DESCRIPTION FOR THE GENERAL PUBLIC

Detached eclipsing binaries (DEBs) are one of the most important objects for stellar astrophysics. They are pairs of stars that formed in the same time from the same cloud of gas and dust, which orbit around themselves in a way that once a while one hides behind the other. In the same time they have no other influence on themselves as through the gravity, in particular there is no transfer of material from one star to the other. Such configuration allows us to measure fundamental stellar properties, such as the sizes of stars, their individual brightnesses, and masses. Especially the last one is very important, as it determines how a star changes during the course of its life. No wonder that scientists have been interested in DEBs for over a century. However, most of the research so far has not been giving the complete description of a given DEB, missing other important characteristics, such as the chemical composition – the second most important factor that drives the stellar evolution. Only in the last few years, thanks to the advancements in instrumentation and techniques of data analysis, it became possible to quickly and effectively measure the composition and temperatures of stars in DEBS, and other parameters (like masses and sizes) can now be measured with precision impossible to reach a decade or two ago.

Due to the new possibilities in DEB study, many researchers urged to renew the interest in this topic. They pointed out the small number of known and well-characterized systems with very low or very high mass stars, or ones showing large sizes, which indicates either very young age or very old. As a response to this call, in 2010 we've started a large spectroscopic survey of detached eclipsing binaries. Our observations first serve for measuring the radial velocities of stars, which then, in combination with measurements of how the brightness changes in time, allow us to initially say what are the masses, sizes and brightnesses of the components. Then, we check if a given system shows one of the following characteristics: low or high mass, large size, multiplicity, pulsations, total eclipses, activity, membership to a cluster, or allows us to measure its velocities very precisely. Selected systems qualify for further observations, both spectroscopic and photometric, whose results allow for a much more precise determination of the parameters of interest. In particular, for the stars that show the last feature, we are able to measure velocities with precision of 1-2 m/s, not achievable by other research groups in the World. It allows us for record-braking determination of stellar masses. The project that focuses on the detailed study of the selected systems is called *Comprehensive Research with Echelles on the Most interesting Eclipsing binaries* (CREME). Till date we have about 380 systems observed, 160 of which qualified to the CREME stage. Our goal is to study up to 1000 stellar pairs, and to obtain complete description of few hundreds. Except masses and radii, we are also interested in chemical composition, temperatures, or distances to our targets. These are features difficult to assess, therefore relatively few systems have them given. Our work will at least double the number of well-characterized DEBs, providing unique possibilities of further studies in various branches of astronomy, such as: stellar structure and evolution, celestial mechanics, extrasolar planets, activity and magnetic fields, theory of relativity, and others.

We also want to present a novel approach to publication of results. Apart from the “traditional” writing of articles to prestigious, international journals, our results will also be collected in an open Internet data base DEBOOLA (*Detached Eclipsing Binaries Open On-Line Archive*). It will include not only the stellar parameters we obtained (more precise and complete than in any other similar catalogue), but also our measurements. Any scientist in the World will be able to analyse these data by her-/himself, and also his own data, using the computational tools and services that will be provided, which will be run through the web, in the browser. In other words, everybody will be able to study her/his favourite eclipsing binary system using only her/his laptop, without installing any specialised software. Such an approach will surely contribute to faster and more convenient publication of results.