Among the most common interacting binaries are cataclysmic variables, in which a white dwarf accretes hydrogen-rich material from a red dwarf, subgiant or giant companion. The accretion leads to various outburst phenomena; among the most spectacular are thermonuclear nova explosions recurring with timescales from months to millions of years.

The objective of this project are a study of novae with evolved donors, and especially those with red giants also known as symbiotic novae. They are very suitable to study nova life cycles, because they have higher accretion rates and shorter recurrence timescales than classical novae with dwarf donors, and therefore their life cycles are much shorter. In addition, evolved donors are bright in the optical red and near infrared range which makes relatively easy to measure their radial velocities from absorption lines, and to derive reliable masses of the binary components. The pre- and post-novae can be also detected in nearby galaxies and distance-related parameters can be reliably determined.

The proposed research will focus on deriving strong observational constraints on the physical parameters of Galactic and extragalactic symbiotic novae, and various aspects of their outburst as well as pre- and post-outburst behavior with the aims to define a realistic input parameter space for theoretical symbiotic nova evolution models. The project also includes extensive follow up studies of the recently recovered by us progeny of Nova Sco 1437 which has appeared to be the longest-period eclipsing intermediate polar known - a unique system to investigate particularly as firm link between the classical novae, and cataclysmic variables and intermediate polars, and also to test their evolution. We will study the resolved shell of Nova Sco 1437 as well resolved shells and outflows from a few other symbiotic using spectra from the South African Large Telescope. Also, we will image the mass transfer and inner jet region in another ancient symbiotic nova, R Aqr, with Atacama Large Millimeter Array.

The proposed research is, in many respects, pioneering and will have significant impact on studies of long-term behavior of cataclysmic variables. For example, for the first time we will investigate relative frequencies of symbiotic novae with respect to other types of symbiotic stars in our Galaxy, the Magellanic Clouds and M31. Also, there has been no exploration of the hot white dwarf evolution when the accretion rate is not kept constant. For the first time we will directly study the mass transfer from the AGB star to its white dwarf companion. The proposed research will significantly improve our knowledge of these interesting novae with important implications for wide range of applications including thermonuclear runaways on low-mass white dwarfs accreting at high rates, quasi-stable nuclear-burning white dwarfs, mechanisms to increase the white dwarf mass and evolution towards supernova type Ia.