Duets - Using asteroseismology to characterise the binary population among evolved stars

Supervisor: Andrea Miglio

Project description and activity plan:

The Research Fellow will lead the development of the MUR-funded project *Duets.* Duets will leverage the combination of astrometric, spectroscopic, and, crucially, asteroseismic data to open a new window on the population of (products of) binary systems among red giant stars. The project will identify and model in detail unresolved stellar binary systems comprised of red giants by detecting the presence of two solar-like oscillation spectra in the frequency spectrum of a single light curve (in so-called asteroseismic binaries). Determining the occurrence rate of such objets will yield invaluable results to probe the initial mass ratio distribution function of binaries and provide well-constrained systems that can be used stresstest models of stellar structure.
Moreover, the project will identify and study products of coalescence and mass exchange, with the aim of quantifying the occurrence of these objects in the composite galactic disk population. By comparison with synthetic binary populations and with parameterised post-merger / post-mass-transfer evolution models, *Duets* will set constraints on some of the key assumptions in models of binary evolution, such as the initial binary fraction and the initial period distribution, with the potential of reducing some of the uncertainties affecting the description of mass-transfer events.

The appointee will work closely with Andrea Miglio and other researchers involved in the ERC-funded asterochronometry project, with members of the the Department of Physics and Astronomy, Università di Bologna (https://fisicaastronomia.unibo.it/). The department, together with the adjacent INAF-OAS (https://www.oas.inaf.it/en/) offers a lively and inspiring environment, with about 100 academic and research staff involved in astrophysics.