

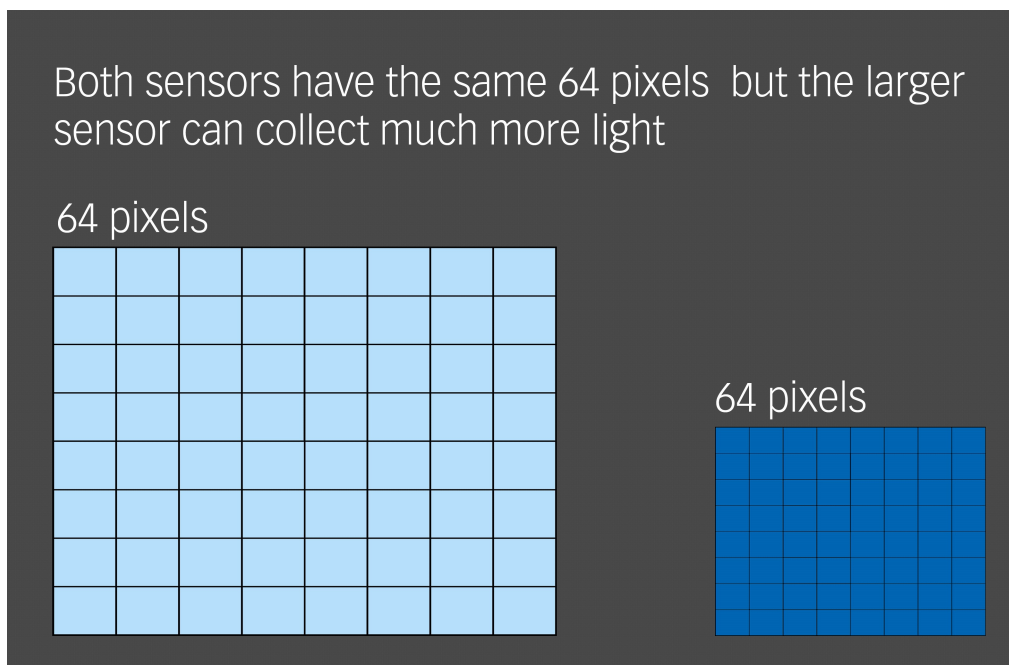
# Slit lamp imaging: Why more pixels are not always better

## Introduction

The more the better – this is not always true, especially when it comes to the amount of pixels on a camera sensor. The quantity of pixels is only a statement how much resolution is possible from your camera and generally is only partly related to overall image quality. There are several other important key factors for high quality ophthalmic images such as a large sensor with high sensitivity, physical magnification, wide aperture, efficient optics and high quality illumination.

## Sensor size

As the sensor is the heart of every camera system it has to be of high quality for use in slit lamp imaging. This cannot be overstated. The job of the sensor is to record the light that forms the image. Generally the larger the sensor, the more light (photons) can be 'recorded'. This can result in a clean and noise free image with a wide dynamic range of tones. With slit lamp imaging there are many low light situations and therefore light gathering capability is key.



## Pixels

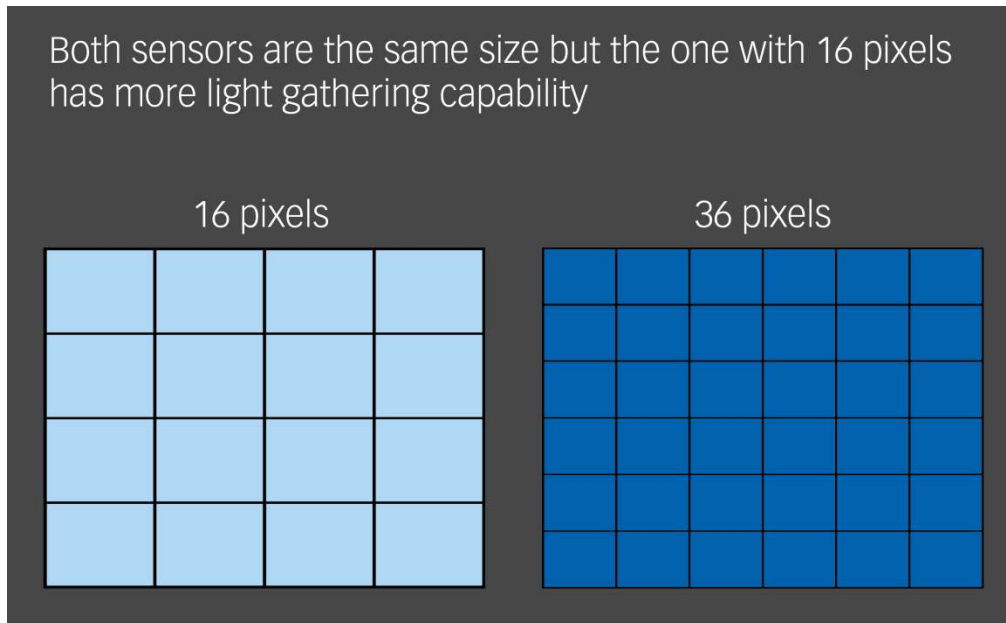
Cluttering more pixels into a camera sensor can have an adverse effect to the light gathering capability and enhancing the amount of noise in the picture. This can lead to situations where a camera with fewer pixels will outperform one with more.

The negative effects of having more pixels for slit lamp imaging can be:

- Reduced sensitivity
- Increased noise
- Longer processing times
- Extended transfer time
- More hard disk space is required

Pixel size is important and is generally related to sensor size. Each pixel on a camera sensor is an individual photodetector that changes light energy into electrical energy. The larger the surface of the photodetector the more light it can gather. This efficiency helps to reduce any noise in the image. Noise often appears as graininess in low light situation.

Larger pixels are often a compromise between camera resolution and sensitivity. In slit lamp imaging this is an important consideration.



### The 'megapixel race'

From the heavy advertising of consumer cameras it's not hard to see why pixel numbers are promoted so prominently. The average consumer has little point of reference for sensor size and quality and the message that "more pixels = better camera" can easily be conveyed and understood. In consumer camera promotion this now appears to have reduced as other features that can improve image quality or impact on ease of capture are now advertised more prominently.

### Conclusion

- There are many sensor related factors that have influence on image quality
- The number of pixels is no conclusive statement about the picture quality
- Larger sensors provide better image quality
- A larger pixel size provides better light gathering ability