Foreword

Gianfausto Dell'Antonio is a prominent figure in Mathematical Physics, and one of the founders of the group of mathematical Quantum Mechanics in Italy. This issue – edited on the occasion of his 85th birthday – is a homage to his scientific work. Beyond his personal contributions to the advancement of the theory, ranging from Quantum Field Theory and Quantum Mechanics to Dynamical Systems and Variational Methods, he has been able to mentor and guide several generations of younger researchers and has played an outstanding role in growing up a scientific community related to mathematical Quantum Theory.

Gianfausto Dell'Antonio

Gianfausto was born in Udine on January 27th, 1933, in a family coming from the Ladin community of Val di Fassa, in the middle of the Dolomites. He graduated in Physics in 1955 in Milano, where he interacted both with theoreticians and with the leading experimental physicists Giuseppe Occhialini, from whom he learned - in his words - not only Physics but also "how to be a good scientist without neglecting other aspects of life".

In the years 1957-58, Gianfausto visited Copenhagen where he had the occasion to meet some of founding fathers of Quantum Mechanics, including Niels Bohr, Wolfgang Pauli and Werner Heisenberg. In September 1958 he became assistant

to Pauli at ETH Zurich, where he also met Res Jost who guided him towards the rigorous methods of Mathematical Physics. In 1960 he moved to Northwestern University, where he obtained one of his most important results, namely the relation between spin and statistics in the framework of Axiomatic QFT.

In 1961 Gianfausto came back to Italy and moved – invited by Eduardo Caianiello – to Napoli, where he later became Full Professor of Theoretical Physics in 1970. In the Neapolitan years, Gianfausto revealed his peculiar talent in mentoring younger scientists. The group of his first students includes Giuseppe Marmo and Rodolfo Figari. During the Sixties and the early Seventies, Gianfausto spent some terms in prestigious research institutions, as the IHES in Paris, the Courant Institute in New York, and the Institute for Advanced Studies in Princeton, where he worked mainly on the mathematics of Quantum Field Theory. In Princeton he first met the young Sergio Albeverio, starting a deep scientific and human relationship that still continues.

In 1974 he got the Chair of *Meccanica Razionale* at "La Sapienza" in Rome, where he stayed until his retirement in 2008. In the first Roman years he further extended his scientific interests, working on Hamiltonian Dynamical Systems, Calculus of Variations, and the mathematics of composite materials. In the last two decades, he came back to Quantum Theory, and his scientific interests have been mainly focused on the mathematical theory of Schrödinger operators, both as an autonomous subject and as regards their many physical applications.

In the middle Eighties, he contributed to the foundation and initial development of the Mathematical Physics Sector of SISSA, the International School for Advanced Studies in Trieste. During these years, his ability to attract motivated students and to guide their first steps in the research activity manifestly emerged. He supervised several theses, both at Master and Ph.D. level, and collaborated with many young researchers, including many contributors to this volume: G. Gaeta, A. Teta, V. Nesi, A. Posilicano, F. Cipriani, D. Noja, R. Adami, D. Finco, M. Correggi, G. Panati, and A. Michelangeli.

Gianfausto mentored his younger collaborators with a peculiar style, based on his capability to establish strong human relations, going beyond a mere scientific collaboration to build up mutual trust and friendship. He sometimes compared the young scientist to an apprentice painter in the Renaissance, who learns his art and improves his skills by working side by side to the *Maestro*. He has been able to create a collaborative research atmosphere, and to encourage his students to cultivate their freedom of thought and to broaden their curiosity and their interests, in Mathematics and beyond.

Following Gianfausto's style, a community of people working with similar spirit and intertwined by strong human relations has grown up over the years. The variety of their scientific interests is reflected in the large spectrum of themes in the contributions to this volume, which now we very briefly introduce.

Some papers concern few and many-body Quantum Mechanics, in particular the mathematical theory of point interactions and their connection with Efimov physics by Basti, Figari and Teta, and also with non perturbative QFT in the

essay by Albeverio and Figari. Again bursted by the effort to understand phenomena in few-body body physics is the paper of Carlone and Finco, while the definition of the dynamics of anyons is the subject of Correggi and Oddis. These papers are complemented by a few more contributions related to classical items in operator theory, more specifically related to the abstract theory of self-adjoint extensions in the paper by Cacciapuoti, Fermi and Posilicano, and to the analysis of eigenvalue counting function for Schrödinger operators in Cipriani's contribution. Other papers are devoted to the study of effective theories derived from many body Quantum Mechanics. Michelangeli and Pitton after a general discussion of a 2D binary condensate described by a Gross Pitaevskii system, discuss numerical results. Adami and Dovetta consider a nonlinear Schrödinger equation posed on a 3D periodic quantum graph, showing several results related to ground states and an unexpected behavior of Sobolev exponents. Bertini, Noja and Posilicano investigate the infrared problem in the van Hove and related models of QFT.

A section on topological and geometric aspects in Classical and Quantum Mechanics is also present. The contribution by Marcelli, Monaco, Moscolari e Panati discusses the correspondence between localization and topology in the paradigmatic Haldane model. The paper by Marmo and Zampini treats with critical remarks the geometric structure of the manifold of pure states of a quantum system, and the Gaeta, Lunini and Spadaro contribution provides a geometric description of symmetry properties of classes of stochastic differential equations. The contribution due to Alessandrini and Nesi concern a classical problem about conditions guaranteeing that planar $\sigma-$harmonic mappings are local diffeomorphisms.

Many contributors to this volume have moved their first steps in the scientific life under the guidance of Gianfausto Dell'Antonio. The breadth of his scientific interests and his intellectual curiosity are now mirrored in the variety of subjects, problems and mathematical methods of the volume you are keeping in your hands.

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The Editorial Board of the special issue:
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