

PREFACE

These Conference Proceedings contain most of the contributions and lecture courses presented at the 13th International Conference on Geometry, Integrability and Quantization. The Conference took place in the gorgeous geographical frame of the Saints Constantine and Elena resort, on the Black Sea coast, from June 3-8, 2011.

The Conference was organized in a unique session providing the setting for vivid discussions and interactions between participants and lecturers. The interdisciplinary character of the Conference attracted a variety of interesting and modern topics.

Namely, the mathematical theory of solitary waves and soliton equations was amply represented with talks on viscous fingering interfaces, geometry of the space of initial data in PDE, integrable hierarchies, integrability problems, integrability in $(1 + 1)$ -dimensions, polynomial bundle Lax operators, symmetric spaces, and recursion operators.

There were very original presentations on various formal and applied subjects like three-dimensional rotations group of absolute rigid bodies, combinatorics of stable plane curves, fixed points and stability.

Modern topics in differential geometry with applications in cosmology, relativity and gravitation were delivered: differential geometry of vectors fields, the Dirac equation in curved space-time, Kerr-Schild geometry, hidden symmetries and complete integrability in higher dimensional black holes, Lorentzian manifolds and surfaces, semi-symmetric non-metric connections on warped product manifolds, star products and application to MIC Kepler problem, and Riemannian manifolds of nonpositive curvature.

The Conferences hosted several talks on geometric quantization and quantum field theories, like Liouville integrability in field theory, algebraic methods of many-body systems, topological quantization, Krichever formal group theory, noncommutative quantum mechanics, the Goursat equation, quantization of Kahler manifolds, chiral de Rham complex and sigma-models, relativistic fields, quantization operators and invariants.

In addition to the productive interaction between the participants, and the high-quality of the talks, we have to emphasize the international atmosphere of the conference with participants from Czech Republic, France, Italy, Japan, Poland, Portugal, Romania, South Africa, Turkey, the USA and of course from Bulgaria. The quality of the Conference was highly increased by the inclusion of three Lecture Courses.

The first set of Lectures was devoted to geometric methods in quantum mechanics containing, among other subjects, geometric quantum mechanics in projective

form, geometric quantization, as well as their physical applications and connections with other parts of mathematics.

The second Lecture Course was delivered in the field of geometry of monopoles, featuring nonabelian magnetic monopoles theories from many perspectives. These lectures focused on the geometry of $\mathfrak{su}(2)$ BPS monopoles in particular. Descriptions of BPS monopoles, the Nahm equations and Nahm transform, monopoles and spectral theory, and monopoles as the rational maps of Donaldson and Jarvis were presented. The Hitchin's spectral curve was also discussed in detail as this makes the connection to the geometry of integrable systems.

The third Lecture Course elaborated on solitons and generalized Heisenberg ferromagnetic models on various symmetric spaces. Every lecturer concluded with the presentation of new results in the field and outstanding open problems. The lectures were appreciated and highly attended due to the speakers effort to present both the basics and the results in a rigorous yet colorful way.

We would like to address thanks to all participants at the Conference for contributing their time and effort to its completion, and for sharing the originality of their work with all of us, on the screen and in the Proceedings.

Gracious thanks to Mrs. Mariana Hadzhilazova for her creative organizing tips and ideas, for her assistance and overall help during Conference and the preparation of these Proceedings.

We would like to extend special thanks to the Bulgarian organizers and participants for their generous support, warm hospitality which made possible such a successful melting pot of mathematics, physical science and cultures. The organizers did everything in their powers to allow the foreign participants to feel like home.

We hope that everyone of us will meet again at the 14th International Conference on Geometry, Integrability and Quantization that will be held on June 8-13, 2012 at the same exquisite location. We also hope that it will attract even more participants and it will be of the same high quality and fun as all its other thirteen predecessors.

The Editors