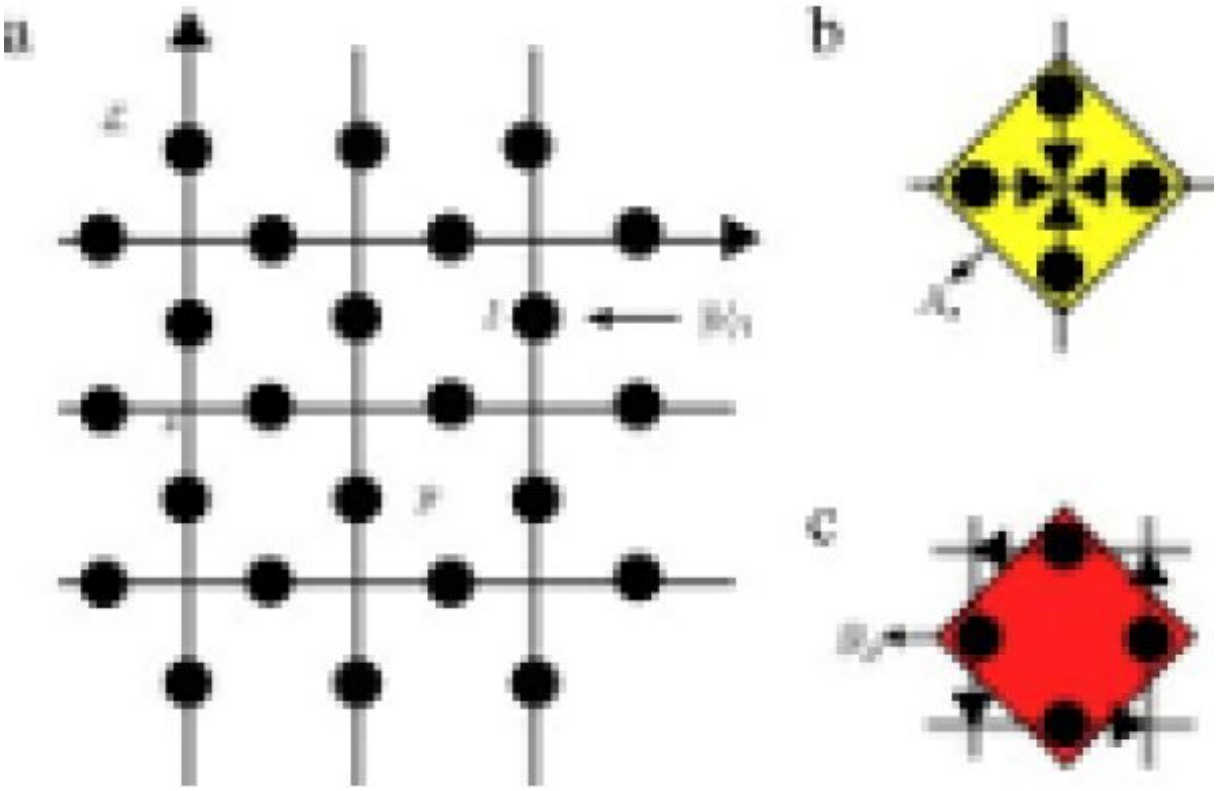

Quantum Optics? most cited articles

The study "Optical Abelian lattice gauge theories" selected as the most cited papers of the Annals of Physics 2013

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The research paper, entitled "Optical Abelian lattice gauge theories", written in 2013 by ICFO researchers Dr. Luca Tagliacozzo, Dr. Alessio Celi, and Dr. Alejandro Zamora, led by ICREA Prof at ICFO Maciej Lewenstein, has recently been selected by the journal Annals of Physics as the top cited article published in 2013, for the period ranging from January 2014 thru July 2016.

Annals of Physics is a monthly peer-reviewed scientific journal covering all topics of physics. It was established in 1957 and is published by editorial Elsevier. The journal publishes original work in all areas of basic physics research, in particular, on topics spanning theory, methodology, and applications.

Gauge theories are at the hearth of our understanding of fundamental physics and seems to play a key role in emerging phenomena in condensed matter like quantum magnetism, High-Tc superconductivity, and fractional quantum Hall effect. Full understanding of gauge theories at strong coupling is missing due to the limitations of numerical and theoretical methods, and quantum simulation have been very recently proposed as novel tool for achieving it. Quantum simulating gauge theories is itself very challenging.

The paper provides a general framework for the realization of a family of Abelian lattice gauge theories, analyzing the key ingredients of these models that have to be implemented in quantum simulators. In particular, they focused on digital quantum simulators built of ultracold atoms in optical lattices. They proposed concrete experiments for determining charges? confinement and the puzzling phase diagram of gauge magnets (spin formulation of a U(1) gauge theory), by elaborating a protocol for time evolution and ground-state preparation in presence of static charges. Such experiments would serve to validate gauge theory quantum simulators and as preliminary steps to the simulation of quantum chromodynamics.

Congratulations Luca, Alessio, Alejandro and Maciej for this recognition!