

# MetaSystems White Paper TissueFISH with Metafer

## Introduction

The analysis of FISH signals in cell nuclei which are part of a solid tissue section requires special tools and methods. Based on the requirements of users and researchers, MetaSystems has now launched a dedicated software module for automated analysis of signals in tissues. The module is based on the powerful analysis engine of MetaCyte, extended with a new, convenient analysis environment. The user interface supports either conventional mouse control or the optional interactive pen display.

Once images of selected regions in the tissue are acquired automatically, they can be loaded into the new TissueFISH user interface. Cells of interest can be quickly selected with pen or mouse. On selection all FISH signals in the selected cell/nucleus are automatically analyzed. Analysis can encompass counting of signals, but also the detection of fused signals, a quantification of intensities, the identification of

split signals and much more. Results for each nucleus are shown together with a gallery image, thus offering the possibility to immediately check and eventually correct the data. The configurable data histogram is updated with each nucleus that is added to the gallery. After finishing analysis, data can be summarized and printed in a convenient, adaptable report.

Though nucleus selection is done very conveniently in the TissueFISH interface, it is also possible to apply special algorithms for automated nucleus segmentation. Pre-segmented nuclei can quickly be selected for analysis with a pen tip or with a mouse click.

A toolkit of dedicated image processing operations offer the possibility to enhance the images prior to analysis. Hereby it is possible to quickly switch between the original and the processed image.

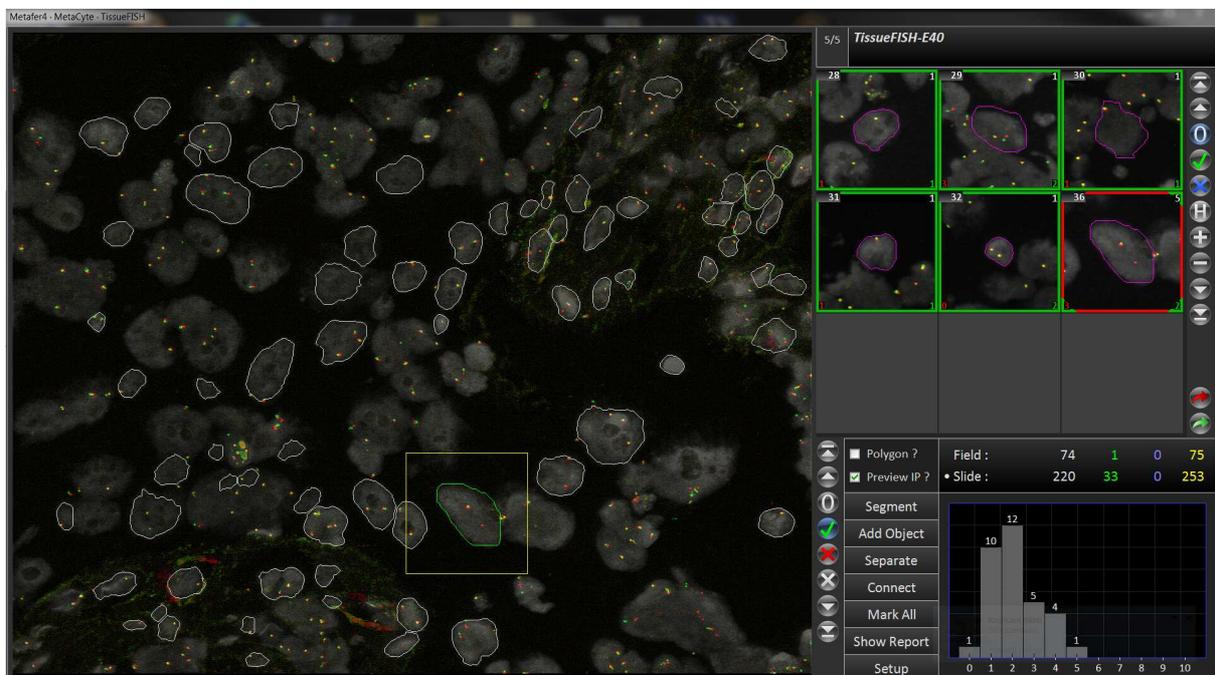


Fig. 1: Metafer TissueFISH analysis environment. Left part of the screen shows the selected image field with pre-segmented nuclei (white outline). The nucleus with the green outline has just been entered to the analysis (results visible in gallery image no. 36).

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## Functionality

Images for TissueFISH analyses are automatically acquired with **Metafer MetaCyte**. Specimen-specific image acquisition parameters (e.g., the color channels or the number of focus planes to be captured) can be determined in a comprehensive settings file ('*classifier*'). Images can either be acquired of the whole tissue, or based on a position list which may contain previously obtained coordinates of certain regions of interest. The classifier also switches the automated cell segmentation on or off. Pre-segmented nuclei appear as white outlines in the TissueFISH user interface, and can be added to analysis with just a click.

MetaSystems recommends to use an interactive, pen driven display (e.g. the WACOM DTU-2231) for manual nucleus segmentation. The user interface does not just allow to select single nuclei for analysis, but also to delete unwanted objects, to split objects, and to connect separate objects. Finishing any of these operations automatically leads to updating the gallery, the signal analysis results, and the data histogram. Therefore the impact of each interactive step can be immediately controlled by the user.

1. **Automated Image Acquisition with MetaCyte**  
Images are automatically captured based on user-definable parameters. Up to 12 color channels, focus stacks, and automated image processing is supported.
2. **Automated Cell/Nucleus Segmentation**  
Cells or nuclei can be automatically segmented based on the counterstain color channel.
3. **Convenient Interactive Cell/Nucleus Segmentation**  
In the TissueFISH main user interface cells or nuclei can be easily interactively selected. This is also possible with the help of an interactive pen display. Selected cells are highlighted and immediately analyzed. Analysis results are displayed for inspection directly after analysis.
4. **Image Processing**  
For better analysis, images can be processed based on a large tool shed of algorithms. Display can be quickly changed between original image display or processed image display.
5. **Signal Analysis**  
All cells marked are immediately analyzed with the comprehensive possibilities of MetaCyte. User-defined parameter sets ('*classifiers*') determine the cell and signal features that are obtained.



*TissueFISH can be used very conveniently with an interactive pen display like the WACOM DTU-2231.*

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