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LIGHT MICROSCOPY OF THE XXI CENTURY – INTRODUCTION

Dear Readers, we present to you the new edition of the KOSMOS journal, dedicated to the microscopic techniques and imaging methods, the strong development of which took place at the turn of the 20th and 21st Century.

Imaging is the key word not only for the articles published in this edition, but for the whole modern biology. We are not all fully aware of how long the history of this research method is. Of we define the microscope as an instrument enabling the visualization of objects and structures too small to be seen with bare eye, we will find that it's history goes more than 400 years back.

The first ones to create microscopes were the Dutch optics Zacharias Janssen and his father Hans, who by the end of the 16th century have constructed instruments which could enlarge objects in daylight 10 times.

But it was not before the second half of the 17th century, that the microscope started to be used as a research tool, and we owe it to two constructors: Robert Hook and Anton von Leeuwenhoek. R. Hook delivered the first description of colored objects visible in light microscope. Anton von Leeuwenhoek was the first to observe living cells.

The use of microscopes in research works was of great importance for the enormous progress both in biology and medicine. New fields of science were born: cytology and microbiology. And at the same time the development of cell biology had stimulated the works on new constructions and microscope techniques. At the turn of the 19th and 20th century the light microscopy lived

it's renaissance as one of the main research techniques in natural sciences, which was related to the success of Adolf von Baeyer in gaining in 1871 the first fluorescent dye, the fluorescein. This has marked the beginning of fluorescence microscopy.

At the very beginning of the 20th century such of technical microscope improvements turned up as the ability to change the image magnification by changing the objective without re-focusing of the sample, or an inverted microscope allowing i.a. imaging objects on the bottom of the dishes.

In the thirties of the 20th century the phase contrast was applied in the light microscopy, worked out by Frits Zernick, which enabled the observation of the transparent slides without staining. In 1955 Jerzy Nomarski worked out a new optical solution for imaging of unstained cells, called since the interference contrast or the Nomarski contrast. Both techniques are used until today in cells visualization in the transmitted light.

The technical details of those solutions have been described in one of the articles published in this edition.

The 20th century was already the era of nanotechnology, the development of which is linked directly to the progress in microscopy development. As for today, most of the research done in cell biology is based on analyzing of complicated structures and processes visualization on the cell as well as on the tissue level. This edition of the journal contains several texts on the possibilities of solving research problems with the use of

advanced microscope techniques, as well as on the construction and rules of operation of modern microscope systems and the possibilities given to the researcher with microscope techniques and computer analysis of data obtained in the process of imaging.

I recommend to you all the articles published in this edition, dedicated to the techni-

que, which as no other has had great impact on the research possibilities of the human. As Robert Hook already wrote in the 17th century: "...and by the help of microscopes there is nothing so small as to escape our inquiry ...".

A handwritten signature in cursive script, appearing to read "W. O. Grodzki".