



GEFES 2023 Best Theoretical Thesis in Condensed Matter Physics

Javier Argüello awarded for thesis *Synthetic quantum matter using atoms and light*

January 24, 2024

GEFES, the Condensed Matter Physics Division of the Spanish Royal Physics Society, has awarded Dr. Javier Argüello Luengo the prize for the best theoretical doctoral thesis in Condensed Matter Physics out of all theses defended between October 2022 and September 2023. His thesis entitled *Synthetic quantum matter using atoms and light* was supervised by ICREA Prof. at ICFO Dr. Darrick Chang and Prof. Dr. Alejandro Gonzalez Tudel, Instituto de Física Fundamental-CSIC, and was defended at ICFO on October 21, 2023. Dr. Argüello's doctoral thesis explored new scenarios where the interaction between light and matter can help advance our understanding of quantum matter. First, he investigated how an individual atom coupled to a cavity can manifest unique optomechanical properties at the quantum level, due to its low mass and strong interaction with light. In the second part of the Thesis, he proposed how some synthetic materials manufactured with light can be used as quantum simulators, thus challenging the limitations that classical comput

rs currently face when exploring quantum phenomena. In particular, he studied ultracold atomic mixtures trapped in optical lattices, where long-range interactions mediated by these atoms can play a fundamental role in the simulation of relevant problems in condensed matter and quantum chemistry.

Javier was the recipient of various awards during his PhD studies. In 2020 he was recognized by the Ministry of Science, Innovation and Universities of the Government of Spain for his exceptional undergraduate work in Physics (Premio Nacional Fin de Carrera). In 2022, he received the RSEF-BBVA Foundation Physics Award for the Best Dissemination Contribution for his article [Analog quantum simulators: a tool for understanding the matter that surrounds us](#) (Simuladores cuanticos analogicos: una herramienta para entender a materia que nos rodea) published in the Revista Espanola de Fisica, Vol. 35, nº 1, enero-marzo 2023.

1. Following his PhD studies, Javier moved to the Quantum Optics Theory group where he worked as a postdoctoral researcher led by ICREA Prof. at ICFO Dr. Maciej Lewenstein. More recently, Javier has been appointed as an Assistant Professor at the Physics department of UPC, and continues collaborating with ICFO as a visiting scientist.

t. Congratulations Javier for this recognition of your remarkable career to date.



Dr. Javier Argüello