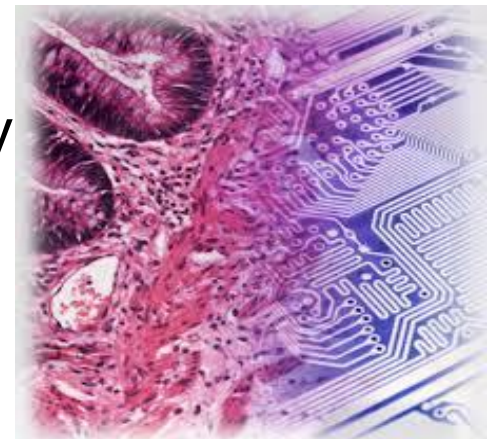
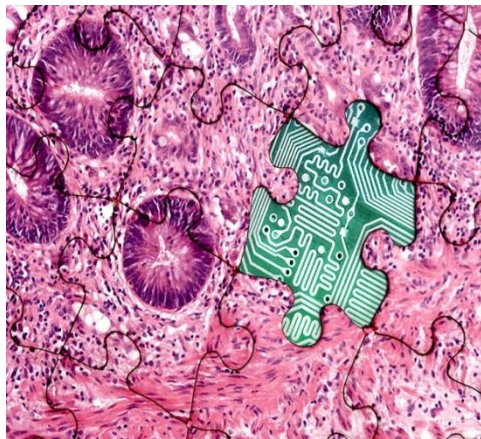


Putting a System in Place – Quality and Governance Issues

Dr Bethany Williams
PhD Fellow in Digital Pathology





The Royal College of **Pathologists**

Pathology: the science behind the cure

Best practice recommendations for implementing digital pathology

January 2018

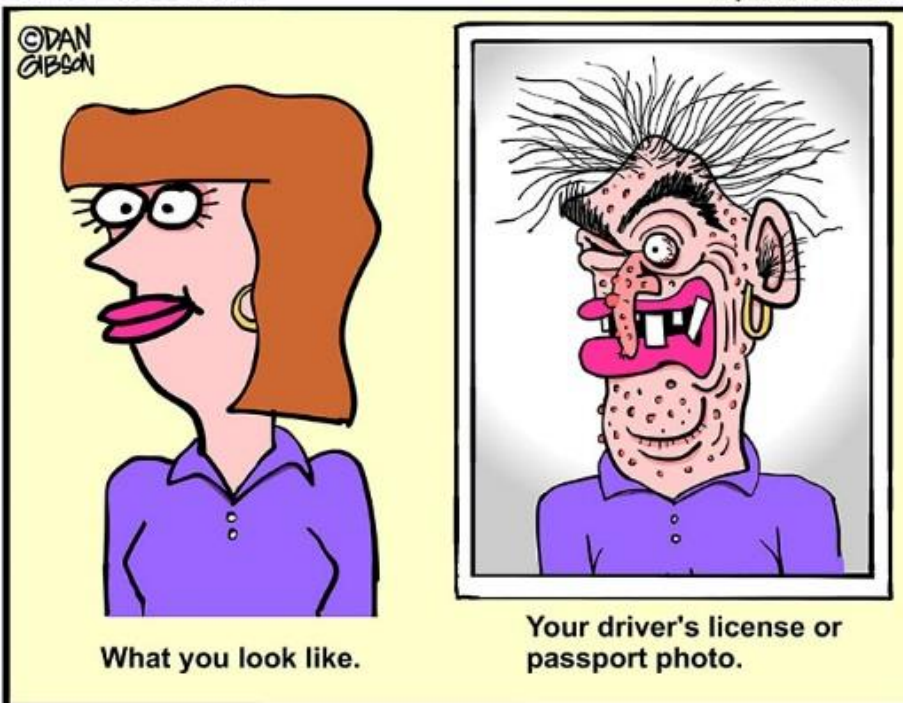
Authors: Simon Cross, Peter Furness, Laszlo Igali, David Snead, Darren Treanor



Digital imaging fundamentals...

GIBBLEGUTS.COM

By Dan Gibson



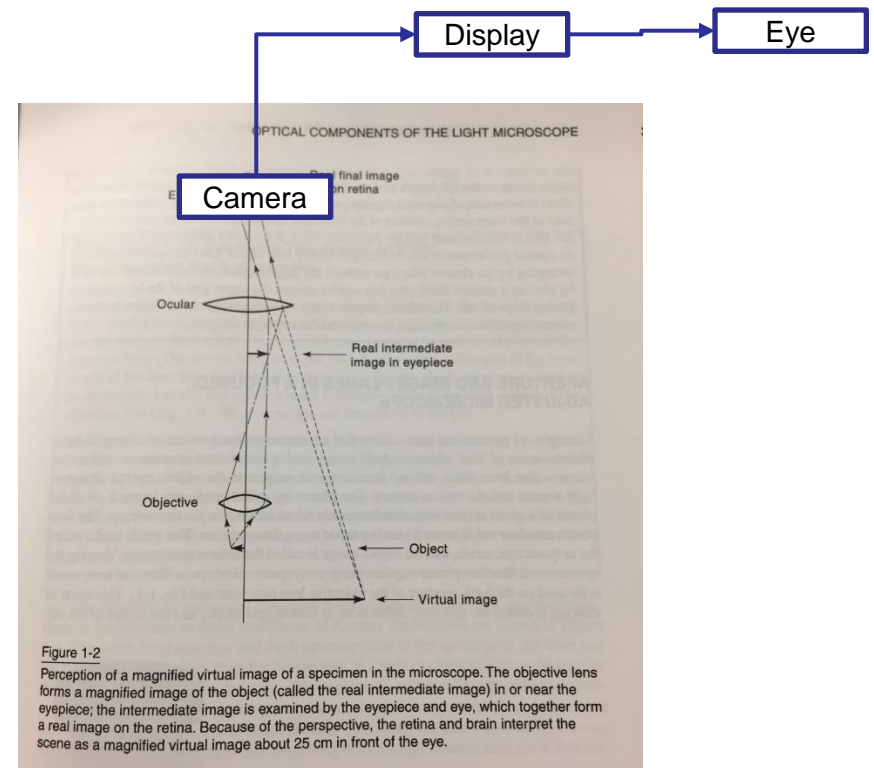
A digital image is a high resolution replica of a section of a glass slide....

It is NOT an exact replica in every way



Microscope vs digital image

- Microscope
 - Direct visualisation of object
 - Limited by resolution of light, numerical aperture of lens, quality of optics to reduce chromatic/ shape aberrations
- Digital image
 - *Indirect* visualisation of object
 - Limited by factors above PLUS engineering decisions/ limitations of the digital system



Fundamentals of light microscopy



Digital imaging as an end to end process



The “imaging chain”



Radiology comparison



IT Guidance

National Strategy for Radiology Image and Report Sharing

A paper prepared by the Information Technology Sub-Committee of The Royal College of Radiologists



Radiology

Guidelines and standards for implementation of new PACS/RIS solutions in the UK

Board of the Faculty of Clinical Radiology
The Royal College of Radiologists



The Royal College of Radiologists
Board of the Faculty of Clinical Radiology

The adoption of lossy image data compression for the purpose of clinical interpretation

This guidance is only available electronically from www.rcr.ac.uk



The Royal College of Radiologists
Board of the Faculty of Clinical Radiology

DICOM and HL7 standards

This guidance is only available electronically from www.rcr.ac.uk

Risk Reduction : Multiple factors to consider



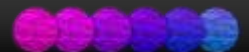
The scan

The workstation/
environment

The pathologist

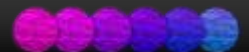
Failsafes/Support

Storage





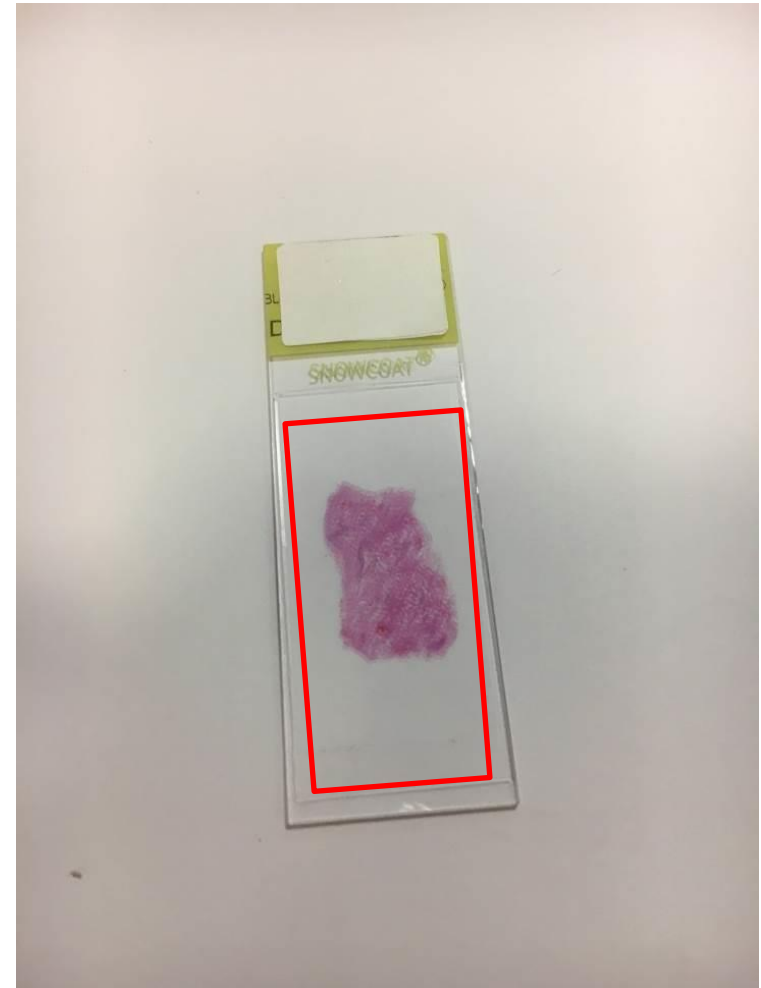
The scan...





Slide Preparation- Scanning

- Tissue placement vital – particularly for smears
- DRY
- No dirt, fingerprints, wax etc on coverslip and slide.
- Clean with tissue, and 70% alcohol (if necessary).





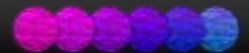
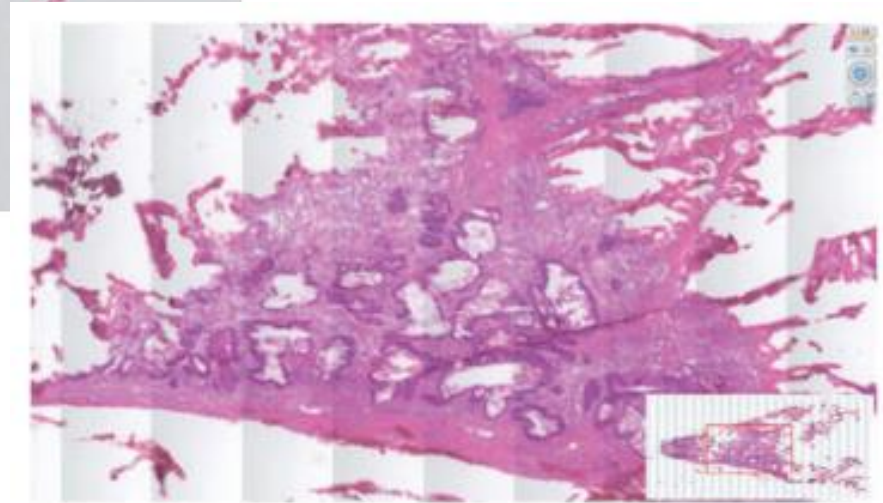
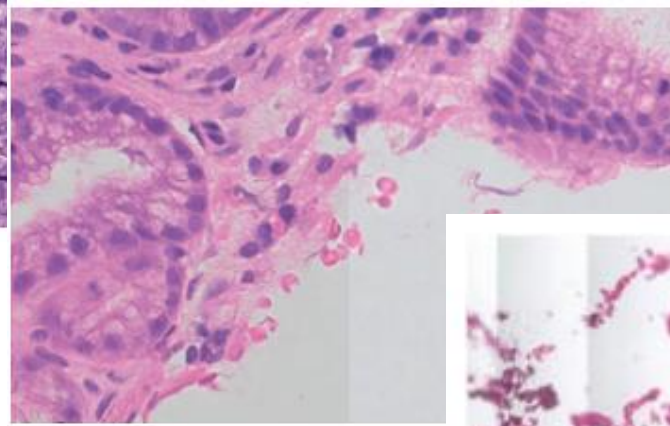
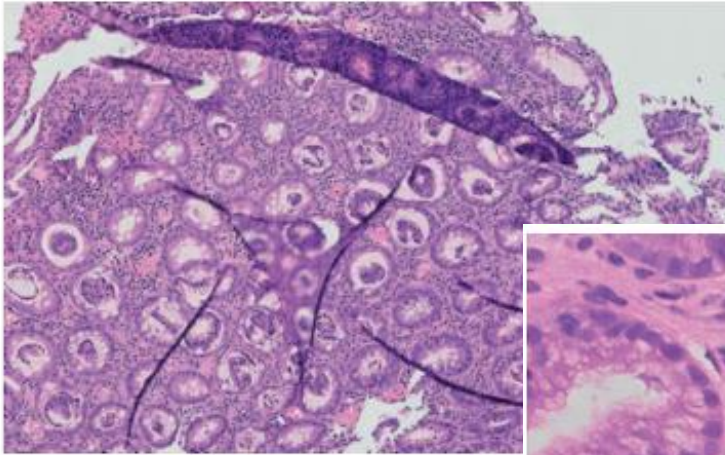
Tissue detection

- Need to have QA procedures to ensure all tissue scanned
- Manual scanning and tissue detection verification





Artefact Recognition





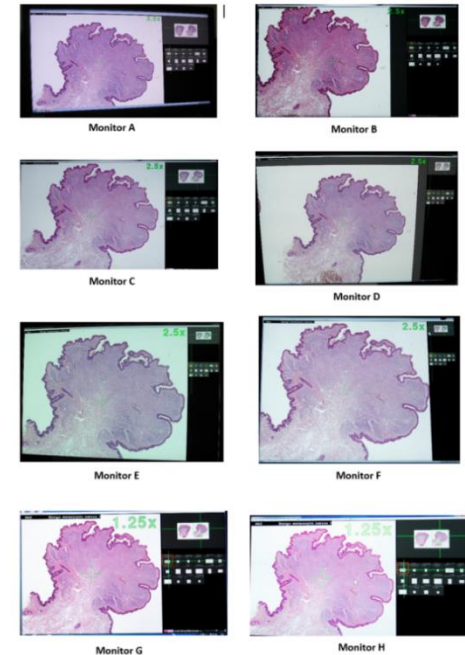
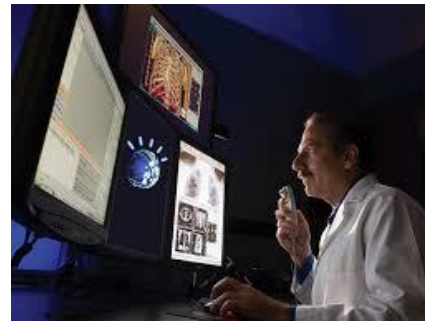
Diagnostic review



Displays (and viewing environment)

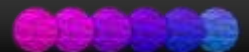


- Very important part of imaging chain
- Not much evidence to guide us
- Lots of work in radiology
- So far we think these are important factors:
 - Resolution (how many pixels)
 - Luminance (how bright)
 - Contrast
 - Colour reproduction
 - Consistency
 - Calibration
 - Working environment





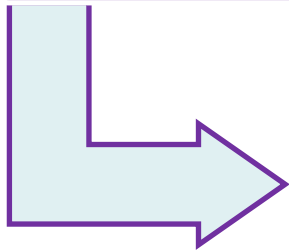
Training and validation



Validation summary – frozen section

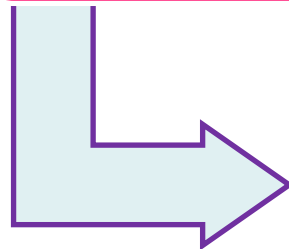
Training

- 1:1 formalized training in digital microscope use
- Observed practice with feedback



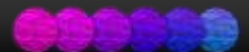
Validation 1
Training set

- Test set of 20 challenging and informative specialty specific cases
- View on digital, make notes, compare with glass immediately



Validation 2
Live cases

- Audit of digital v glass diagnosis

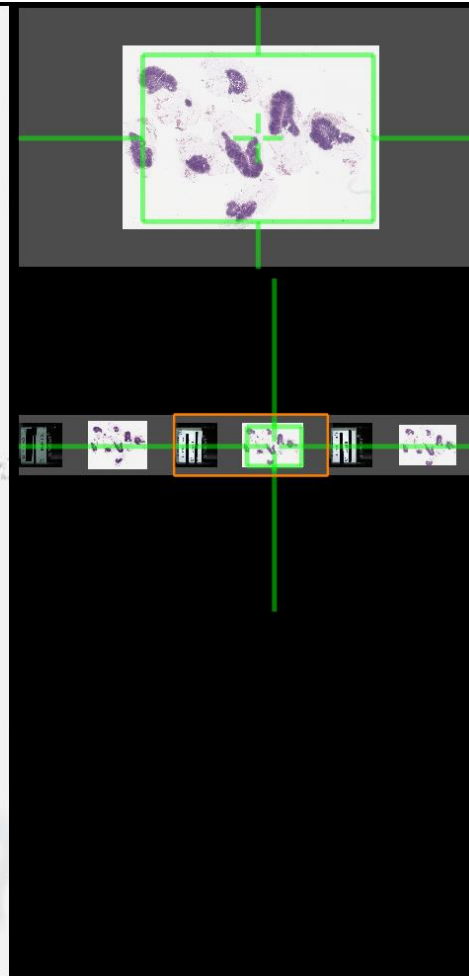


Common issues – Navigation within slides

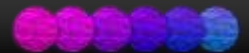
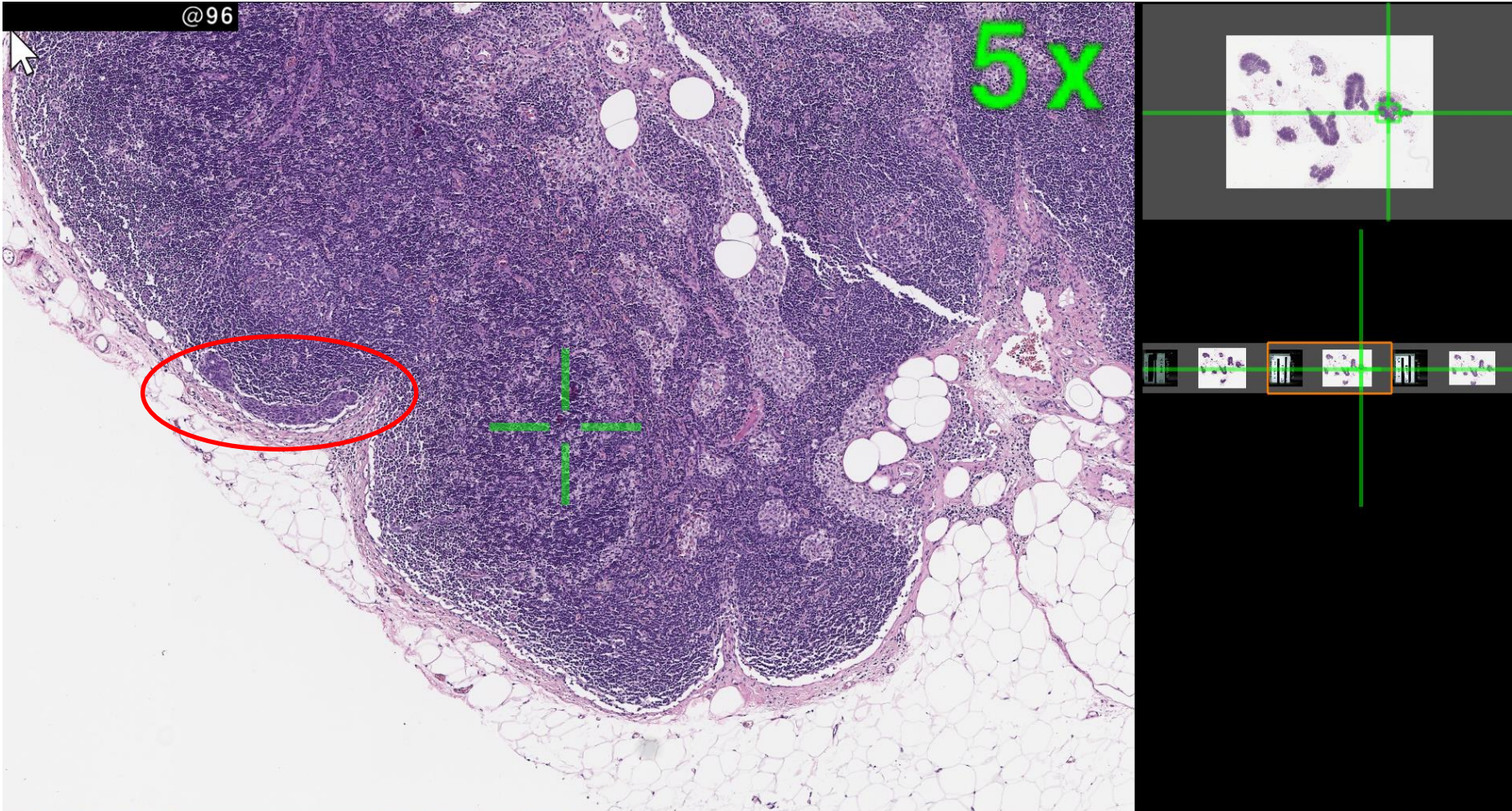
@96

0.63x

**WHOLE SLIDE
SEDUCTION**



Common issues – Navigation within slides



Common issues - Navigation within slides



- High volume tissue search tasks
- Be systematic and disciplined!
- Develop your own technique





Possible diagnostic pitfalls

- Finding small diagnostic/prognostic objects
- Nuclear detail – dysplasia/grading
- Specific items/textures - eosinophilic items/textures, amyloid, granulation tissue





Validation training

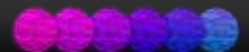
1. Basic understanding of the capture and imaging system

2. Digital artefact identification

3. Familiarisation with hardware and software

4. Experience of direct comparison of digital and glass slides

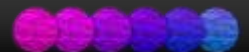
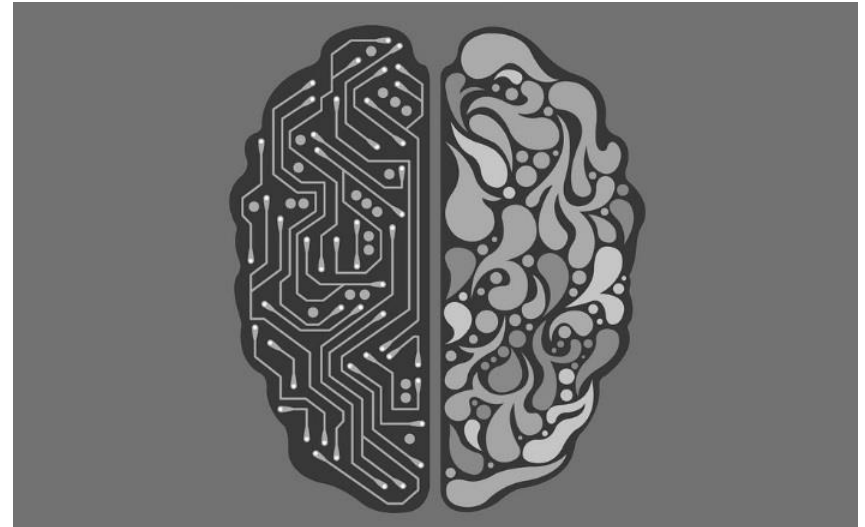
5. Professional engagement and judgement





Support and Storage

- Direct contact with BMS to feedback scan issues/ request rescans
- Access to second opinion/ specialist opinion
- Audit/continuous learning from difficult cases
- Image storage – ideally indefinite – medicolegal, role in AI development



Final messages

- Laboratory staff need to follow protocol which incorporates quality assurance steps to minimize risk of missing tissue and optimise scan quality
- Reporting pathologists need to have some knowledge of the technology to use it safely
- Specific validation for the use case (frozen section transplant bx) can aid competent and confident diagnosis
- **Digital pathology is the key to future-proofing diagnostic pathology services in the UK, and will be of great benefit to the transplant programme!**

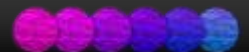




Final thought....

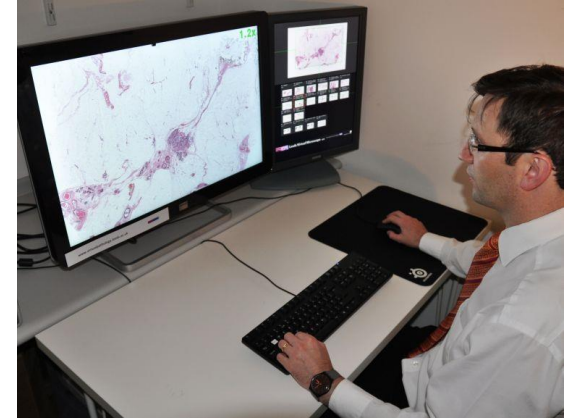
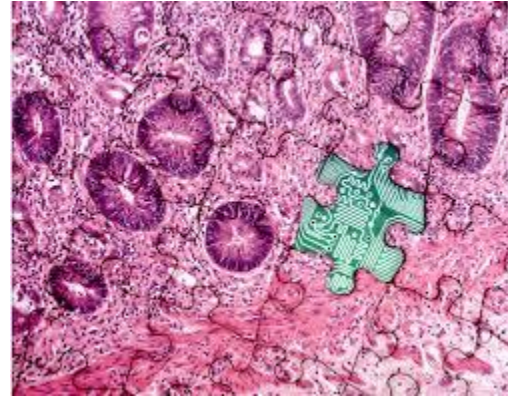


“My interest is in the future because I’m going to spend the rest of my life there....”





Thank you!



Bethany.williams2@nhs.net

