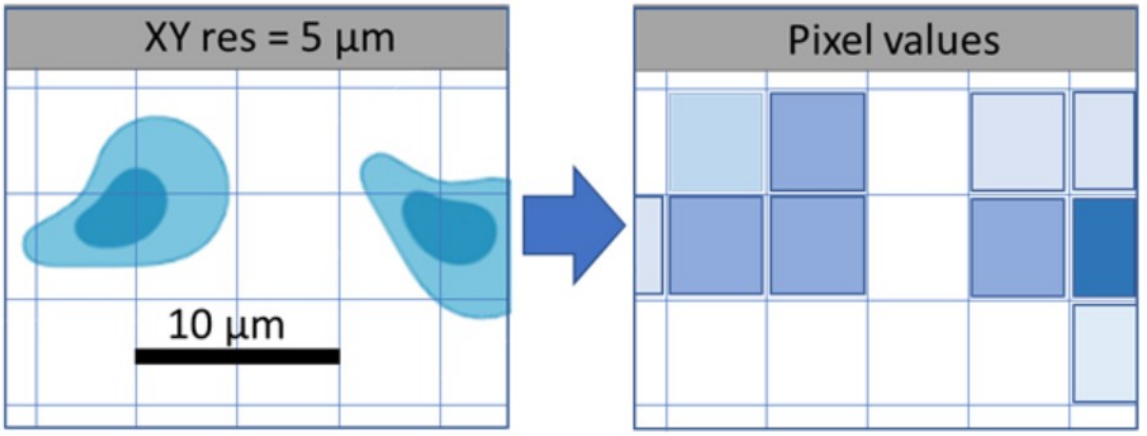
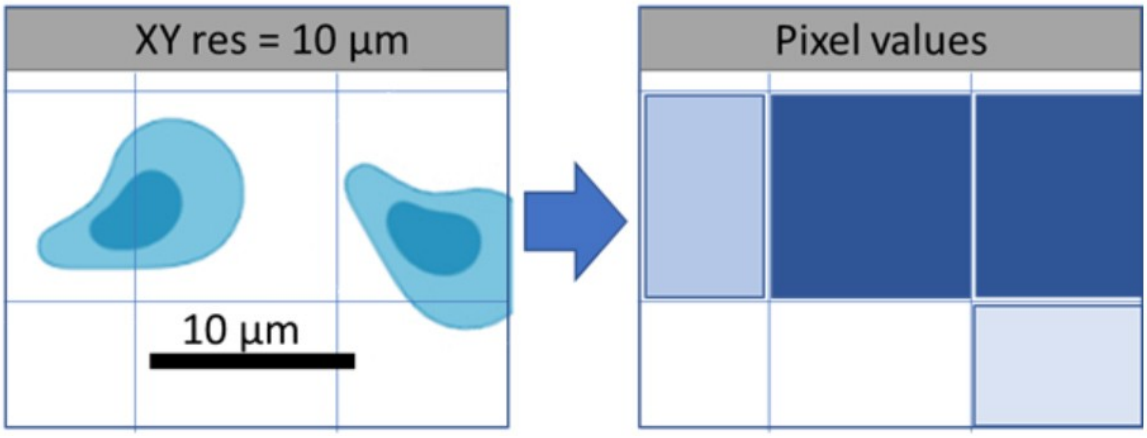
Sampling

How does digital sampling affect resolution

Look at imaging these object with a digital camera

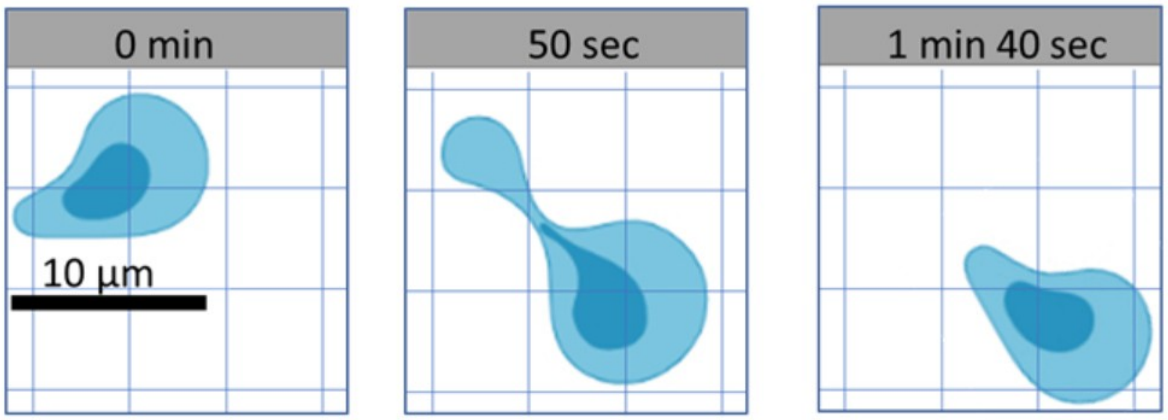
How close together do pixels need to be?





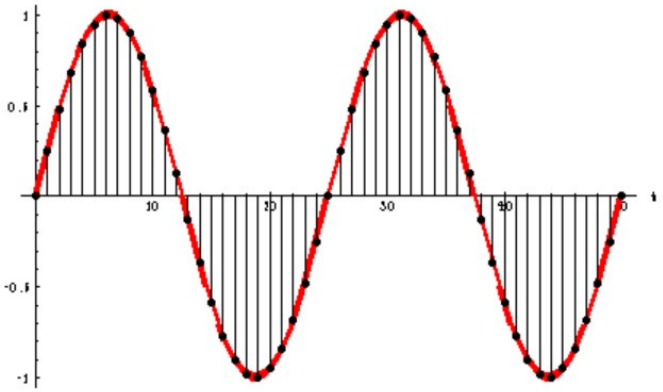
Sampling over time:

How often do you need to image a moving sample

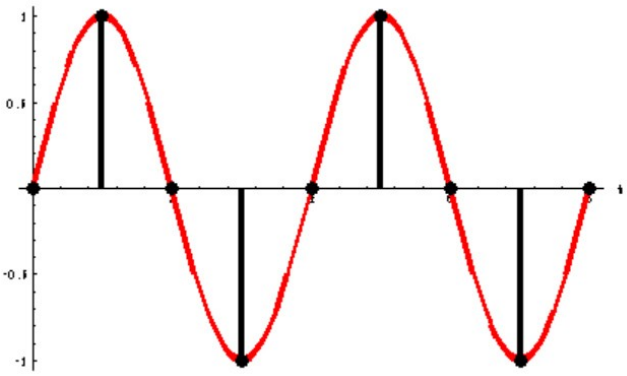


Nyquist theory states that you should sample more than 2 X the frequency that you expect.

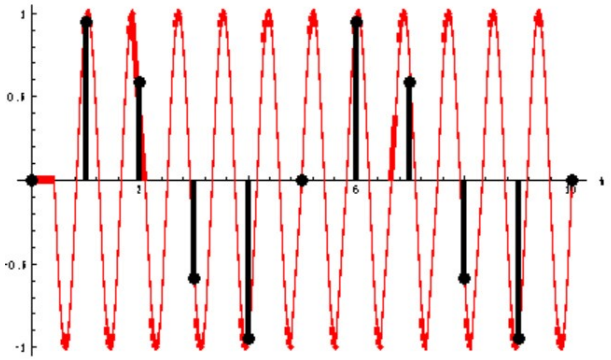
Over sampling



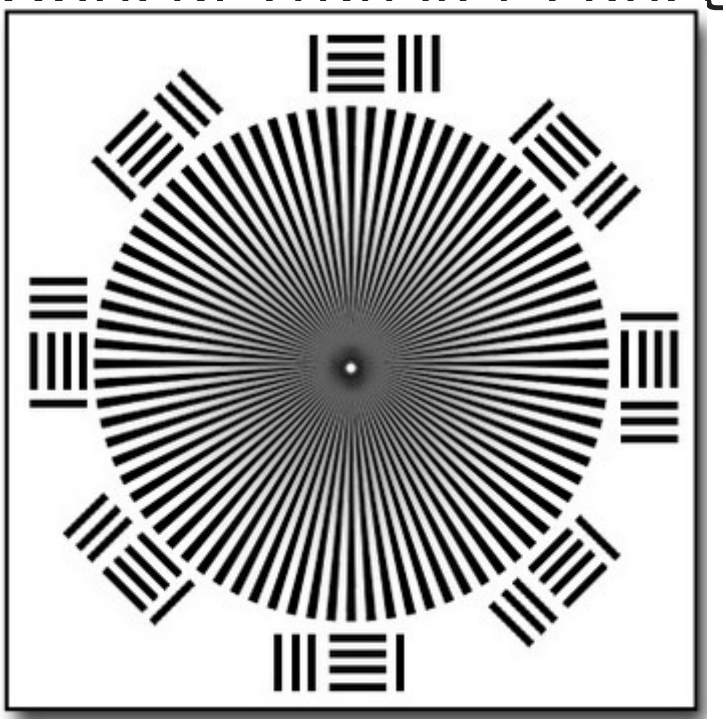
Nyquist sampling

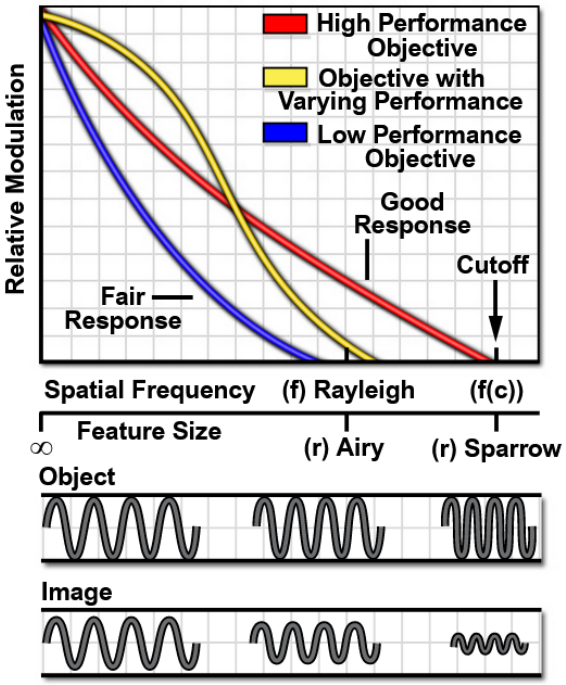


Under sampling causes aliasing



Optical Transfer Function MTF





When objects get close together the contrast decreases.

MTF = Image Modulation/Object Modulation

$MTF = 2(\varphi - \cos\varphi\sin\varphi)/\pi$ and

$$\varphi = \cos^{-1}(\lambda\nu/2NA)$$

The Optical Transfer function is the Modulation transfer function times a phase component.

$OTF = MTF \times e^{i\varphi(f)}$

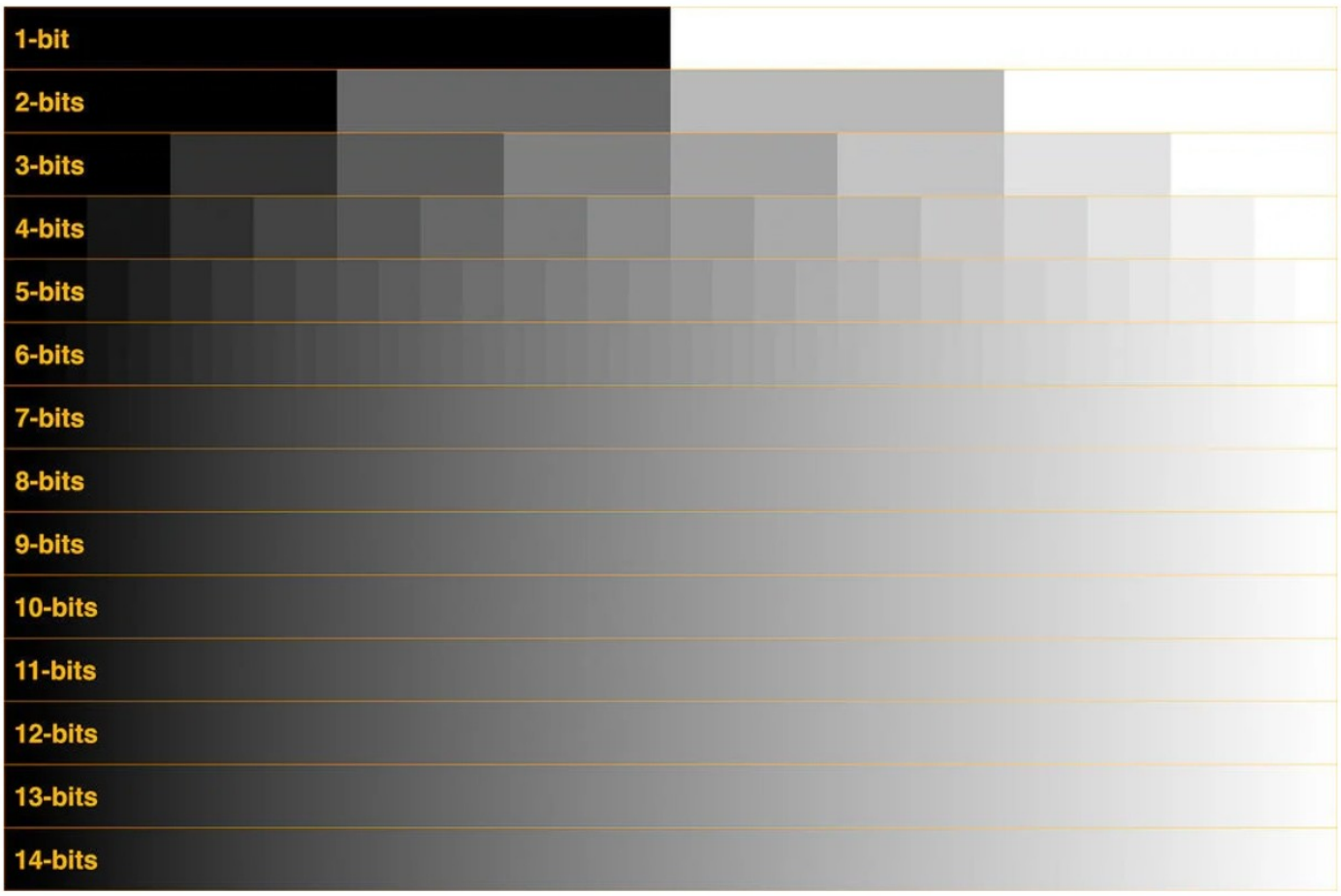
Camera bit depth

0 or 1

00 or 01 or 10 or 11

000 or 001 or 010 or 011 or 100 or 101 or 110 or 111

and so on



Jpg is 8 bit Tiff can be 16 bit

references

https://imb.uq.edu.au/research/facilities/microscopy/training-manuals/microscopy-online-resources/image-capture/nyquist-conditions

https://microscopy.berkeley.edu/courses/dib/sections/02images/sampling.html

https://ocw.mit.edu/courses/mechanical-engineering/2-71-optics-spring-2009/video-lectures/lecture-22-coherent-and-incoherent-imaging/MIT2_71S09_lec22.pdf

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