

One of the most important tasks of astrophysics as a science is to understand the evolution of stars of different masses, both those that from the beginning to the end of their stellar “life” evolve alone, as well as those whose evolution is altered by the presence of a close companion. Evolving stars occupy well-defined positions in a two-dimensional Hertzsprung-Russell (HR) diagram, in which we usually draw their luminosities as a function of their effective temperatures. The latter parameter approximates the temperature of the upper layers of the star’s photosphere. Some regions of the HR diagram remain empty or almost empty due to the fact that even if an evolving star crosses this region, it does this very fast.

A few years ago a new group of compact pulsating stars was discovered, which due to their hot atmospheres and large pulsation amplitudes are called blue large-amplitude pulsators (BLAPs). Interestingly, BLAPs are located in the HR diagram at the region where the stellar density is very low. This indicates that they are extremely rare or that these stars evolve through this area of the HR diagram very quickly. Observations have confirmed that there are very few such stars — only about 30 stars of this type are currently known. Although theoreticians have proposed several scenarios for the formation of these stars, their origin still remains a mystery. This project aims to explain the origin of BLAPs. We want to do this by carrying out several tasks, including the search for new members of this group, above all in the DR3 data of the Gaia mission just made available to the astronomical community. We will mainly focus on the search for the signs of binarity in these stars, since all the scenarios of their formation suggest that they are (or were) the members of binary systems. We have recently discovered a BLAP in a double system with a late B-type star — the first known binary BLAP. We already know that it will be possible to determine its mass, which will significantly reduce the possibilities to interpret its origin. We also hope to discover more binary BLAPs, which should allow us to explain the mystery of their origin.