

CONTEMPORARY MATHEMATICS

161

Differential Topology, Foliations, and Group Actions

Workshop on Topology
January 6–17, 1992
Pontifícia Universidade Católica,
Rio de Janeiro, Brazil

Paul A. Schweitzer, S.J.
Steven Hurder
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INTRODUCTION

This volume contains the Proceedings of the Workshop on Topology which took place at the Pontifícia Universidade Católica of Rio de Janeiro (PUC-Rio) from January 6 to 17, 1992, with the participation of about a hundred mathematicians from Brazil and various other countries. The four minicourses and about forty lectures and contributed papers covered a variety of topics in differential and algebraic topology, including group actions, foliations, low dimensional topology, and connections with differential geometry, among others. The main area of concentration was foliation theory, reflecting the interests of most of the topology group at PUC-Rio, but there was a lively interchange on various other topics of current research in topology. The scientific program and the list of participants are included below.

The contents of this volume reflect both this concentration and dispersion. The first section consists of several articles on various aspects of foliation theory, such as their characteristic classes, degree of differentiability, and singularities of holomorphic foliations. It also contains an excellent list of open problems for foliations research, the result of two problem sessions during the Workshop and much careful work by Remi Langevin in contact with many specialists in the field.

Two articles in the second section, starting from different but complementary perspectives, relate De Rham theory to singularities and stratifications. The third section contains two survey articles on actions – Alejandro Adem’s minicourse on finite group actions and cohomology and Hurder’s survey of rigidity of Anosov actions. Finally there are some papers in topology of low dimensions and characteristic classes, including the notes of Nicolau Saldanha’s elementary minicourse on geometric structures on 2- and 3-manifolds. Ron Stern’s minicourse on 4-manifolds is not included in this volume, nor is Etienne Ghys’ minicourse on the dynamics of the horocyclic flow (based on his Séminaire Bourbaki lecture, Exposé 747, November 1991).

The Organizing Committee of the Workshop was composed of Profs. Plácido Andrade, José Luis Arraut, Marcos Craizer, Suely Druck, Nathan Moreira dos Santos, and Paul Schweitzer (chair), all from PUC-Rio, Lawrence Conlon (Washington University, St. Louis), Luiz Antônio Favaro (Universidade de São Paulo, São Carlos campus), Daciberg Lima Gonçalves (Universidade de São Paulo), and Mrs. Maria Tereza Milagres Nascimento, secretary.

As in any meeting, the staff support was essential for its smooth functioning, and this was especially so in a period of financial crisis and at the beginning of a new fiscal year in Brazil. The excellent work of the Workshop Secretary Maria Tereza Milagres Nascimento made its success possible; she showed that she really deserves her maiden name ‘Milagres’ (which means ‘miracles’)! In the name of the Organizing Committee, I would like to thank her and other staff members of the Mathematics Department and other sections of PUC-Rio for their invaluable contributions. We would also like to express our sincere and deep thanks to the many government organs and private companies whose financial support made the Workshop possible (listed under “Sources of Support” below), especially the CNPq (the main source of financial support) and the Votorantim Group (whose early support was essential). The four minicourse lecturers deserve our grateful appreciation for their excellent presentations.

In conclusion, on behalf of the editors of these Proceedings and the Workshop Organizing Committee, I would like to thank the American Mathematical Society for including this volume in the Contemporary Mathematics series. I am personally very grateful to Steve Hurder for doing the lion’s share of the work of editing this volume. I hope it will contribute to the continuing vitality of research in topology and related areas.

Paul A. Schweitzer, S.J.
Rio de Janeiro, June 1993

SOURCES OF SUPPORT

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Brazilian government organs: CAPES, CNPq, FAPESP, FAPERJ, FINEP;

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PROGRAM OF THE WORKSHOP ON TOPOLOGY

MINICOURSES

- Alejandro Adem, *Cohomology and actions of finite groups.*
Etienne Ghys, *The horocycle flow and ergodic theory.*
Ronald Stern, *Recent developments in smooth 4-manifolds.*
Nicolau Saldanha, *Geometric structures of 2 and 3-manifolds*

LECTURES

- Jacob Palis, *Recent developments in the theory of chaotic dynamical systems.*
Steven Hurder, *Geometric rigidity for lattice actions.*
William H. Meeks, *The topological uniqueness of Heegaard and minimal surfaces in R^3 .*
Sóstenes Lins, *A string theory for 3-manifolds.*
J.P.Brasselet, *De Rham theorems for singular varieties — a survey.*
José Seade, *Invariants of 3-manifolds and surface singularities.*
Shigenori Matsumoto, *The Lie affine foliations on 4-manifolds.*
Nathan M. dos Santos, *Foliated cohomology and characteristic classes.*
Lawrence Conlon, *Surgery and foliations of knot complements.*
Yoshihiko Mitsumatsu, *Amenability of foliations and characteristic classes of $SL(2, R)$ -actions on surfaces.*
Duane Randall, *Topological bundles with fiber R^4 .*
Paweł Walczak, *Mean curvature in the theory of foliations.*
Michel Boileau, *Foliations with compact leaves and bounded cohomology.*
J. Omegar Calvo, *Some irreducible components of the space of holomorphic foliations.*
Elmar Vogt, *Foliating R^n in codimension two by tori.*
Takashi Tsuboi, *Rationality of certain foliations.*
Maria Aparecida Soares Ruas, *Geometry and classification of singularities of surfaces in 3-space.*
Xavier Gómez-Mont, *The index of vector fields on singular surfaces.*
Franz Kamber, *Foliation reduction and the twistor correspondence.*
Paul Schweitzer, *Contractibility of the space of foliations of $S^2 \times I$.*
Maria del Carmen Romero Fuster, *Topological properties of bitangent surfaces associated to generic families of curves.*
Daniel Lehmann, *Realizing usual diagrams of algebraic topology in differential geometry.*

Aleksandr G. Aleksandrov, *On the De Rham complex of singular spaces.*
 Marcos Craizer, *Linearization of codimension one R^2 -actions near a compact orbit.*

José Maria Montesinos, *Arithmetic 2-bridge knot orbifolds.*

Harold Rosenberg, *The geometry of hypersurfaces of constant curvature.*

Nicolau Saldanha, *Stability of compact actions of R^n .*

Sandy Blank, *Irrational foliations on tori.*

Alejandro Adem, *A splitting theorem for the K -theory of a discrete group.*

Nelza Baruffati, *Immersiones of projective Stiefel manifolds.*

Remi Langevin, *How to generalize entropy of maps to foliations, relations and operators.*

Ricardo Cruz, *Non locally flat embeddings of circles in spheres.*

Fabiano Brito, *Heinz's problem for Weingarten surfaces.*

CONTRIBUTED TALKS

Dirce K.H. Mochida, *Geometric characterization of the singularities of height functions on surfaces in R^4 .*

Maria Gorete C. Andrade, *A cohomological invariant for pairs of groups.*

Norikazu Hashiguchi, *On the rigidity of PL-representation of a surface group.*

Pedro Luiz Pergher, *On the equivariant bordism class of actions of $(Z_2)^k$.*

Ozírde Manzoli Neto, *Seifert surfaces for knotted manifolds.*

Richard Nelson Urzua, *Cohomology of Z^p actions in the affine group of T^q .*

Rafael Ruggiero, *Expansive dynamics and hyperbolic geometry.*

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This volume contains the proceedings of the Workshop on Topology held at the Pontifícia Universidade Católica in Rio de Janeiro in January 1992. Bringing together about one hundred mathematicians from Brazil and around the world, the workshop covered a variety of topics in differential and algebraic topology, including group actions, foliations, low-dimensional topology, and connections to differential geometry. The main concentration was on foliation theory, but there was a lively exchange on other current topics in topology. The volume contains an excellent list of open problems in foliation research, prepared with the participation of some of the top world experts in this area. Also presented here are two surveys on group actions—finite group actions and rigidity theory for Anosov actions—as well as an elementary survey of Thurston's geometric topology in dimensions 2 and 3 that would be accessible to advanced undergraduates and graduate students.

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