

# Proceedings of Symposia in PURE MATHEMATICS

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Volume 71

## Topology and Geometry of Manifolds

2001 Georgia International Topology Conference  
May 21 – June 2, 2001  
University of Georgia  
Athens, Georgia

Gordana Matić  
Clint McCrory  
Editors



American Mathematical Society

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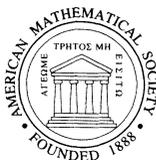
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ATHENS, GEORGIA, MAY 21–JUNE 2, 2001

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## Preface

The 2001 Georgia International Topology Conference was held at the University of Georgia in Athens, Georgia, from May 21 to June 2. There were forty talks and four problem sessions over this two-week period. This conference has been held every eight years since 1961, for the purpose of bringing together mathematicians to discuss the most exciting new developments in topology. While the invited talks always represent a wide variety of topics, a large number of talks usually focus on a common theme. The choice of speakers for the 2001 conference reflects the current interest in low dimensional topology, symplectic and contact topology, and foliations.

In the last decade gauge theoretic methods in low dimensional topology, in particular Seiberg-Witten theory, were developed, and relationships between gauge theoretic invariants and symplectic and contact topology and geometry were established, as well as deep relations between foliations and contact topology. Analysis of symplectic and contact structures and holomorphic curves emerged as tools to study and construct new invariants for both three and four dimensional manifolds. There were also significant advances in our understanding of foliations and laminations of 3-manifolds. Other rich sources of invariants for 3-manifolds which emerged over the last decade are Vassiliev invariants and topological quantum field theory, including Rozansky-Witten theory.

The two main goals of the Georgia Topology Conference are to give wide exposure to new and important results and to encourage interaction among researchers in different stages of their careers. Towards this end, we encourage speakers to aim their talks at a broad audience of topologists. Some, unfortunately not all, of the expository talks given at the 2001 conference are represented in this volume. Several of the papers are surveys, some with the goal of introducing students and newcomers to the subjects presented, and some with the goal of summarizing the results of years of research. Several papers present new research that was the subject of talks at the conference.

This volume also contains two extensive problem lists. There is a history of problem lists in low dimensional topology and the Georgia Topology Conference. Rob Kirby's famous 1977 problem list was updated and extended for the proceedings of the 1993 Georgia conference, and it is still an important reference. David Gabai's list of problems in foliations and laminations, published in the same 1993 proceedings, is complemented here by *Problems in foliations and laminations of 3-manifolds*, a new list assembled by Danny Calegari, who led a problem session on the topic during the conference.

Contact topology, a new topic of interest in low dimensional topology which emerged in the last decade, was present in the Kirby problem list, but only in

a very modest way. John Etnyre and Lenhard Ng's *Problems in low dimensional contact topology* is a new list assembled for these proceedings. It is a product of two problem sessions held at the conference, one on 3-dimensional contact topology led by Emmanuel Giroux, and another led by John Etnyre which focused on Legendrian knots and contact homology.

Both problem lists have been assembled with essential help from many mathematicians, some of whom were present at the conference and some of whom gave input afterwards.

During the conference there were several talks organized for the purpose of introducing graduate students to topics of current interest which were subjects of invited talks at the conference. One of these lectures is presented in extended form in this volume. John Etnyre gave an introductory lecture on contact topology, and the notes in this volume will be a welcome resource for students entering the subject. While there are several sources of introductory material for the more geometric aspects of symplectic and contact geometry, the more topological approach has been a subject of very few expository articles. Etnyre's lecture notes are followed by several papers containing expositions of results in the field.

It is our wish to express special thanks to Rob Kirby, who has been a supporter of the Georgia Topology Conference for more than thirty years, and whose participation in the early stages of planing for the 2001 conference was invaluable. The list of principal speakers for the 2001 conference was made with the help of a scientific organizing committee consisting of Mladen Bestvina, Simon Donaldson, Yasha Eliashberg, Steve Ferry, Dave Gabai, Helmut Hofer, Rob Kirby, and Cliff Taubes. As is the tradition at Georgia conferences, there were thirty invited principal speakers over two weeks, and the remaining slots were filled by people whose names were suggested to the scientific committee during the conference.

We would like to thank the authors and the referees for the work they have done in preparing this volume for publication. Many thanks also go to Julie McEver and Gail Suggs, who provided invaluable logistical support for the conference, and to Suzie Radosic Pagnut, who did the final  $\text{\LaTeX}$  formatting.

Funding for the conference was provided by the National Science Foundation (grant DMS-0110085) and the University of Georgia—the Vice President for Academic Affairs, the Georgia Research Foundation, the Franklin College of Arts and Sciences, and the Department of Mathematics. We are grateful for their support.

G. M.  
C. M.

Athens, Georgia  
May 2003

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