



# ICFO Colloquium Series: Time Crystals for Photonics and Timetronics

NIKOLAY ZHELUDEV

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12:00 to 13:00

ICFO Auditorium

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**BIO:**

Professor Nikolay Zheludev FRA NAE is a world leader in the field of nanophotonics and metamaterials. He received MSc, PhD and DSc from Moscow State University. His international research careers continued at the University of Southampton in the UK where he became Deputy Director (Physics) of the world-famous Optoelectronics Research Centre and Director of the Centre for Photonic Metamaterials. At NTU Professor Zheludev is founding director of the Centre for Disruptive Photonic Technologies and co-director of The Photonics Institute. He is also a fellow at the Halger Institute for Advanced Study, Texas A&M University, USA. Nikolay is a fellow of the Royal Society of London, Member of the United States of America National Academy of Engineering. He is also a fellow of the European Physical Society, the Institute of Physics and the Optical Society of America (Optica) and American

Physical Society. His personal awards include the IOP Thomas Young medal and Michael Faraday Gold medal, the President of Singapore Science and Technology Award and the IPS President Gold medal.

**ABSTRACT:?**

We witness the growing excitement and breadth of research on Time Crystals, many-body strongly correlated systems exhibiting broken time-translation symmetry. We demonstrate that a metamaterial nanostructure, a two-dimensional array of plasmonic metamolecules supported on nanowires, exhibit the continuous time crystal dynamics in the presence of light that triggers a spontaneous first order phase transition to a superradiant-like state of transmissivity oscillations, resulting from many-body interactions among the metamolecules. It is characterized by long-range order in space and time, broken ergodicity and reduced spectral entropy that are driven by non-reciprocal non-Hamiltonian forces of light pressure. I argue that nanophotonics can play a pivotal role in bringing this sophisticated, yet esoteric subject to the domain of *timetronics* - an information and data technology relying on the unique functionalities of Time

Crystals. Hosted by Prof. Dr. Javier Garcia de Abajo

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