



IMAGING

Take a closer look

# SPOT™ 5.4 Software

Imaging Software for Microscopy  
and Macro-Photography

Introducing a Full  
Resolution Live Image  
for Insight CMOS Cameras



# Up until now...



**SPOT™**  
**5.4 Software**  
Imaging Software for Microscopy  
and Macro-Photography

## We used a reduced resolution Live image

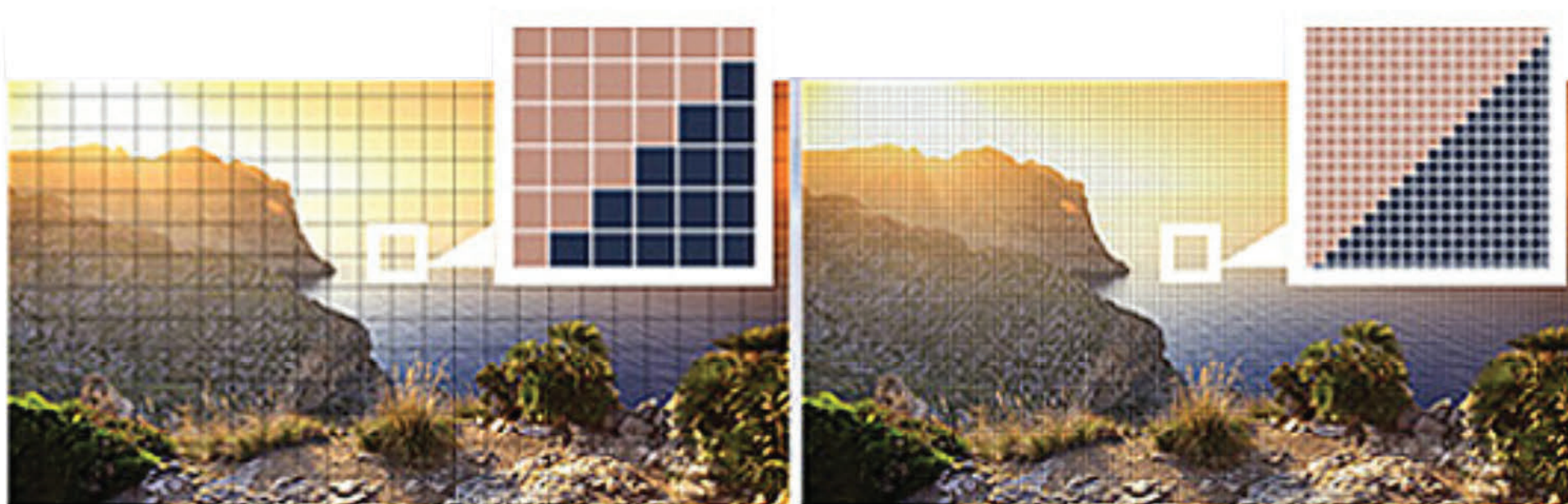
Our focus had been on getting a great **captured** image. The **Live** image was treated as a framing and focusing aid. In order to get an acceptably high frame rate for the Live image, we only displayed half the rows and half the columns that were available from the image sensor. **This meant that the Live image only displayed  $\frac{1}{4}$  of the full sensor resolution.** This is similar to what consumer digital cameras do for their viewfinder.



# We changed that in 5.4.



# The Live image now displays EVERY row and EVERY column!



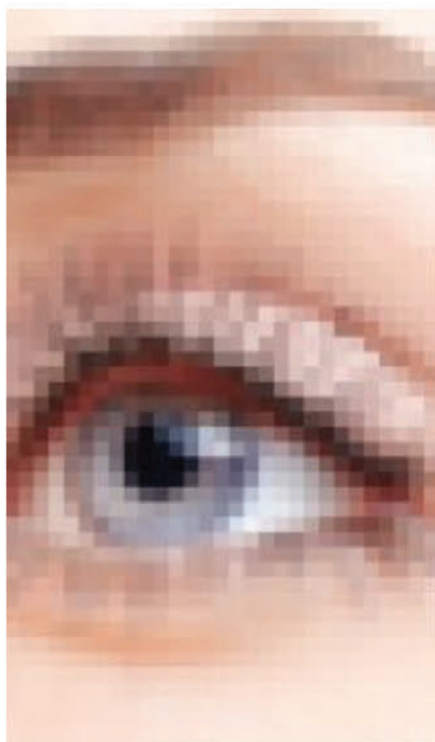
Current 5.3 software

**NEW! 5.4** software

# Live images now have more detail!



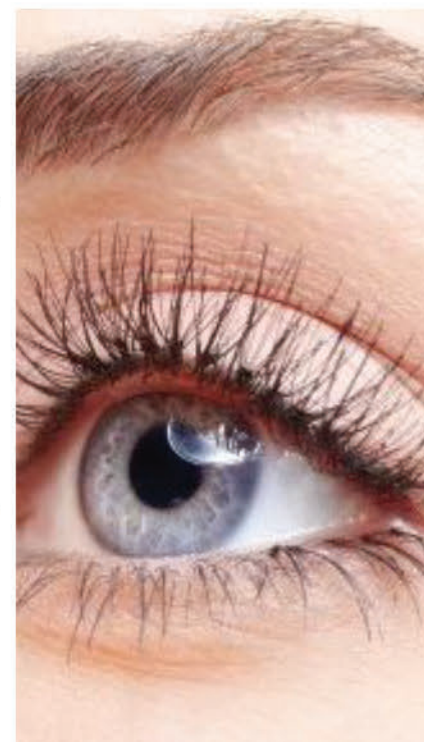
Current 5.3 software



**5 MP Insight CMOS**  
Live image resolution increases from  
**1.25 MP to 5 MP**

**12 MP Insight CMOS**  
Live image resolution increases from  
**3 MP to 12 MP**

New! 5.4 software

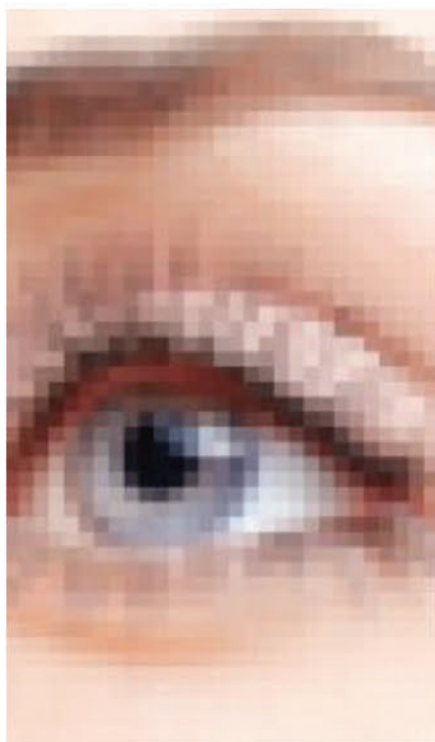


**And, we did that  
without reducing the frame rate!**



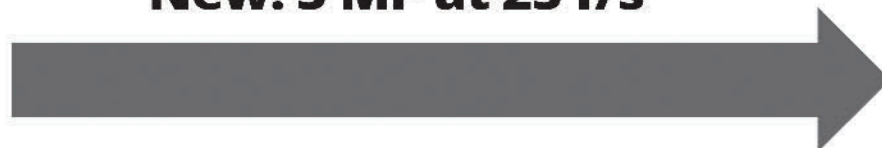
# We Maintained the Frame Rate

Current 5.3 software



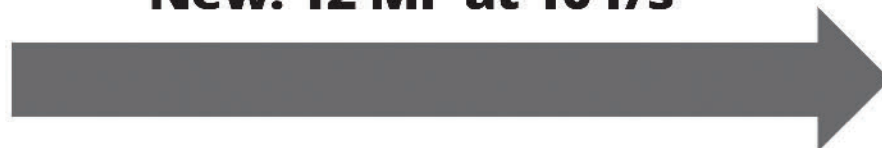
5 MP Insight CMOS Live image  
(Full Chip)

**Old: 1.25 MP at 22 f/s**  
**New: 5 MP at 25 f/s**

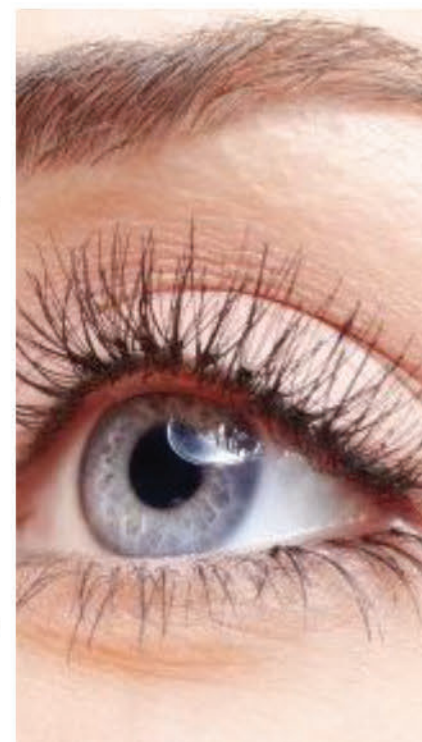


12 MP Insight CMOS Live image  
(Full Chip)

**Old: 3 MP at 11 f/s**  
**New: 12 MP at 10 f/s**



New! 5.4 software





# Something else has happened recently...

Pathologists wanted a camera to feed live images from their microscope to a large, wall-mounted flat-screen television during tumor board discussions. At first, the wall-mounted televisions were HD. Now, no one would be caught dead with a stinkin' HDTV.

**They all want 4K.**



# 4K. Everyone wants it. What is it?



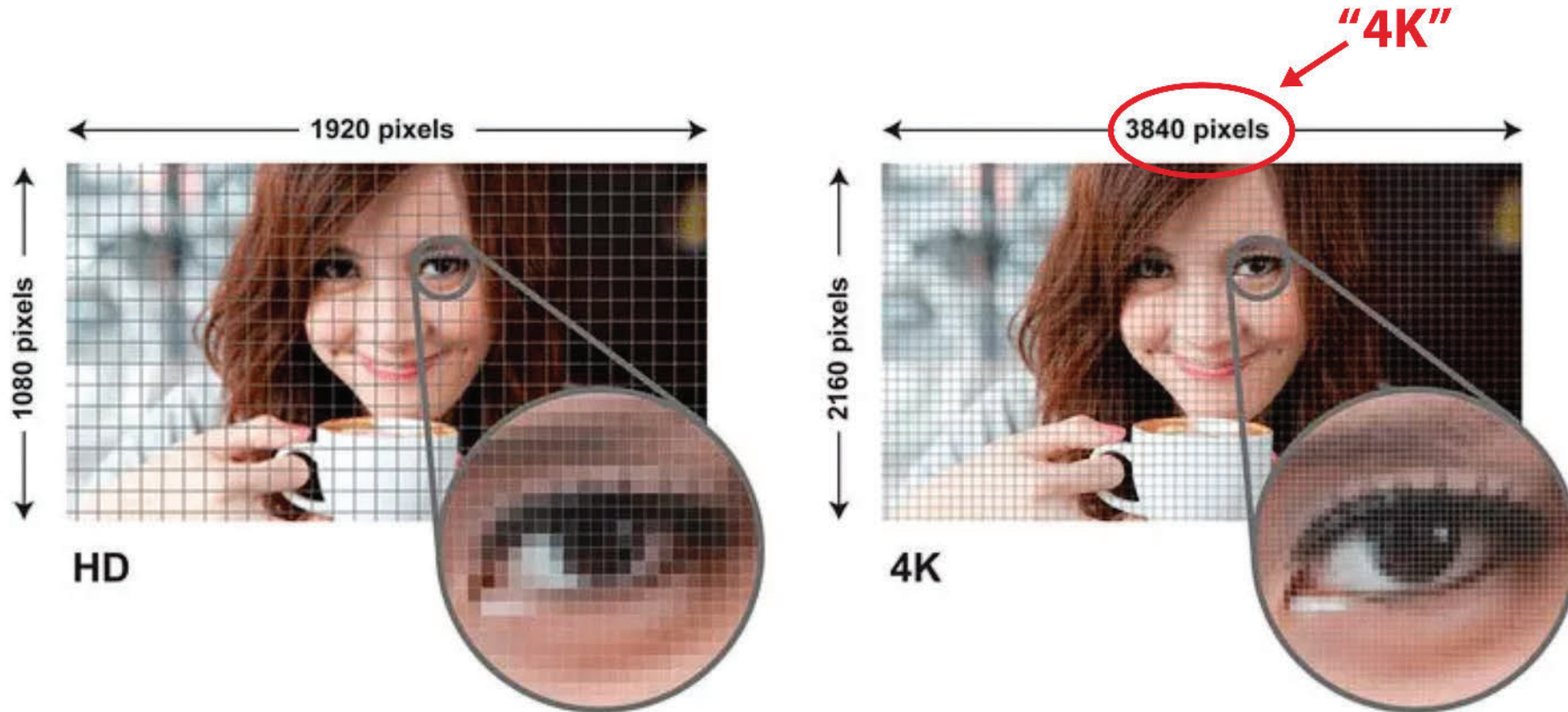
# 4K televisions have the highest pixel resolution currently available

4K has twice as many pixels horizontally and vertically as HD.

4K has 3840 pixels horizontally by 2160 pixels vertically.

HD has 1920 pixels horizontally by 1080 pixels vertically.

**"4K" refers to the horizontal pixel resolution.**



# Early adopters

Early adopters of 4K technology were forced to buy expensive 3-chip analog cameras. These cameras were in the \$12K - \$16K price range. Getting acceptable color rendition required diving into complex adjustment menus and the results were always a compromise. And, in the end, all you got out of the bulky control box was a 4K video image. No annotations, no measurements, no saved images.





**We believed that we could offer  
something better.**

**For less money.**

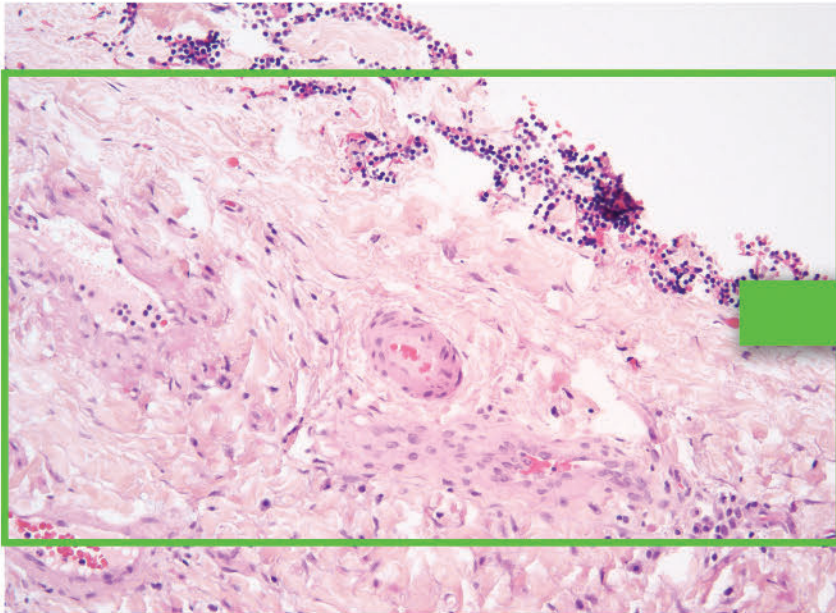
# How did we get 4K?

**Once we had a high-resolution  
Live image...**

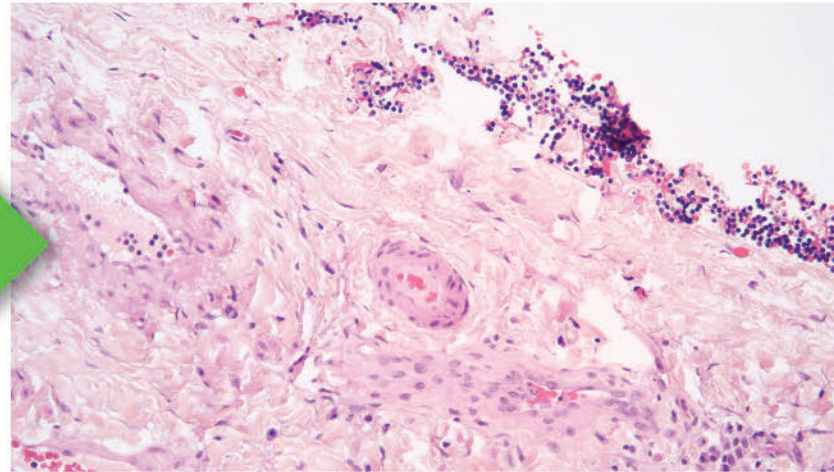
**...the rest was easy!**



We use the center portion of the Live image from the 12 MP camera to create the 4K image.

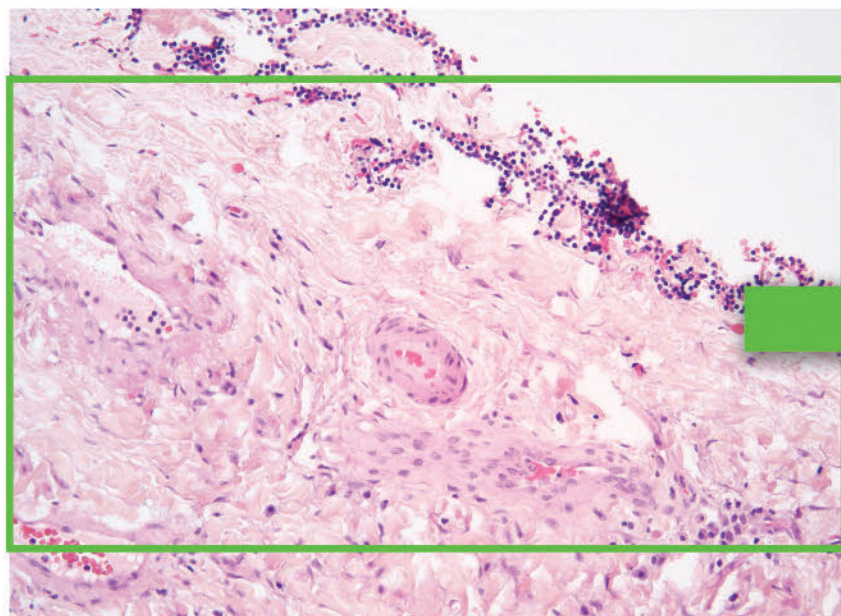


**12 MP (4096 x 3000)**

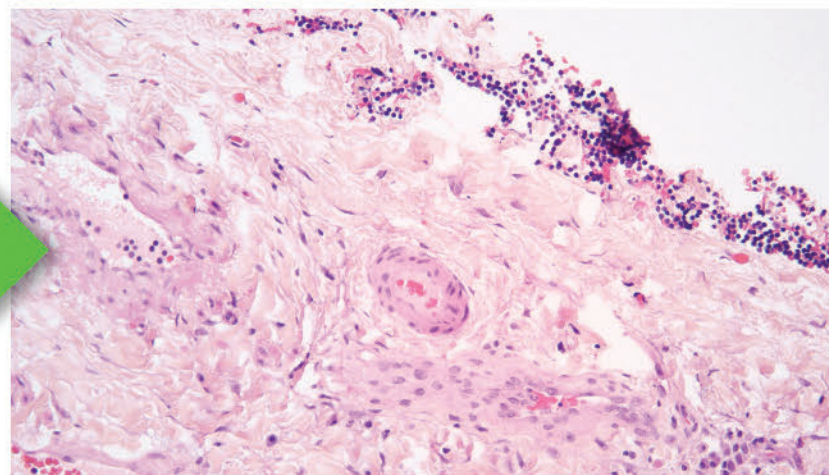


**4K (3840 x 2160)**

We use the same technique to get an HD image from the 5 MP camera.



**5 MP (2248 x 2048)**



**HD (1920 x 1080)**



# 4K



**12 MP**  
**Insight CMOS**  
4K at 13 frames/second

# HD



**5 MP**  
**Insight CMOS**  
HD at 36 frames/second



**SPOT™**  
**5.4 Software**  
Imaging Software for Microscopy  
and Macro-Photography

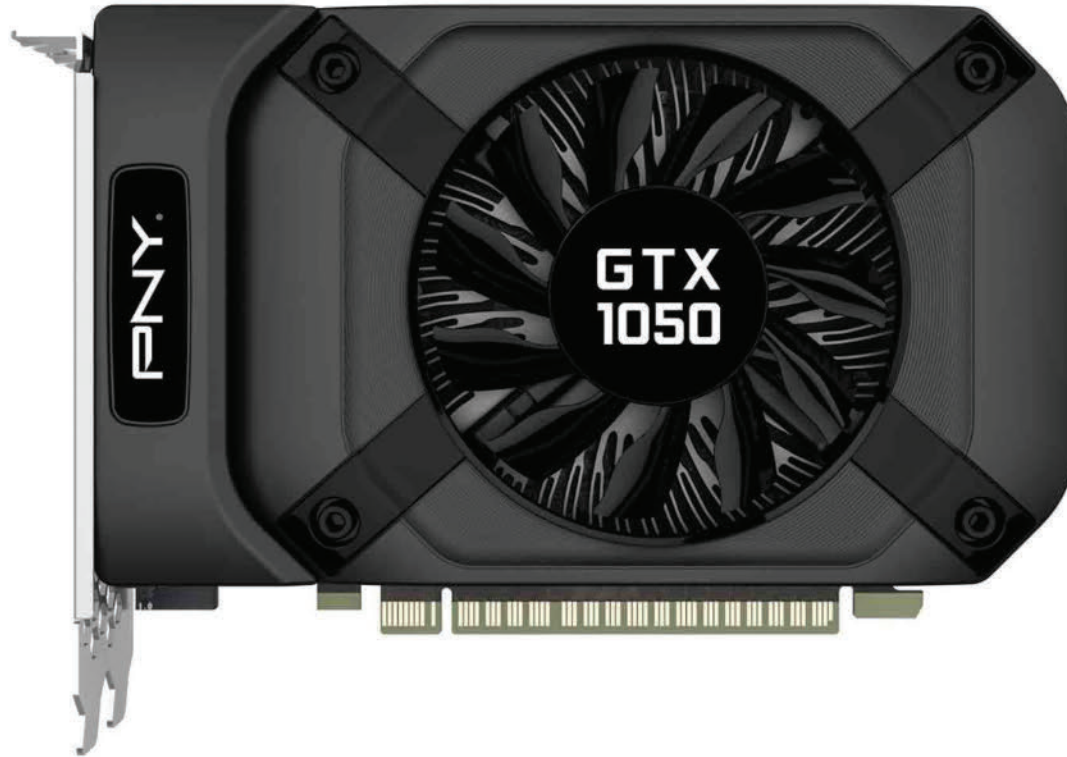


# Wait a minute!

The frame rate for the 4K camera  
looks a bit low.

Don't people get 30 f/s on their  
4K televisions at home?

# What to do?



# Add a NVIDIA video card!





**Adding a NVIDIA video card to  
the computer  
increases the 4K frame rate  
from 13 f/s to 37 f/s**



# Summary

# Live Image **Resolution** and **Frame Rates** for SPOT Insight CMOS Cameras

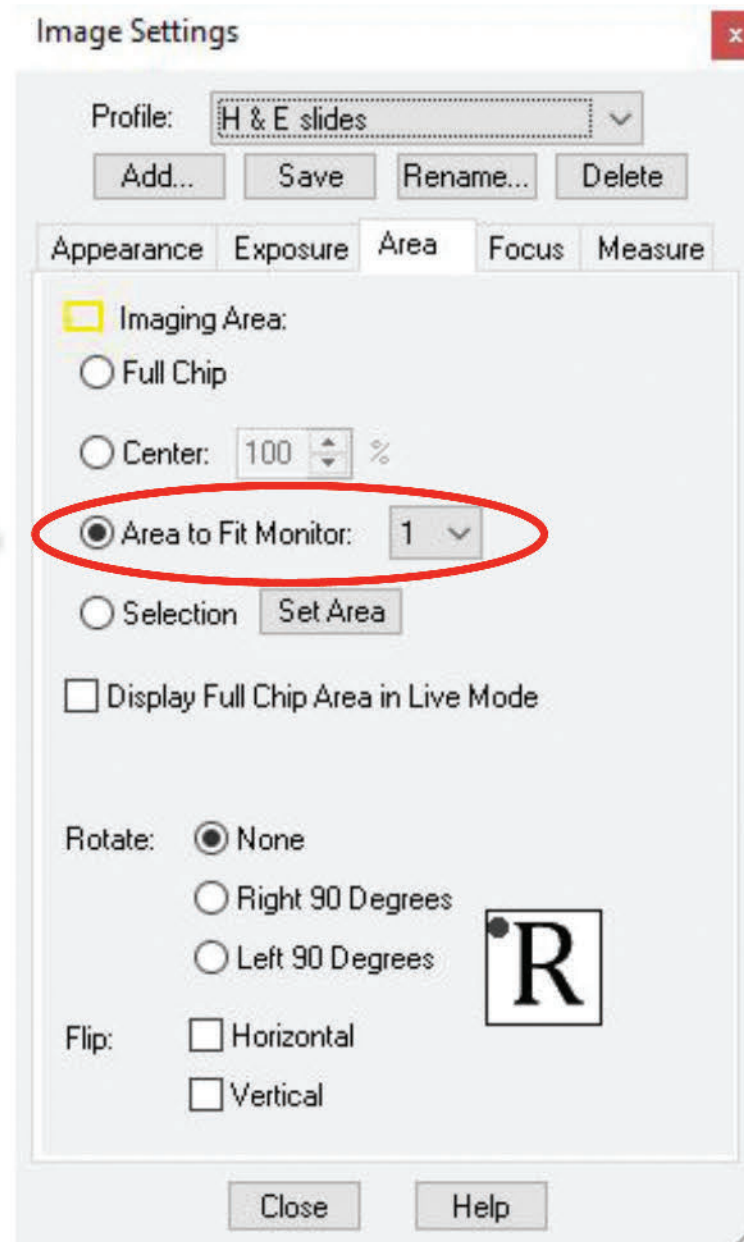


5 MP Insight CMOS				12 MP Insight CMOS			
	CURRENT 5.3 Software	NEW 5.4 Software			CURRENT 5.3 Software	NEW 5.4 Software	
Resolution		Frame Rate		Resolution		Frame Rate	
		no NVIDIA video card	with NVIDIA video card			no NVIDIA video card	with NVIDIA video card
<b>FULL CHIP</b> 5.0 MP 2448 x 2048		<b>25 f/s</b>	<b>67 f/s</b>	<b>FULL CHIP</b> 12.3 MP 4096 x 3000		<b>10 f/s</b>	<b>29 f/s</b>
<b>2x2</b> Decimation 1.25 MP 1224 x 1024	<b>22 f/s</b>	<b>101 f/s</b>	<b>212 f/s</b>	<b>2x2</b> Decimation 3.1 MP 2048 x 1500	<b>11 f/s</b>	<b>40 f/s</b>	<b>103 f/s</b>
<b>HD</b> --- 1920 x 1080 ROI		<b>36 f/s</b>	<b>99 f/s</b>	<b>4K</b> --- 3840 x 2160 ROI		<b>13 f/s</b>	<b>37 f/s</b>

Now, about that *Magic* button...

We have added a new button to the Live Image Controls.

**This button** will automatically size the Live image to fit your monitor.





**This is especially useful for filling the screen of a large 4K or HD flat-panel TV.**

The “magic” button eliminates the distracting “black bars” when in Full Screen mode.



Full Chip – 12 MP  
the wrong shape to  
fit the television

Removes the top and bottom  
of the Live image  
to fit the shape of the  
4K television

# To be perfectly clear...

**Older, previously purchased Insight CMOS cameras will see the same benefit with SPOT 5.4 as new cameras.** It is worthwhile for existing users to upgrade their software.

**The Live mode now displays every row and column from the sensor at all times.** The higher resolution is not limited to 4K and HD applications.

**The improved Live image is available in both Basic and Advanced versions of the SPOT 5.4 software.**

**Adding a NVIDIA video card is most useful for the 12 MP camera,** increasing the full-chip frame rate from 10 f/s to a wonderful 29 f/s.

**Adding a NVIDIA video card is usually not necessary for the 5 MP camera.** The full-chip frame rate is already a wonderful 25 f/s without the NVIDIA card.

**Windows computers.** The frame rates in this presentation apply to Windows computers only.

**Mac computers.** Macs enjoy the same increased resolution with 5.4 as Windows computers. Frame rates are also increased (TBD). Since only the very rare and expensive Mac Pro desktop accepts plug-in cards, we have elected to not support NVIDIA GPUs as a special case. Instead, we have written our software to be more general and use whatever GPU is installed in the Mac to speed up the frame rate.



**I have a low resolution monitor.**

**How does this higher  
resolution help me??**



# WHEN ZOOMING IN!!!

When you are zooming in on the Live image to examine a fine detail, a high-resolution image remains sharp while a low-resolution image just gets blurrier.

This is important when discussing a specimen with a group of people.

**People ALWAYS want to zoom in on an interesting part of the specimen.**

# Computer Suggestions

**12 GB of RAM is good.** With less RAM, Windows has a tendency to start paging things from RAM to the hard drive. This will slow down the Live image frame rate.

**Solid State Drives (SSDs) are good.** The queue of data waiting to be written to a slow mechanical hard drive sometimes backs up, causing the OS to get busy managing the queue. This can slow down the frame rate.

**Use only NVIDIA cards with “GeForce” GPUs.** Only NVIDIA GeForce GPUs will speed up the frame rate. Cards using NVIDIA “Quadro” GPUs will not. A list of supported GeForce GPUs is at:

<https://www.geforce.com/hardware/technology/cuda/supported-gpus>

**The famous Windows update.** Your customer calls and complains that the camera had been working great, but this morning he comes in and the Live image frame rate sucks. You discover that Windows is downloading its massive quarterly OS update. This will slow down all operations on the computer, including the Live image frame rate.

# A word about “mobility” chip sets.

These are found in most (but not all) laptops. “Mobility” chip sets are challenged when faced with high-speed high-resolution streaming video. Desktop computers and “gaming” laptops use more robust “desktop-grade” CPUs and GPUs and are generally a better choice.



**OK, you’re stubborn.**

You still want to use your laptop that has a mobility chip set. As long as it contains a NVIDIA GeForce GPU (mobility version, or otherwise), SPOT 5.4 software knows how to smooth out the bottlenecks and still achieve 4K frame rates above 30 f/s.





# A note about NVIDIA...

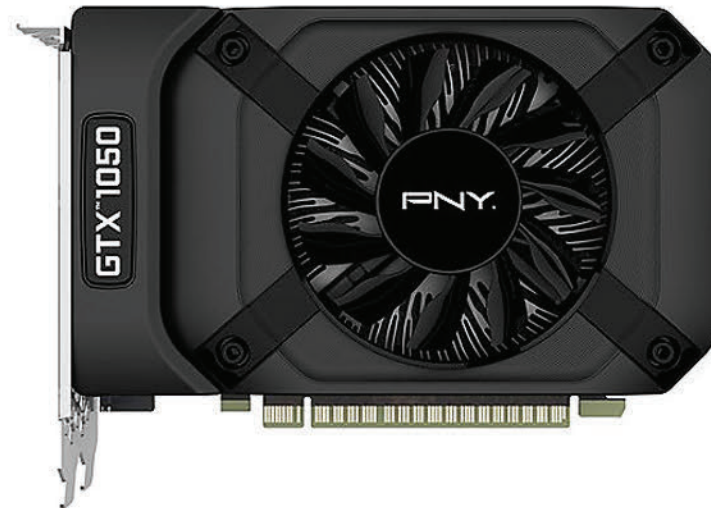
NVIDIA makes the GPU (Graphics Processing Unit) chip. Other companies buy the GPU chip from NVIDIA and solder it to a video card of their own design that plugs into a PCIe slot.

Only “GeForce” NVIDIA GPUs will speed up the SPOT frame rate. “Quadro” GPUs will not. A list of supported GeForce GPUs is at: <https://www.geforce.com/hardware/technology/cuda/supported-gpus>

Every 1 – 2 years NVIDIA introduces a new generation of better, faster GeForce GPUs, with a wide range of performance and prices. Previous generations have included the 400, 500, 600, 700 and 900 series. The current generation is the 1000 series. One of the less expensive chips in this series is the 1050. We have found that cards using this chip work quite well for our purposes. The entry-level 1030 is not powerful enough. Cards using the more powerful 1050TI, 1060, 1070 and 1080 chips are overkill.

This is an example of a video card using the NVIDIA 1050 GPU that will fit tower and mini-tower computers. It is wider than a standard PCIe card so that it occupies two adjacent slots. It needs the extra width for the fan and heatsink.

Be aware that some computers, like Dell SFF (Small Form Factor) computers, require a smaller “low-profile card”. These cards are available and will also occupy two adjacent slots.



# End of Presentation