

ICFO COLLOQUIUM NANDA REA 'Pulsars: Magnetic Monsters at the Nuclear Density, Gravitational Wave Emitters, and GPS for Future Deep Space Travels'

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January 18, 2019

Friday, January 18, 2019, 12:00. ICFO Auditorium

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CSIC Staff Scientist, Institute of Space Sciences (ICE, CSIC-IEEC), Barcelona, Spain. Winner of the Catalan National Research Award for Young Talent 2018.$$Nanda Rea obtained her PhD in Physics (2006) from the University of Rome Tor Vergata, partly working at the SRON Netherlands Institute for Space Research under an EU Marie Curie Training fellowship. She continued her research with an NWO Veni Fellowship, and she went for a long-term visit at the University of Sydney, Australia. In 2009 she was awarded a Ramon y Cajal fellowship to

join the Institute of Space Sciences (ICE, CSIC-IEEC) in Barcelona, and soon after a Research Group Leader position and an NWO Vidi Award at the University of Amsterdam, The Netherlands. Since 2016 she is a CSIC staff scientist at the Institute of Space Sciences (ICE, CSIC-IEEC) in Barcelona. Her research focuses on observations and theoretical simulations of neutron stars, the compact and strongly magnetic remnants of the Supernova explosions of relatively massive stars. Her work was published in high impact journals (i.e. Rea et al. 2010, Science; Rea 2017, Nature Astronomy) and received several international awards as for the Young Scientist Price from the International Union of Pure and Applied Physics (IUPAP), the Zeldovich Medal from the Russian Academy of Sciences (RAS) and the international Committee of Space Research (COSPAR), and the Young Research Talent Award from the Fundacio Catalana per a la Recerca i la Innovacio (FCRi). She is also very involved in outreach activities, and gave invited presentations at the CosmoCaixa in Barcelona, the Caixa Forum in Zaragoza, in the Planetario de Madrid, as well as writing semi-outreach invited articles for Physics Today and Nature Astronomy. She recently obtained an ERC Consolidator Grant with the aim of studying the neutron star population in our Galaxy via population synthesis simulations, and she is the PI of an H2020 COST Action on neutron stars encompassing 30 countries and more than 300 scientists world-wide.

Pulsars now turned 50 years! Pulsars turned 3000! These relativistic stars are unique laboratories where not only the most extreme gravity and electromagnetism can be probed, but also the strong and weak interaction can be studied in regimes that have no hope of being explored on Earth. The recent discovery of gravitational waves is allowing an unprecedented view of previously invisible parts of the Universe. This will unravel the physics of the neutron stars (aka pulsars), which are unique objects whose emission encompasses all the available multi-messenger tracers: electromagnetic waves, cosmic rays, neutrinos, and gravitational waves. The study of these objects transcends the traditional astrophysical approach and requires a multidisciplinary effort that spans from particle and nuclear physics to astrophysics, from experiment to theory, from gravitational waves to the electromagnetic spectrum. I will review in this seminar what pulsars are, as well as the most important discoveries in the field, their consequences to physics in general, and what we aim for in the next decade. Particular attention will be given i) to magnetars - the biggest magnets in the Universe, ii) to millisecond pulsars - the fastest rotating astrophysical objects, iii) to pulsars as gravitational wave emitters and detectors, and iv) to pulsars as GPS systems for future deep space travels.

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