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Preface

This issue of RACSAM is entirely dedicated to Topology and some of its interactions, not only with other areas of Mathematics but also with other sciences. It consists of eight papers which deal with purely topological topics as well as with applications of Topology to fields such as Dynamical Systems, Differential Equations, Game Theory and Economics.

The first article, presented by **N. Brodskiy** and **J. Dydak** is concerned with several notions related to the asymptotic dimensions introduced by M. Gromov and A. Dranishnikov. As the authors point out, one of the main motivations in this research is the result of G. Yu that the Novikov Conjecture holds for groups of finite asymptotic dimension. The present paper represents an important step towards coherence and unification of many different definitions and provides a firm basis for further developments.

J. Keesling shows in his paper how effective the topological tool of inverse limit is in the study of attractors. This is an important field of research since R. Williams proved that hyperbolic attractors are inverse limits of systems of branched manifolds, an essential point in the program of S. Smale to understand the dynamics of hyperbolic attractors. Keesling's article is mainly centered on the study of inverse limits of tent maps and Ingram's Conjecture, a subject in which he is one of the main experts.

Another area in which inverse limits have found a fruitful application is backward dynamics in Economics. **J. Kennedy**, author of the next article, has greatly contributed to this area, where she has collaborated with B. Raines, D. R. Stockman and J. A. Yorke in the study of chaotic equilibria in models with backward dynamics, as well as in the study of utility in models with chaos. Here she offers a thorough discussion of some of the models and a description of how inverse limits have recently been applied to the problems of backward dynamics in Economics.

J. M. Montesinos dedicates his article to a chapter of the most classical Topology. He discusses some consequences of the fact that the fundamental group of the orbifold with singular set the Borromean link and with isotropy cyclic of order 4 is a universal kleinian group. The author gives here an exposition of some of his research with H. M. Hilden and M. T. Lozano on this and other matters related to the geometry and topology of three-manifolds.

R. Ortega considers in his paper two situations which illustrate the fact that some problems in differential equations that are initially treated with analytical tools later evolve towards a topological framework. He develops a topological approach, using the fixed point index and Brouwer's theory of translation arcs, to handle a problem of instability treated by Levi-Civita. He also studies, in a concrete situation, how Wazewski's theory can be used to construct asymptotic solutions for differential equations. These problems have their origin in the work of Poincaré and belong to an illustrious line of research where mathematicians like Birkhoff, Arnold and others have substantially contributed.

J. Porti presents an exposition of some of the central results in contemporary topology. His survey deals with Thurston's geometrization conjecture of three manifolds and Perelman's proof with the Ricci flow. He

discusses in the paper the results of R. S. Hamilton and G. Perelman which lead to the proof as well as many other relevant results which go back to Kneser, Seifert, Milnor and other outstanding names in Topology.

J. J. Sánchez-Gabites shows in his paper how homotopy theory, shape theory and other techniques from algebraic topology can be applied to dynamical systems and, in particular, to specific areas, like the Conley index theory, Morse decompositions of isolated invariant sets, boundaries of atractors and of their regions of attraction, etc. He also discusses the beautiful theory of unstable attractors, an area of research which is experiencing a fast development.

The paper by **R. S. Simon, S. Spież** and **H. Toruńczyk** is devoted to the study of equilibria in a class of games by using topological methods, some of them having their origin in the work of the Polish School of Topology. The authors have carried out a remarkable work on the proof of existence of equilibria in various classes of infinitely repeated games, solving a problem posed by R. Aumann, M. Maschler and R. Stearn that is widely discussed in the paper.

We hope that the reader will find the new results exciting and the content of the expository articles useful and we would like to thank, on behalf of the Spanish Academy of Science, the authors and referees who have kindly collaborated in this issue.

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