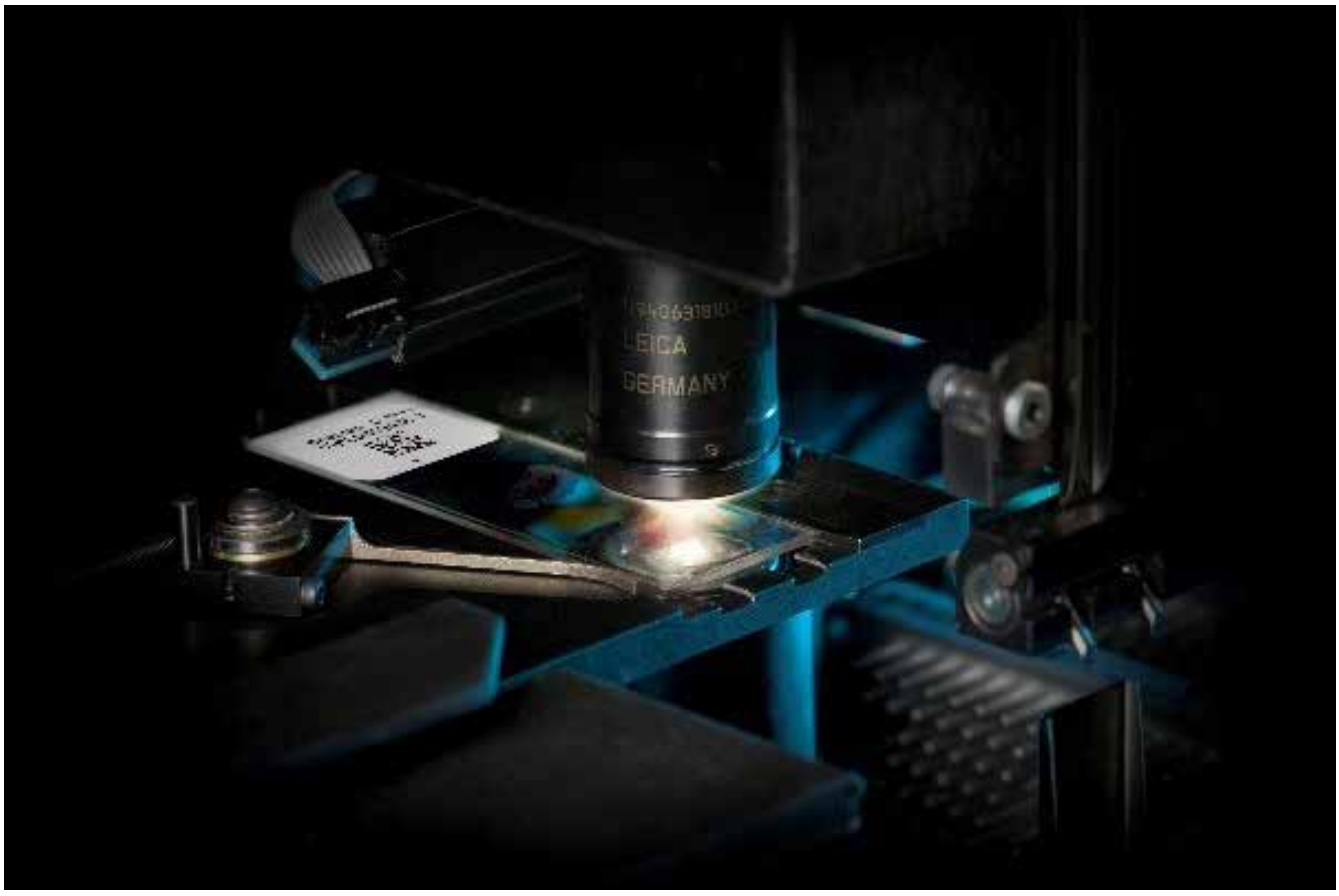
Advancing Cancer Diagnostics
Improving Lives



Through global engineering collaborations at Leica Microsystems and Leica Biosystems, engineers designed a novel high performance objective specifically designed to maximize field of view for high speed digital pathology scanning.

Your Focus is Our Objective

Leica Engineers Collaborate to Solve a Problem with Innovative Optics Design

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In today's global environment, enabling large global engineering teams to collaborate while being in physically different locations can be challenging for many companies. This is not the case at Leica Biosystems (LBS) and Leica Microsystems (LMS). Our optics engineers worked together to solve the following problem:

"What objective design can maximize field of view, handle very fast accelerations and decelerations, and deliver excellent image quality during extremely fast scanning speeds using real-time focusing?"

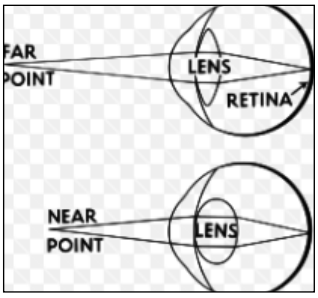
Leveraging 171 Years of German Craftsmanship into Today's Digital World

Our digital pathology optics engineers from Leica Biosystems based in Vista, Ca combined their innovation efforts with optics engineers from Leica Microsystems in Wetzlar, Germany to solve this problem. The optics engineering team in Germany has an almost 175 year history of designing, from raw silicone material, high performance objectives with extremely tight tolerances. The engineers from Leica Microsystems designed and tested several different objectives and tested them with high speed scanning real-time focusing technology via the Leica Biosystems team in Vista.

A key consideration was understanding how human eyes focus light

When Pathologists look into their microscopes, the human eye is able to refocus for different parts of the field of view (FOV). Because camera sensors are flat and the camera optics cannot refocus for different parts of the FOV, usually only a part of this full FOV is imaged onto the sensor to achieve a sharp image over the complete sensor. Consequently, this mis-match of using a typical microscope objective combined with a flat camera sensor is not ideal for high speed scanning in digital pathology scanners with a very large FOV.

The eye, unlike a camera sensor, can refocus to different object distances, and therefore is able to view a large image even with a curved retina.



A Carefully Designed Solution

After testing many different designs the engineering teams finally came up with an objective that solved the problem. Specifically the final objective included the following key elements:

1. Extra-wide flat field correction that enabled a large FOV (more than 1mm) that could accommodate extremely large digital image for fast scans
2. A lightweight and robust design that could handle very fast accelerations and decelerations
3. An objective that resulted in 0.26 um/pixel resolution at 40x magnification
4. A novel design that the digital pathology market has not yet seen before

Customers Benefit with Excellent Image Quality Without the Wait

Over the last several years, product development teams at Leica Biosystems have studied barriers to scaling up digital pathology by visiting Pathologists in high volume anatomic pathology labs around the world. A common theme that was observed is that scan speeds of current digital pathology offerings are not fast enough at 40x magnification to keep up with high volume scanning (120,000+ slides per year). The consequent problem with this is that the use of digital pathology in high volume labs has, more or less, been reluctantly limited to going digital for one or two organs only, such as breast or prostate samples. This objective design which maximizes FOV, combined with Real-time focusing, offers the potential to solve this problem.

By employing this new objective design combined with RTF there is an opportunity to achieve extremely fast scan speeds at 40x while simultaneously maintaining excellent focus on the tissue sample. Consequently, this may lead to an opportunity to combine high speed scanning with high volume slide production in anatomic pathology labs. The main benefit of this would be the ability to significantly scale up digital pathology operations. Further studies are ongoing to evaluate this technology by Leica engineers. The future looks bright!

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