

**FREELY-BEHAVING
CELLULAR-RESOLUTION
MULTI BRAIN REGION
OPTOGENETICS & CALCIUM IMAGING**

INTRODUCTION

The OASIS Fiberscope is a ground-breaking platform for simultaneous single-cell resolution optogenetics and calcium imaging in freely-be-having animals in the deep-brain, cortex, or spinal cord. Whether you are investigating a single region or multiple regions at the same time, this is the all-optical solution for your freely-behaving experiments. The OASIS Fiberscope is purposefully designed to be reconfigurable and scalable, such that researchers can easily tackle both current and fu-ture *in vivo* optogenetics and imaging applications. Truly understand the link between neural circuits and behaviour using the OASIS Im-plant.

FUTUREPROOF TECHNOLOGY

The OASIS Fiberscope is not simply a product but a platform onto which you can build your complete *in vivo* imaging and photostimulation system. It is a reconfigurable solution that allows you to put togeth-er the components required for your current research goals including different wavelegths of illumination, spatiotemporal control of stim-ulation, cameras, imaging fibers, and more. By adding the necessary components to your system as time progresses, your OASIS Fiberscope can evolve as your experiments evolve. With the OASIS Fiberscope plat-form you can seamlessly transition from fiber photometry functional-ity to cellular-resolution calcium imaging capability or from widefield optogenetic stimulation to single-cell patterned stimulation.

FEATURES

- Cellular Resolution Optogenetics and Imaging
- Designed for Experiments in Freely-Behaving Animals
- Simultaneous Multi-Region Illumination
- Light-Weight Headmount
- Reconfigurable Futureproof Platform
- Easy Synchronization with Behavioural Equipment
- Third-Party Camera Compatible

APPLICATIONS

- Deep-Brain Optogenetics and Calcium Imaging
- Multi-Region Optogenetics and Calcium Imaging
- Cortex-Wide Optogenetics and Calcium Imaging

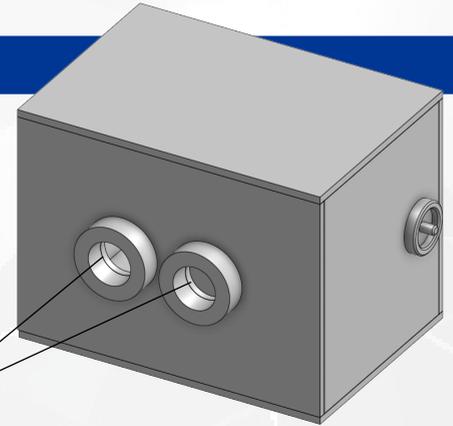


THE OASIS FIBERSCOPE PLATFORM

Multiple components make part of the OASIS Fiberscope platform to allow the system to perform its many functions. Let's take a look at the individual components and their features:

RECONFIGURABLE ILLUMINATION PORTS

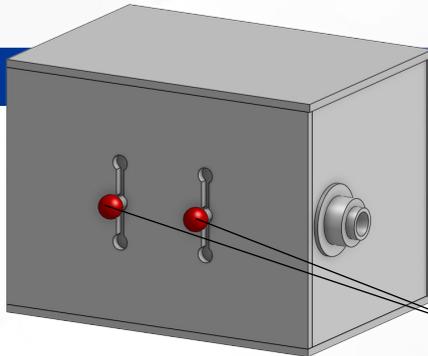
The two (2) illumination ports at the back of the OASIS Fiberscope main chassis allows the introduction of multiple light sources, either via an epi-fluorescent illuminator that accepts a 3mm-core liquid lightguide input or by coupling Mightex's Polygon1000 DMD illuminator for maximum illumination control. This flexibility allows researchers the ability to use the light sources and wavelengths that will suit their specific imaging and optogenetic applications.



BACK ILLUMINATION PORTS

SWITCHABLE FILTER SETS

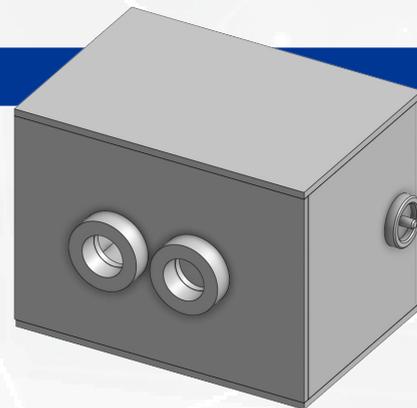
Each of the two (2) illumination ports on the OASIS Fiberscope contains a filter holder that can hold up to three (3) filter sets, allowing researchers to easily switch between filters to meet their unique imaging and optogenetic stimulation needs.



3-POSITION FILTER HOLDERS

INTERCHANGEABLE IMAGING FIBER

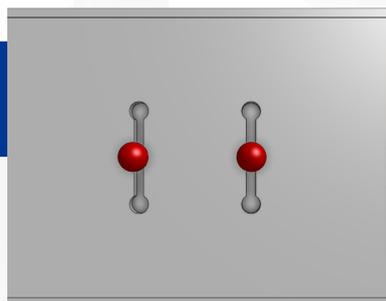
The OASIS Fiberscope uses a flexible imaging fiber to transmit and collect light from the deep-brain or the cortex of a freely-behaving animal for imaging and optogenetics. A standard SMA multimode fiber is also compatible with the OASIS Fiberscope for fiber photometry experiments.



SMA FIBER RECEPTACLE

COMPATIBLE WITH SCIENTIFIC-GRADE CAMERAS

Equipped with a standard C-mount camera port, the OASIS Fiberscope system works with any low-noise, high-sensitivity, good-linearity and high-speed scientific camera, enabling high-quality image acquisition and high-precision quantitative data analysis. Multiple cameras can also be supported.



C-MOUNT CAMERA PORT



CELLULAR RESOLUTION OPTOGENETICS

The OASIS Fiberscope makes use of a imaging fiber cable to not only carry the image collected from the brain to the OASIS Fiberscope for calcium imaging but also transmit light from the OASIS Fiberscope to the brain for optogenetic stimulation with low transmission loss. Individual pixels within the image can be individually addressed for patterned illumination with Mightex’s Polygon1000 for cellular resolution optogenetic stimulation. Our imaging fiber cables are also highly durable and flexible, and can withstand the many forces involved in freely-behaving experiments.

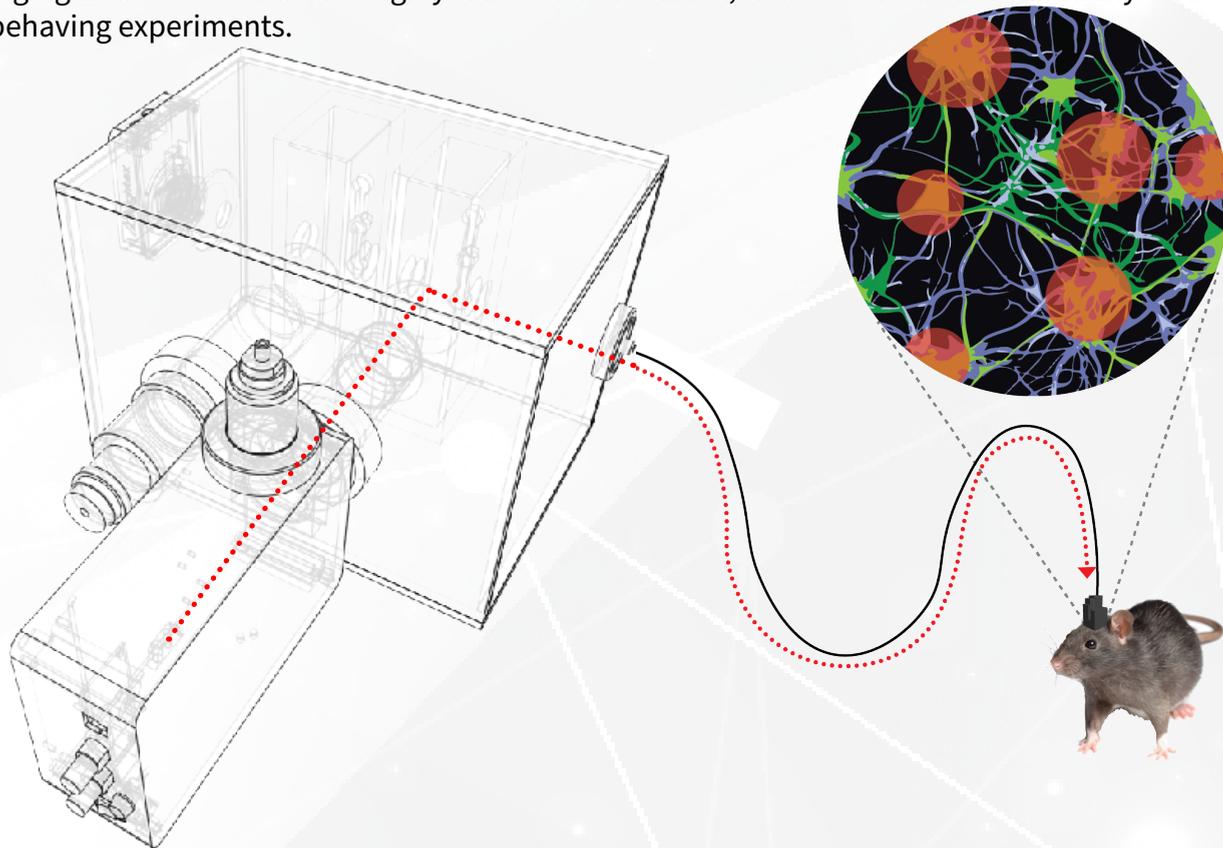


Figure 1. Patterned Illumination with the Polygon1000 to create any shape for freely-behaving simultaneous multi-region targeted optogenetic stimulation.

HEADMOUNTS AND IMAGING PROBES

To access deep brain regions, the OASIS Fiberscope headmount is designed to interface with implantable GRIN lenses to position and focus the fiber relative to the GRIN. The total weight of the setup is only **0.7g**, which minimizes stress and improves the quality and reliability of the data collected. Also, our headmounts come with focus and orientation locking mechanisms to ensure reproducibility of experiments over longer timelines. Our headmount is also compatible for cortical imaging and stimulation in freely-behaving animals.



PLEASE CONTACT MIGHTEX FOR FURTHER IMAGING FIBER CABLE AND HEADMOUNT OPTIONS

COMPACT HEADMOUNT

7mm 8mm 14mm
STANDARD HEADMOUNT

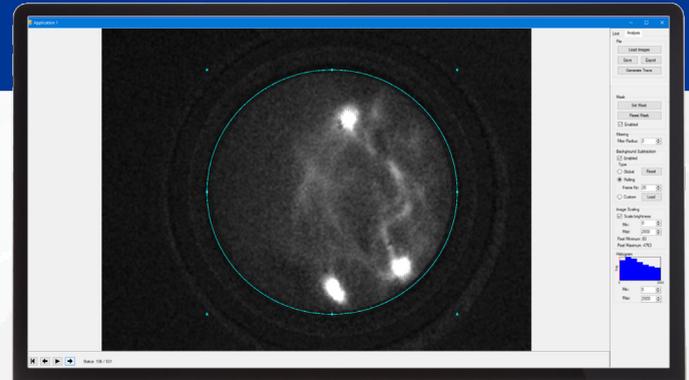


IMAGE ACQUISITION AND ANALYSIS SOFTWARE

Every OASIS Fiberscope system comes with Mightex's Image Acquisition and Analysis software that allows users to collect large data sets of neural recordings from calcium imaging experiments and provides the key processing and analysis tools required to help users quickly convert these large data sets into results that can be clearly interpreted for analysis. The software module has been designed with the help of feedback provided by neuroscientists to ensure that the platform is easy to use, integrates smoothly with typical behavioral experiments, while including the powerful tools needed for studying large scale neural networks.

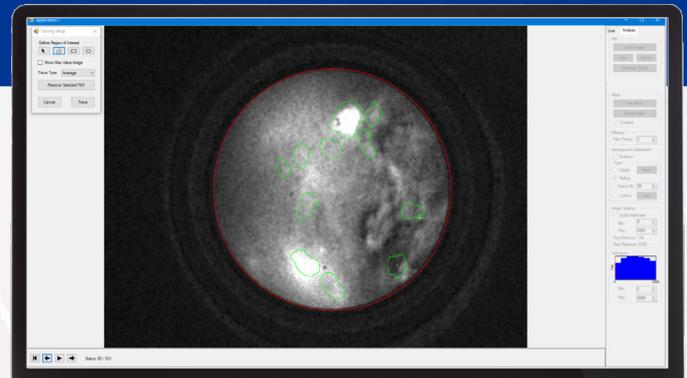
ACQUIRE IN VIVO CALCIUM RECORDINGS

The software provides a complete set of tools to allow researchers to visualize and capture calcium imaging recordings. The software includes features to synchronize the calcium recordings taken with the rest of the behavioral equipment and cameras used in the experiment.



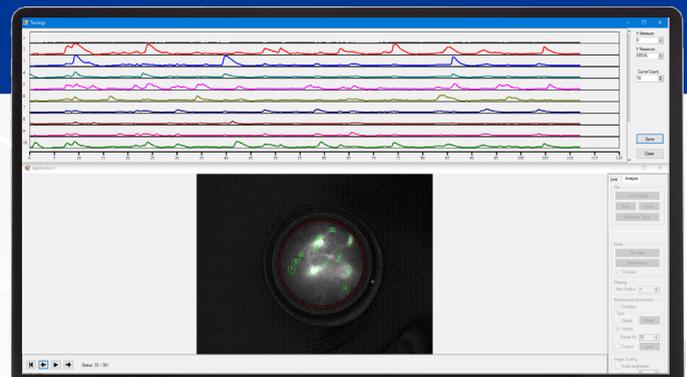
IDENTIFY INDIVIDUAL CELLS

Once calcium recordings are acquired, researchers are able to instantaneously view and process the captured data. The cell identification tools allow for easy detection of cells and sub-cellular features with a high level of quality control to ensure reliable data is collected for analysis.



EXTRACT CELL $\Delta F/F_0$ TRACES AND IDENTIFY SPIKES

Traces of the calcium imaging data can be extracted for each cell that was identified by the researcher. Along with the cell traces collected in the software, all inputs and outputs to behavioural equipment/cameras will be contained in collected data sets to allow for easy matching of neural events with behavioral activity.

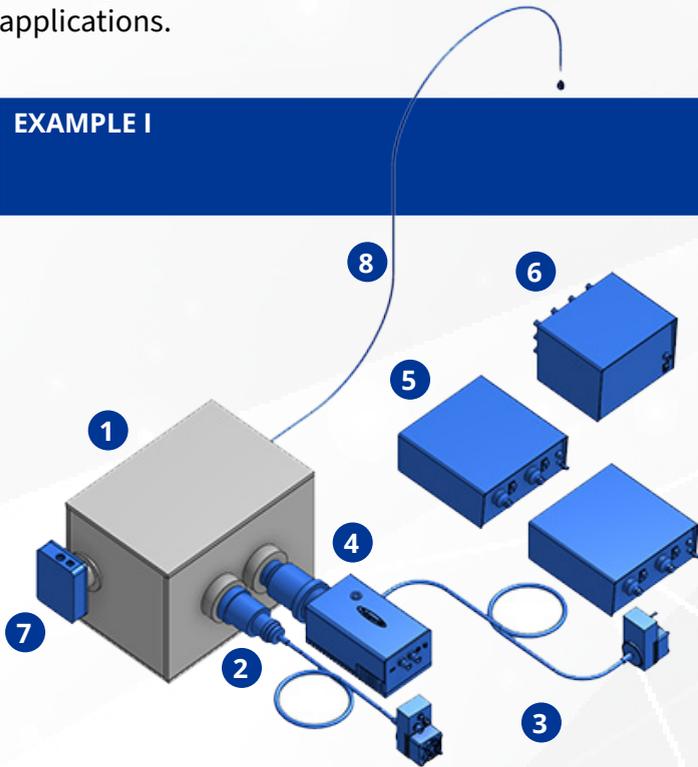


OASIS FIBERSCOPE SYSTEM CONFIGURATIONS

The OASIS Fiberscope is designed to be a futureproof platform that can be reconfigured by customers to suit their current and future optogenetics and imaging research on freely-behaving animals. Below, please see examples of configurations that provide customers with a starting point of how the system can be configured for certain applications.

EXAMPLE I

CALCIUM IMAGING & TARGETED OPTOGENETICS

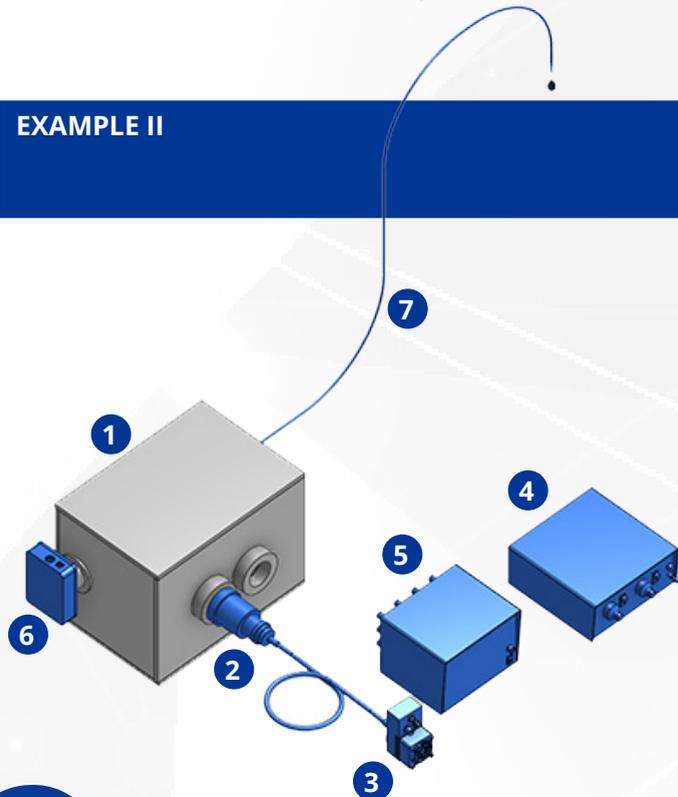


COMPONENTS

- OASIS FIBERSCOPE PLATFORM **1**
- GCAMP (OR RCAMP) FILTER SET
90R/10T BEAM SPLITTERS
- EPI WIDE-FIELD ILLUMINATOR **2**
- BLS-SERIES LIGHT GUIDE COUPLED LED SOURCES **3**
- POLYGON1000 DMD ILLUMINATOR **4**
- LED CONTROLLERS **5**
- BLS ANALOG & DIGITAL INPUT/OUTPUT MODULE **6**
- HIGH-SENSITIVITY CCD CAMERA **7**
- IMAGING FIBER CABLES **8**
- HEADMOUNT
GRIN LENS

EXAMPLE II

CALCIUM IMAGING CONFIGURATION



COMPONENTS

- OASIS FIBERSCOPE PLATFORM **1**
- GCAMP (OR RCAMP) FILTER SET
90R/10T BEAM SPLITTER
- EPI WIDE-FIELD ILLUMINATOR **2**
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- HIGH-SENSITIVITY CCD CAMERA **6**
- IMAGING FIBER CABLES **7**
- HEADMOUNT
GRIN LENS



IN VIVO CALCIUM IMAGING & OPTOGENETICS

Optogenetics and calcium imaging have greatly advanced the field of neuroscience by making it possible to manipulate and image neural activity in vivo with cellular-resolution. Using these techniques in a freely-behaving animal enables researchers to stimulate/control and visualize neurons or regions, individually or simultaneously, in order to study the relationship between neural circuits and animal behaviour. Below you can find examples of current customers using the OASIS Fiberscope for their freely-behaving research.

FREELY-BEHAVING GCAMP IMAGING

A freely-behaving mouse is connected to the OASIS Fiberscope via an imaging fiber (on the right). The OASIS Fiberscope is imaging GCaMP signals from the striatum (on the left) during the animal's behaviour.

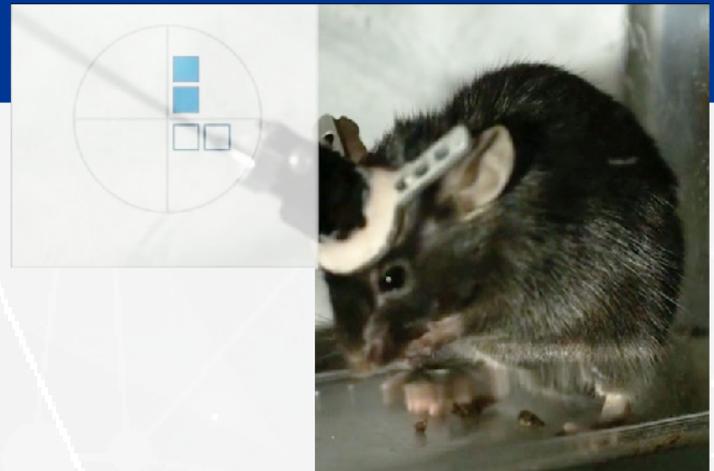
Courtesy: Dr. Alexxai Kravitz, Washington University in St. Louis.



FREELY-BEHAVING CORTICAL TARGETING OPTOGENETICS

The OASIS Fiberscope with the Polygon DMD illuminator was used to target specific parts of the cortex with optogenetic stimulation in a freely-behaving animal. The optogenetic stimulation corresponds to a behavioural response, and this changes depending on where the optogenetic stimulation is targeted.

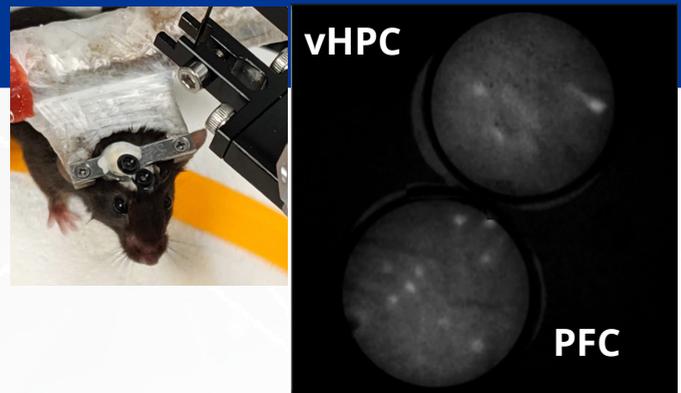
Courtesy: Dr. Zhigang He and Noaf Salah, Harvard University.



SIMULTANEOUS MULTI-REGION GCAMP IMAGING

A mouse is connected to the OASIS Fiberscope via a split imaging fiber to simultaneously image GCaMP signals in the mouse prefrontal cortex and ventral hippocampus.

Courtesy: UCSF.



VIRTUAL PRODUCT DEMO NOW AVAILABLE!

Our primary goal is to help you find the optimal solution for your research. We have a dedicated technical support and sales team committed to providing guidance on our OASIS Fiberscope system and other Mightex products.



Please visit www.mightexbio.com/virtual_demo
to schedule a virtual demo with an expert today!

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