

Multi-wavelength observations of compact objects



Photo (M. Linares): Gran Telescopio Canarias

Multiple MSc thesis projects (30 or 60 ECTS) are available at the Astrophysics and Particle Physics group at NTNU, in the research area of *Observational Astrophysics*. The group studies compact objects (neutron stars, black holes and white dwarfs) with a main focus on binary systems, neutron stars and accretion flows. In exceptional cases, BSc thesis or “specialization projects” may also be available within the group (15 ECTS).

- **OPTICAL STUDIES OF SPIDERS.** About 60 rapidly rotating neutron stars (or millisecond pulsars) are known in our Galactic vicinity within compact binaries, with orbital periods shorter than about a day. Their companion stars are sometimes irradiated or heated by the relativistic pulsar wind. The orbital period, inclination and the amount of irradiation can be inferred from the optical light curves. In this project the student will analyze and interpret optical photometric and/or spectroscopic observations of compact binary millisecond pulsars, taken with ground-based telescopes.
- **HIGH-ENERGY STUDIES OF MILLISECOND PULSARS.** Neutron stars were discovered in the radio band as pulsars, but also emit a large fraction of their rotation power at high energies, in the X-ray and gamma-ray bands. In this project the student will analyze X-ray and/or gamma-ray observations of neutron stars in binary systems, using data from ESA/NASA’s space-based observatories (Chandra, XMM, Swift, Fermi).
- **ACCRETION AND NUCLEAR-POWERED NEUTRON STARS AND BLACK HOLES.** More than 200 neutron stars and black holes are known in our Galaxy as bright X-ray sources, called low-mass X-ray binaries. When hot plasma falls on them, they display a combination of accretion- and nuclear-powered phenomena. In this project the student will analyze multi-wavelength observations of low-mass X-ray binaries, using a combination of imaging, spectroscopic and timing techniques to study their behavior.

All projects require: i) at least FY3215 (observational astrophysics) and FY2450 (astrophysics), or equivalent; ii) analytical and computing (linux, programming) skills, and iii) interest and enthusiasm for astrophysics.

For more information, see <https://folk.ntnu.no/manuelli> and contact manuel.linares@ntnu.no.