



Condensed Matter Theory

Macroscopic Quantum Phenomena

Speaker: Prof. Dr. **Luca Salasnich**, PhD

Full Professor of Condensed Matter Theory

Quantum Field Theory of Macroscopic Quantum Phenomena

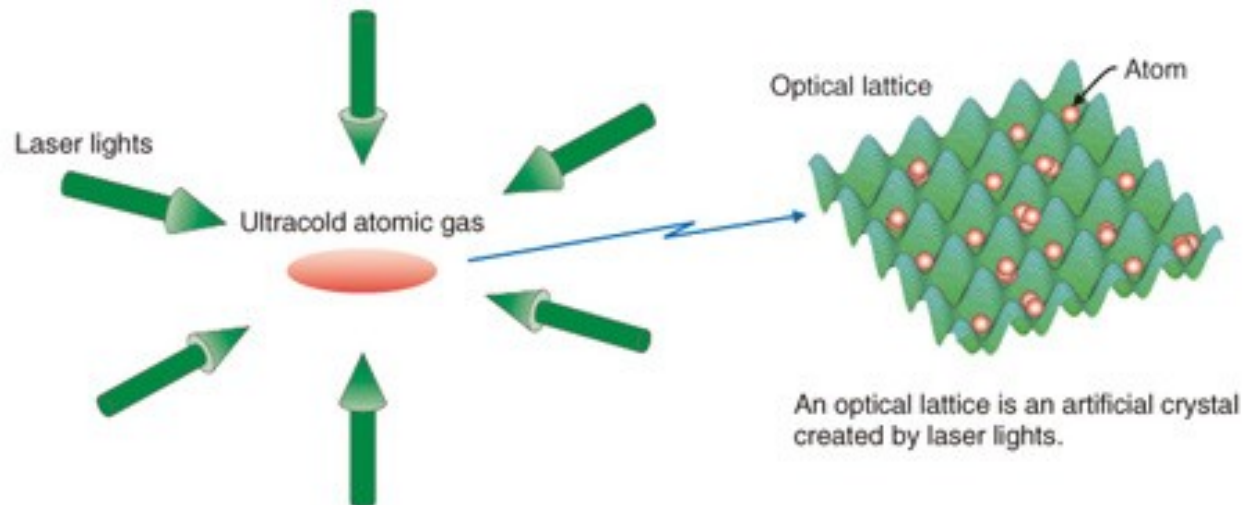
BEC and BCS-BEC with atomic quantum gases

QFT of superconductors and Josephson junctions

Quantized vortices, solitons, nonlinear physics, curved geometries

Quantum tunneling, quantum entanglement, out-of-equilibrium

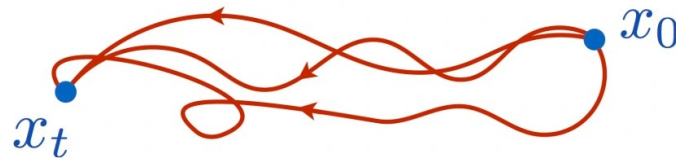
Laser light, coherent states, BEC of photons



Methods of Theoretical and Mathematical Physics

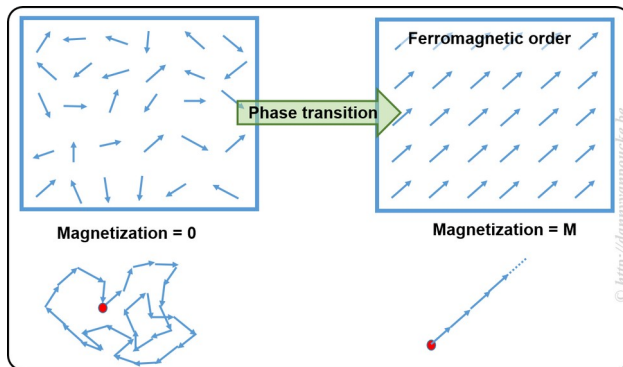
Quantum field theory, Feynman path integral, quantized vortices, solitons

$$\langle x_t | e^{-i\hat{H}t/\hbar} | x_0 \rangle =$$



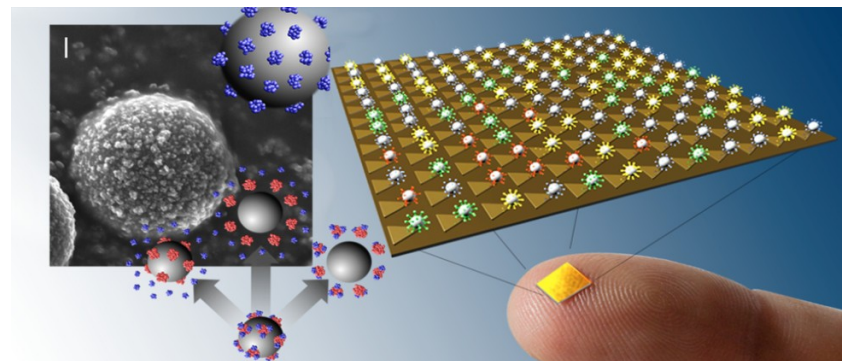
Quantum Statistical Mechanics

Phase transitions with quantum gases, superconductors, spin systems



Low-Dimensional Physics

Quantum field theory of many-body systems confined in quasi-2D or quasi-1D in flat or curved manifolds



Main recent scientific results of the group

- An average of 8 Scientific Papers per year
- Papers published in prestigious scientific journals, among them:
 - Nature Reviews Physics (impact factor: 36.273)
 - Physics Report (impact factor: 30.51)
 - Physical Review Letters (impact factor: 8.6)
 - Scientific Reports (impact factor: 4.6)
 - Physical Review B (impact factor: 3.7)
- Invited Talks at many International Conferences and Schools

Examples:

- A. Tononi and L. Salasnich, Low dimensional quantum gases in curved geometries, Nature Rev. Phys. **5**, 398 (2023).
- A. Tononi, F. Cinti, and L. Salasnich, Quantum Bubbles in Microgravity, Phys. Rev. Lett. **125**, 010420 (2020).
- A. Tononi and L. Salasnich, Bose-Einstein condensation on the Surface of a Sphere, Phys. Rev. Lett. **123**, 160403 (2019).
- L. Salasnich and F. Toigo, Zero-Point energy of ultracold atoms, Phys. Rep. **640**, 1 (2016).

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Contact

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Other informations:

My research group is presently composed by

- 1 visiting professor (Alexander Yakimenko)*
- 1 postdoc (Koichiro Furutani)*
- 2 PhD students (Francesco Lorenzi and Andrea Bardin)*
- 2 MSc students*
- 2 BSc students*

Remark: within the Excellence DFA Project “Quantum Frontiers”, there will be 20 PhD “specific” positions in the next five years (4 per year).