

# PHINDEN

## PHASEFORM SENSORLESS ADAPTIVE OPTICS SOFTWARE

PHINDEN is Phaseform's turnkey software package that incorporates an intuitive graphical user interface for sensorless, image-based adaptive optics (AO) microscopy. PHINDEN automatically estimates aberrations and applies corrections via the Deformable Phase Plate (DPP) to enhance resolution, signal-to-noise ratio (SNR), and contrast. PHINDEN runs seamlessly in the background alongside native microscope control software, allowing you to preserve your existing workflow.

## KEY FEATURES

### Automates sensorless aberration measurement & correction

Brings the power of image-based adaptive optics to your fingertips — just a few mouse clicks to optimize image quality during live acquisition.

### Enables plug-and-play adaptive optics

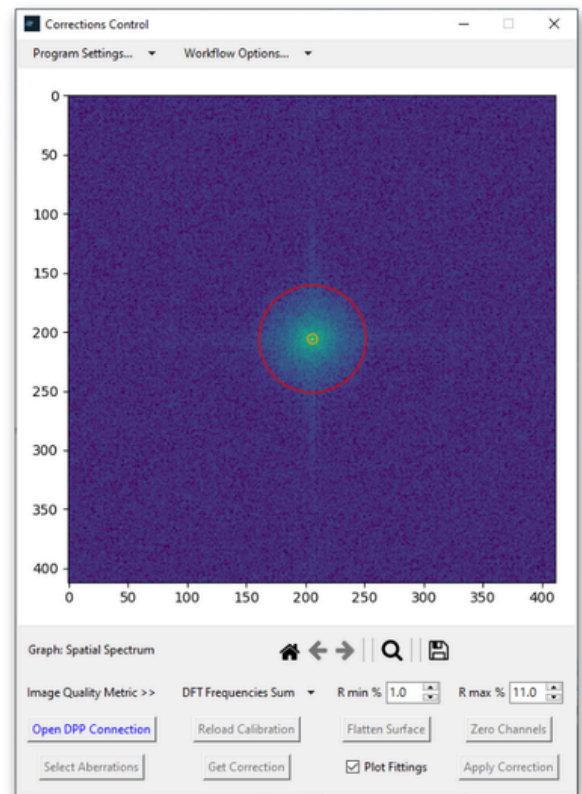
Provides a streamlined path to full AO integration, combining Phaseform's DPP with minimal hardware and software setup, with minimal disruption to your workflow.

### Seamlessly integrates with native control software

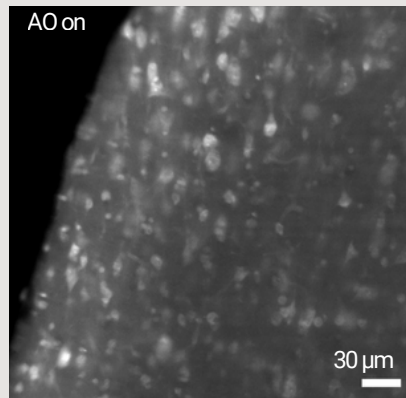
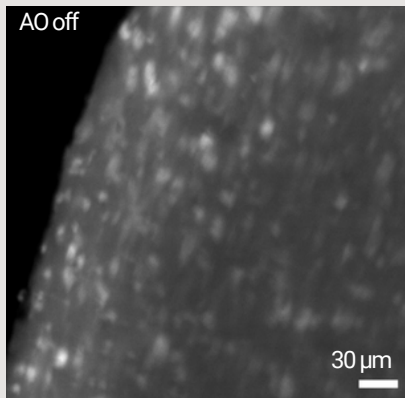
Runs in the background alongside platforms like  $\mu$ Manager & ScanImage, allowing users to operate their microscopes as usual.

### Adapts to diverse modalities and specimen types

Compatible with a wide range of microscopy techniques and biological samples, using a broad selection of implemented image quality metrics to guide optimal correction.

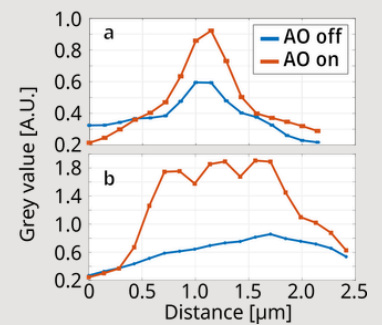
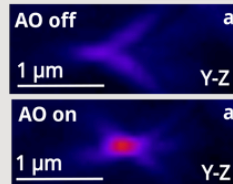
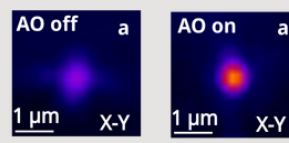
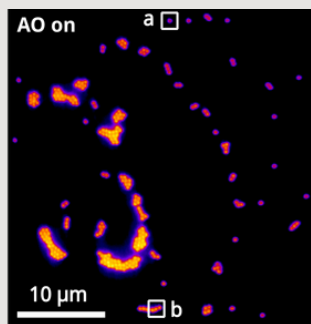
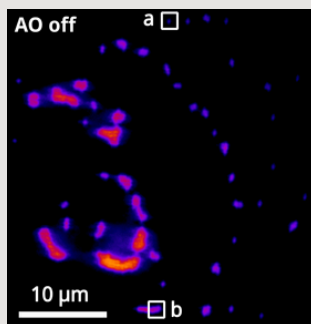


# CASE STUDIES

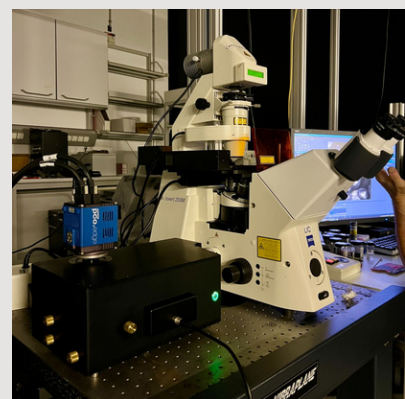
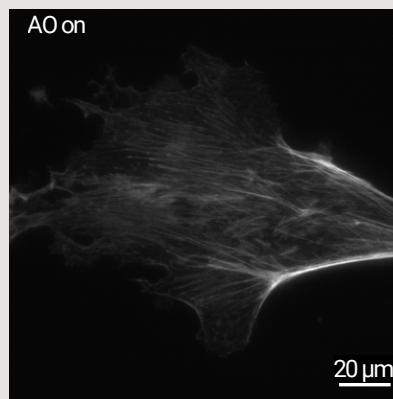
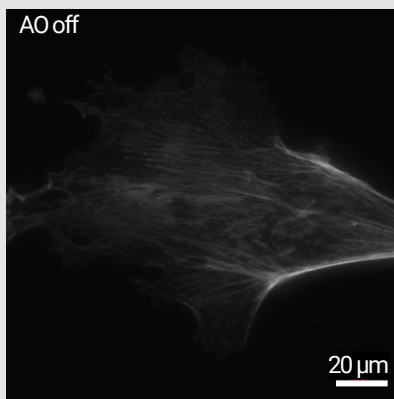


Delta 7<sup>10</sup> integrated behind a detection objective of a light-sheet microscope, enabling imaging >2 mm deep in a cleared pig brain slice.

*Custom Light-Sheet Microscope, Center for Brain Research, Medical University of Vienna, Courtesy of Prof. Hans-Ulrich Dodt.*



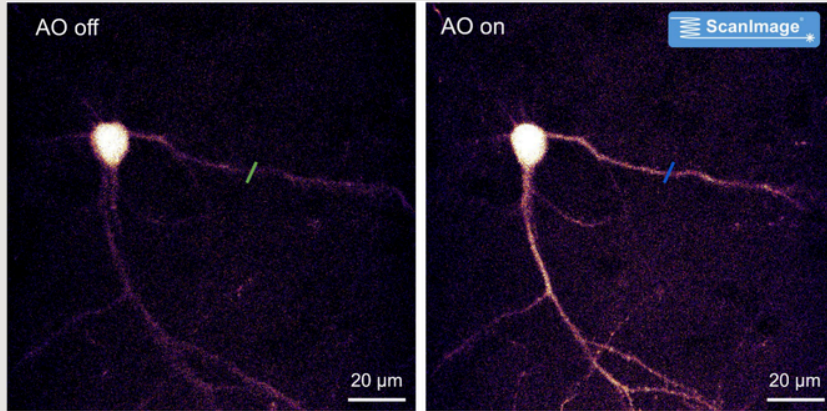
Fluoresbrite® YG microspheres (0.50 µm) imaged with a Zeiss 40×/1.3 NA oil objective under mismatched immersion ( $n = 1.566$  vs.  $1.518$ ). Delta 7<sup>10</sup> corrects spherical aberration and higher-order modes up to 4th-order Zernike.



Fluorocells imaged with a 40×/1.3 NA Oil objective, no deconvolution. AO off: system aberrations corrected via sensorless AO on 200 nm beads. AO on: adds sample-induced and higher-order corrections, with notable gain from Z(6,0).

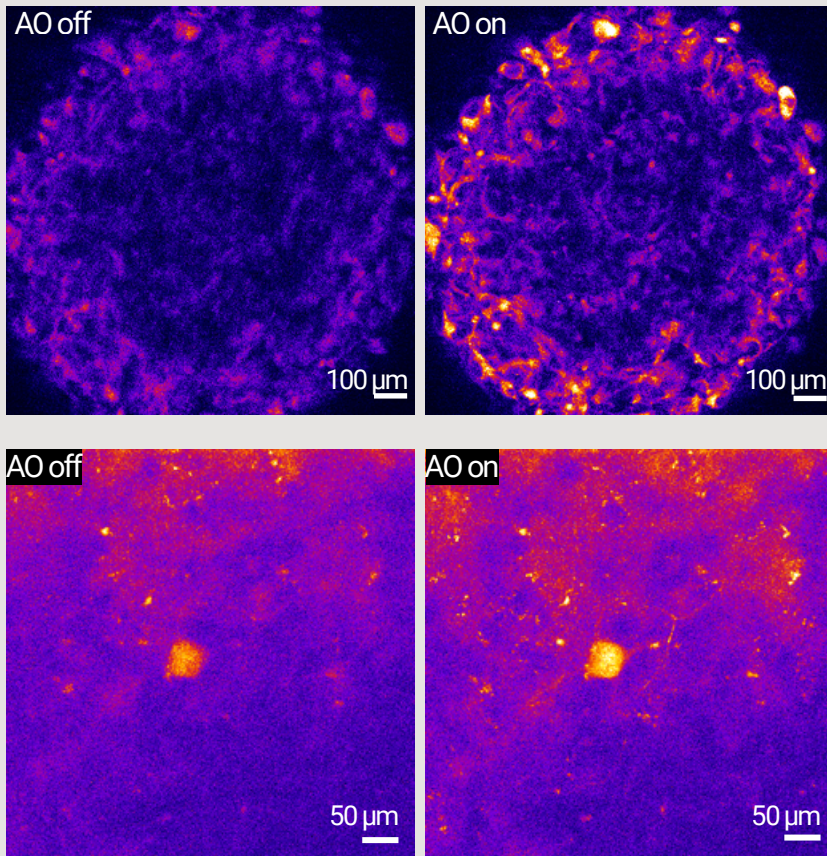
*Zeiss Axiovert 200M  
University of Freiburg, Life Imaging Center  
Courtesy of Dr. Roland Nitschke.*

# CASE STUDIES CONT.

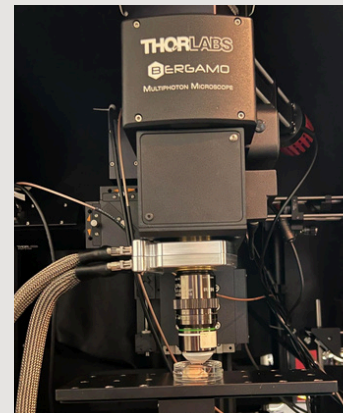
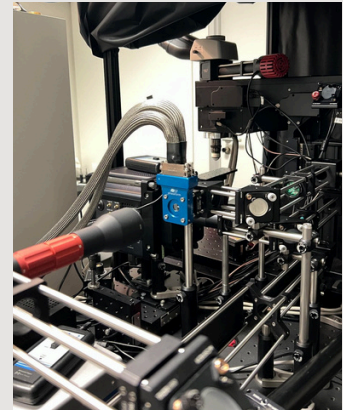


Single neuron imaged 200  $\mu\text{m}$  deep in a *fixed* mouse brain slice using 2-photon microscopy with AO correction enabled by a DPP in the illumination path and sensorless correction via Phinden.

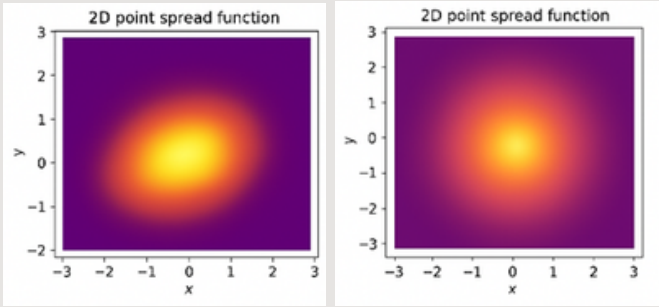
*INSS Multiphoton Microscope  
DZNE Bonn, Light Microscopy Facility  
Courtesy of Dr. Hans-Ulrich Fried*



Top: 2-photon deep-tissue imaging in an organic spheroid (Olympus 25x/1.05 W, 920 nm). Bottom: 3-photon imaging 320  $\mu\text{m}$  deep in *fixed* mouse brain (32  $\mu\text{m}$  Z-stack projection; Olympus 25x/1.05 W, 1300 nm).



*Thorlabs Bergamo Platform  
DZNE Bonn, Light Microscopy Facility  
Courtesy of Dr. Hans-Ulrich Fried*



Single-Molecule Localization Microscopy (SMLM) of mobile ATTO488-DOPE in a supported lipid bilayer using TIRF illumination (Zeiss Plan-Apochromat 100x/1.46). AO correction symmetrizes the PSF and improves localization accuracy and effective resolution.

*TU Wien. Courtesy of Dr. Mario Brameshuber.*

\*Requires verification of compatibility using a special script or during a remote session.

## SYSTEM REQUIREMENTS

Python  
 µManager  
 ScanImage

ZenBlue  
 ThorImage

Minimum version 3.8, Maximum version 3.12

Version: µManager 2.0

MATLAB: version R2020b and higher

ScanImage: Premium license,  
 2019R0 <= version <= 2023.1.0

Widows: Supported on Windows 7 SP1, 8.1, 10, 11.

Tested on: ZEN 3.2

Tested on: special version (2025 latest) provided by Thorlabs

## YOUR DESIRED CONTROL SOFTWARE NOT LISTED?

Contact us to explore possibilities for integrating PHINDEN with your specific system. We'll make it happen!

## DISCLAIMER

All specifications are preliminary and subject to change without notice. No representation or warranty, either expressed or implied, is made as to the reliability, completeness, or accuracy of this specification sheet.

## CONTACT US

Get in touch with us today for a live demo!

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