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PROCEEDINGS OF THE REGIONAL CONFERENCE ON THE APPLICATION OF TOPOLOGICAL METHODS IN DIFFERENTIAL EQUATIONS

Introduction. The present issue of the Rocky Mountain Journal of Mathematics contains selected proceedings of the regional conference on the *Application of Topological Methods in Ordinary and Partial Differential Equations* which was held on the campus of the University of Colorado in Boulder from May 31 through June 4, 1976. This conference was one of a series of five-day regional conferences held at various locations geographically distributed throughout the United States. These conferences are funded by the Mathematical Sciences Section of the National Science Foundation (NSF) with supporting services provided by the Conference Board of the Mathematical Sciences (CBMS) through the medium of a contract with the National Science Foundation. The objective of these conferences is to stimulate and broaden research activity across the spectrum of the mathematical and computer sciences.

There were seventy-five participants at the conference. The principal lecturer was Professor Charles Conley of the University of Wisconsin. There were five invited lecturers: Michael Crandall, University of Wisconsin; Paul Fife, University of Arizona; Jean Mawhin, Université Catholique de Louvain (Belgium); R. Clark Robinson, Northwestern University; and Jim Yorke, University of Maryland. The other sixty-nine invited participants were primarily drawn from the broad geographic region around Boulder.

Professor Conley delivered two one-hour lectures each day. The theme of his lectures could be described as applications of topological theorems to questions concerning the existence of orbits connecting equilibrium solutions for differential equations and generalizations of such ideas.

A prototype of the techniques discussed was the "shooting method" which makes use of the topological property of connectedness to prove the existence of solutions to certain kinds of boundary value problems. A simple observation of T. Wazewski places the shooting method as the most elementary instance of a fundamental principle which brings to bear all the topological invariants of homotopy theory. The first three lectures by Professor Conley were devoted to the Wazewski principle and its applications. One such example was concerned with the existence of a standing wave solution of the Kolmogoroff equation $u_t = u_{xx} + p(x)u(1 - u)$. In the next three lectures, the notion of

isolated invariant sets, the Morse index and the invariance of the index under continuation was developed. The Morse homotopy index of an isolated invariant set is a generalization of the Morse index of a non-degenerate critical point of a gradient flow. In the final four lectures the ideas of filtrations and chain recurrences were discussed and a generalized Morse-Smale theorem was proven, then hyperbolic structures were developed, and finally applications to the three body problem were considered in the context of the previous lectures. These lectures will be published separately as a research monograph by the American Mathematical Society.

The other seventy-four participants were invited to submit their invited or contributed papers, subject to referee's approval, to the *Rocky Mountain Journal of Mathematics*. Thomas Sherman, director of the Rocky Mountain Mathematics Consortium and William Scott, Managing Editor of the *Rocky Mountain Journal of Mathematics* had agreed to devote a special issue of this Journal to the proceedings of the conference.

The sixteen papers appearing in this issue are testimony of the diversity and the power of topological methods being utilized in the study of differential equations and their applications today. The papers speak for themselves.

J. Bebernes
Conference Director

LIST OF PARTICIPANTS

Principal Lecturer

Charles Conley — University of Wisconsin

Invited Lecturers

Mike Crandall — University of California — L.A.
Paul Fife — University of Arizona
Jean Mawhin — University of Louvain, Belgium
Clark Robinson — Northwestern University
Jim Yorke — University of Maryland

Invited Participants

Prem N. Bajaj — Wichita State University
Jerrold W. Bebernes — University of Colorado
Steve Bernfield — University of Texas
T. Burns — University of New Mexico
T. A. Burton — University of Southern Illinois
Gail Carpenter — M.I.T.

John Chadam — Indiana University
Shui Nee Chow — Michigan State University
Richard Churchill — Hunter College
William Coles — University of Utah
Robert Easton — University of Colorado
Rick Elderkin — Pomona College
Jim Ellison — University of New Mexico
John Franks — Northwestern University
Bob Gaines — Colorado State University
Jack George — University of Wyoming
William Grassman — University of Iowa
Stephen Grossberg — Boston University
Bob Gunderson — Utah State University
Grant Gustafson — University of Utah
Chaitan Gupta — Northern Illinois University
Carl Hartzman — Dalhousie University
Stuart Hastings — S.U.N.Y. Buffalo
Henry Hermes — University of Colorado
David Hoff — University of Michigan
Fred A. Howes — University of Wisconsin
Sze-Bi Hsu — University of Iowa
Chris Jones — University of New Mexico
Walt Kelley — University of Oklahoma
Arthur Krener — University of California, Davis
Bob Liang — University of Kansas
Dick McGehee — University of Minnesota
Bob McKelvey — University of Montana
David McLaughlin — University of Arizona
John Mallet-Paret — Brown University
Steve Merrill — University of Iowa
John T. Montgomery — University of Rhode Island
Bob Moyer — University of Kansas
Zbigniew Nitecki — Tufts University
Bob O'Malley — University of Arizona
Giampiero Pecelli — Hunter College
William Perrizo — North Dakota State University
Allan C. Peterson — University of Nebraska
Aubrey Poore — Colorado State University
David Rod — University of Calgary
Robert J. Sacker — University of Southern California
Duane Sather — University of Colorado
Klaus Schmitt — University of Utah

Keith Schrader — University of Missouri
Allyn Scott — University of Wisconsin
Hal Smith — University of Iowa
Joel Smoller — University of Michigan
Monty J. Strauss — Texas Tech University
Ronald Svedlove — Stanford University
Russell Thompson — University of Northern Illinois
William C. Troy — University of Pittsburgh
Paul Waltman — University of Iowa
R. J. Wolfe — S.U.N.Y. Buffalo
F. Wesley Wilson — University of Colorado
Jay H. Wolkowisky — University of Colorado
Hermann Flascha — University of Arizona
Henry Kurland — University of Wisconsin
William E. Fitzgibbon — University of Houston
Dr. H. O. Peitgen — Universitaet Bonn
Tien-Yien Li — University of Utah
Kai-Nan Chueh — University of Colorado
Paul Talaga — University of Colorado
Warren Shreve — North Dakota State University