PREFACE

The contributions to the present volume are based on talks delivered at the workshop *Geometry of Jets and Fields* which took place from May 10 to May 16, 2015 in the Mathematical Research and Conference Center at Będlewo, Poland. The workshop, aside from its scientific aims, was dedicated to Janusz Grabowski on his 60th birthday.

The subject of the workshop reflects Janusz's life long work: *Differential Geometry*, *Classical Mechanics*, *Classical Field Theories* and *Quantum Mechanics*. Most of Janusz's scientific activity was, and still is, motivated by the problem of how to identify the relevant mathematical structures of modern physical theories. Most of the analogies between classical and quantum mechanics rely on the algebraic structures used within the two pictures, an approach which was also pursued by P. A. M. Dirac in all his research.

Janusz is never satisfied with the ad-hoc introduction of hypotheses and additional structures which he feels are not natural (in the categorical sense), and that he believes are only a partial answer to the problems born in specific physical situations. An example of what I mean here is provided by the paper *The Schrödinger operator as a generalized Laplacian*.

Some of his widely known contributions are the following. He established an algebraic characterization of smooth and analytical manifolds, in particular in terms of the correspondence between maximal ideals of an algebra A and maximal ideals of the Lie algebra of all derivations of A. Very important contributions are represented by his papers on Poisson brackets, Jacobi brackets, Schouten brackets, Gerstenhaber brackets, and many others, all beautifully presented in the expository overview *Brackets*. An important revisitation and generalization of geometrical mechanics has been treated by Janusz in terms of algebroids. He has written several very interesting papers on quantization and starproducts. Apart from the above mentioned paper on the Schrödinger operator, Janusz has written several papers dealing with quantum mechanics. Let me mention just a few of them: *Binary operations in classical and quantum mechanics*; *Geometry of quantum systems*; *Symmetries, group actions and entanglement*; *Convex bodies of states and maps*; *Segre maps and entanglement for multipartite systems of indistinguishable particles*; *Entanglement for multipartite systems of indistinguishable particles*; *Wigner's theorem and the geometry of extreme positive maps*. In these papers, the geometry of density states for finite level quantum systems is fully elucidated and it is possible to appreciate the high class of Janusz as a mathematician, able to provide new contributions even in a by now well-established field of research. Recently, he has also masterfully used Tulczyjew triples in field theories.

I would like to conclude this brief excursion into the scientific production of Janusz by remarking that his papers have provided inspiration for many mathematicians and mathematical physicists. His notoriety in the communities of mathematicians and mathematical physicists is shown by the ample participation at the workshop of well-known colleagues who have also contributed to this volume.

On the personal side, in my long association with Janusz over almost a quarter of a century, I have learned a lot from him on all the topics on which we have collaborated.

Giuseppe Marmo