

CONTEMPORARY MATHEMATICS

301

The Legacy of the Inverse Scattering Transform in Applied Mathematics

Proceedings of an AMS-IMS-SIAM
Joint Summer Research Conference
on the Legacy of Inverse Scattering Transform
in Nonlinear Wave Propagation
June 17–21, 2001
Mount Holyoke College, South Hadley, MA

Jerry Bona
Roy Choudhury
David Kaup
Editors



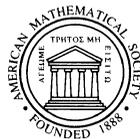
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Preface

This volume contains the proceedings of the conference on the Legacy of the Inverse Scattering Transform which was held at Mount Holyoke College in Massachusetts from June 17–21, 2001.

Current progress in the area of Solitons and the Inverse Scattering Transform continues to be rapid and new applications are also multiplying, with current nonlinear optical technology moving so rapidly, larger and larger intensities becoming more available, pulse widths becoming smaller and smaller, and relaxation times and damping rates becoming less and less significant. As this limit is approached, the exactly integrable soliton equations, such as 3-wave resonant interactions and second harmonic generation become more and more relevant to experimental applications. Experimental techniques are currently being developed to use these interactions to frequency convert high intensity sources into frequency regimes where there are no lasers. Other experiments are using these interactions to develop intense variable frequency sources, opening up even more new experimental possibilities.

However, in regard to the mathematics of this area, the ‘easy’ problems have been solved long since, and the field has attained a kind of intellectual adolescence. As such, it was felt that it was a good time for taking stock of the current situation, and seeing where the area might go next. We believe that such a reconsideration of the numerous strands of activity which are the legacy of the Inverse Scattering Transform can reveal much about where the field can go in the future, and can even re-energize the field significantly. It will also bring lines of research which currently are somewhat independent of each other closer together, and possibly even open up new avenues of enquiry.

Thus, the conference provided a forum for the more general exposition and assessment of recent developments in Nonlinear Waves and related areas and of their potential applicability in various fields, and this is clearly reflected in the articles in these proceedings. The present volume is thus expected to be of strong interest to experienced and beginning researchers in the Mathematics, Physics, and Engineering communities.

We express our sincere thanks to the American Mathematical Society for their support of the Joint Summer Research Conference Series and the publication of this volume, and to the U.S. Army Research Office for a generous supplemental travel grant that enabled us to cover the travel expenses of all participants. Our greatest single debt of gratitude is undoubtedly to Wayne Drady for his thoroughness and sang-froid at all stages of the conference organization. We knew that we could leave all the practical details in his capable hands and concentrate on enjoying the

meeting. Our grateful thanks also to Chris Thivierge and Gil Poulin for all their help and support on the many steps in the process of putting this volume together.

This volume contains new developments and state-of-the-art research arising from the conference on the "Legacy of the Inverse Scattering Transform" held at Mount Holyoke College (South Hadley, MA). Unique to this volume is the opening section, "Reviews". This part of the book provides reviews of major research results in the inverse scattering transform (IST), on the application of IST to classical problems in differential geometry, on algebraic and analytic aspects of soliton-type equations, on a new method for studying boundary value problems for integrable partial differential equations (PDEs) in two dimensions, on chaos in PDEs, on advances in multi-soliton complexes, and on a unified approach to integrable systems via Painlevé analysis.

This conference provided a forum for general exposition and discussion of recent developments in nonlinear waves and related areas with potential applications to other fields. The book will be of interest to graduate students and researchers interested in mathematics, physics, and engineering.

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