Centre for Biomedical Image Analysis

Â (includes Laboratory of Optical Microscopy)
Who we are at CBIA

First of all, we are an interdisciplinary group. We are scientists with experience in biology, medicine, physics, computer science and mathematics joined under common will and areas of interest. We inspect each research problem from specific points of view representing each discipline. The sharing of problems is one of the motivations that drive our development.

Geographically we are located at three working places in Brno city. Our primary working place is the Faculty of Informatics of Masaryk University. Recently, we expanded into Integrated Laboratories of Biomedical Technologies, ILBIT. This is part of new Bohunice University Campus which also belongs to the Masaryk University. Tight collaboration is also held with the Institute of Biophysics of Czech Academy of Sciences.

We also collaborate with a number of other research institutes as well as clinical centres in Czech Republic and abroad.

What we have done so farÂ

We have focused our research and also clinical applications on 2D as well as 3D analysis of fluorescence-stained cells and/or their components observed using optical microscopy. The main aim was to contribute to the understanding of the chromatin organisation in human cell nuclei. Clinical applications were aimed at the study of mechanisms of induction, diagnostics and prevention of deleterious human diseases. We have also studied the function-structure relationship for human genome.

For that reason we have developed several high-resolution image cytometry (HRCM) instruments. These enabled us the analysis of large number of nuclei (comparable to flow cytometry or laser-scanning cytometry) with high accuracy (comparable to confocal microscopy). The HRCM technique is based on automatic acquisition and analysis of fluorescence-stained specimen using a computer-controlled optical microscope, a computer-controlled low-light camera and special software developed and optimised specifically for this task. The instruments allow for both conventional wide-field and direct-view confocal (3D studies) observations using a spinning Nipkow disk.

We also use this technology for experiments with live cells. Image analysis is being developed for microarray experiments too.

We have participated in a number of national as well as international projects related to the above-mentioned topics such as recent EU FP6 3DGENOME project.Â

The results of our work can be found in "Publications" section.

What we would like to achieveÂ

Our ultimate goal is advance in the research in the above-mentioned areas. We would like to report methodologies enabling scientists to observe and analyse more structures and in a more automated way. We would like to describe functional dependencies of structures inside the cell more precisely with the hope to understand how specific human cells work. The path we follow on our way to new discoveries and contributions is outlined in "Research Activities" section.

The insights from interdisciplinary cooperation, state-of-the-art microscope technologies and methodology as well as education of new brains should be the key to achieve that.