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Abstract. The 11th edition of the biennial national workshop on the physics of compact objects, “CNOC XI”, was held at the Department of Physics and Astronomy of the University of Florence. Workshops of this series have always intended to bring together the Italian community interested in scientific topics related to the astrophysics of compact objects: neutron stars, black holes, and white dwarfs. In recent times, the detection of gravitational waves and very high energy neutrinos has motivated the addition of multi-messenger astronomy as an important, rapidly growing subfield. The final part of the workshop has traditionally been devoted to the discussion of upcoming observational facilities and brainstorming on the science which they will make possible.

Keywords. Neutron stars, black holes, white dwarfs, pulsars, supernova remnants, X-ray binaries, gravitational waves, instrumentation.

Summary of the workshop

Astrophysics research in the field of compact objects is experiencing particularly exciting times. These objects are at the very heart of the multi-messenger astrophysics revolution, which started with the first detection of gravitational waves, which closely followed the first detection of very high energy neutrinos.

As has always been the case for conferences in the CNOC series, this workshop brought together an important portion of the national academic community working on different aspects of the astrophysics of compact objects. The Italian community engaged in this field of research is very lively and has a recognized international prestige, which is fostered by the constant wealth of important results obtained. The CNOC provides an occasion to share and discuss main developments. All sections are introduced by ample invited reviews by top experts and host a few solicited talks on particularly topical new findings. A good number of talks is reserved for students (mostly Ph.D., but also some master level students), who are given the opportunity to present their results (often for the first time in their career) in a relaxed environment, but in front of a highly qualified audience. The CNOC certainly represents for students the perfect opportunity

to get acquainted with all the different aspects of the field that are covered within Italian research institutions, and may stimulate new collaborations and new directions in their research. On the other hand, this gathering also provides an opportunity for the entire community to determine the current state of research as well as to do some brainstorming on which directions we would like to pursue and concentrate our efforts.

The scientific program of this edition of the CNOG covered the following topics: radio pulsars; supernova remnants and their role as cosmic ray factories; pulsar wind nebulae; neutron stars in X-ray binaries; magnetars (including anomalous X-ray pulsars and soft gamma-ray repeaters); isolated neutron stars; ultra-luminous X-ray sources (ULXs); black holes in X-ray binaries; white dwarfs and cataclysmic variables; gravitational wave emission and multi-wavelength, multi-messenger follow-up; and new instrumentation relevant for the astrophysics of compact objects.

Just to recall a few of the many interesting results presented at the conference: the first three-dimensional simulations of the coupled magneto-thermal evolution equations in the magnetar crust, and their impact on our understanding of magnetar field geometry; the new simulation of the supernova (SN) SN1987A, linking the observed morphology of the remnant and the structure of ejecta to the physical and geometric characteristics of the SN explosion and of the progenitor star; the recent evidence for the interaction of the striped pulsar wind from a transitional millisecond pulsar with the accretion disk from the companion, and the formation of dwarf pulsar wind nebulae around ULXs. We also heard how obscuration of the Fe K α profile, generated in the innermost disk regions around compact objects, can be used to constrain the neutron star radius or the black hole spin. There was even a discussion on the possible existence of habitable zones around nearly maximally spinning black holes.

As far as present and future observational facilities are concerned, there was a general review of the status and perspective of the electromagnetic follow-up of gravitational radiation; an update on the status of upcoming observatories such as CTA and IXPE, in which the Italian community is heavily involved; news on the recent development of high time resolution optical observations with IQ-eyeye, which have already allowed us to determine the relative time of arrival of the radio-optical-gamma-ray peaks with an accuracy of a fraction of a millisecond; the presentation of the ambitious GrailQuest fleet of small satellites designed to perform temporal triangulation of high signal-to-noise impulsive events to probe the quantum properties of space-time.

The total number of participants was 88, among which 22 were students. We had a total of 66 presentations: 21 of these were invited reviews, while 18 of the remaining talks were given by students. The participants came from all over Italy and several places in Europe: 49 came from INAF structures, 26 from different Italian universities and 13 from different European institutions.

This event has received funding from INAF and was hosted by the Department of Physics and Astronomy of the University of Florence. The website of the meeting, including all presentations, is available at this link: <http://www.arcetri.astro.it/~cnoc11/>.



Figure 1. Group photograph at the Garbasso building.