

PREFACE

This collection of articles is a natural continuation of the volume that appeared in this journal exactly ten years ago. It is motivated by research topics investigated for many decades at the Logic seminar of the Mathematical Institute SASA, and by the course given at the Institute in the spring of 2023 as a part of the series called *Lectures of Mika Alas*. In recent years, set theory and surrounding areas have seen much progress both in its own internal development, but also in connections with other areas of mathematics. This can serve as another motivation for this volume, as it contains papers exploring both directions. The connections are mainly with topology, functional analysis, and Ramsey theory. Each paper is general enough to present methods which can be used in a wide range of problems, and contains a number of particular open questions an interested reader can attempt to solve. All the papers provide a bibliography for further reading.

We briefly explain the content of the present articles. The paper of Bergfalk is an introduction to the higher dimensional version of the Todorćević method of minimal walks. It is shown that these generalized walks can help one to understand the combinatorics of ordinals ω_n in a manner similar to the way how classical walks provide better understanding of the ordinal ω_1 . The article of Brech covers the combinatorial aspects of the celebrated separable quotient problem. This is a well-known question in functional analysis, posed by Banach and Mazur, and open since 1930s. The paper by Brodsky, Rinot, and Yadai focuses on parameterized proxy principles in set theory. These principles were introduced by Brodsky and Rinot as a new method for uniform constructions of higher Souslin trees on regular uncountable cardinals, and in this paper the authors give some models when the principles holds, as well as provide some new examples of higher Souslin trees. The contribution of Cancino, Guzmán and Hrušák explores the ways in which one can compare ultrafilters on the set of positive integers. The central method in their paper is the Katětov order between ultrafilters. The contribution of Corson is in the area of topology. In particular, they motivate and sketch the proof that the fundamental group of the Griffiths double cone is isomorphic to that of the triple. The paper of Dasilva Barbosa and Mašulović introduces a way to compare statements in finite Ramsey theory. They show that the notion of pre-adjunction between categories generalizes the notion of Tukey reducibility between preorders, and use it to compare Ramsey statements. They also propose a conjecture, that in their formalism, the finite dual Ramsey theorem is the strongest statement of finite Ramsey theory. In their article, Fischer and Schembecker introduce novel proof techniques for determining the possible values of the cardinal characteristic \mathfrak{a}_T . This characteristic presents the minimal cardinality of an uncountable partition of the Cantor set into closed sets. The survey of Grebík and Vidnyánszky presents how ideas from descriptive set theory can be used to prove results in the field of distributed computing. This is in contrast to the more usual application of finitary algorithms to the analysis of infinite structures. The paper of Hubička and Zucker covers the area of structural Ramsey theory. In particular, it concentrates on the phenomenon of big Ramsey degrees. The paper of Kumar focuses on the interplay

between set theory and computability theory. More precisely, their paper explores the order structure of Turing degrees, and the effect that set theory has on it. In their article, Kuzeljević and Raghavan survey the order structure of various kinds of ultrafilters on positive integers, under the Rudin-Keisler and Tukey ordering. Some of the classes they consider are selective, P-point, stable ordered union, and basically generated ultrafilters. The contribution of Lambie-Hanson, Rinot and Zhang is investigating the relationships between various set-theoretic compactness principles. They find versions of squares compatible with forcing axioms and with certain indecomposable ultrafilters, as well as the connection between the PFA and uniform indecomposable ultrafilters. The survey of Lücke focuses on the problem of definability of the non-stationary ideal on an uncountable cardinal. Their paper reveals the connection of this problem to various parts of modern set theory. The article of Peng and Wu is another contribution to topology, where they present some very old and some very much recent results about L -spaces, a hereditary Lindelöf non-separable spaces. In this article, the emphasis is on the kind of algebraic structure that can be meaningfully added to an L -space. In a paper by Šobot, the extension to ultrafilters of the divisibility relation on integers is thoroughly explored. Their paper also contains a definition of congruence of ultrafilters, which resembles the congruence relation on the set of integers. The article by Yorioka gives an extensive survey of the Todorčević method of side conditions. They present how this method can be used in various problems in set theory, most prominently in the specific area of proper forcing and its variations.

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