-dimensional algebras. Rosanna Laking was recognised for her work towards understanding unbounded derived categories of finite-dimensional algebras, especially their Ziegler spectrum. A highlight is her work on purity in compactly generated derivators and t-structures with Grothendieck hearts. Alexandra Zvonareva was awarded for her broad range of work in representation theory, including influential results on silting theory and on stability conditions. A highlight is the derived equivalence classification of Brauer graph algebras which can be seen as the culmination of a substantial program of research. Both winners contributed to this volume of proceedings.

The volume collects fourteen articles on recent developments and trends in the area of representation theory of algebras and related topics, reflecting the contents of some lectures presented during ICRA 2022 and making these topics accessible to a broader audience.

Let us briefly describe the contents of the articles.

The article by Andruskiewitsch is a survey on pointed Hopf algebras with finite Gelfand–Kirillov dimension and related aspects of the theory of infinite-dimensional Hopf algebras.

In her article, Barbieri provides an introduction to the space of Bridgeland stability conditions, with a focus on examples from representation theory, including the example of the Bridgeland–Smith correspondence for certain quiver categories from marked surfaces.

The survey of Bazier-Matte presents many results about quasi-cluster algebras. She presents a comprehensive study of non-oriented surfaces, focusing on their triangulations and arc flips. Next, she provides the definition of quasi-cluster algebras, originally introduced by Dupont and Palesi, and highlights some of their properties, notably their connection to cluster categories. Finally, she introduces Wilson's alternative definition which endows these algebras with Laurent phenomenon algebra properties.

The article by Blanchette, Brüstle and Hanson is located at the interface between foundational topological data analysis (multiparameter persistence) and homological algebra. It presents applications of exact structures and relative homological algebra to the study of invariants of multiparameter persistence modules.

Xiaofa Chen's contribution is about exact dg categories, which simultaneously generalise exact categories in the sense of Quillen and pretriangulated dg categories in the sense of Bondal–Kapranov. The author presents the definition and a number of fundamental results concerning the dg nerve, the dg derived category, tensor products and functor categories with exact dg target. He concludes with a generalisation of Rump's theorem on the existence of the greatest exact structure on an additive category.

The paper by Xiao-Wu Chen and Zhengfang Wang reports on some progress on the Singular Presilting Conjecture. The authors describe two different dg enhancements of the singularity category: the Vogel dg category and the singular Yoneda dg category. These two dg enhancements turn out to be quasi-equivalent.

The paper of Erdmann is a survey on tame symmetric algebras, which are related to algebras constructed from surface triangulations. They generalise naturally tame blocks of group algebras. Most of this is joint work with the late Andrzej Skowroński.

The paper by Kaipel and Treffinger is devoted to the wall-and-chamber structure of an algebra and its connection with torsion classes and τ-tilting theory.

In his article, Külshammer proposes the notion of a bound quiver for an exact category. This generalisation of the classical concept of a Gabriel quiver is motivated by previous work of the author and coauthors for the case of the exact category given by the modules with a standard filtration over a quasi-hereditary algebra.

Kvamme's contribution deals with the theory of monomorphism categories. After a survey on the representation theory of these categories, the author presents his own

work with coauthors on a functorial approach to the topic, discusses the relationship between submodule categories and p-valuated abelian groups, and rectifies a statement in the literature by providing a proof for the wildness of a certain monomorphism category.

Laking's paper offers a new viewpoint on the lattice of torsion classes over a finite-dimensional algebra. The Hasse quiver of this lattice is interpreted in terms of HRS-tilts of associated t-structures and mutation of cosilting sets in the derived category.

The paper by Opper presents an overview on group actions on triangulated categories induced by collections of spherical objects, guided by the question of which structure such groups attain. The author discusses his ongoing joint project with Wassilij Gnedin and Alexandra Zvonareva on graded generalisations of Brauer graph algebras associated to suitably decorated punctured surfaces and conjectural faithful actions by surface braid twist groups via spherical twists.

Mutation of cosilting objects is also the topic of Vitória's article. Here the focus is on commutative noetherian rings, and the combinatorial techniques available over finite-dimensional algebras to study mutation are replaced by a topological tool: the prime spectrum of the ring.

Finally, Zvonareva's contribution provides a survey on the geometric model used in studying derived categories of gentle and Brauer graph algebras and explains the major steps and tools in achieving the derived equivalence classification of Brauer graph algebras.

We warmly thank all contributors to this volume, both the authors who shared their work and the referees who provided valuable feedback. Special gratitude goes to Apostolos Damialis, Gabriella Böhm and Fernando Gómez at EMS Press for their dedicated assistance in preparing this publication.

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