

CUSTOM OBJECTIVES

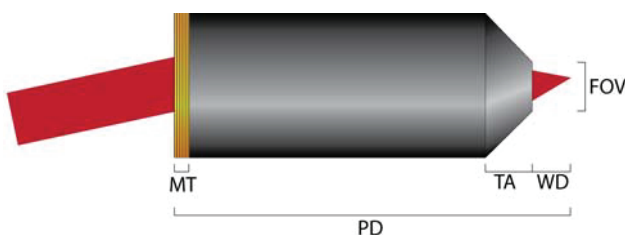
• Cutting-edge Research Requires State-of-the-art Optics

A brief discussion on the increased demand for custom objectives and Special Optics' competitively priced solutions.

As the scientific knowledge base expands and hypotheses become more specific, the requirement for equally specific tools increases proportionally. The number of investigators employing confocal, multiphoton, and other forms of laser scanning microscopy for specialized research applications has continually outpaced the rate at which affordable customized microscope objectives have been developed. The cost of specialized equipment coupled with a lack of qualified vendors forces investigators to perform complex research with less-than-ideal tools. Special Optics, a Navitar company, has emerged as a vendor of choice for investigators needing highly-customized microscope objective solutions at off-the-shelf cost without the limitations and bureaucracy of working with OEM microscope manufacturers.

Customized Research Oftentimes Necessitates Custom Optics

Research in biomedical microscopy is inherently dynamic – today's investigations require different tools than what tomorrow's questions necessitate. However, researchers often feel trapped to stay within the catalogue of components offered by OEM microscope manufacturers because objective lenses are typically not universally compatible.



Many parameters of an objective lens may be customized according to the needs of a research project. The mounting threads (MT) and parfocal distance (PD) depend on the OEM microscope manufacturer. The housing tip angle (TA) and working distance (WD) can limit the types of peripheral instruments used during imaging. The working distance (WD) and field of view (FOV) are specific to the sample of interest and the protocol being followed.

This lack of flexibility in microscope component offerings leads to unique difficulties for investigators. Many factors influence the overall design of a microscope objective. The excitation and emission design wavelengths are often-times dictated by the fluorophores and biological systems under study. The design wavelengths can also be affected by the method of interrogation, such as through the use of uncaging or optogenetics. The WD is affected by the required depth of imaging, the necessary field of view, as well as the physical space required for peripheral experimental and vital instrumentation (micropositioners, pipettes, monitors, drug delivery systems, etc.). The overall design of the objective is also a function of excitation and transmission, resolution, and power requirements, and ideally must also compensate for optical aberrations induced by the particular sample of interest. It is impossible for any one objective, or even a reasonable series of objectives, to compensate for all of these factors and constitute a complete set adequate for biomedical microscopy.

As a result, commercial microscope manufacturers offer objectives that represent what they consider to be best compromises. Unfortunately, many current optical microscopy techniques require tolerances outside of the common one-size-fits-all catalog objective. The forefront of multiphoton microscopy is continually using wavelengths farther into the infrared spectrum and pushing the boundaries of transmission efficiency and chromatic aberration correction. Multifocal microscopies that use tunable lenses and acousto-optical deflectors require a large depth of field. Polychromatic techniques like single- and multi-photon stimulated emission depletion (STED) microscopy require broadband chromatic aberration correction across much of the visible and NIR spectrum. Simply stated, customized solutions are truly necessary to accomplish revolutionary research.

The Special Optics Solution

For a similar cost to purchasing a stock objective from Nikon, Olympus, Zeiss, or Leica, a custom objective can be designed and built for a specific application by Special Optics - where competitive price and performance meets the flexibility of truly unique design. Our development team takes the time to fundamentally understand the specific research goals of each of our research partners to deliver the best possible microscope objective solution.