Preface

Pavel Exner was born in Prague on March 30, 1946. After his studies at the Faculty of Technical and Nuclear Physics[1] of the Czech Technical University and at the Faculty of Mathematics and Physics (FMP) of the Charles University in Prague, he earned his MSc-equivalent degree in 1969 from the Charles University on the basis of his thesis on the theory of inelastic e-p scattering. In the subsequent years he continued to work at the Department of the Theoretical Physics of FMP. He was primarily interested in the quantum theory of unstable systems and, influenced by M. Havlíček, also in the representations of Lie algebras. In 1978 he left for the Joint Institute for Nuclear Research (JINR) in Dubna, where he spent 12 fruitful years.

In the 1970's he was not allowed to defend his CSc (PhD-equivalent) thesis on unstable systems at the Charles University, for the reasons which had nothing to do with science and which nowadays nobody would understand. In 1984, for the same reasons, he changed his home affiliation to the Nuclear Physics Institute of the Czechoslovak Academy of Sciences[2] at Řež near Prague where he still works. In Dubna, Pavel started to be interested in path integrals and earned his CSc degree on this subject from JINR in 1983. The results of his efforts in the study of open quantum systems and path integrals are summarized in the monograph *Open quantum systems and Feynman integrals* [1]. He was awarded several prizes, in particular, the JINR Prize in theoretical physics.

Starting from the 1980's, Pavel initiated his works on solvable models in quantum mechanics with particular attention to contact interactions supported by points, curves and surfaces. A long series of his papers in this field is still far from its end. His mathematically rigorous studies of quantum mechanical problems and his university lectures also gave rise to a monograph on the theory of linear operators, written jointly with J. Blank and M. Havlíček; first as a text book for graduate students and then as a book for active researchers in mathematical physics and applied mathematics. By now the book exists in three editions, each substantially upgraded: [2], [3], and [4].

One of the most important of Pavel's results is the discovery of the existence of bound states in curved quantum waveguides, i.e., for quantum particles confined in the two or three dimensional tube-like regions. His early papers on this subject with P. Šeba and P. Šťovíček [5] and [6], together with that of Goldstone and Jaffe [7],

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started the development of this new field in mathematical physics in which Pavel remains to be one of the leading scientists. Theory of quantum waveguides is summarized in the recent book [8].

In recent years Pavel has been working mainly on the theory of the so-called leaky quantum graphs where the particle is transversally bounded by a contact type interaction to the graph-like structure, bounded or with unlimited leads. These structures have attracted a lot of attention in the mathematical physics community over the past decade. Pavel has contributed to this rapidly developing research area by publishing numerous works on the subject on one hand, and by organizing a series of meetings and programmes for specialists in the field on the other hand.

At present, Pavel Exner is an author of more than 250 original papers with about 3300 total citations. He is also a member of several editorial boards and professional societies among which is the Academia Europaea, just to mention one of them.

A substantial part of Pavel Exner's scientific activity is dedicated to collaborations with students and young scientists. Since his return from Dubna in the early 1990s more than twenty Ph.D. students and postdocs worked under his supervision. Many of them have later continued their career in the academy and became independent researchers.

Besides his research and teaching activities, Pavel has not failed to serve the mathematical physics community also as an organizer. He founded the series of conferences "Mathematical Results in Quantum Theory" (QMath) and personally organized a number of them. The first QMath conference was held at Dubna in 1987, the QMath13 took place at Atlanta in 2016. In 2009, Pavel was the main organizer of the XVI International Congress on Mathematical Physics in Prague. He initiated the foundation, and for a number of years he has been serving as the scientific director, of the Doppler Institute for mathematical physics and applied mathematics, a group of mathematical physicists and mathematicians from a few Czech institutions collaborating and having common seminars since 1993. Pavel was the president of the International Association of Mathematical Physics in 2009–2011, vicepresident of European Research Council in 2011-2014, president of the European Mathematical Society for 2015-2018 to mention just his most important duties. Needless to say that Pavel always tries to support and push up his students and colleagues. The picture would not be complete without mentioning Pavel's family, his wife Jana with whom he had lived since marriage in 1971, three daughters, Milena, Hana, and Věra, and five grandchildren.

The present proceedings collect papers submitted to celebrate Pavel's seventies birthday. Most contributions treat subjects closely related to Pavel's scientific interests; quantum graphs, waveguides and layers, contact interactions including time-dependent ones, Schrödinger and similar operators on manifolds or on certain special

domains with special potentials, product formulas for operator semigroups. Other papers deal with infinite finite-band matrices, abstract perturbation theory, nodal properties of the Laplacian eigenfunctions, non-linear equations on manifolds, stochastic and adiabatic problems, and some issues in quantum field theory. All together they provide various examples of applications of functional analysis in quantum physics and partial differential equations.

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Hynek Kovařík
Ari Laptev

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