Optimization using quantum mechanics: quantum annealing through adiabatic evolution



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# Corrigendum

**Optimization using quantum mechanics: quantum annealing through adiabatic evolution**

Giuseppe E Santoro and Erio Tosatti 2006 *J. Phys. A: Math. Gen.* **39** R393-R431

In our recent paper (Giuseppe E. Santoro and Erio Tosatti 2006 J. Phys. A: Math. Gen. **39**, R393-R431) we reviewed some of the recent work in the field of quantum annealing, *alias* adiabatic quantum computation. Here we point out two early references, due to Apolloni, de Falco and collaborators and dating back to 1988, where the idea of quantum annealing was first put forward and tested on hard combinatorial optimization problems.

The idea of quantum annealing is an elegant and fascinating alternative to classical thermal simulated annealing; it consists in helping the system escape the local minima using *quantum mechanics* — by tunneling through the barriers rather than thermally overcoming them, with an artificial and appropriate source of quantum fluctuations (the counterpart of the temperature) initially present and slowly (adiabatically) switched off.

In our recent review on this subject [1] we erroneously indicated what appeared to us as being the earliest references [2–4] in which similar ideas were first explicitly formulated, and tested in numerical simulations.

We have in the meantime learned that the idea of using stochastic processes based on quantum mechanics with the goal of minimizing classical complex functions was indeed formulated and tested much earlier, in 1988, by the group of Apolloni, de Falco and collaborators, who applied these ideas to combinatorial optimization problems like graph-partitioning [5, 6].

We also stress that the idea of quantum annealing is inherently related to the idea of adiabaticity. Computing by adiabatic evolution of a quantum system has become a quite popular idea in the Quantum Computing community, where it is commonly known as *adiabatic quantum computation*, and commonly traced back to Ref. [7]. Quantum annealing and adiabatic quantum computation are, however, two names given by two different scientific communities to the very same idea.

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## References

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