DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Among the multiplicity of types of binary systems it can be distinguished the special group of so called symbiotic stars consisting two stars greatly advanced in evolution – giant star and compact remnant of stellar evolution (mostly a white dwarf) – that are orbiting around the center of mass of the system once for a several years or decades. Giant stars are source of effective mass loss and compact object are copious in high-energetic radiation, which interacting each other develop a very complex environment and the whole system is embedded in ionized nebula. This very complex characteristics of symbiotic stars makes them particularly useful for studying the latest stages of binary evolution. Part of the mass losing by giant is transferred to the surface of its companion. In the past when currently compact object had gone through AGB phase, the mass transfer process should proceed in opposite direction leaving traces in the chemical composition of the component observed today as the giant. In previous projects we measured chemical composition in several dozens of symbiotic giants. In result the total number of these object with known chemical composition was increased by a bit more than ten times what enabled first attempts of statistical analysis to study metallicities, evolutionary status, and to map their parent Galactic populations. Here I propose to study chemical compositions for representative sample of symbiotic systems having the dynamic nature of the atmosphere and non local thermal equilibrium taken into account and by performing modeling in three dimensions, which approach although it is less efficient computationally it, however, allows to obtain more precise chemical compositions (cooperation with M. Bergemann from MPIA, Heidelberg). The high resolution spectra (R~50000, acquired with PHOENIX spectrograph on Gemini-S and Mayall/Kitt-Peak telescopes – cooperation with K. H. Hinkle from NOAO, USA) that have been previously used to study chemical compositions with the classical approach, revealed the differences visible in line profiles in spectral regions observed at various wavelengths. It is planned to study this phenomenon, which could be perhaps interpreted as manifestation of the effects of stratification and differential rotation in the giant's atmospheres. Using optical spectra (SALT and 1.9m Radcliffe telescope at Sutherland in South Africa) the enrichment with products of the *s*-processes from the previous accretion were detected (cooperations with J. Mikołajewska from NCAC, Warsaw), which are clearly visible in the spectra of about half of objects from the southern sky. There are plans to widen the sample including objects at northern hemisphere that represent mainly external Galactic disk. Measurements of the abundances will be made by comparing the observed spectra with synthetic spectra generated with use of a large grid of MARCS model atmospheres for the giant stars with incorporation of the large number new models for S-type stars covering wide range of atmospheric parameters (cooperation with A. Jorissen and S. Van Eck from ULB in Brussels). Additional spectra needed for analysis in this project will be acquired with ESO instruments (UVES, HARPS) and the SALT telescope in South Africa.

The results will provide qualitatively new information about symbiotic systems, obtained with the methods not used previously for researches in such a context. Detailed analysis of the chemical compositions using 3D–NLTE method for a representative sample of objects will provide more realistic informations about chemical compositions. There are very few studies of the chemical composition in stars, especially in giants and supergiants, with use of this method in literature and these available are restricted mainly to objects with very low metallicity. The analyses will be performed in a broader context including comparison with “normal” singular giants and post-AGB stars. The new quantitative information about abundances of the *s*-process elements in symbiotic giants representing all regions of the Milky Way and selected objects from Magellanic Clouds after joint analysis would allow to understand better the issues of the mass transfer and history of the interactions in these systems. The proposed studies of possible differential rotation and stratification in the symbiotic giants atmospheres will be, to my knowledge, the first attempt to address these issues. This should allow for better understanding for processes of the mass transfer, the physical conditions in the giant's atmospheres and mechanisms leading to the formation of winds and interaction with companion, and thus the history of evolution of binary systems.