Since the dawn of humanity we are interested in understanding the World around us. At the beginning it was sufficient to use our senses. However, very soon it became clear that the World was more complicated than the eye could see. We had to wait until the 17$^{th}$ century, when the optical microscope was invented, to be able to see more. Since then an astonishing progress of technology which has happened. It caused that we are interested today in studying the systems with dimensions of only one billionth part of a meter, or nanometer. New experimental techniques had to be invented to open this nanoworld to our curiosity. One of these techniques is Secondary Ion Mass Spectrometry (SIMS). SIMS is based a very simple concept of collecting material that is ejected by projectile impact at investigate material. It is like when a stone drops into the water and a splash is created. In SIMS a beam of energetic particles plays a role of stones. These projectiles bombard investigated material leading to numerous „splashes" of particles initially residing at its surface. Identification of ejected particles, for instance, by measuring their mass, allows deducting the surface original chemical composition.

In fact, we can achieve even more. "All pictorial form begins with the point that sets itself in motion…". Moving a point creates a line. Group of lines creates an image. Moving the ion beam over the investigated surface simultaneously recording the particles ejected from each point, allows to create its chemical image. As a results of such methodology, one is able to identify not only what was at the surface, but also where it was originally located. The implementation of this concept made it possible today to create chemical 3-dimensional images. This technique is called "imaging SIMS". Imaging SIMS has already found numerous practical applications. It can be used, for instance, to make 3D images of microprocessors or other electronic devices with nanometer resolutions. It can be also used to create chemical "sculptures" of living cells. In the latter case, we can study, for instance, where and how fast a drug is delivered? What is the effect of its presence? Is there any difference in chemical image of cells attacked by a cancer? These are just a few of many questions that can be answered by using imaging SIMS. Finding the answers to all these questions will help us someday to live in a World, where being sick will be just a reminiscence of the past. SIMS will definitely play an important role in reaching this goal.

The main goal of the proposed research program is to perform studies that would allow us to understand what happens in the organic materials, when bombarded with keV cluster projectiles. By using cluster projectiles we plan to throw big stones rather than small pebbles. As a result larger splashes will be created. The results obtained in this project will allow to expand our knowledge about ion-surface collisions. Our results should be especially beneficial for the imaging of biological systems. Knowledge about the physicochemical processes leading to emission of biomolecules may simplify finding the most optimal parameters to perform analysis of biomaterials, and help to properly interpret the measured mass spectra.