

A group of astronomers from the University of Warsaw led by Professor Andrzej Udalski carries out the world's largest observational project aimed at searching for variability in the sky. The project named the Optical Gravitational Lensing Experiment (OGLE) was established in 1992 and continues to this day. The survey is carried out with a dedicated 1.3-meter Warsaw telescope located in the Chilean Andes – one of the best sites on Earth suited for astronomical observations. Within its long history, OGLE has been evolving, gradually increasing its observing capabilities. Currently, in its fourth phase, the survey monitors daily about two billion objects in the most interesting areas of the sky: central regions of the Galaxy, the Galactic disk, and the Magellanic Clouds – two nearby galaxies.

The aim of the research project “One million binary systems in the OGLE project” is to discover and study at least a million binary and multiple stars in the huge OGLE databases. It has long been known that at least half of all stars occur in binary or multiple systems. Such stellar systems may vary their brightness due to mutual eclipses of their components (eclipsing binaries), a deformation of the stars caused by the gravity interaction from their companions (ellipsoidal variables), a reflection of the light from the hotter component of the system (reflection effect), or processes related to a mass transfer between both stars (cataclysmic variables).

The stellar binary systems have many important astrophysical applications. They are used for direct measuring the masses of stars, as well as their sizes, temperatures, absolute luminosities and ages. Detached binary systems are precise distance indicators in our Galaxy and beyond and thus they allow us to improve the distance scale in the Universe. Moreover, binary and multiple systems are excellent laboratories for studying the formation and evolution of stars, exploring the theory of stellar interactions, mass-loss and mass exchange mechanisms.

The long-term time-domain photometric data collected by the OGLE survey are ideally suited for detecting and studying binary systems. The precise OGLE photometry of over one million binary and multiple stars will be shared with the astronomical community to enable detailed analyzes of these objects. As part of this research project, it is planned to conduct many studies, including search and analysis of binary systems with ultra-short orbital periods, detection of multiple systems, identification of potential stellar mergers, exploring of the reflection effect, search for dormant black holes and neutron stars in eccentric orbital systems, and study of probable planets and brown dwarfs orbiting red giant stars exhibiting the so-called long secondary period.