

Lecture Notes on Quantum Chaos

Pavel Stránský

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1 Literature

- [1] Martin C. Gutzwiller, *Chaos in Classical and Quantum Mechanics* (Springer, 1990)
 - Classical monography about chaos in physics.
 - Profound physical and mathematical discussion.
 - Sometimes nonstandard notation.
- [2] Fritz Haake, *Quantum Signatures of Chaos* (Springer, 2010)
 - Up-to-date topics, including chaotic dissipative systems and supersymmetric approaches.
- [3] Oriol Bohigas, *Random Matrix Theories and Chaotic Dynamics*, Les Houches LII, ed. M.-J. Gianonni, A. Voros, J. Zinn-Justin, 1989
 - Brief and concise notes on the basics of quantum chaos.
- [4] Madan L. Mehta, *Random Matrices* (Elsevier 2004).
 - Everything you always wanted to know about random matrices (and quantum chaos is from a big part about random matrices).
 - ... and probably even didn't want to know.
 - If you love formulae, you'll be happy happy reading this book.

2 A way to quantum chaos

2.1 Quantum mechanics is linear

Classical chaos is tightly connected with the nonlinearity of classical equations of motion. Quantum mechanics is linear, quantum evolution unitary → no sensitive dependence on “initial conditions”.

Reference

- [1] Martin C. Gutzwiller, *Chaos in Classical and Quantum Mechanics* (Springer, 1990).
- [2] Fritz Haake, *Quantum Signatures of Chaos* (Springer, 2010).
- [3] Oriol Bohigas, *Random Matrix Theories and Chaotic Dynamics*, Les Houches LII, ed. M.-J. Gianonni, A. Voros, J. Zinn-Justin, 1989.
- [4] Madan L. Mehta, *Random Matrices* (Elsevier 2004).
- [5] Linda E. Reichl, *The Transition to Chaos: Conservative Classical Systems and Quantum Manifestations* (Springer, 2004).

- [6] Hans-Jürgen Stöckmann, *Quantum Chaos: An Introduction* (Cambridge University Press, 1999).
- [7] Alfredo M. Ozorio de Almeida, *Hamiltonian Systems: Chaos and Quantization* (Cambridge University Press, 1988).