

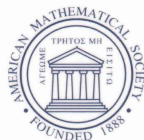
# CONTEMPORARY MATHEMATICS

379

## Mathematical Studies in Nonlinear Wave Propagation

NSF-CBMS Regional Research Conference on  
Mathematical Methods in Nonlinear Wave Propagation  
North Carolina A&T State University  
Greensboro, North Carolina  
May 15–19, 2002

Dominic P. Clemence  
Guoqing Tang  
Editors



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Providence, Rhode Island

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The NSF-CBMS Regional Research Conference on “Mathematical Methods in Nonlinear Wave Propagation” was held at North Carolina A&T State University, Greensboro, North Carolina, May 15–19, 2002.

2000 *Mathematics Subject Classification*. Primary 00B25, 35-06, 65-06.

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### Library of Congress Cataloging-in-Publication Data

NSF-CBMS Regional Research Conference on Mathematical Methods in Nonlinear Wave Propagation (2002: North Carolina A&T State University)

Mathematical studies in nonlinear wave propagation : NSF-CBMS Regional Research Conference on Mathematical Methods in Nonlinear Wave Propagation, North Carolina A&T State University, Greensboro, North Carolina, May 15–19, 2002 / Dominic P. Clemence, Guoqing Tang, editors.

p. cm. — (Contemporary mathematics, ISSN 0271-4132 ; 379)

Includes bibliographical references.

ISBN 0-8218-3349-9 (acid-free paper)

1. Wave motion, Theory of—Congresses. 2. Nonlinear theories—Congresses. I. Clemence, Dominic P., 1959– II. Tang, Guoqing, 1959– III. Title. IV. Contemporary mathematics (American Mathematical Society) ; v. 379.

QA927.N74 2002  
530.12'4—dc22

2005041238

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10 9 8 7 6 5 4 3 2 1 10 09 08 07 06 05

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## Preface

The NSF-CBMS Regional Research Conference, “Mathematical Methods in Nonlinear Wave Propagation”, was hosted by the Mathematics Department at North Carolina A&T State University, May 15-19, 2002. The five-day-long conference was intended to stimulate interest and activity in the study of nonlinear wave phenomena, with encouraging minority participation as a stated priority. The proceedings were anchored by ten lectures on wave propagation in nonlinear fiber optics, delivered by Professor J. K. Shaw of Virginia Tech, with supporting lectures and semi-structured discussion sessions by other researchers in nonlinear mathematics. Participants included faculty and other postdoctoral researchers, as well as graduate and undergraduate students, with participation mostly from within North Carolina. The conference anchor lectures were chosen to give a focal subject of application to a diverse set of specialized mathematical areas, thus creating opportunities for collaborations amongst mathematicians of different specialties, and at the same time laying a foundation for interdisciplinary collaboration.

The ten principal lectures gave a fiber optics communications overview and addressed both modeling as well as mathematical issues; these have been published as the CBMS conference series monograph, “Mathematical Principles of Optical Fiber Communications”. The present volume is a collection of the supporting lectures given at the conference as well as papers which grew out of poster presentations and ensuing discussions. It is expected to be a useful research companion of the monograph accessible to diverse mathematical specialists interested in fiber optic communications and other nonlinear phenomena, as well as to engineers and other scientists interested in the mathematics of nonlinear wave propagation; the volume is envisaged as an easily accessible reference for interdisciplinary collaboration.

The meeting offered opportunities for collaboration amongst mathematicians of different specialties, while at the same time laying a foundation for interdisciplinary collaboration. While the majority of participants were mathematicians, others represented engineering disciplines and physics. The 44 registered participants represented 14 universities, 2 NASA research centers, and three private firms. While participation was mainly from within the state, 10 other states and one foreign nation were represented. Although only 3 HBCU’s were represented, 21 participants were African-American minorities.

On each of the first four days of the conference, four lectures were given, two by Professor Shaw and two by other invited speakers, followed by informal discussion sessions; the last day ended at lunch following Professor Shaw’s final two lectures. Active experts came from dynamical systems and chaos, scattering and

spectral theory, nonlinear wave equations, optimal control, optical waveguide design, and numerical simulation. In addition to the main lectures, structured discussion sessions were offered in the afternoons, as well as poster presentations on Saturday. In addition to Professor Shaw's outline, all abstracts were distributed to all participants at the beginning of the conference. The following delivered one or two lectures each: Tuncay Aktosun (Mississippi State University, Mathematics), Bolindra Borah (North Carolina A&T State University, Mathematics), Sin-Chung Chang (NASA, Glenn, Engineering), Martin Klaus (Virginia Tech, Mathematics), Ching Ken Loh (NASA, Taitech, Engineering), Ronald Mickens (Clark Atlanta University, Physics), William H. Prosser (NASA, Langley, Engineering), Jianke Yang (University of Vermont, Mathematics).

All conference lectures were held in Marteena Hall (home of the Mathematics and Physics Departments) on the campus of North Carolina A&T State University. A block of rooms was reserved at the Drury Inn, Greensboro. Scheduled transportation between the hotel and the conference venue was provided. On Wednesday evening, a reception was hosted by the Dean of the College of Arts and Sciences, Dr. Caesar R. Jackson, followed by a dinner hosted by the Vice Chancellor for Research, Dr. Earnestine Psalmonds.

The local organizing committee consisted of Shea D. Burns, Mingxiang Chen, Dominic P. Clemence (co-chair), Janis Oldham, and Guoqing Tang (co-chair), all of NC A&T State University Mathematics Department. The organizers are grateful for logistical assistance from Ms. Belinda Clemence of the Mathematics and Sciences Learning Resource Center, which hosted the lunches, Ms. Sharon Goins and Ms. Patricia Shelton of the Mathematics Department, as well as Mathematics and Physics graduate students Courtney Davis, Mookesh Dhanasar, Michelle Massey, and Tenesha Young.

We thank the National Science Foundation and the Conference Board of Mathematical Sciences for financially supporting the conference. We are also grateful to both NSF (DPC,GT) and NASA (DPC) for supporting the preparation of this volume.

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Lively discussions and stimulating research were part of a five-day conference on Mathematical Methods in Nonlinear Wave Propagation sponsored by the NSF and CBMS. This volume is a collection of lectures and papers stemming from that event. Leading experts present dynamical systems and chaos, scattering and spectral theory, nonlinear wave equations, optimal control, optical waveguide design, and numerical simulation.

The book is suitable for a diverse audience of mathematical specialists interested in fiber optic communications and other nonlinear phenomena. It is also suitable for engineers and other scientists interested in the mathematics of nonlinear wave propagation.

ISBN 0-8218-3349-9



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