

What we can offer

TECHNOLOGIES

Multi-actuator
adaptive lens

Deformable
mirrors

Wavefront
sensing

Control
systems

EXPERIENCE IN THE APPLICATION OF ADAPTIVE OPTICS IN MANY FIELDS

Ophthalmic
instruments

High power
lasers

Microscopy

Atmospheric
turbulence

Metrology

Fast
focusing

About

Dynamic Optics aims to become a technology leader in adaptive optics technologies.

Recent advances in imaging and laser processing techniques are increasingly requiring optical systems to be tuned in accordance with the specific configuration in which optics are used.

Defocus adjustment, aberration correction, light shaping are some of the many tasks that traditional optics are not able to achieve with the accuracy and speed needed for many applications.

Dynamic Optics is ready to take on this challenge thanks to its researchers' experience, motivation and clear understanding of where the market is going.

Dynamic Optics manufactures multi actuator adaptive lenses, deformable mirrors and wavefront sensors for use in many applications: microscopy, vision science, astronomy, high power lasers and defence.

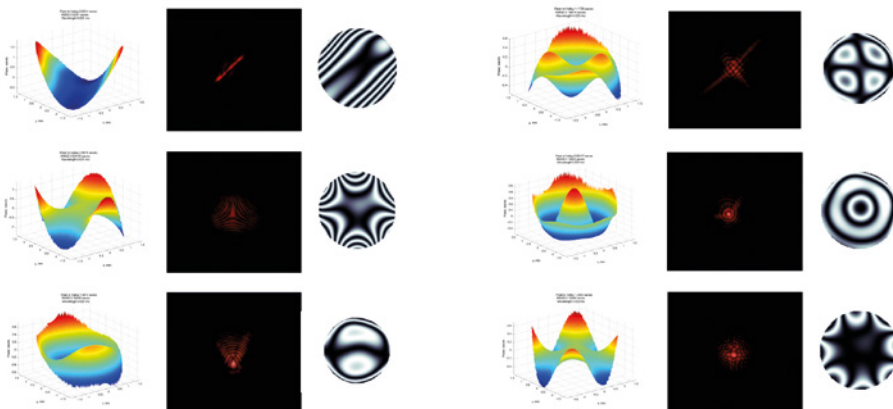
Products

ADAPTIVE LENSES

Multi-actuator adaptive lenses

Dynamic Optics provides adaptive lenses that can replace deformable mirrors in many applications in order to design compact adaptive optics systems.

Dynamic Optics multi actuator adaptive lenses can correct up to the 4th order of Zernike polynomial with a response time <5ms.



Measurement of Zernike polynomials realized with the AL1810.

They are ideal to realize new instruments with adaptive functionalities with complexity, size and cost compatible with market requirements.

Our adaptive lenses do not suffer from gravity-induced aberrations and can be AR coated on request.

KEY FEATURES:

Correction of aberrations with an adaptive lens instead of deformable mirror.

Aberration correction capabilities:

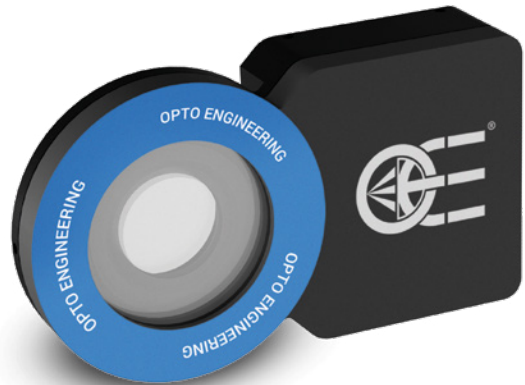
Aberrations	Peak to Valley (waves@633nm)	rms (waves@633nm)
Tip	23.0	6.0
Astigmatism	12.0	2.5
Defocus	9.0	2.7
Trefoil	7.5	1.4
Coma	4.0	0.7
Quadrifoil	4.6	0.7
Secondary Astigmatism	1.3	0.2

Focusing adaptive lenses

The **AO series** is a focusing module which can be mounted in front of a fixed focal length lens to rapidly change focus. The AO series allows the user to refocus the lens faster than mechanically moving the lens with traditional motorized solutions.

The built-in driver has been specifically developed to accurately control the piezoelectric elements.

A demo user interface with basic control functions is available via a web browser interface. The lens can also be fully controlled with a dedicated .dll library, downloadable from the Opto Engineering® website. The library includes an autofocus algorithm and a calibration tool to help users integrate the AO module into their product or application.



Part number	Optical specs					Electrical specs		Communication		Dimensions			Accessories	
	Power min (D)	Power max (D)	Clear aperture (mm)	Scan rate max (Hz)	Trasmittance (%)	DC voltage (V)	Power consumption max (W)	Connector	Interfaces	Mount	Length (mm)	Width (mm)		Height (mm)
AOL0223A	0	+3.5	23	100	>90	24	5	1	2	M30.5x0.5	116	63	26.7	CBGPIO001, CBETH003, AO mechanical adaptors
AOL0223B	-3.5	0						RJ45, 12-pin Hirose	Ethernet, RS232, Analog control, Digital control, Ready					

1 Standard industrial circular connector, for I/O and power connections.

2 Custom protocol, see manual for more information.

DEFORMABLE MIRRORS

Dynamic Optics deformable mirrors are ideal for high peak power and CW laser because they can be realized with high reflectivity, high damage threshold coating.



KEY FEATURES:

Damage threshold up to 20J/cm² @ns and 5J/cm², low GDD.

Aberration correction capabilities (20mm x 20mm square deformable mirror):

Aberrations	Peak to Valley (waves@633nm)	rms (waves@633nm)
Tip	24.0	6.0
Defocus	18.0	5.0
Astigmatism	18.0	4.0
Coma	7.0	1.2
Trefoil	9.0	1.6
Spherical aberration	3.5	0.8
Secondary Astigmatism	4.0	0.8
Quadrifoil	5.0	0.8

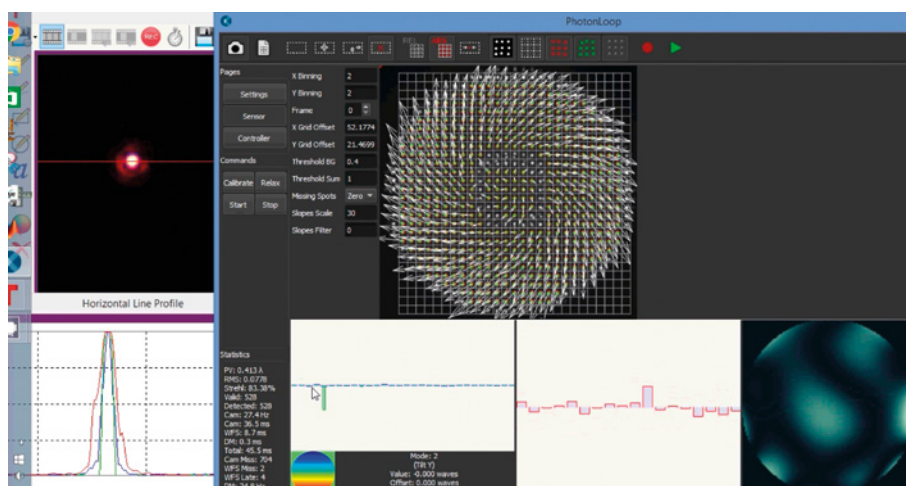
WAVEFRONT SENSOR

Wavefront sensor detector:

Dynamic Optics Shack Hartmann wavefront sensor offers the best compromise between fast acquisition (up to 1KHz with 8 x 8 centroids) and ease of use.

Wavefront sensor software:

- **Photon Probe:** for metrology applications
- **Photon Loop:** for adaptive lenses and deformable mirrors closed loop control



PZT-MINI ELECTRONIC CONTROL SYSTEM (driver dII)

Dynamic Optics products can be used in both academic and real industrial applications.

A compact electronic driving system is essential for a neat and tidy laboratory where new scientific applications are developed.

Furthermore, the small size and low power consumption of the PZT-Mini high voltage driver make it possible to embed it into industrial machines.

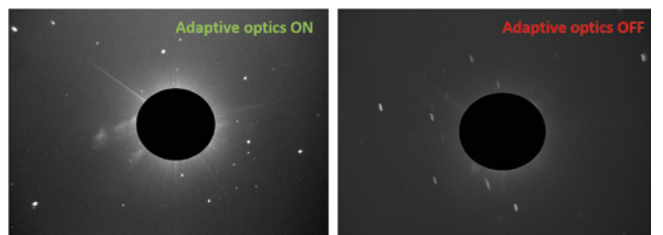
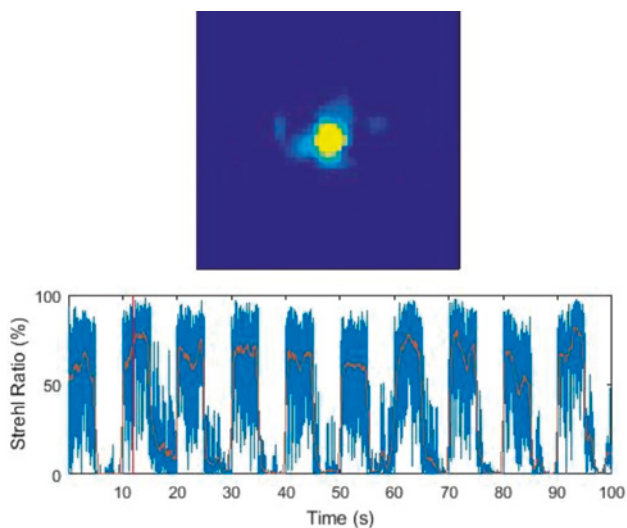


Applications

TELESCOPES

Adaptive lenses and fast wavefront sensors can be used to correct for aberrations induced by atmospheric turbulence.

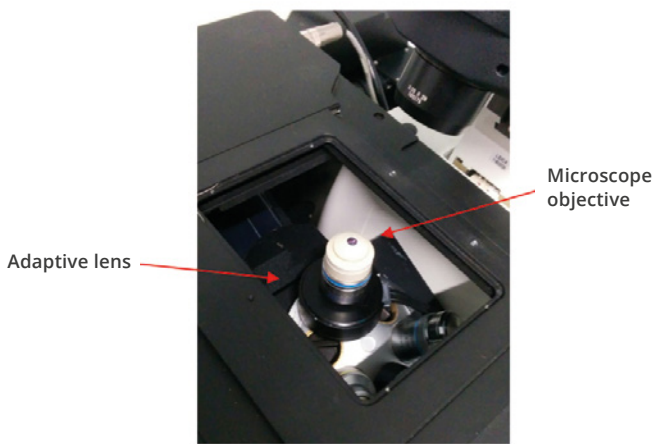
The use of adaptive lenses instead of deformable mirrors makes it possible to design compact adaptive optics setups that can be mounted on small/medium size telescopes.



Images acquired with and without adaptive optics.

MICROSCOPY

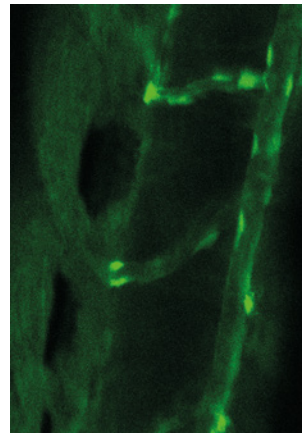
Adaptive lenses can be used to correct for sampled induced aberrations in order to increase the penetration depth inside the sample.



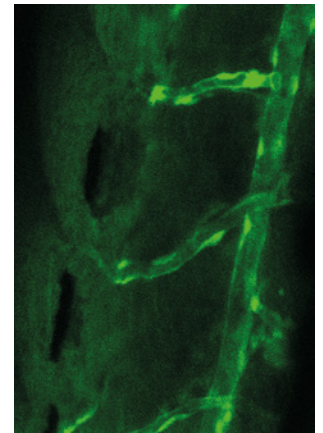
Example of integration of the adaptive lens inside a microscope.

Compared to deformable mirrors, adaptive lenses can be easily integrated into existing microscopes.

Before optimization



After optimization

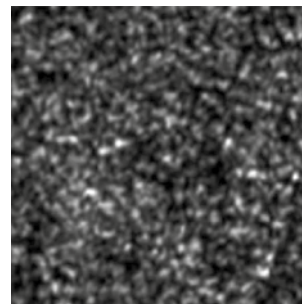


*In vivo image of Zebrafish vasculature with confocal microscope.
Courtesy of P.Pozzi, Delft Centre for Systems and Control, TU Delft.*

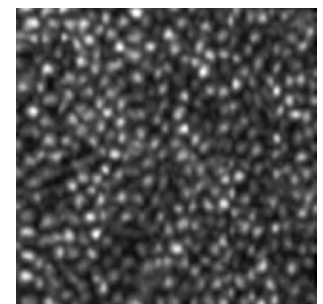
RETINAL IMAGING

Adaptive lenses are the ideal tool for the realization of compact AO systems for high resolution retinal imaging. Fundus cameras, OCT and SLO can incorporate Adaptive Lenses for the correction of eye aberrations.

Before optimization



After optimization



*In vivo image of human retina photoreceptors.
Courtesy of Y.Jian, R.Zawadzki, M.Sarunic, EyePod Lab UC Davis
and Borg Lab Simon Fraser University.*



HIGH POWER LASERS

High power laser beams can be subject to aberrations induced by the thermal heat in the amplifiers. These aberrations can be reduced using deformable mirrors. In addition, deformable mirrors can provide pulse-shaping capabilities for the optimization of the interaction of the laser with the sample.

High reflectivity, high damage threshold coating can be mounted on Dynamic optics deformable mirrors in order to withstand with high energy pulses (up to $20\text{J}/\text{cm}^2$ in ns) and high average power lasers (up to 4kW).

DEFENCE

Fast wavefront sensors are ideal to study the propagation of light beams in the atmosphere. High power lasers beams and imaging systems can utilize adaptive optics to improve their performance.

Dynamic optics offers the combination of performance and ease of use in order to compensate atmospheric effects.

AUTOFOCUS SYSTEM

Dynamic Optics adaptive lenses are the ideal device where large aperture fast focusing is necessary.

Our adaptive lenses can be mounted on camera objectives and provide up to 3 Diopter focal modulation.





DYNAMIC OPTICS srl

Piazza Zanellato 5, Torre 1

35131 Padova (PD) • Italy

phone +39 391 7993796

info@dynamic-optics.eu

dynamic-optics.eu