Large-Area Imaging

TIDE System
Configured on a Cerna®
Upright Microscope

TIDE®
TIMED INTEGRATION
DIGITAL EXPOSURE

High-Speed Slide Scanning on a Research Microscope

Thorlabs' TIDE® systems provide a fast, accurate solution for large-area imaging. Our Timed Integration Digital Exposure technology (US Patent 9,402,042) synchronizes the position of the stage with the transfer of charges across the camera's sensor to effectively eliminate the relative motion between the sample and the imaging array. This technology enables longer effective exposure times without stopping motion, while also eliminating image alignment errors associated with stop-and-stare imaging. An additional benefit is the increase in scanning throughput: up to 5 times compared to stop-and-stare methods for similar exposures.

The dynamic autofocus feature (US Patent 9,869,852) adjusts for variations in the sample. Once the whole-slide scan is complete, regions of interest can be drawn on the slide image displayed in the TIDE LS GUI. The stage can be moved to these regions for more detailed study with the fully featured research microscope. Thorlabs' TIDE is available in three configurations: fluorescence imaging, brightfield imaging, or both; with options for inverted or upright microscopes.

THORLABS

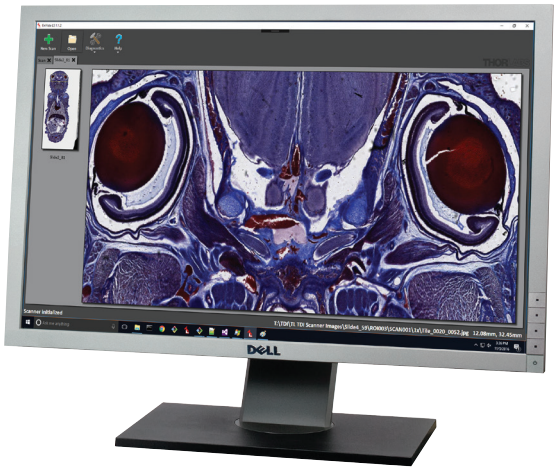
Advantages

- Complete Microscope Systems Configurable for Fluorescence and/or Brightfield Imaging
- Real-Time, Dynamic Autofocus Eliminates the Need for Focus Maps
- Image Glass Slides, SBS Slides, or Well Plates
- 72 mm x 107 mm Maximum Scan Area
- Exposures from 3 ms to 499 ms

Example Scan Parameters[a]

Area	Magnification[b]	Scan Resolution	Scan Time
15 mm x 15 mm	27X	0.37 µm/pix	32 s
25 mm x 50 mm	27X	0.37 µm/pix	131 s
15 mm x 15 mm	13.5X	0.74 µm/pix	12 s
25 mm x 50 mm	13.5X	0.74 µm/pix	41 s

a. Based on our 4 Megapixel CCD Camera Configuration
b. Magnification Calculated using DICOM (Digital Imaging and Communications in Medicine) Standard



Brightfield and fluorescence TIDE® system configuration on a Nikon Eclipse® Ti-E inverted microscope. The monitor displays whole-slide and detail views of the Tiki Goddess, a trichrome-stained frontal young mouse tissue section. Sample courtesy of Dr. George McNamara, MD Anderson Cancer Center, Houston, Texas.

Configurations

- Thorlabs' Cerna® Upright Microscope Configurations
  - Brightfield with 1.4, 4, or 8 Megapixel Scientific CCD Camera
- Nikon Eclipse Ti-E Inverted Microscope Configurations
  - Brightfield with 1.4, 4, or 8 Megapixel Scientific CCD Camera
  - Fluorescence with 1.4, 4, or 8 Megapixel Scientific CCD Camera
  - Combined Brightfield and Fluorescence with 1.4, 4, or 8 Megapixel Scientific CCD Camera

A complete TIDE system consists of an imaging platform in one of these configurations, imaging optics, control electronics, and high-performance computer. We invite you to visit www.thorlabs.com to view model numbers and base pricing for each configuration. Alternately, contact us at sales.tsi@thorlabs.com and we will work with you to select the components for a complete TIDE system.

This system is for research applications only.

Thorlabs' TIDE systems offer many advantages over stop-and-stare imaging techniques, including increased imaging speed and large-format images that do not require stitching. While stop-and-stare systems require the scans to overlap in order to align the individual image frames, TIDE uses the high positional accuracy of the scanning stage to tile the images without overlap. The TIDE LS software package controls image acquisition and includes a zoom function that allows the output image to be examined at a variety of scales.

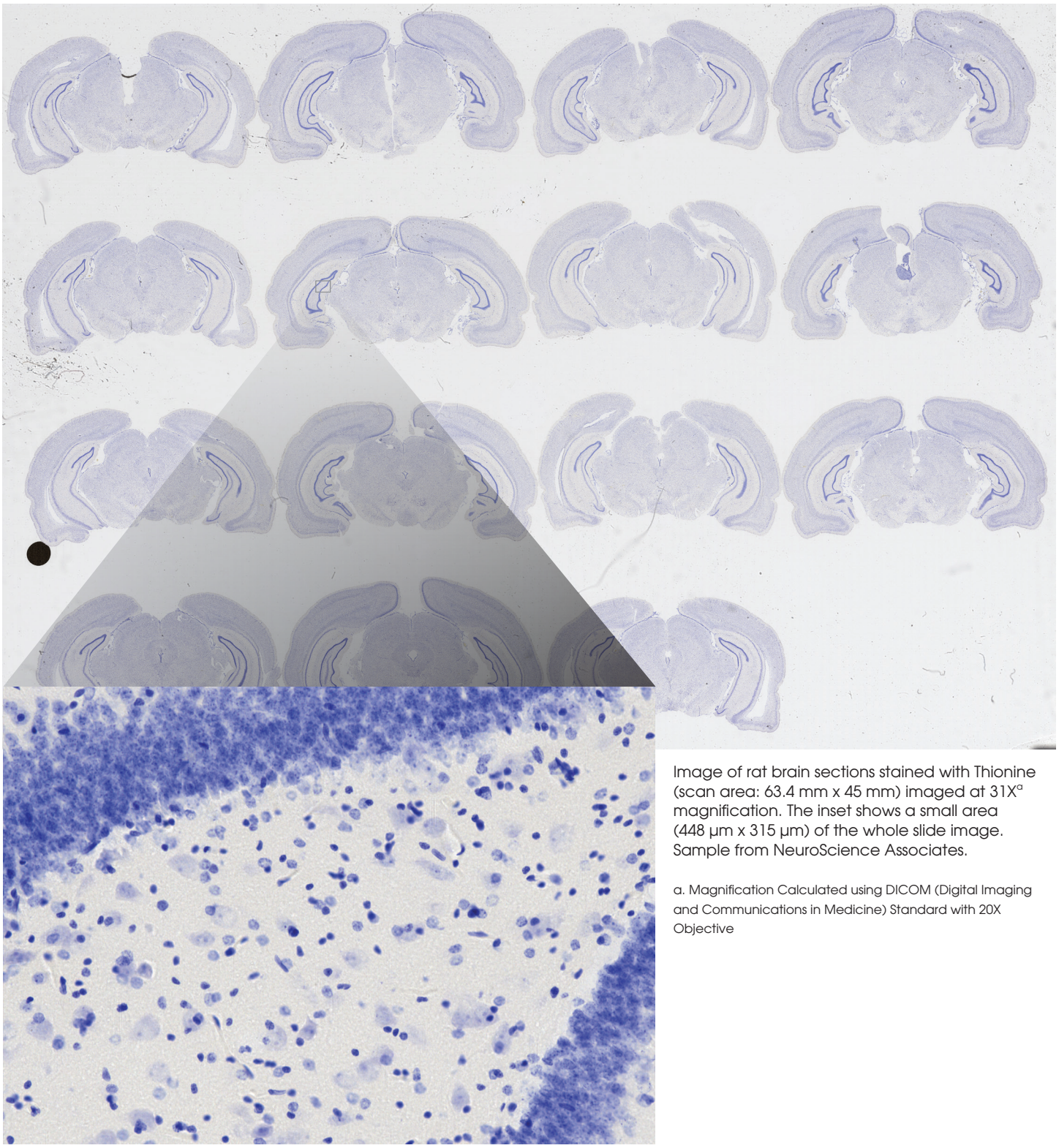
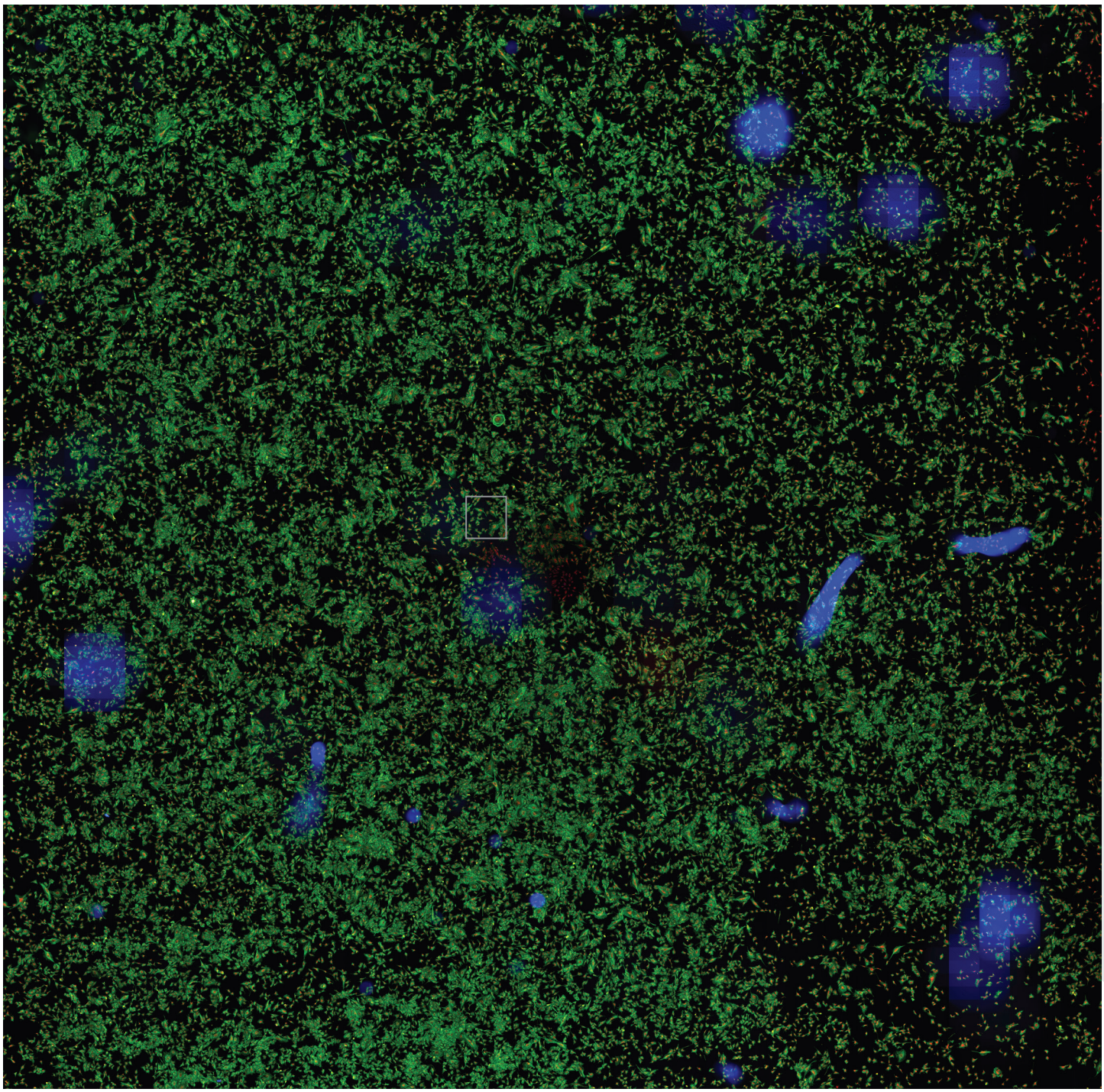


Image of rat brain sections stained with Thionine (scan area: 63.4 mm x 45 mm) imaged at 31X[a] magnification. The inset shows a small area (448 µm x 315 µm) of the whole slide image. Sample from NeuroScience Associates.

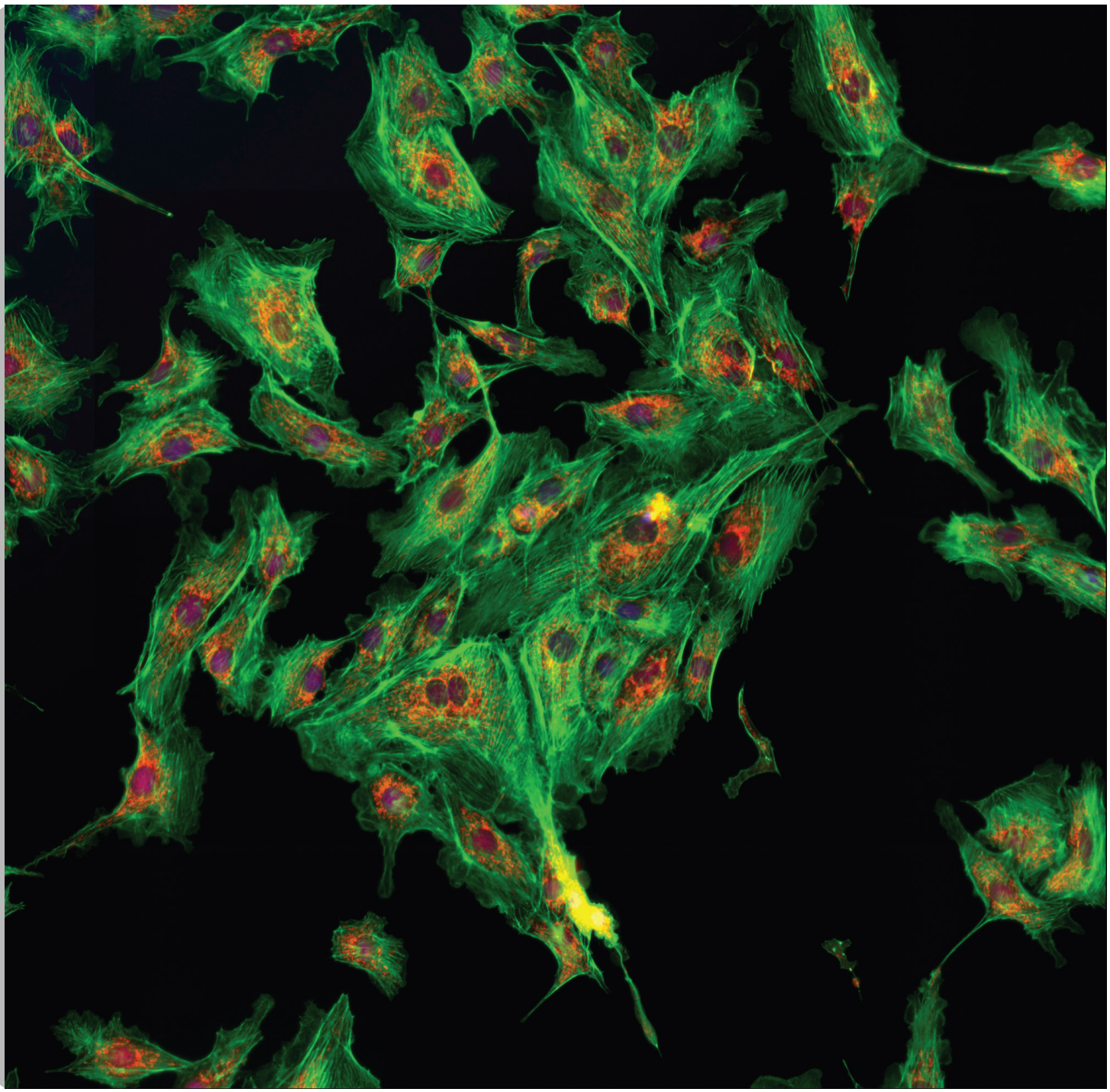
a. Magnification Calculated using DICOM (Digital Imaging and Communications in Medicine) Standard with 20X Objective

Higher Quality, Large-Format Images



Thorlabs' TIDE® Systems are ideal for applications where positional accuracy is paramount. The integration of the camera into the control loop of the scanning stage allows for precise image registration on the pixel level while capitalizing on the speed of the stage. The resulting images can therefore be precisely tiled, not stitched. These stitchless images are an advantage when imaging samples with sparse features or when needing to analyze image stacks. The result is one large image without the risk of lost data inherent in many stitching schemes.

An additional benefit of our TIDE systems is their incorporation into research microscopes. A researcher can scan the entire slide, then switch to live imaging mode, focus the slide at a particular region of interest, and continue researching without disruption to the workflow.

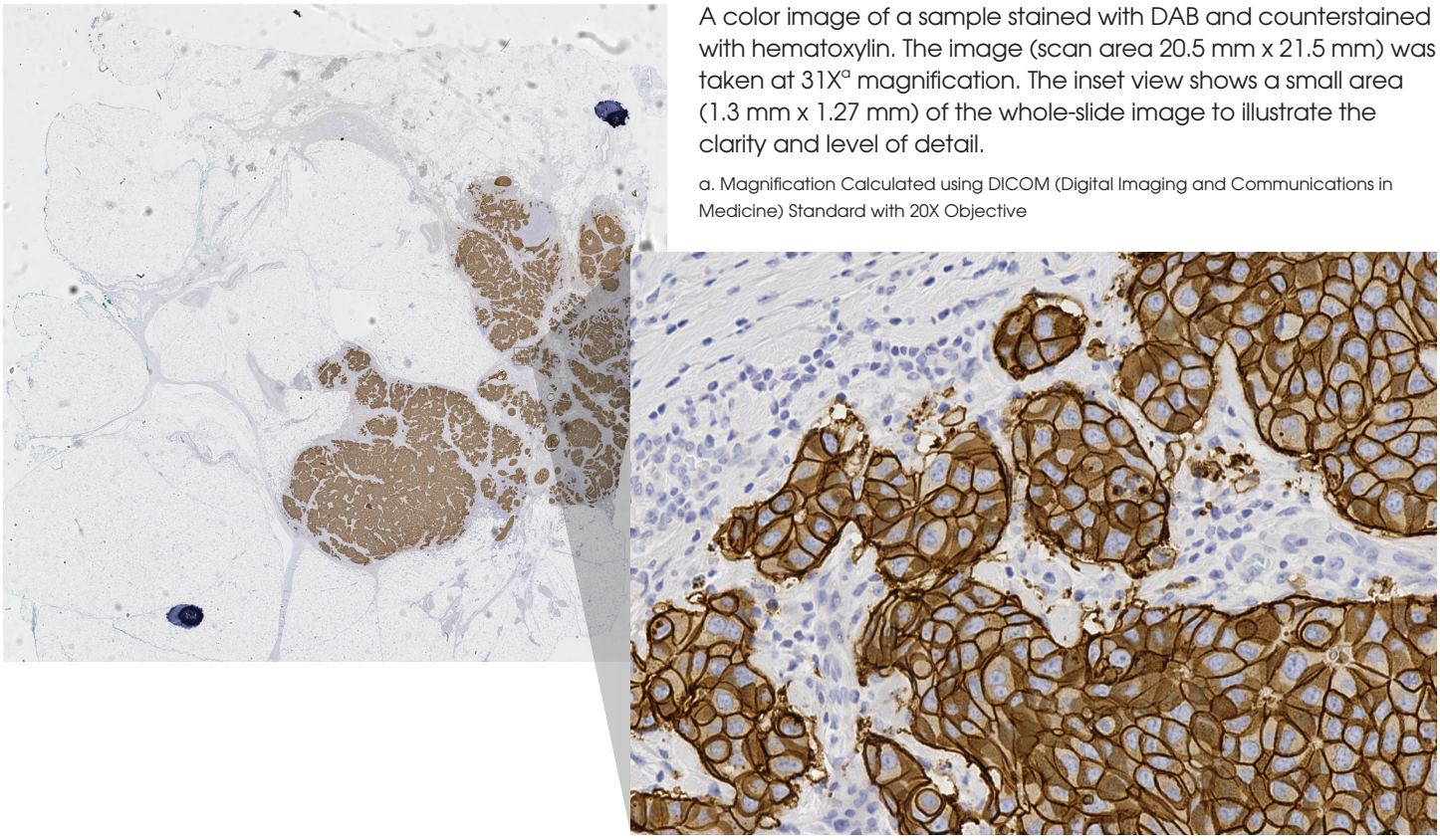


This is a fluorescence image of bovine pulmonary artery endothelial (BPAE) cells. The mitochondria were stained with MitoTracker® Red CMXRos, the f-actin was stained with Alexa Fluor® 488 phalloidin, and the nuclei were counterstained with DAPI. The image on the opposite page (scan area: 15 mm x 15 mm) was taken at 31X[a] magnification. The inset view above shows a small area (604 µm x 627 µm) of the whole-slide image to illustrate the clarity and level of detail.

MitoTracker and Alexa Fluor are registered trademarks of Molecular Probes, Inc.

a. Magnification Calculated using DICOM (Digital Imaging and Communications in Medicine) Standard with 20X Objective

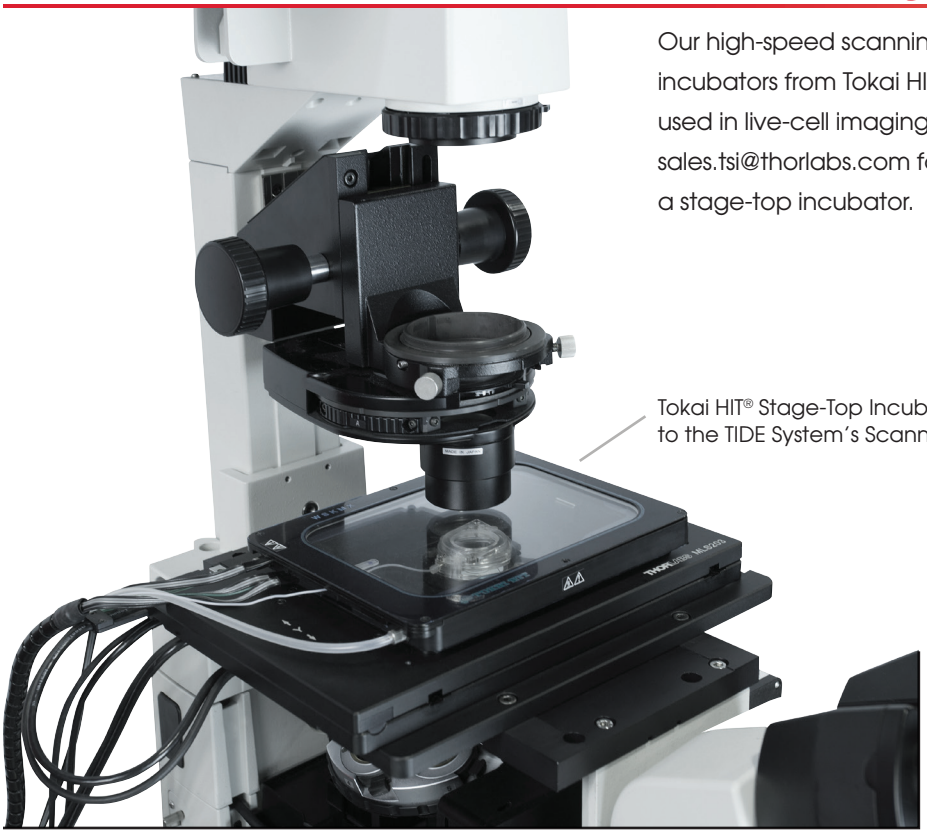
Higher Quality, Large-Format Images



A color image of a sample stained with DAB and counterstained with hematoxylin. The image (scan area 20.5 mm x 21.5 mm) was taken at 31X[a] magnification. The inset view shows a small area (1.3 mm x 1.27 mm) of the whole-slide image to illustrate the clarity and level of detail.

a. Magnification Calculated using DICOM (Digital Imaging and Communications in Medicine) Standard with 20X Objective

Additional Option for Live-Cell Imaging



Tokai HIT® Stage-Top Incubator Mounted to the TIDE System's Scanning Stage

Our high-speed scanning stage is compatible with stage-top incubators from Tokai HIT®. This allows our TIDE® systems to be used in live-cell imaging experiments. Please contact us at sales.tsi@thorlabs.com for more information about integrating a stage-top incubator.

Export Control for Manageable Data Sets

The included TIDE LS software provides a user-friendly GUI that allows the ability to select and save regions of interest. In addition to composite, large format images, TIDE LS can also save each high-resolution image in TIFF or JPEG format. These file formats provide full flexibility for any post-processing required, improve ease of sharing results with remote collaborators, and simplify preparing images for publication.

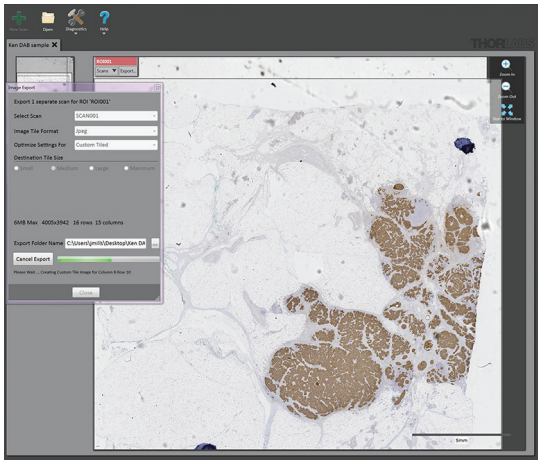
The image exporter in TIDE LS offers several options for Image Export:

- Export to JPEG or TIFF
- Options for Creating Large Single Images:
  - Downsampling Ideal for Publications and Notes
  - Preserve the Full Resolution
- Easily Create Custom Tiled Images: Preserve the Full Resolution while Choosing the Size of Images

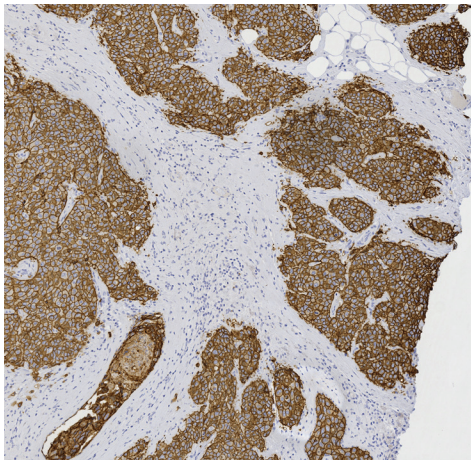
Tiled Full-Resolution Images

Selecting "Custom Tiled" from the Image Export window allows the user to optimize the size of the individual high-resolution images for either smaller file size or smaller number of images. Selecting a smaller number of larger full-resolution images can often save processing time.

In the example shown to the right, the whole-slide scan of a sample stained with DAB and counterstained with hematoxylin is saved as a matrix of 16 x 15 full-resolution images. One of these tiles is shown to the right of the software screenshot.



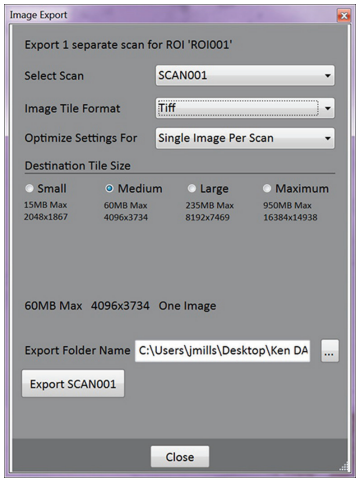
Setting up a Custom Tiled Image



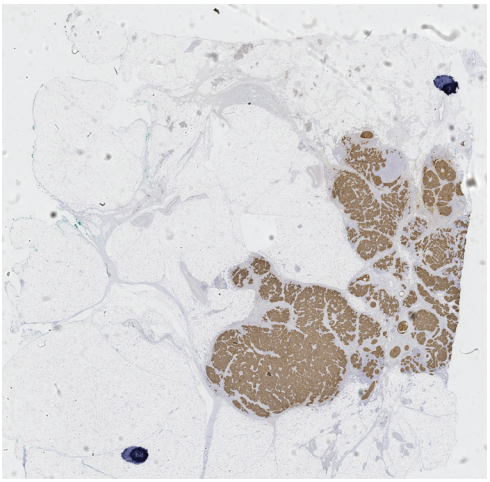
One Custom Image Tile

Downsampling

Selecting "Single Image Per Scan" from the Image Export Window allows the user to export one single image. This reduces the image size by sampling the image to fit a user-selected size, which is ideal for exporting the whole-slide image for publishing.



Setting up a Downsampled Single Image



Downsampled Single Image

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