Chapter 2

Navigation, Annotations, Measurements

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Chapter 2

2.1 Navigation

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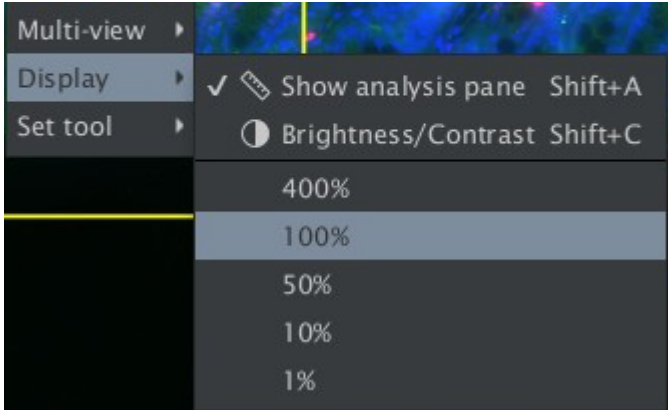
The Image Viewer

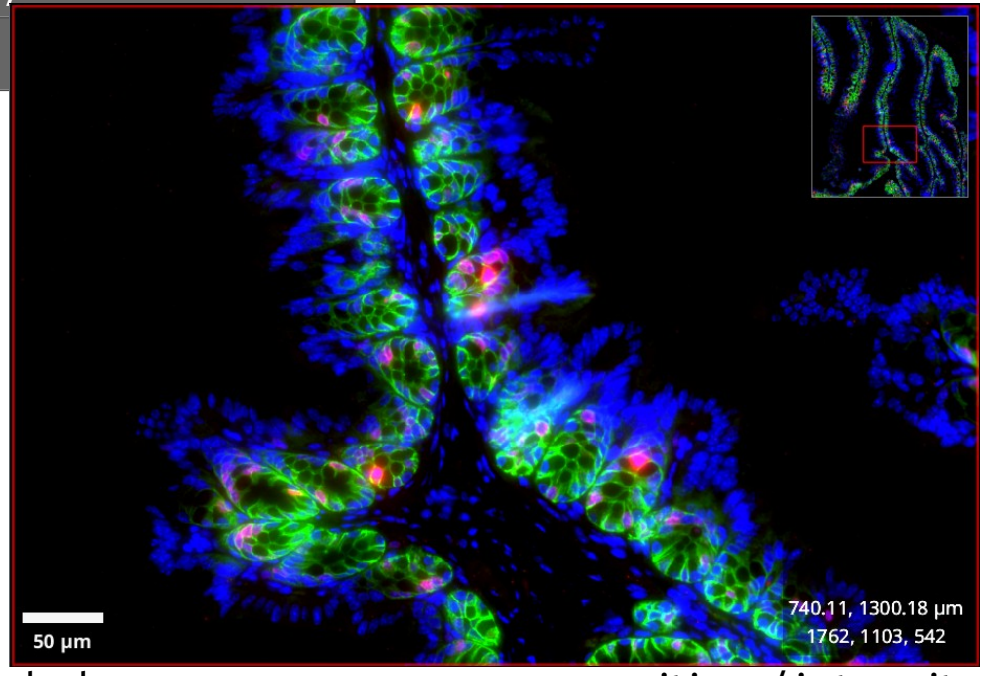
Open image	Double click
Pan	Hold left button and move the mouse
Shift half a field of view	Arrow keys
Zoom in and out	Mouse wheel or shift+up / shift + down
Move to location	Click into the overview

Set zoom manually
Fit image to window



Set zoom from the viewer's context menu

overview

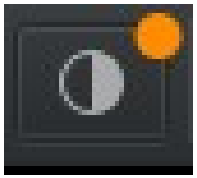


scale-bar

position / intensity

Adjust Brightness and Contrast

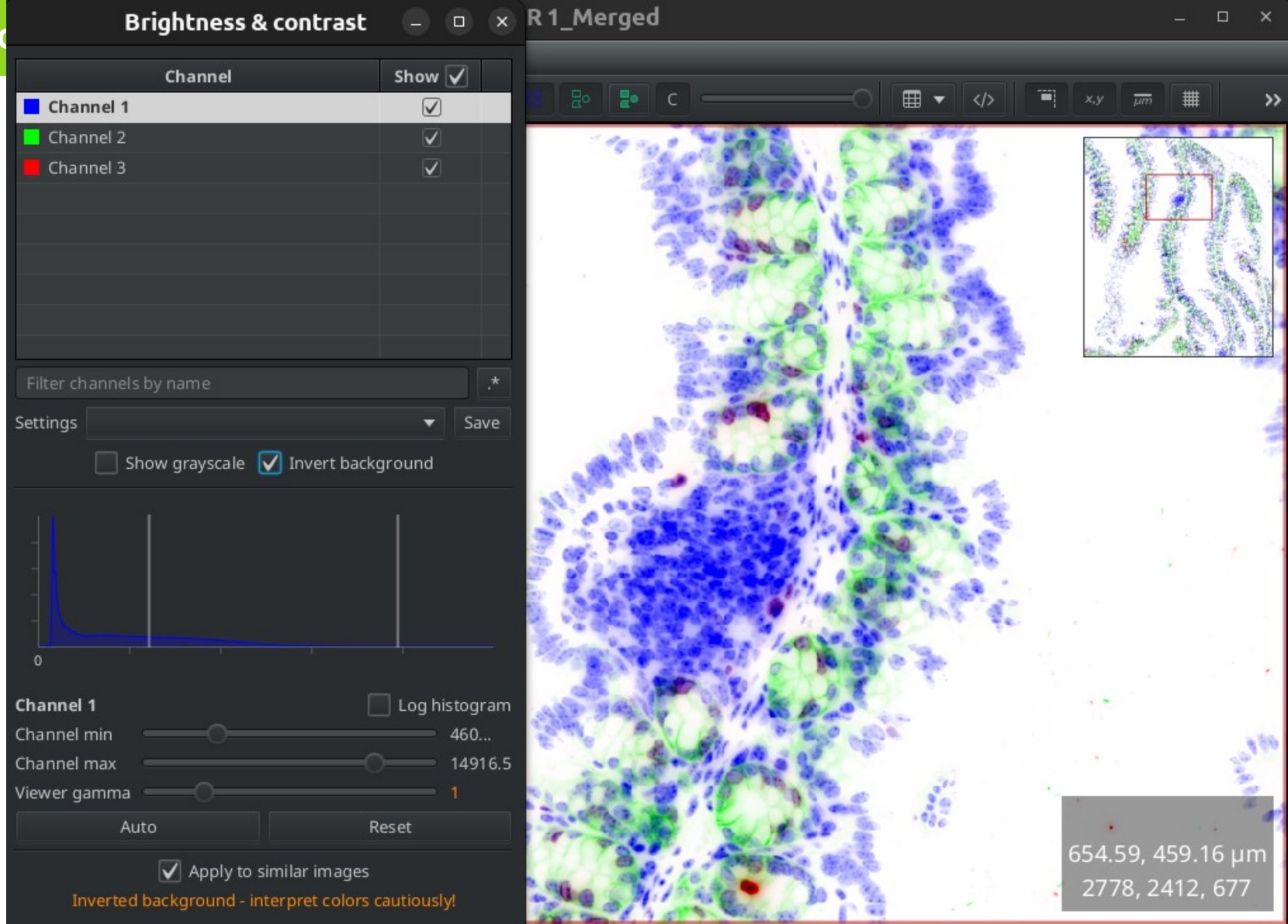
B&C



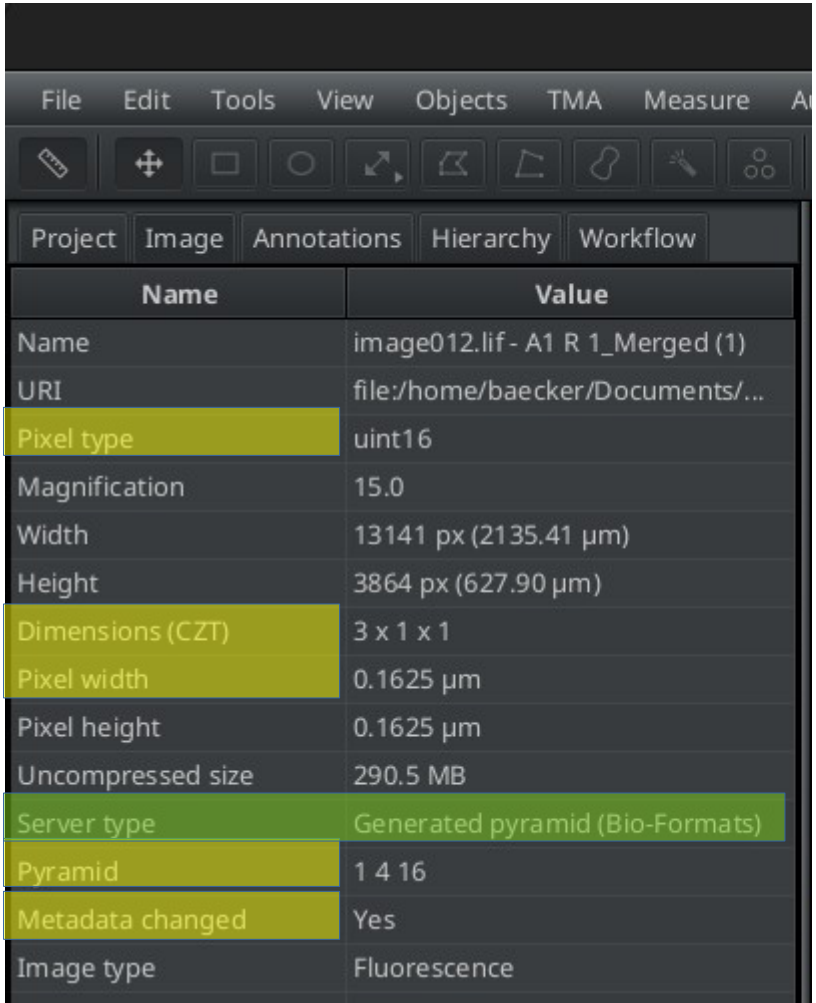
1, 2, 3…
- Toggle channel

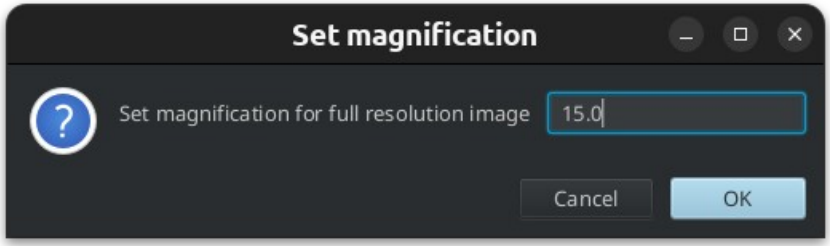
Shift+c
- Show B&C

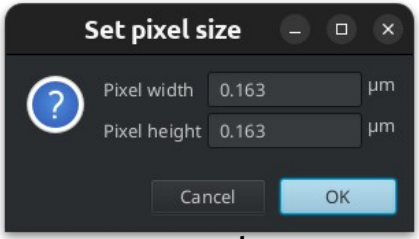
Apply to similar images



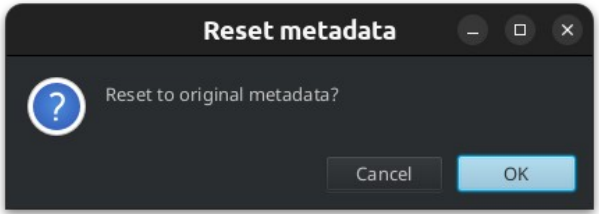
The image-tab





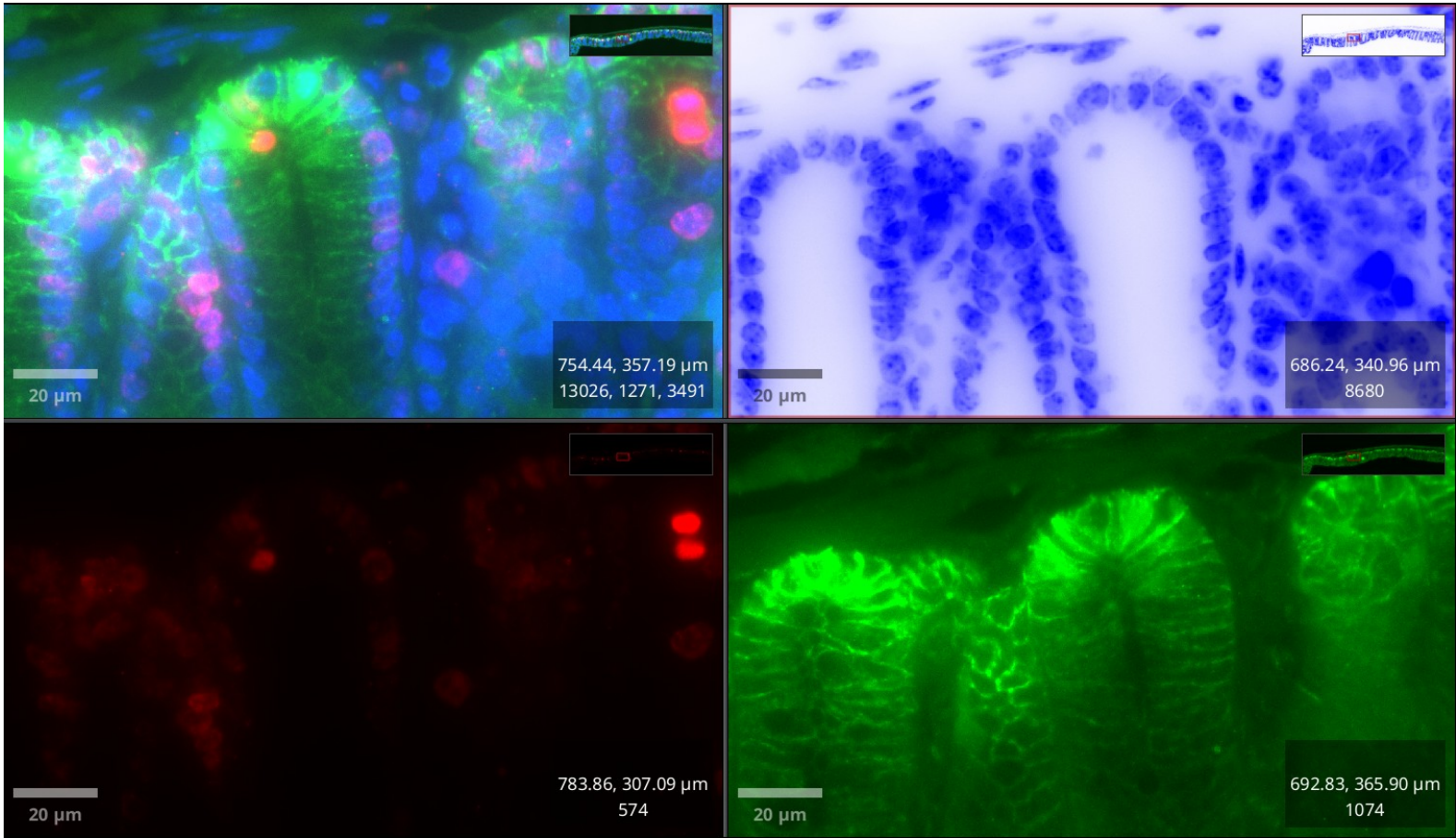


You can also use
line or area annotations



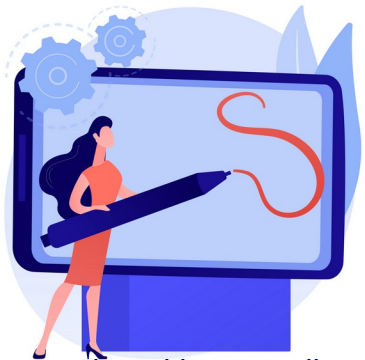
Multi-View

- Duplicate image
- Synchronize viewers
- Allows to
  - See channels separately



Chapter 2

2.2 Annotations



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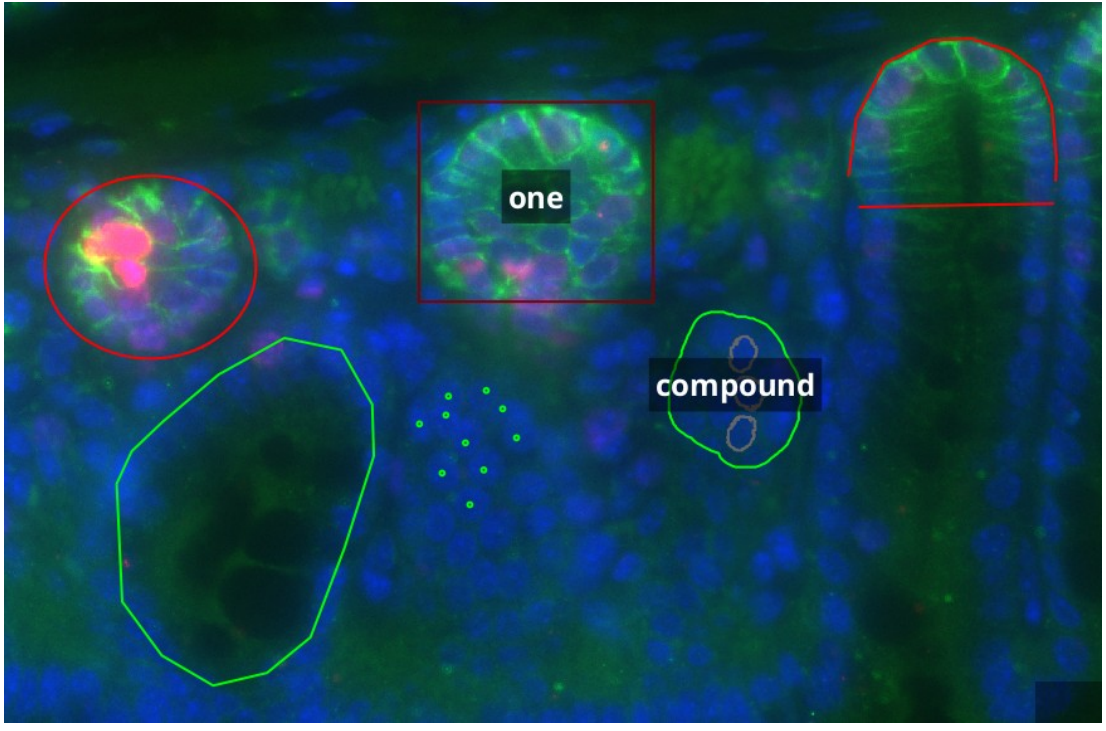
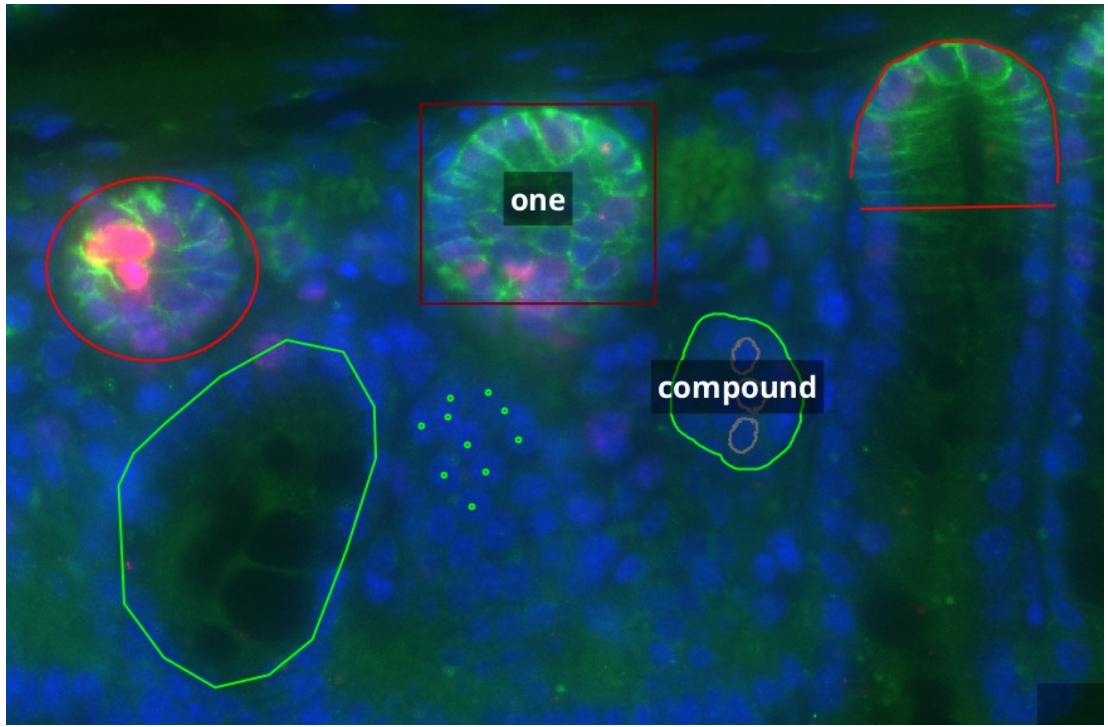
Annotations



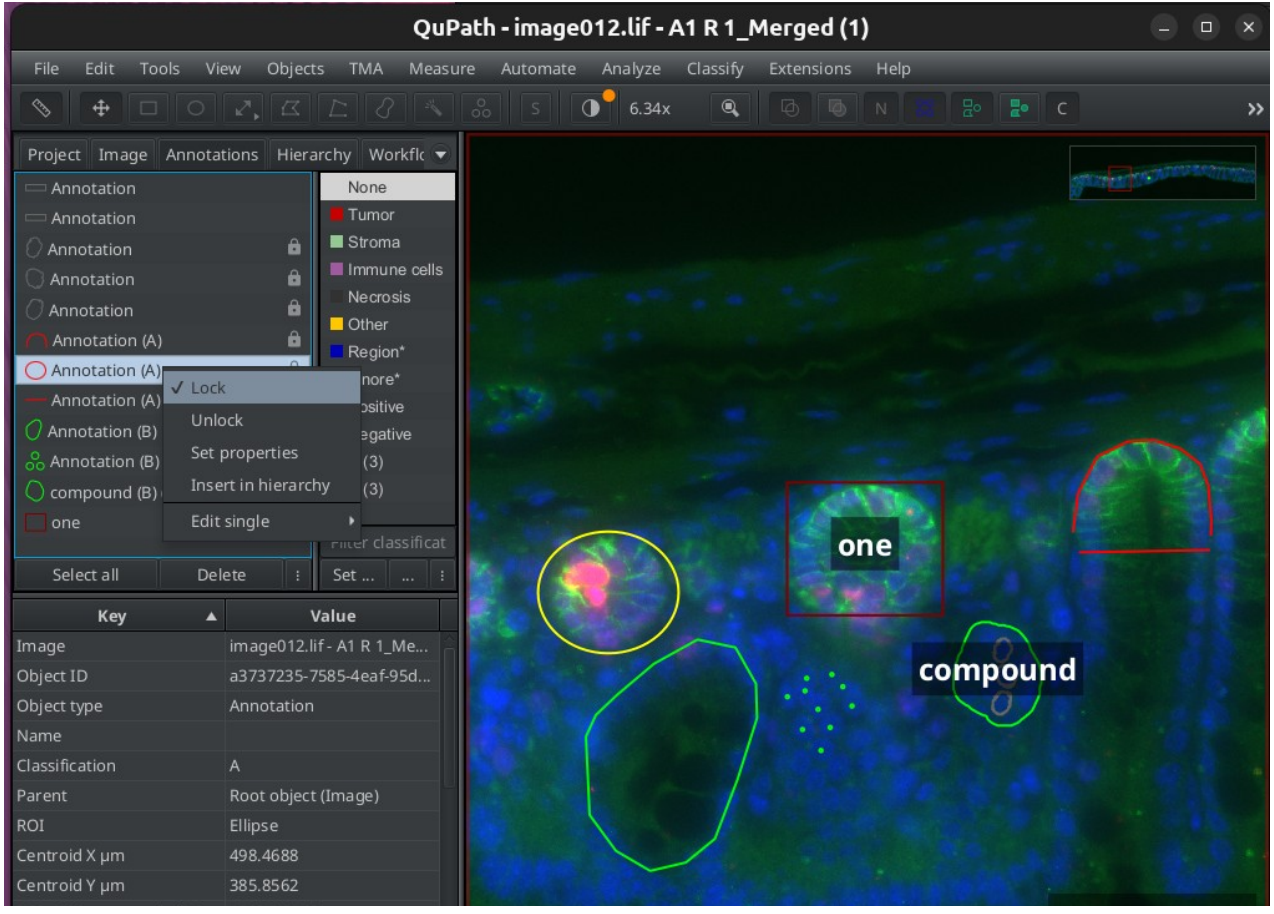
- Highlight a zone
  - Diagnostic for a zone
  - Name + description
- Classify zones
- Measure
  - Area, perimeter, diameter, length, number, intensities
- Select
  - Region of interest for further analysis
  - Work on small zone to find parameters
- Result of an analysis
  - Tissue segmentation

Annotations

- Area
  - Rectangle / Square (shift)
  - Ellipse / Circle (shift)
  - Polygon
  - Brush
  - Wand
- Line
  - Straight
  - Polyline
- Points
  - Count



Annotations Tab

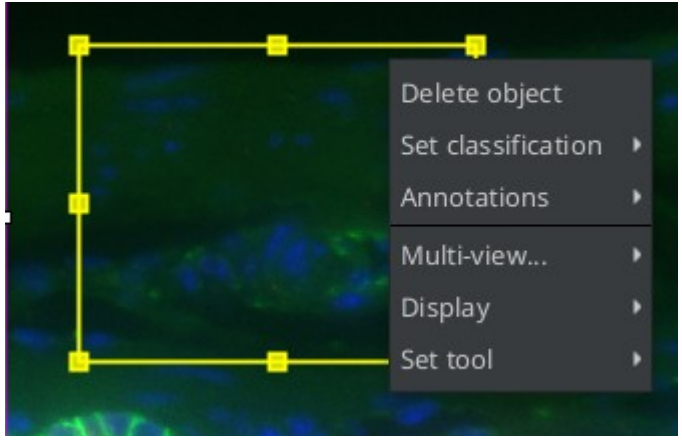


- Lock finished annotations
  - protected from modification
  - “selected” for actions
- Unlock
  - to modify again
- Select annotation
  - click In list
    - select
  - double click in list
    - select and show
  - or double click on it in the image
  - alt or ctrl + click

Selecting Annotations

- Select all annotations
  - ctrl+alt+a
    - ctrl+shift+a makes an annotation of the whole slide
- Add annotation to selection
  - ctrl+left-click on unselected
- Remove annotation from selection
  - ctrl+left-click on selected

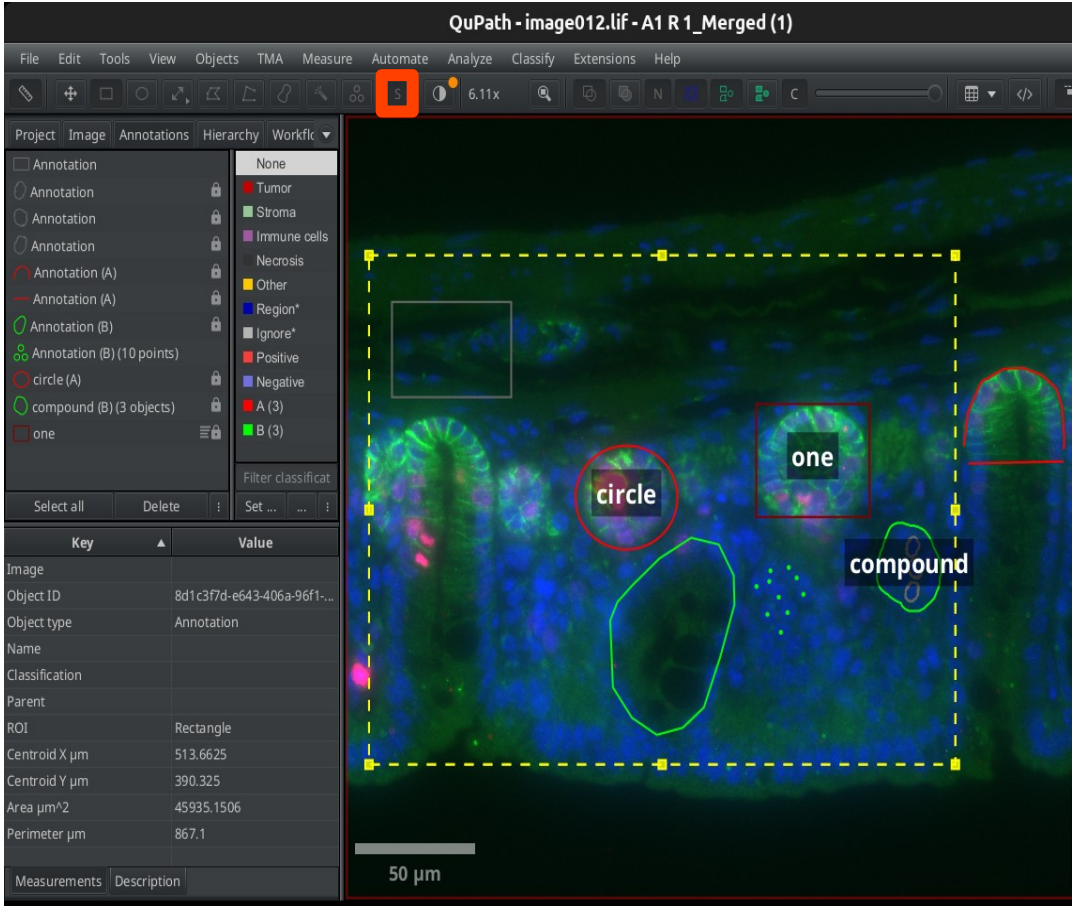
- Delete selected
  - del / backspace
  - menu / context menu



Selection Mode

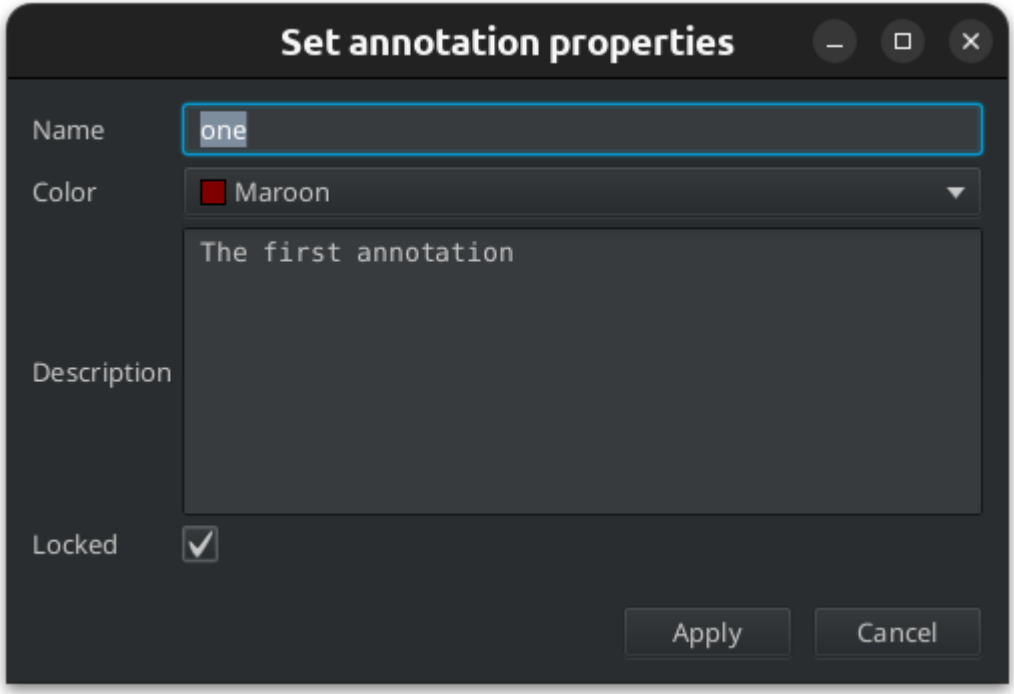
Selection Mode

- Toggle with S-button
- When activated
  - Tools select existing annotations
- When deactivated
  - Tools create annotations
- Use shift to add to a selection

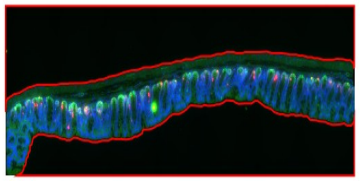


Annotation Properties

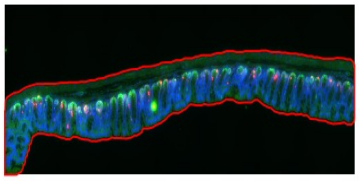
Applied to all selected annotations

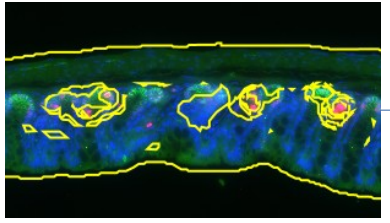


Editing Annotations

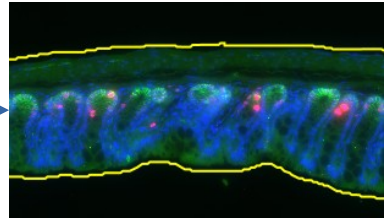


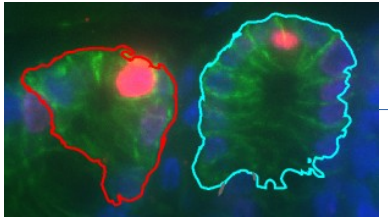
make inverse



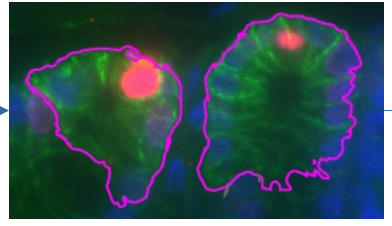


fill holes

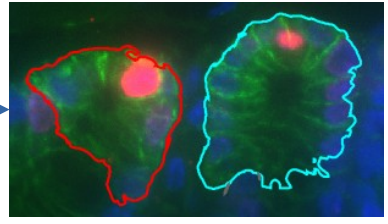


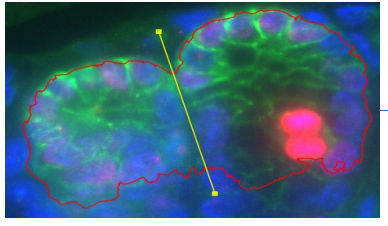


merge

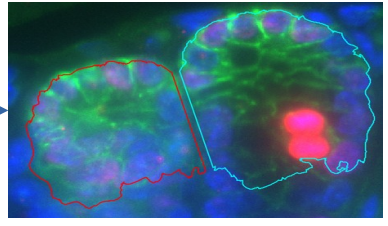


split





split by lines

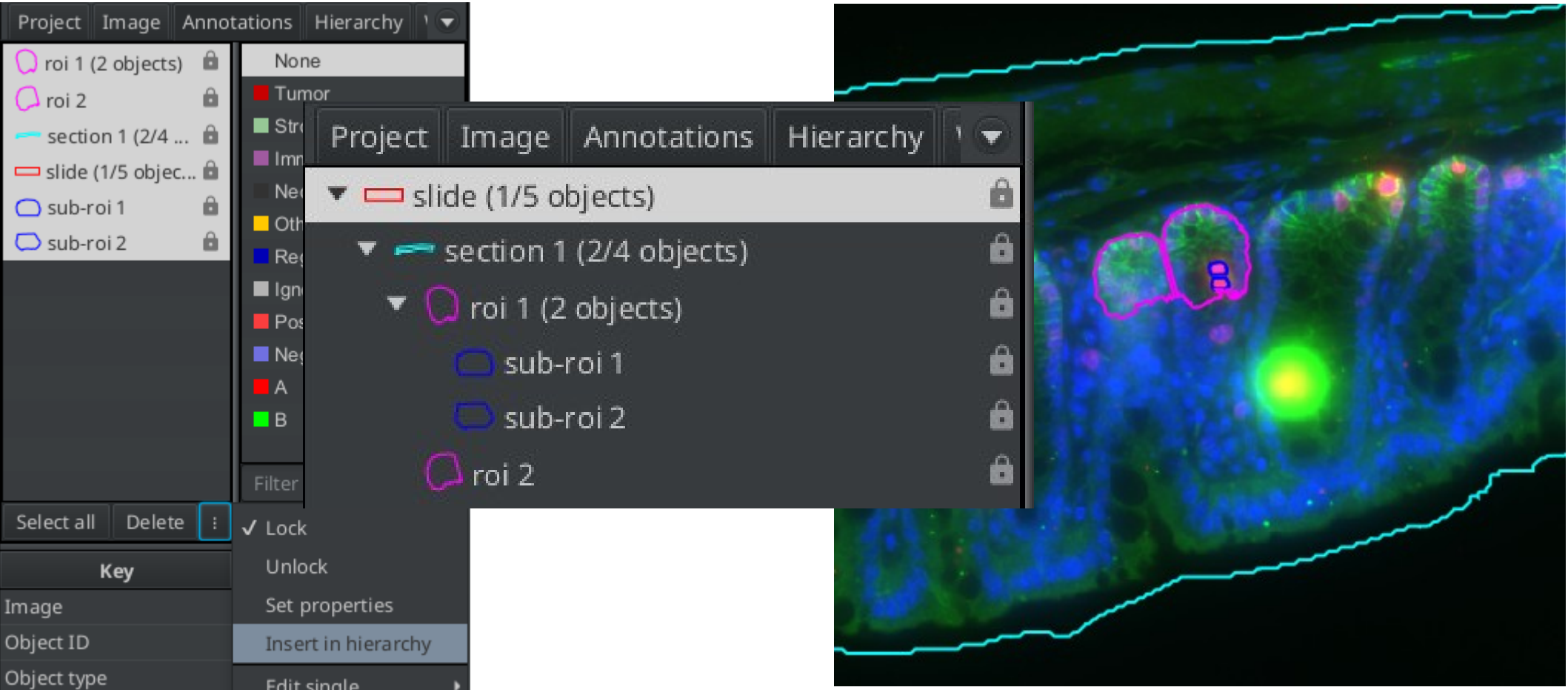


- Subtract
- Intersect
- Specify (rectangle, ellipse)
- Transform (rotate)
- Duplicate
- Copy to current plane
- Transfer last annotation (shift+e)

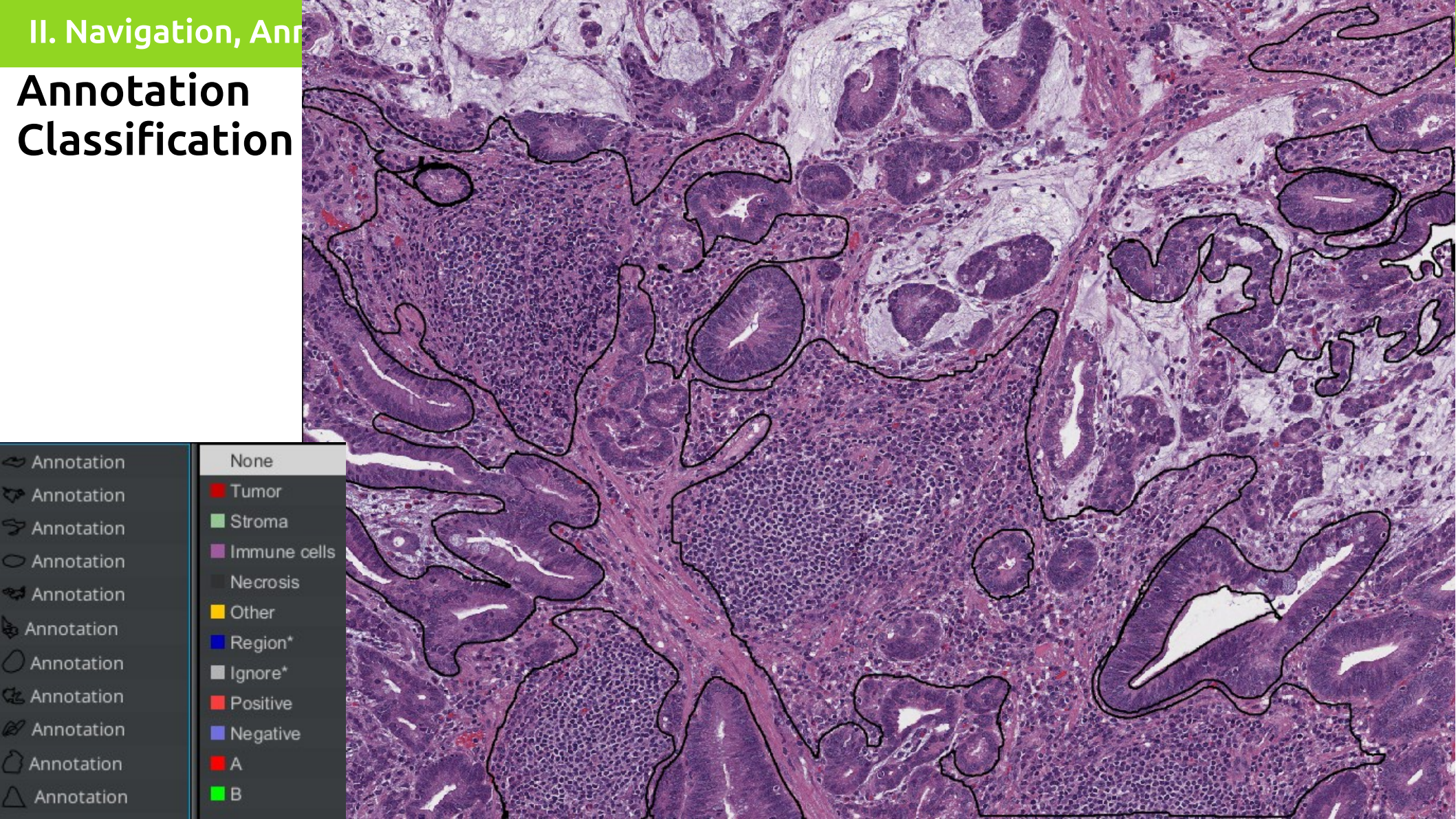
- Annotations context menu
- Objects> Annotations… menu

- Expand annotations
- Remove fragments and holes
- Simplify

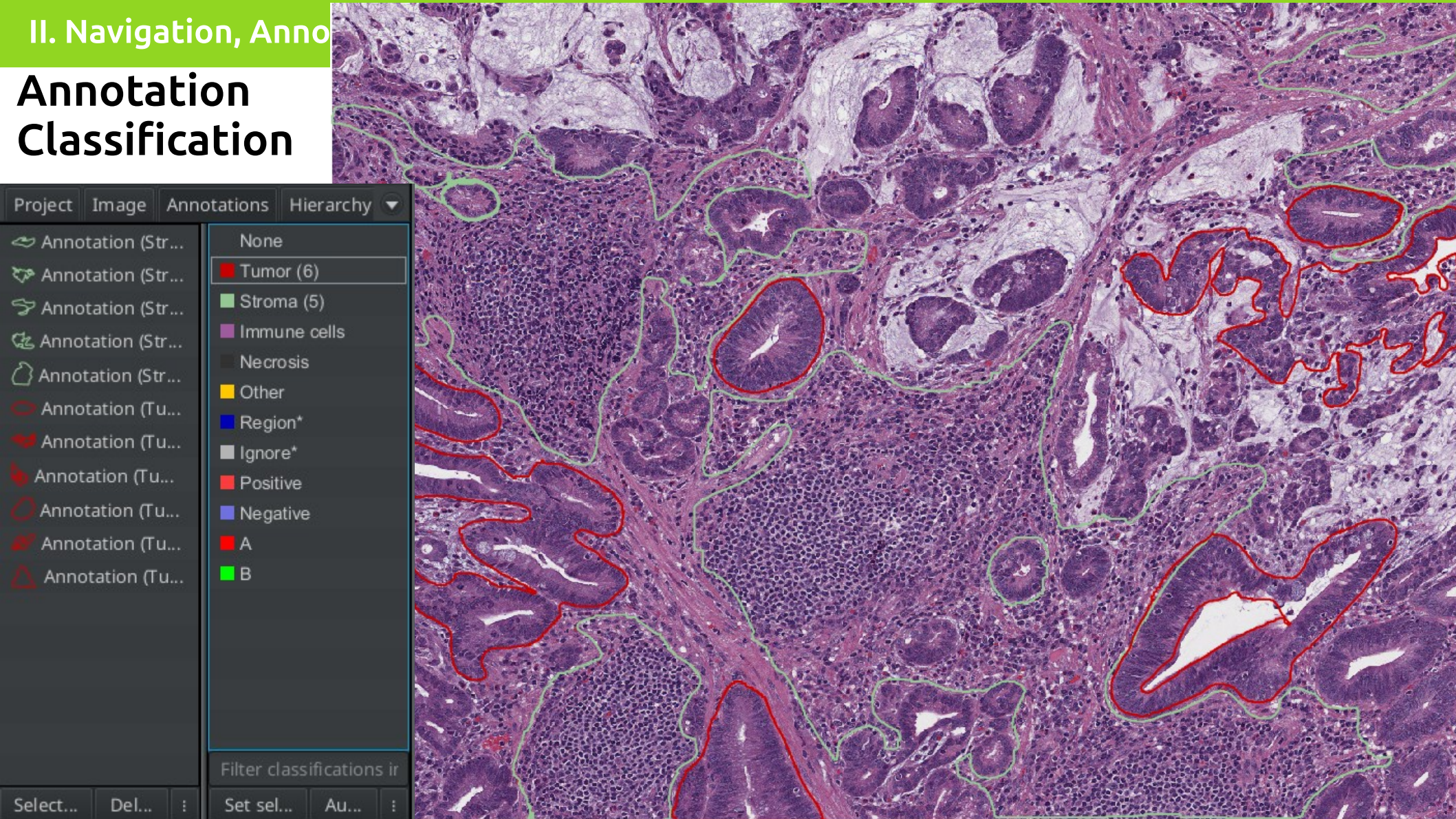
Annotation Hierarchy



Annotation Classification



Annotation Classification



Annotations vs. Detections

Annotation

- Zone
- Limited number
- Name, description
- Class
- Measurements
- Can be parent in hierarchy
- Can be child in hierarchy
- Can be modified

Detection

- Cell (nucleus + surrounding area)
- Large number
- No name or description
- Class
- Measurements
- Can not be parent in hierarchy
- Can be child in hierarchy
- Can not be modified

Chapter 2

2.3 Measurements

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Measurements

Key	Value
Image	101.png
Object ID	63467c99-2b52-4e78-8a0f-85...
Object type	Annotation
Name	
Classification	Tumor
Parent	Root object (Image)
ROI	Polygon
Centroid X px	518.6721
Centroid Y px	623.2351
Num Detections	86
Num A	0
Num B	4
Area px^2	11959.8043
Perimeter px	448.4494

Within selected annotation

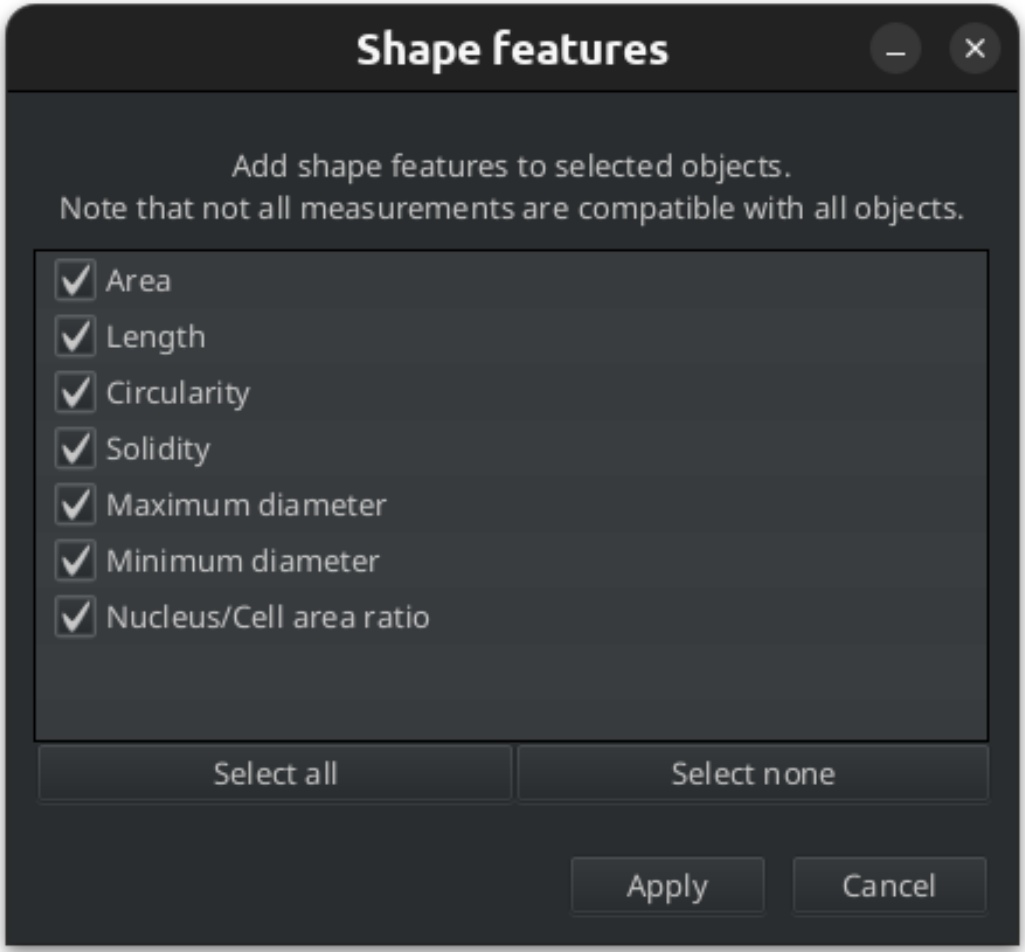
- Number of detections
- Number of detections for all classes

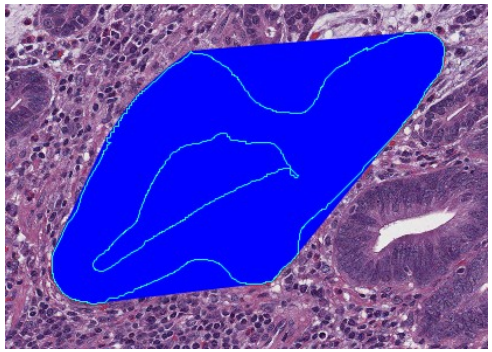
By default

- Area
- Perimeter

Shape Measurements

Analyze>Calculate features>Add Shape Features

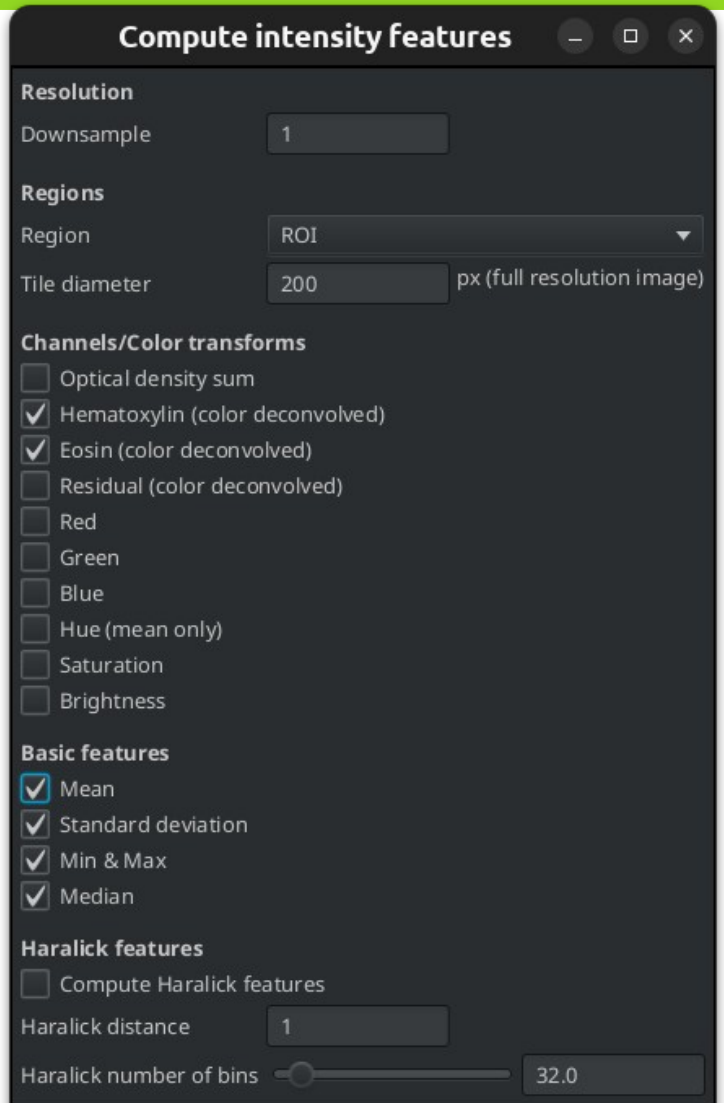




Solidity = Area / Convex Area

$$c = 4 \cdot \pi \cdot \frac{area}{perimeter^2}$$

circularity



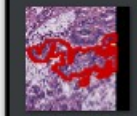
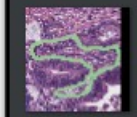
Intensity Measurements

ROI: 1.00 px per pixel: Hematoxylin: Mean	0.4315
ROI: 1.00 px per pixel: Hematoxylin: Std.dev.	0.1847
ROI: 1.00 px per pixel: Hematoxylin: Min	-0.0441
ROI: 1.00 px per pixel: Hematoxylin: Max	1.4258
ROI: 1.00 px per pixel: Hematoxylin: Median	0.4275
ROI: 1.00 px per pixel: Eosin: Mean	0.2711
ROI: 1.00 px per pixel: Eosin: Std.dev.	0.0911
ROI: 1.00 px per pixel: Eosin: Min	-0.2869
ROI: 1.00 px per pixel: Eosin: Max	0.7897
ROI: 1.00 px per pixel: Eosin: Median	0.2755

Analyze>Calculate features>Add Intensity Features

Show Annotation Measurements of on image

Annotations: 101.png

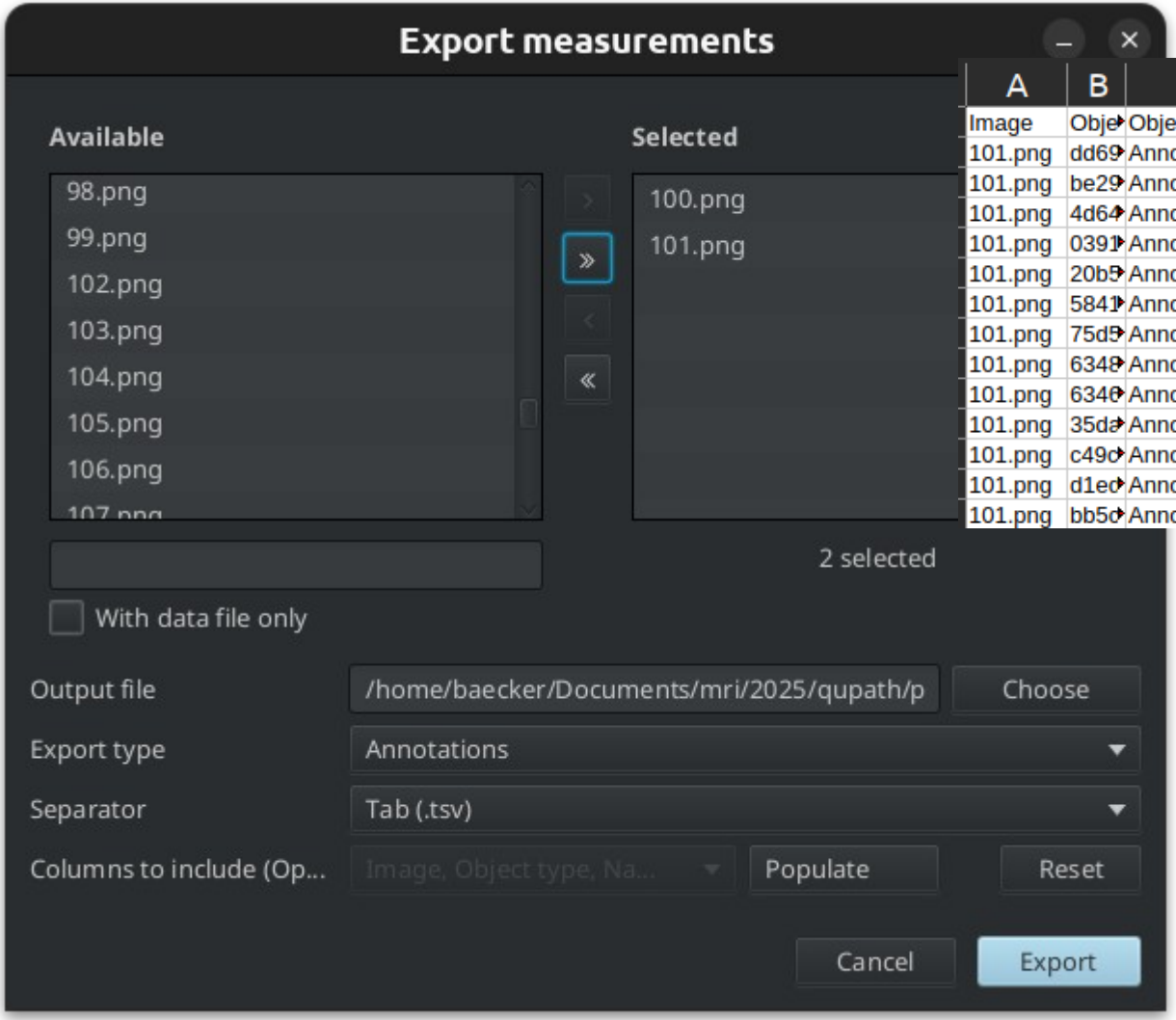
Thumbnail	Image	Object type	Name	Classification	Parent	ROI	Centroid X px	Centroid Y px	Area px^2	Length px	Solidity	Max diameter px	Min diameter px
	101.png	Annotation		Tumor	Root object (Image)	Geometry	1158.4	578.33	40152.7	2714.1	0.614	416.58	221.44
	101.png	Annotation			Root object (Image)	Rectangle	665.5	596	1586552	5046	1	1786.7	1192
	101.png	Annotation		Stroma	Root object (Image)	Polygon	1232.2	445.69	10702.1	825.84	0.53	206.5	140.22
	101.png	Annotation		Stroma	Root object (Image)	Polygon	1220.7	305.46	13109	722.66	0.79	238.87	99.06

Column filter .*

Show histograms | Copy to clipboard | Save

Display histograms and scatter plots

Export Measurements



A	B	C	D	E	F	G	H
Image	Obje	Object type	Name	Classification	Parent	ROI	Centroid X px
101.png	dd69	Annotation		Stroma	Root object (Image)	Geometry	281.49
101.png	be29	Annotation		Stroma	Root object (Image)	Geometry	776.09
101.png	4d64	Annotation		Stroma	Root object (Image)	Geometry	327.22
101.png	0391	Annotation		Stroma	Root object (Image)	Polygon	1220.7
101.png	20b9	Annotation		Stroma	Root object (Image)	Polygon	1232.2
101.png	5841	Annotation		Tumor	Root object (Image)	Geometry	146.19
101.png	75d9	Annotation		Tumor	Root object (Image)	Geometry	1078.6
101.png	6348	Annotation		Tumor	Root object (Image)	Polygon	486.25
101.png	6346	Annotation		Tumor	Root object (Image)	Polygon	518.8
101.png	35da	Annotation		Tumor	Root object (Image)	Geometry	1158.4
101.png	c49c	Annotation		Tumor	Root object (Image)	Geometry	1190.9
101.png	d1ec	Annotation			Root object (Image)	Rectangle	665.5
101.png	bb5c	Annotation			Root object (Image)	Rectangle	570.5

Export Type

- Image
- Annotations
- Detections
- Cells
- TMA cores