

Artist Relies on Lumenera to Bridge the Gap Between Science and Art

Background on Dr. Robert Rock Belliveau

In 1957, Robert Rock Belliveau graduated with an MD from Washington University School of Medicine in St. Louis, MO, and then went on to specialize in both anatomic and clinical pathology in Las Vegas, NV. He has spent the greater part of his life interpreting specimens through a microscope which may explain his passion for the microscopic world. After retirement he continued to examine the world from his microscope and merged it with his artistic side, bridging the gap between science and art.

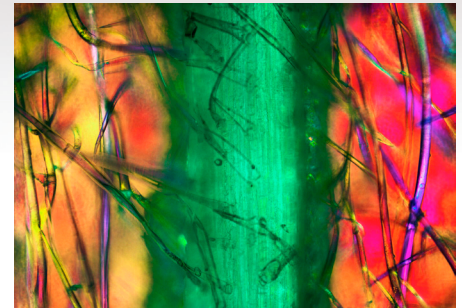
Retired Pathologist Explores the Artistic Side

Even in retirement Dr. Belliveau took courses at the University of Las Vegas where he was taken by the unique characteristic of polarizing microscopes. It was unlike anything he had ever seen during his extensive pathology career, where he routinely administered standard brightfield microscopy combined with special staining techniques to reveal otherwise transparent tissue. Traditionally, pathology does not use polarized light, which is normally utilized in a broad range of disciplines including geology. A polarizing microscope uses transmitted light unequally in different directions. Polarized light microscopy exploits the properties of the light to identify and characterize the structure and properties of materials, producing a sharp, colorful image. There are two polarizing filters present in the microscope positioned above and below the sample known as the polarizer and analyzer. There are also materials that act as polarizing filters. Viewing objects with polarized light can reveal structure in materials where other microscopes fail to bring them into relief. The polarizing microscope results in vibrant colors without the added effort of employing staining techniques.

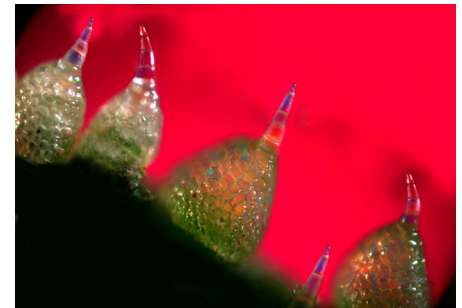
Bringing Life to a Microscopic World

Robert took his fascination with the polarizing microscope, pooled it with his interest in botany, and began investigating with different materials. His quest began at the grocery store, where he turned his microscope on fruits and vegetables, and with extraordinary magnifications returned enigmatic images. Robert uses a sliver of a plant specimen about 30 microns thick, 2 times smaller than the diameter of a human hair and close to the limit of resolution for the human eye, to produce a high-resolution image full of details unseen by the human eye. For example, magnifying the surface of a young cucumber by 800 times brings to life a microscopic world of plant defense mechanisms, unveiling a battleground of toxic spines.

In nature, only the strong survive, and cucumbers are considered to be vulnerable to predators during development. Masses of spiny hairs or trichomes, from the Greek meaning 'growth of hair,' coat the surface of still-growing cucumbers and act as an evolutionary dual shield. The trichomes' acute points are so intensely sharp that they can pierce the mouths or bodies of hungry invaders. Their globular bases are filled with bitter-tasting and toxic compounds called cucurbitacins that repel or even exterminate herbivores. Cucurbitacins are so unpalatable that people can taste their presence even when diluted to one part per billion and serves various uses in pesticide and pharmaceutical industries.



400X Corn (Maize)
Corn Husk with Corn Silk



800X Cucumber (Cucumis sativus)
Skin (ectoderm) with Trichomes

Highlights

- Retired pathologist turned artist uses Lumenera's INFINITYX-32 to produce high-resolution images full of details unseen by the human eye.
- Dr. Belliveau was captivated with the combination of both unmatched high-resolution together with the outstanding color fidelity of the INFINITYX-32.



INFINITYX-32 Offers increased Color Resolution

Robert initially worked with a competing high resolution digital camera but unhappy with his results, he later arrived at Lumenera's INFINITYX-32 for his complete imaging solution. He was familiar with the INFINITY camera series and the reputation that followed. Robert was captivated with the combination of both unmatched high-resolution together with outstanding color fidelity. When Robert needed the absolute highest quality and resolution, the INFINITYX-32 with a maximum resolution of 5.8 million pixels was his best choice. Using the patented pixel shifting technology, each CCD pixel captured full chromatic information resulting in increased color resolution with no degradation.

The INFINITYX-32 utilizes the highly sensitive Sony ICX274 CCD sensor. The 1/1.8" interline Sony megapixel sensor has a pixel array of 1616 X 1216 with 4.4 micron square pixels. Given its ability to perform multiple exposures via shifting the pixel array in sub-pixel increments, the INFINITYX-32 effectively captures all primary red, green and blue color information into each pixel on the array. The RGB data captured through each pixel contains 36-bits of color image information resulting in 4096 intensity values per color. The results are evident in the consistent superior color fidelity in Dr. Belliveau's art.

The INFINITYX-32 offers a variety of capture resolution options, allowing Robert to match image resolution to the maximum resolving power of his microscope objectives. He can capture still images at selectable resolutions between 2 and 32 megapixel, maximizing the resolving power of the microscope optics. Robert quickly realized that he could maximize spatial resolution over a wide field of view by selecting the camera's upper ranges of resolution.

User Friendly Software Provides Complete Imaging Solution

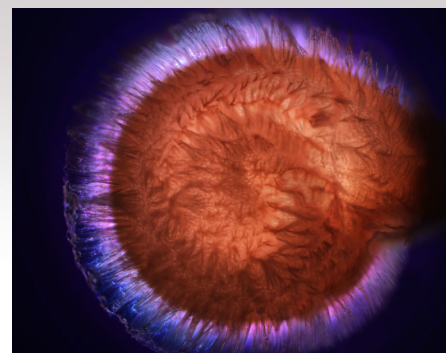
The INFINITYX-32 includes two sets of software providing a complete imaging solution. INFINITY ANALYZE is an advanced image processing, enhancement and analysis software that includes measurement, annotation, archiving and image processing. INFINITY CAPTURE, an intuitive user interface which includes all of the basic features needed to control his INFINITYX-32 camera and capture images, provides Robert with the ability for rapid image capture, archiving and documentation.

The combination of INFINITY ANALYZE and INFINITYX-32 created the perfect solution for all his imaging needs. Aside from the high images acquired, Robert appreciates that his software archives his photographs in the file format of his choice. The TWAIN and DIRECTX drivers ensure integration and compatibility with his digital image editing software. Robert's lengthy process of assembling and combining up to fifty images together to create one incredibly large image with exceptional detail, would take even longer without this integration.

Roberts's ultimate goal is to publish a photography book. Accompanying each image will be a description of interesting facts about his kaleidoscopic photographs.

“ I've been truly impressed with the user friendly software that makes taking and organizing photomicrographs simple and pleasurable, but by far the most important factor for me is the quality of the images I am able to obtain with the INFINITYX-32. ”

Dr. Robert Rock Belliveau



70X Tomato (*Solanum lycopersicum*)
Surface of the Seed of the Common Tomato



INFINITYX-32
32 Megapixel Pixel Shifting
Scientific USB 2.0 Camera

About Lumenera

Lumenera Corporation, a division of Roper Technologies, headquartered in Ottawa, Canada, is a leading developer and manufacturer of high performance digital cameras and custom imaging solutions. Lumenera cameras are used worldwide in a diverse range of industrial, scientific and security applications.

Lumenera solutions provide unique combinations of speed, resolution and sensitivity in order to satisfy the most demanding digital imaging requirements. Lumenera customers achieve the benefit of superior price to performance ratios and faster time to market with the company's commitment to high quality, cost effective product solutions.

For further information about Lumenera, please visit www.lumenera.com or call 613-736-4077.

