QUANTUM THERMOMETERS:
Thermalization and ergodicity in many-body quantum systems

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The emergence of canonical ensembles in quantum statistical mechanics from first principles is one of the key remaining old questions of theoretical physics. Even the definition of the temperature at the nanoscale poses a challenge. Indeed, how precisely the canonical distribution arises from dynamical laws, without *a priori* statistical assumptions, is still unclear.
Our results provide evidence that quantum chaotic systems do thermalize, that is, they exhibit relaxation to an invariant ergodic state.

-V.V.Flambaum, F.Israilev and G.Casati: "Towards a statistical theory of finite Fermi systems and compound states: Random two-bodyinteraction approach" *Phys.Rev.E.* 54 (1996) 2136

-F. Borgonovi,I. Guarneri, F.M. Izrailev and G. Casati: "Chaos and thermalization in a dynamical model of two interacting particles" *physics letters A* 247 (1998) 140

-G. Benenti, G. Casati, and D.L. Shepelyansky: "Emergence of Fermi-Dirac Thermalization in the Quantum Computer core" Eur. Phys. J. D 17(2001)265.

-M. Znidaric, T. Prosen, G. Benenti, G. Casati, and D. Rossini: "Thermalization and ergodicity in one-dimensional many-body open quantum systems". Phys. Rev. E 81, 051135 (2010).