

# Custom Microscope Objectives

## Specialized Designs for Challenging Applications

Special Optics objective lens designs are driven by our customers requirements and applications. Innovative ideas and unconventional solutions developed by OEM instrument makers and the research community cannot be supported by commercial off-the-shelf microscope objectives.

We support customers pushing the limits of microscopy in life science research, life science OEM instruments, semiconductor, light sheet microscopy, two-photon, multiphoton and physical science research.

Our expertise is designing multi-element high NA precision assemblies with diffraction limited performance as well as objectives for single wavelength sampling with modest resolution demands requiring commercial tolerance assembly techniques.

We have a large library of reference designs and the experience to produce lenses that meet exact performance requirements.

Talk with us about the problem you want to solve. We will make it our goal to develop the best solution for that application.

## Custom or Off-the-Shelf Why Choose a Custom Objective?

- risk mitigation
- improve quality
- meet exact specifications
- enhance competitive advantage/business return
- manufacturing consistency
- on time delivery/availability
- warranty/product support
- optical design data for system modeling

## Vertically Integrated for Optimum Quality

- Our optical design experts, educated at the best universities, are ready to discuss your specifications and develop an optical design to meet your needs.
- Mechanical design is crucial when space, weight and interface with other optics in a system must be considered. Our designers accommodate these requests and have experience working with both standard metals and specialty non-metallic materials.
- Lens polishing and generating in our state-of-the-art facility allow us to closely control the fabrication process and monitor manufacturing tolerances associated with the specific design.
- Expert lens assembly in our Class 1000 clean space can range from commercial to ultra precision quality depending on the performance of the design.
- Final testing of objective assemblies using interferometers or our custom Shack Hartann wavefront sensing metrology (300nm-1000nm) are deployed so we can deliver test data with every lens.

With all technology under one roof, and our extensive process control, design, manufacturing and testing experience, Special Optics can manufacture your custom objective to perfection.



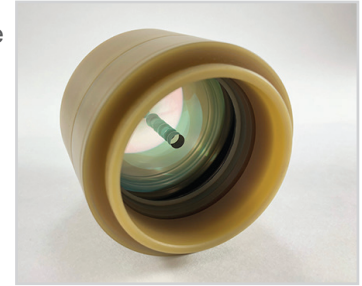
# Innovative Designs

for Cutting-edge Research

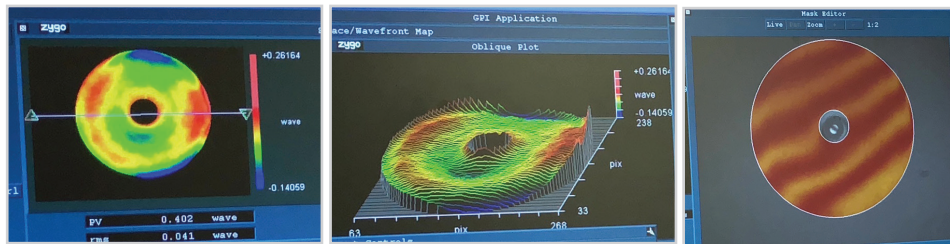
## Custom Objective for Ultracold Atom Research - Resolving Single Atoms

Schleier-Smith Lab at Stanford University use a custom microscope objective for resolving single atoms. By projecting a pattern of 780 nm light onto the atomic plane with diffraction-limited resolution they can then image atoms with high resolution at 852 nm light.

- NA: 0.6
- EFL: 38mm
- FOV: 0.2mm
- WD: 8.91mm Vacuum + 3.175mm Silica + 2.59mm Air
- AR Coating: 320nm, 780-852nm, 1064nm



A hole through the center of the lens allows researchers to send high power 320 nm light (on the same axis as lens) through the objective to highly excite the atoms (principal quantum number  $n > 20$ ). The atoms then interact with each other over distance scales of a few micrometers. Researchers trap the atoms at that distance and resolve single atoms (at 852 nm) with the objective.



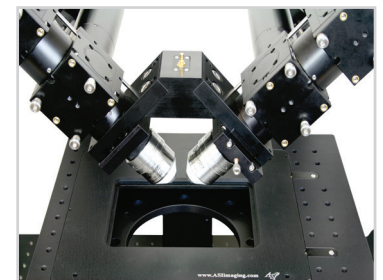
## Immersion Objective for Cleared Tissue Sampling

Together, Special Optics and Applied Scientific Imaging (ASi) developed an immersion objective lens specifically designed for light sheet microscopy of cleared tissue samples, including ASi's Dual-view Selective Plane Illumination Microscopy system (diSPIM).

- NA: ~0.4
- FOV: >1 mm
- MAG: ~17x
- WD: 12 mm

Designed for dipping media RI ranging from 1.33 to 1.56, an enhanced chemically resistance sealant and non-metallic cover make the lens compatible with a wide range of media including:

- water with salt, sugars, and other non-aggressive solutes including routine-use biological buffers
- FocusClear (CLARITY)
- glycerol
- mineral oil
- silicone oil
- TDE (2,2-thiodiethanol)
- ethyl cinnamate
- benzyl benzoate (benzyl alcohol & BABB not yet tested)
- other proprietary organic media
- possibly DBE (initial tests indicate potential compatibility but further tests are needed)



This objective lens appeals to researchers building customized microscope setups (e.g. OpenSPIM type) as it is available for separate purchase, unlike other objectives suitable for cleared tissue.

# Preengineered High N.A. Objectives

Ultra Precision Tolerances - Parameters

**WORKING DISTANCES** 0.3mm to 55mm

**ENVIRONMENTS** Aqueous, Oil and Vacuum

**WAVELENGTHS** Visible (390-750nm) to NIR (700-1400nm)

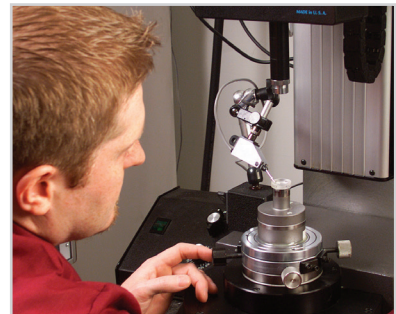
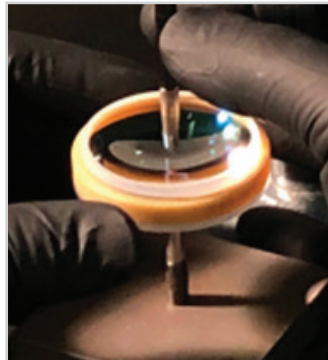
**HOUSING** Stainless, Ultem, Titanium,  
Proprietary Non-Metallic Chemically Resistant Sealant

**MEDIA** Ethyl cinnamate, TDE, Mineral Oil, Silicone Oil, FocusClear,  
Scale, other organic media and aqueous-based solutions

**OTHER** Mounting threads, parfocal distance, Housing tip angle, field of view



We maintain tight coordination between design and manufacturing tolerances and customer requirements to ensure final system performance matches initial design goals.



## Complex Research

Requires an Experienced Optical Design Partner

Our lenses meet performance requirements of cutting-edge research technologies including:

- Immersion
- Multiphoton
- TIRF
- diSPIM/Open SPIM
- LSFM
- Two-Photon
- PALM
- Light Sheet Microscopy
- Cold Fermion / Atom Trapping
- Deep Tissue Imaging
- Quantum Microscopy
- Live Cell Analysis



**SPECIAL OPTICS®**

**A NANITAR COMPANY**

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[Learn more about our microscope objective lens design capabilities](#)