



The Galileo Galilei Institute for Theoretical Physics
Arcetri, Florence



Galileo Galilei

The Structure and Signals of Neutron Stars, from Birth to Death

March 10, 2014 - April 17, 2014

The main topics of the workshop include:

- Equation of state of dense matter, including hyperon, kaon and quark degrees of freedom
- Neutrino emission and cooling of compact stars
- Superconductivity-superfluidity
- Constraints from EM observations; transients
- Gravitational wave emission
- Models for Supernovae and for Gamma Ray Bursts
- Magnetars

Neutron stars (NSs) represent an active area of research, from their birth following the collapse of massive stars in supernova explosions; to their lives as hot thermal sources, radio pulsars and/or magnetars; to their catastrophic demise (when they reside in compact binaries) following gravitational wave-driven coalescence. Progress in understanding the structure and signals of neutron stars demands expertise across a wide range of disciplines, from theoretical and observational astrophysics; to nuclear and particle physics; to computational relativity and gravitational wave (GW) physics. Several recent developments suggest that time is ripe for a workshop which focuses on all facets of NS science. These include the recent discovery of a 2 solar mass neutron star; evidence for cooling of the NS in Cas A, suggesting a possible transition to neutron superfluidity; 'advanced' generation GW detectors LIGO and Virgo coming online in 2015; new observations challenging traditional models for gamma-ray bursts; new lab experiments which aim to probe the conditions of matter at ultrahigh densities and temperatures (e.g. NICA - Dubna coming online in 2015); and new or planned electromagnetic observatories at radio (LOFAR/ ASKAP/ MeerKAT/ SKA), optical (e.g. LSST), X-ray (NICER/ LOFT/ AXTAR/ Athena+), and gamma-ray (e.g. CTA) wavelengths.

This workshop will bring together theoretical and observational astrophysicists from across the electromagnetic and GW spectrum, as well as nuclear physicists interested in the behavior of matter under extreme conditions. The goal is to explore what has been learned from current observations; review what is expected from new facilities; and assess what exploratory work is required to lay the groundwork for these new capabilities. Throughout the workshop, senior researchers will deliver pedagogical lectures to PhD students, young postdoctoral researchers, and to other senior researchers wishing to expand their own knowledge. Lectures will cover topics in computational relativistic astrophysics, gamma-ray bursts, r-process nucleosynthesis, nucleonic and hadronic EoSs, constraints from EM observations, and GW physics. A general conference will also be organized during the workshop.

Local organizer: Daniele Dominici

Organizing Committee:

Fiorella Burgio (INFN Sezione di Catania) - Alessandro Drago (University of Ferrara)
Ian Jones (Southampton University) - Brian Metzger (Columbia University)
Pierre Pizzochero (University of Milano) - Anna Watts (API Amsterdam)