



Multifocus and Snouty Light Sheet Microscopy

Dr. Florian Ströhl

Department of Physics and Technology, The Arctic University of Norway

BACKGROUND

Dr. Florian Ströhl leads a group of physicists to develop advanced microscopy systems, including a new light-sheet imaging system. This custom light-sheet system involves a single-objective oblique plane microscopy (OPM) approach using the Snouty lens, as well as additional capabilities for 3D imaging.

Dr. Ströhl explained what his imaging system can do, "Snouty scans through the sample and produces optically sectioned images. There is a technique called multifocus microscopy that uses multiple focal planes at the same time, and we can optically section all of these planes as well. This allows us to record a full volume in a single camera frame."

This dynamic imaging system allows for 3D imaging at high speed and with a high resolution, once paired with a suitable camera. While intended for use on a range of different samples, Dr. Ströhl described an example of the kind of sample his group intended to image, "We are using this system to image human cardiomyocytes (heart cells) that are grown on flexible posts. The cells attach to these posts and beat, this beating becomes directional and they align, resulting in heart muscle that is in more of an adult state."

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CHALLENGE

These cardiomyocyte samples are highly challenging to image, as Dr. Ströhl mentioned, "The problem is that we are trying to image this large lump of tissue which is beating very fast, so we need to do 3D imaging at a high speed. The whole tissue is constantly moving."

This requires an imaging system that is fast enough to image multiple 3D volumes a second, while retaining high resolution. This system is also working with a low signal level, which means a suitable camera must have low noise levels while also retaining a high speed.

SOLUTION

The Prime BSI Express is a highly flexible camera that features high imaging speeds, high sensitivity and high resolution across a large sCMOS field of view.

Dr. Ströhl uses two Prime BSI Express cameras for his advanced imaging system, due to the ability to easily swap cameras between systems depending on the sample need, such as having one camera on a 3D Snouty system and another doing high speed imaging, or having both cameras on one system for simultaneous multichannel imaging.

When asked about the performance of the Prime BSI Express cameras, Dr. Ströhl said, "Now we have a lot more pixels, which translates to a lot more voxels... The [Prime] BSI Express is the whole package, with flexibility, high speed, high sensitivity, and many pixels."

"The USB 3.1 Gen2 is actually really nice to have as well. Camera setup was smooth... I have tested the cameras and they worked as intended, the speed, FOV and sensitivity were exactly to spec."

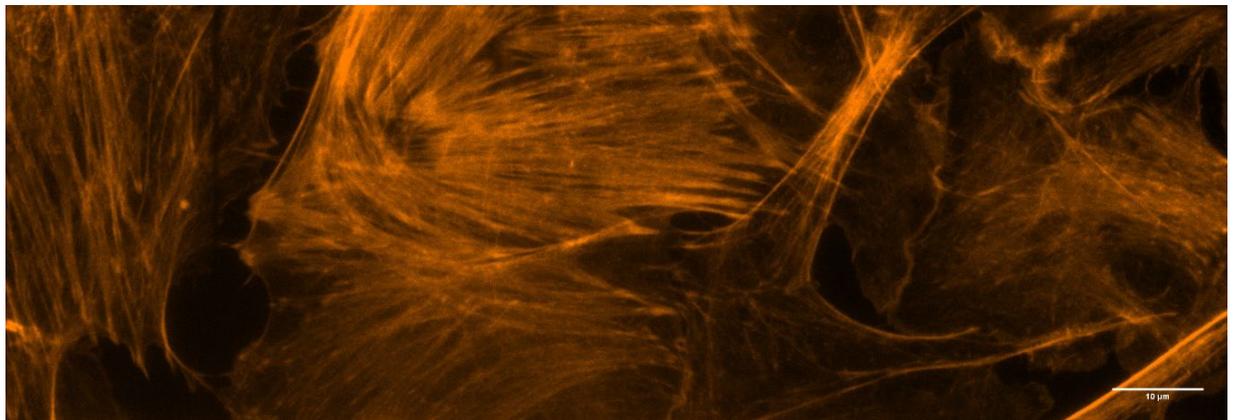


Figure 1: Fixed BPAE cells imaged with the Prime BSI Express on the multi-focus system. Image shows actin labeled with phalloidin.