

# Spin liquid phases in strongly correlated lattice models

Sandro Sorella<sup>1,2,3</sup>

*1 SISSA – International School for Advanced Studies, Via Bonomea 265,  
34136 Trieste, Italy,*

*2 Democritos Simulation Center, CNR – IOM Istituto Officina dei  
Materiali, 34151 Trieste, Italy,*

*3 Computational Materials Science Research Team, RIKEN AICS, Kobe,  
Hyogo 650-0047, Japan*

In the last few years an enormous progress in computer performances and a significative advance in computational techniques are opening a new frontier for the solution of fundamental problems in the physics of strongly correlated systems, that has been lacking for too many decades. We report recent calculations for the Hubbard model on the honeycomb lattice at half filling, for cluster sizes containing up to 2500 sites, much larger than previous simulations[1], ruling out possible spin liquid phases. We instead show that in a spin model with frustrating interactions a gapless spin liquid phase naturally emerges as the variational ansatz is systematically improved by means of few Lanczos steps[2].

[1] S. Sorella, Y. Otsuka and S. Yunoki, Nature, Scientific Reports Scientific Reports **2**, 992 (2012) doi:10.1038/srep00992.

[2] W. Hu, F. Becca, A. Parola and S. Sorella, arXiv:1304.2630 (2013).