The microscopes and contrasting techniques used in contemporary biology provide ever more precise information about the structure and function of the cells and tissues under investigation. However, a microscope image does not only carry information which is readily accessible visually. It also contains information which can be extracted exclusively by means of image processing and laborious analysis.

In order to obtain, store and use all of the information contained in a microscope image, this image must first be recorded in an analog or digital form. The advantages and shortcomings of digital images, the need for objective analysis of these images, and the types of information which can be retrieved exclusively by means of the processing and subsequent analysis of the processed images will be discussed in the context of two- and multi-dimensional digital images of fluorescence and scattered light registered by a confocal light scanning microscope. The examples will include: investigations of chromatin condensation in the cell division cycle, during apoptosis and following interaction with drugs; research into DNA repair; the detection of redox reactions occurring on the plasma membranes of cells cultured in vitro; and the visualization of interactions between cells and extracellular matrix.