

The micro- and nanoengineering techniques allow the fabrication of miniature laboratories, equipped with the instrumentation and functions of standard biochemical laboratories. However, these types of microsystems still require the use of macroscopic instruments, such as imaging devices, controllers for liquid and gas flow control, electronic circuits, power supplies or detection systems. To realize truly portable and automated microsystems that can be commercialized, reduction in the size of the instruments in the measurement system is required. Standard, stationary optical microscopes, equipped with a camera, are widely used as imaging tools in microsystems. The size and weight of a standard microscope, however, often limits the portability of the entire microsystem device and the level of automation of measurements.

I have also met with similar limitations during research on the microsystem for determining the biological potential of animal oocytes. The success in *in vitro* fertilization depends on the quality of the oocyte. By default, this assessment is carried out by observing cells under a microscope and assessing their morphological characteristics. This method depends on the experience of the person making the assessment and the quality of the optical equipment used for this measurement. Research conducted on a microsystem-based cytometer allowed me to link the deformation of a squeezed cell to its quality and to classify oocytes in terms of biological potential.

The aim of the project is to develop a new research station including a platform for holographic microscopy fully integrated with the microsystem for cell research. The research results will enable further development and understanding of the correlation between oocyte quality assessment and the rate of *in vitro* fertilization. They will also allow for greater mobility of the measuring station and increase of the automation of measurements.