The most common classification of galaxies, proposed by Edwin Hubble in 1926, distinguishes four classes: elliptical and lenticular known as early-type, spiral and irregular, known as late-type galaxies. This classification was only slightly modified later. However, elliptical and spiral galaxies are still considered as two main classes. Elliptical galaxies are usually larger, more luminous, redder and populated by older stars. They are known as “red and dead”, as there is no trace of formation of new stars in them. Spiral galaxies are in contrast smaller, less luminous, bluer and populated by young stars due to still on-going star formation. Thus, evolutionary scenario picturing young, spiral galaxies evolving into mature elliptical galaxies, seems quite natural. However, there is a crucial problem: such an evolution would need more time than the age of our Universe. Moreover, spiral galaxies contain not only young stars but also very old ones. Thus, understanding the evolution of galaxies, and the history of star formation in them, is one of the most important problems in modern astronomy.

Astronomers are still searching for a detailed and robust description of the process of galaxy formation and evolution - processes leading to the formation of spiral and elliptical galaxies along radically different evolutionary paths. The fact that complex physical mechanisms regulate these processes is certainly one key contributor to the current state of uncertainty. Another contribution to our lack of understanding can be ascribed to the incomplete census that astronomers have been able to assemble for the properties of galaxies, and for their large-scale distribution, over a large fraction of the 13.5 billion years long history of the Universe. Nowadays we know quite well local Universe – the Universe in the radius of only 2-3 billions of light years from now. The lack of precise measurements of distant, faint galaxies makes it difficult to verify theoretical evolutionary paths of galaxies.

The recently completed VIMOS Public Extragalactic Redshift Survey (VIPERS, http://vipers.inaf.it), a Large European South Observatory Programme, may change this situation. VIPERS observed almost 100,000 galaxies at $0.5<z<1.2$, which means that the light traveled from them to Earth for 5-9 billions years. This means that we see these objects as they were at an epoch when the Universe was at approximately half its current age. VIPERS increased significantly the completeness of the census of galaxy properties at those early epochs of the Universe past history providing a unique opportunity to study galaxies and their evolution.

The goal of our project is to study the evolution of red passive galaxies and the history of their star formation over the last 8 billions years. Results of this work will be unique, as so far there was no spectroscopic survey so wide in an area (24 deg^2) and reaching beyond $z = 1$, which means that for the first time the analysis in this redshift range will be so well-grounded from the statistical point of view, and the findings of this project will play a significant role in understanding the evolution of stellar populations in red passive galaxies.

The proposed project is dedicated for studies of a particular type of galaxies: red and passive. This population of massive, elliptical galaxies contains the oldest stellar populations observed in the local Universe. However, astronomers still do not know when and how they formed stars and became quiescent. If we look at the Universe at the half of its age are we also going to observe red and dead galaxies or they will be just in the stage of the formation? Did their stellar populations form during a violent starbust at high redshift or vice versa, they were gradually assembling their mass till relatively low redshift? The project focuses on addressing these questions by spectral and photometric analysis of red passive galaxies observed by VIPERS.

To determine properties and history of star formation in red passive galaxies, I will analyze spectral absorption lines (age and metallicity indicators) and the whole spectra (not only particular lines but also continuum). I will perform also an analysis of broad band magnitudes (from UV to infrared), which allows to describe simultaneously stellar content and dust part (spectral energy distribution fitting). The proposed project is focused on tracing the build up of stellar content in galaxies observed over the last 8 billion years using spectral and photometric information from VIPERS and local surveys (such as SDSS). Finally, I may be able to constrain evolutionary paths leading to formation of red, elliptical and blue, spiral galaxies observed in the local Universe.