**What is Minerva**

Minerva is a story-telling tool that helps you navigate tissue images and share narrated data with broader audiences. It enables interactive viewing and fast sharing of large image data. Minerva is comprised of **Minerva Author**, a tool that lets you easily create and annotate images, and **Minerva Story**, a narrative image viewer for web-hosting.

[**Example Stories**](https://github.com/labsyspharm/minerva-story/wiki/Example-Stories)**: Follow this link to view example Minerva stories**

[**MINERVA Author Tutorial**](https://github.com/labsyspharm/minerva-story/wiki/How-to-make-a-Minerva-Story%3F)**: A step-by-step guide to create Minerva stories**

**Minerva Glossary**

**Waypoint** A specific location in the tissue image. For example, blood vessel, lymph node margin. The most basic waypoint consists of a user-selected area on the slide and the related text description.

**Channel** Staining for a marker, for example CD3 labeling T cell membranes.

**Channel group** Several channels bundled together to convey information. For example, CD3, CD4, CD8 and FOXp3 to distinguish T cell subtypes, or CD45, keratin, CD31 and SOX10 to distinguish melanoma surrounding epithelia blood vessels and immune cells. Individual channels within the group cannot be toggled. Viewers can choose what channel group to display.

**Mask** Segmentation masks. Masks can be added to a waypoint, and are only visible on that waypoint. Viewer can toggle each mask individually.

**Visualization** Plots and/or videos that help illustrate the point alongside the image data. Minerva Author can generate scatter plot, matrix plot and bar chart (max one of each type) with input data in the form of .csv files. They will appear underneath the text description on a waypoint. Additionally, user can embed images (.png, .jpeg *etc.*) and/or videos in the description using Markdown and HTML.

**Annotation** Arrow, ROI rectangles and text labels can be displayed on your image as annotation.

**Checklist: Preparing for a MINERVA story**

For publication related MINERVA stories, decide key findings you want to showcase

Find and mark the most striking fields of view to illustrate the relevant biology on OMERO

Have your data locally (in your computer or an external hard drive) *OR* in ImStor on HMS O2 server (requires HMS VPN to access)

Have your data in the following compatible formats:

Image data: OME-TIFF

H&E Images: OME-TIFF or SVS

Image segmentation mask: OME-TIFF or TIFF

Data for MINERVA generated plots: CSV

*Before publishing*, notify **Sarah Arena** ([sarah\_arena@hms.harvard.edu](mailto:sarah_arena@hms.harvard.edu)) to properly archive your story.

**A note on naming your story:** We recommend including the following components when applicable: **[Tissue histology]** (e.g. Gastric Adenocarcinoma, Right Atrium) **[Sample Identifier]** (e.g. Patient #1, Case #3) **[Topic of Story]** (e.g. Spatial analysis of immune cells in cancer microbiome). In special cases, such as software demonstration or educational material, provide information on the main aim of the story and the source of image data, e.g. *MCMICRO Exemplar-002*.

|  |
| --- |
| **Sample Name:** Only input once, at the beginning. This is also **the name of your story**. |
| **Sample Description:** Only input once, at the beginning. This will appear above the Table of Content on the home page of your final story. If story is associated with a publication, consider including full citation here. |

**Waypoint #\_\_\_:** waypoint title

|  |  |  |
| --- | --- | --- |
| Channel group name | Target antigen | Display color |
| Name your channel here |  |  |
|  |  |
|  |  |
|  |  |
|  |  |

▫ These antigens and their colors will form a channel group.   
▫ Try to stay under 4-5 colors displayed for each group. Consider the visibility of colors next to each other.   
▫ You can customize the display setting for each channel to optimize signal-to-noise ratio.  
▫ Beware of colocalization of colors. For example, green + red will appear yellow, so you may not want to add another yellow channel.

|  |  |
| --- | --- |
| **Text Description**   * Describe the scene * Who (what cells) are key players in this scene? * What action/conflict/development are we seeing?   + If there are smaller regions of interest, utilize optional annotations to highlight them | **[Sample Image]**  This could be a screenshot of an OMERO.pathviewer image with simple annotation  Consider including:   * OMERO ID of the image * Project number and experiment number (from Experiment Tracker), or other identifiers to help locate the image   Consider:   * How big is the field of view? * Do the colors appear distinct from each other? |

**Optional Annotations:**

|  |  |  |
| --- | --- | --- |
| Type | Description | Location in frame (or indicate in the sample image) |
| Arrow  ROI  Text label | Enter text label here if applicable. |  |

▫ Annotations can be used to indicate specific regions of interest.   
▫ Size of the arrow stays constant during zooming of the perspective.

**Optional Segmentation Masks:**

|  |  |  |
| --- | --- | --- |
| Mask # | Description (cell type, antigen type, tissue architecture etc.) | Color |
| #1 |  |  |

▫ List of masks will appear under the waypoint description following the text **Add data layer**

**Optional Data Visualization Plots:**

▫ Data visualizations are recommended when parts of the story cannot be shown through the image data alone.   
▫ Aside from ones generated by Minerva Author, users can also embed images and videos with Markdown and HTML in the text description.