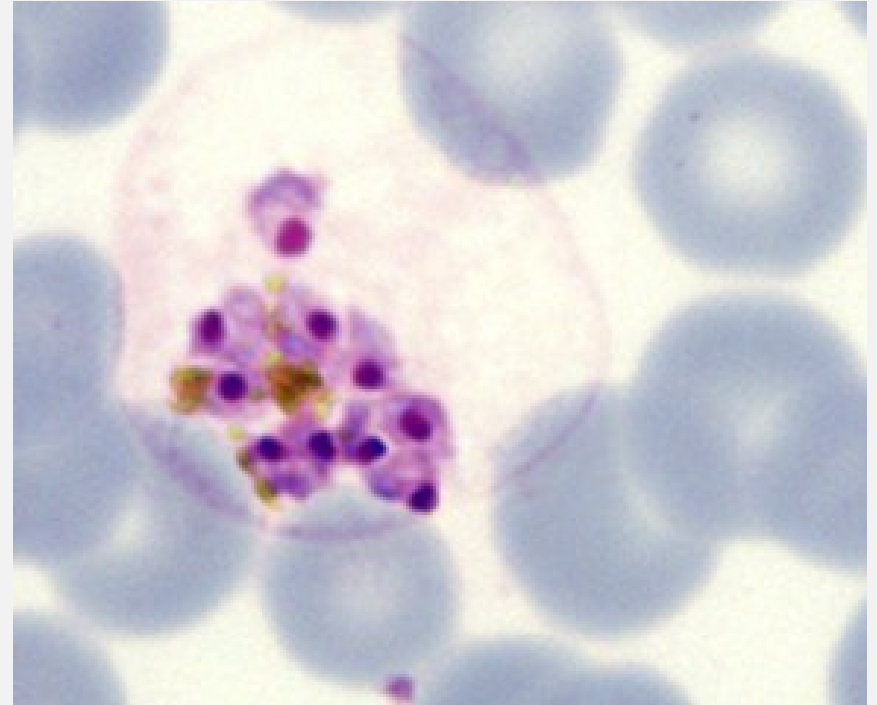


Quality Assuring Telepathology

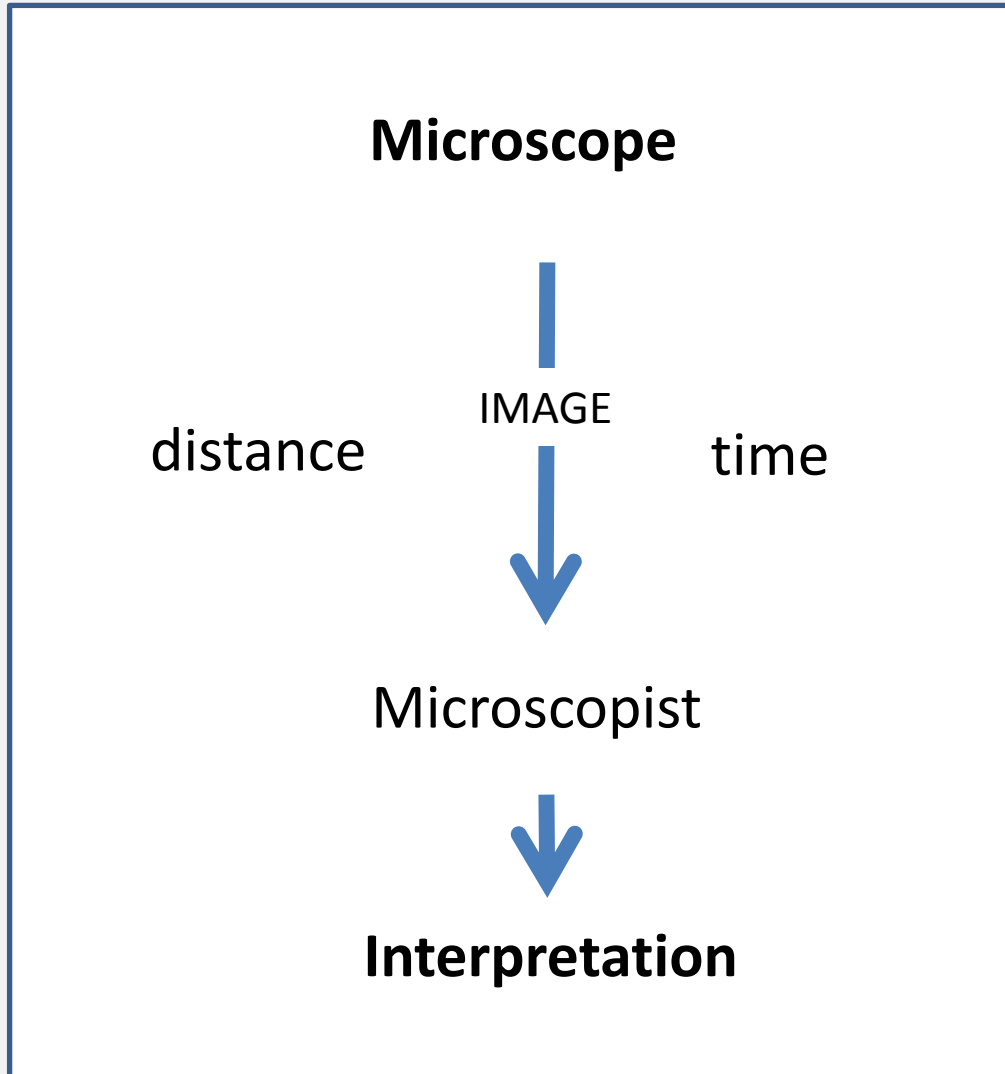


Sold by Edmund Culpeper
The microscope is unsigned and undated.
The back of the pyramidal oak case (not of
Culpeper type) of tripod microscope
century, although by then made
contributed something to
the microscope. Apart
drawn from the
Compt...



John Burthem

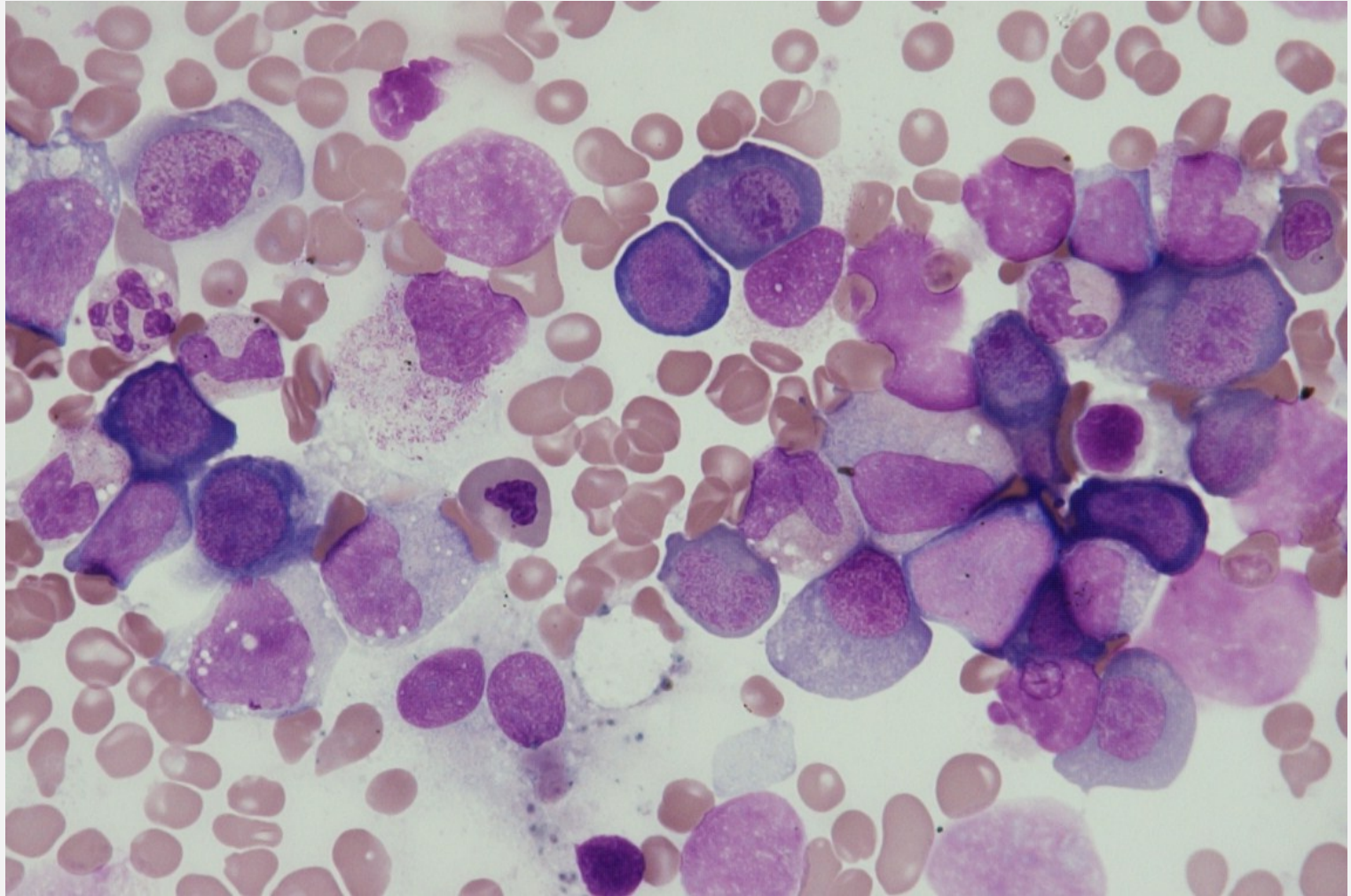
What is telepathology?



Hematology has been slow to take up this process: many IT issues are solved

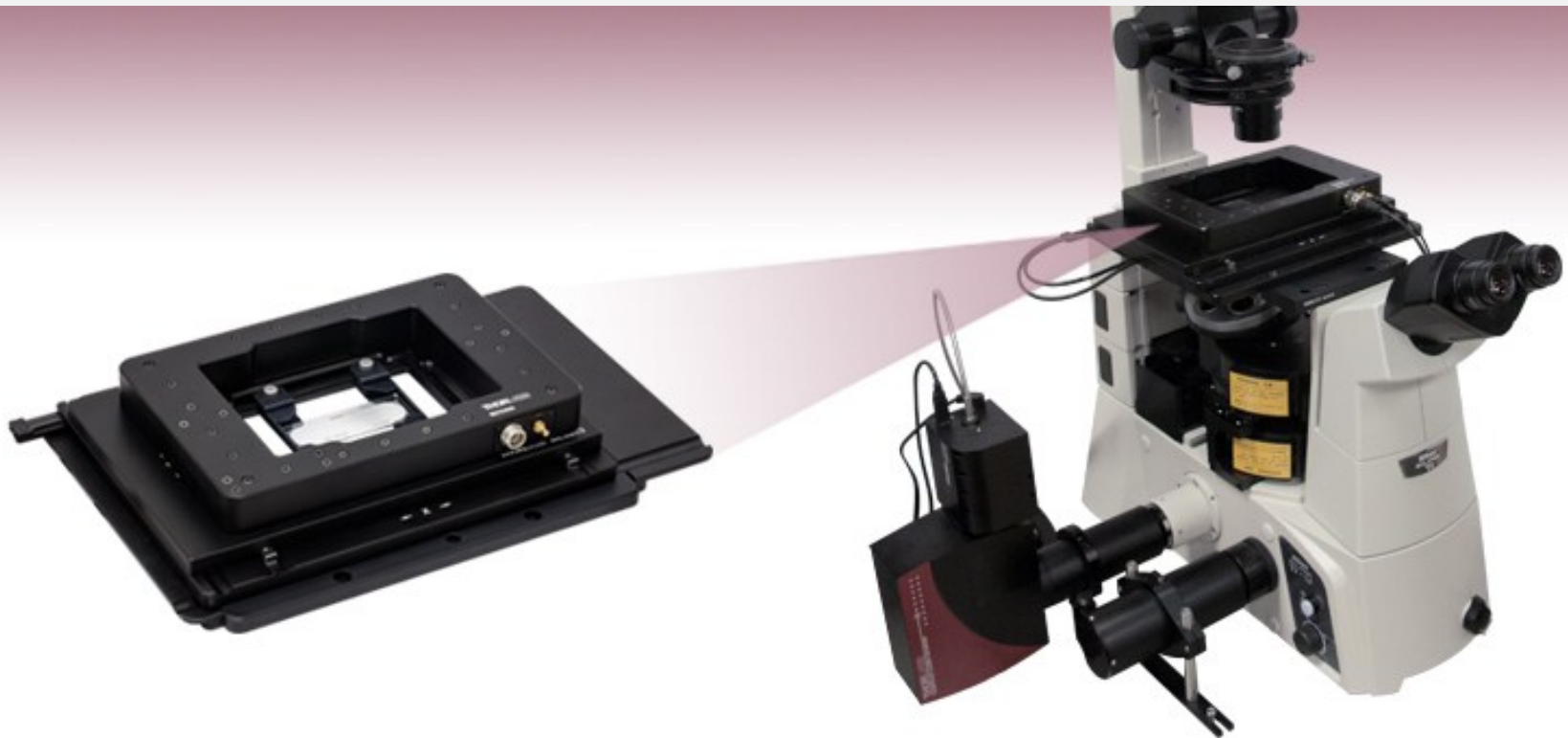
The importance of the image

In praise of the single image – underestimated resource: “easy”.
Many quality issues, but accessible and flexible



Big “slide” imaging

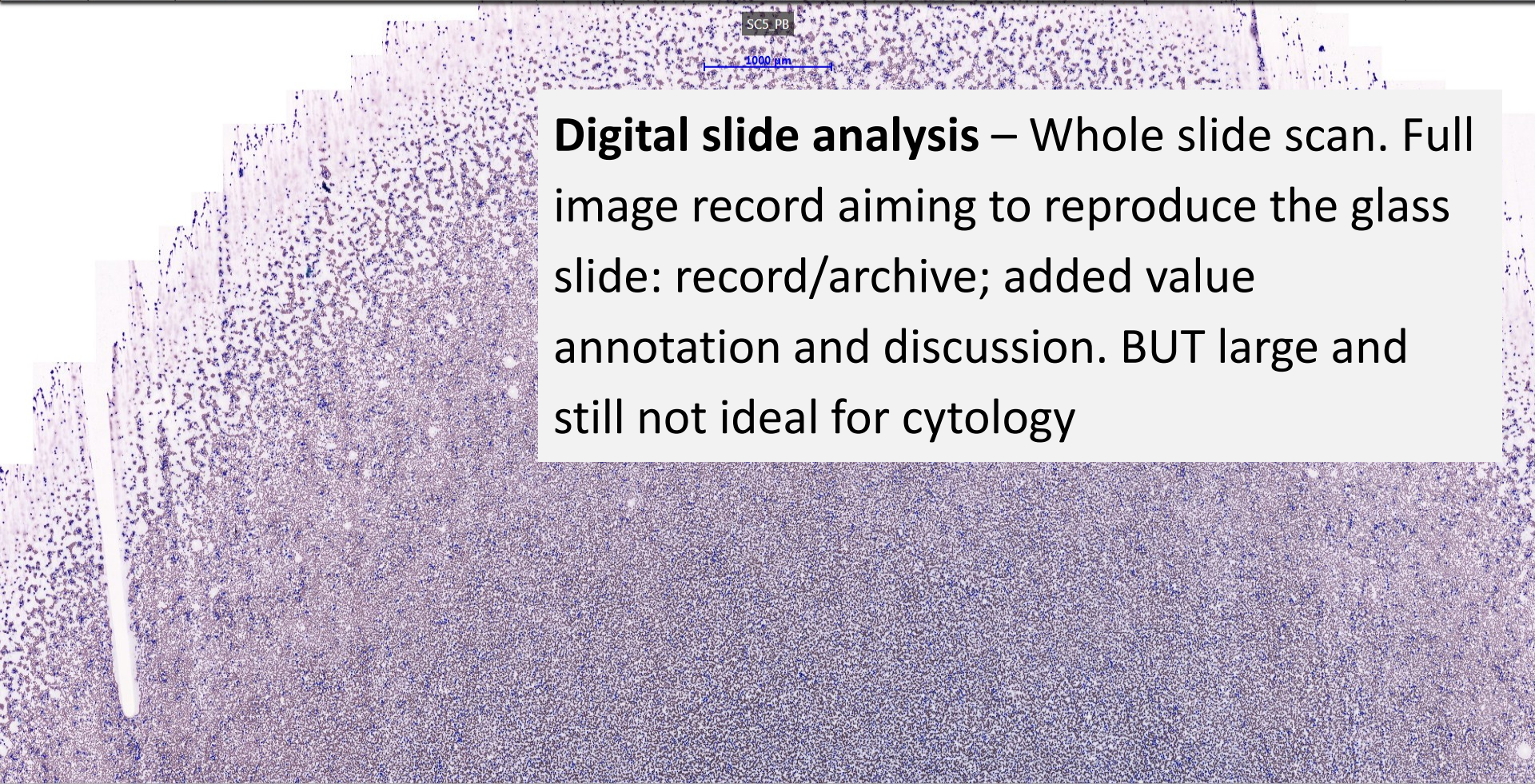
Remote driven microscope – attractive as a remote viewer and if equipped with chat and feedback; tagged and remembered. Added value: decision support and contact.



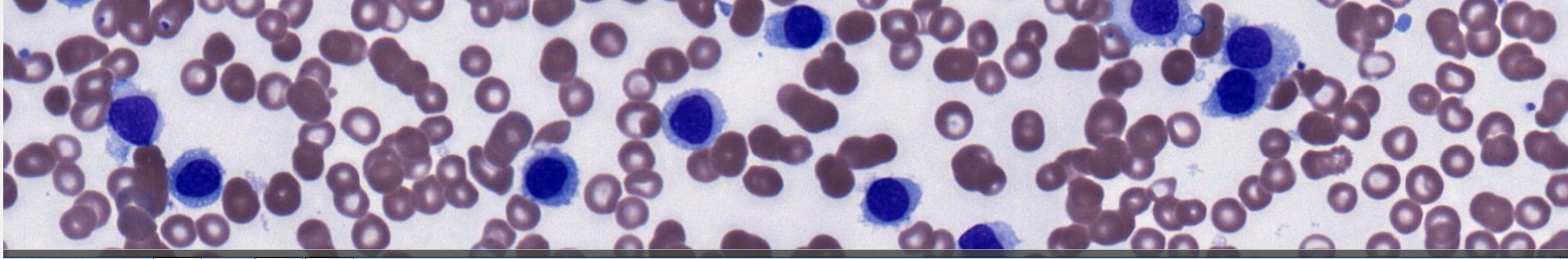
Digital slide analysis – Sampling options: added value search and select and preliminary interpretation; record/archive; excellent image quality/time



Cellavision



Digital slide analysis – Whole slide scan. Full image record aiming to reproduce the glass slide: record/archive; added value annotation and discussion. BUT large and still not ideal for cytology



DRIVERS

Who is interested in telepathology?

Patient: speed, improved accuracy

Provider: Also considers cost : benefit = staff costs vs. setup

Manufacturer: cost : benefit market size vs. multi-use technology

Deliverer make all this a reality: most affected by quality

QUALITY

There are two definitions of quality that are important to telepathology:

- 1. “The standard of something as measured against other things of a similar kind; the degree of excellence of something:”**
- 2. “A distinctive attribute or characteristic possessed by someone or something (positive)”**

QUALITY

1. Does telepathology offer an equivalent experience to existing techniques and services? **The glass slide**
2. Are there unique attributes to be realised and developed that will improve diagnosis? **Other stuff**

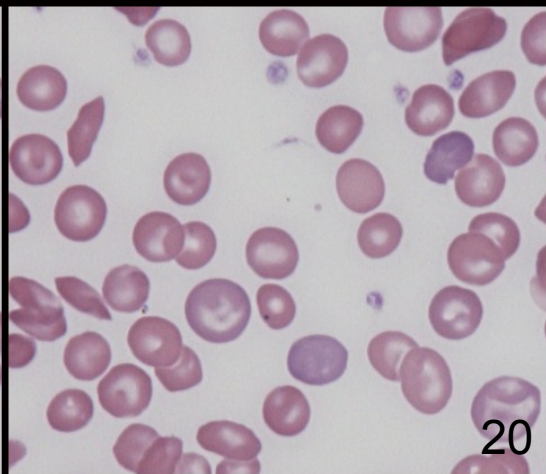
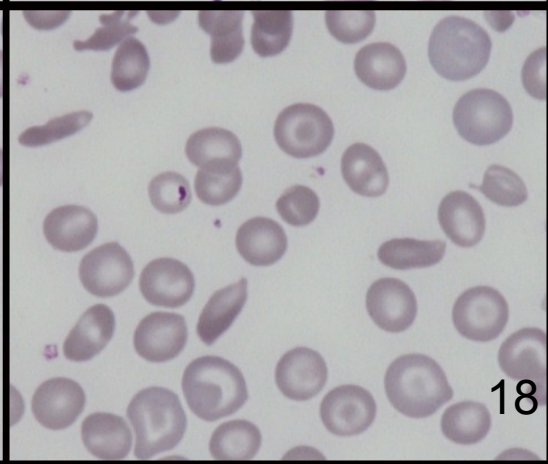
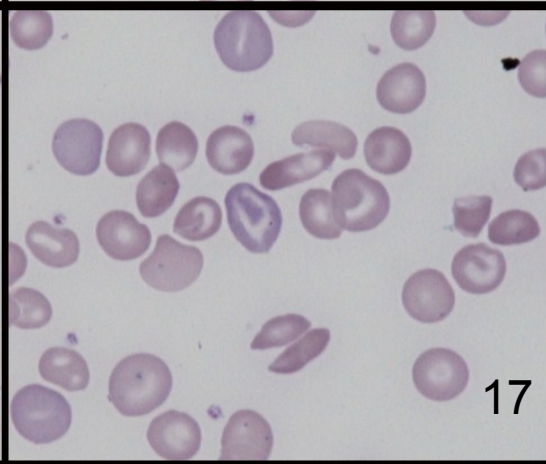
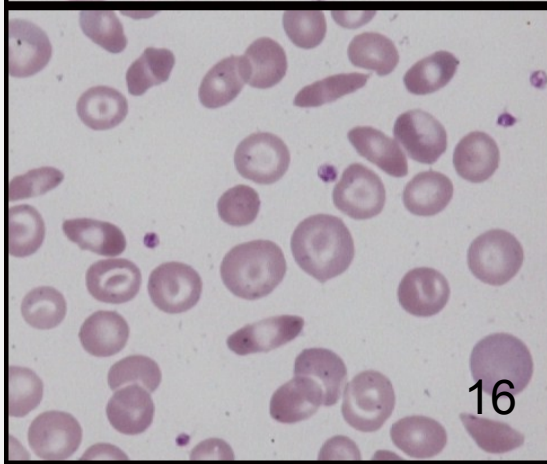
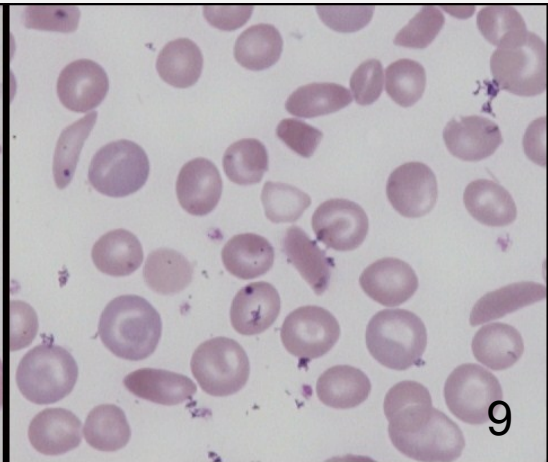
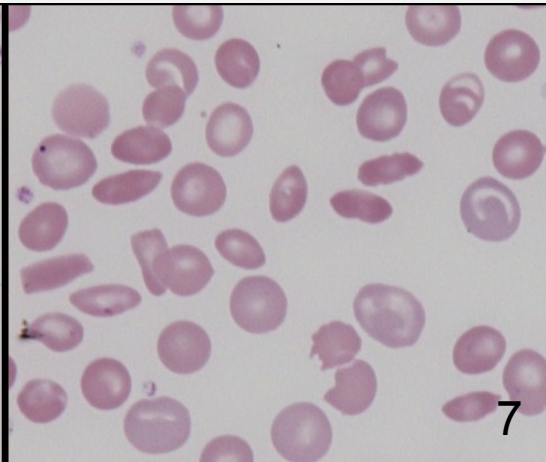
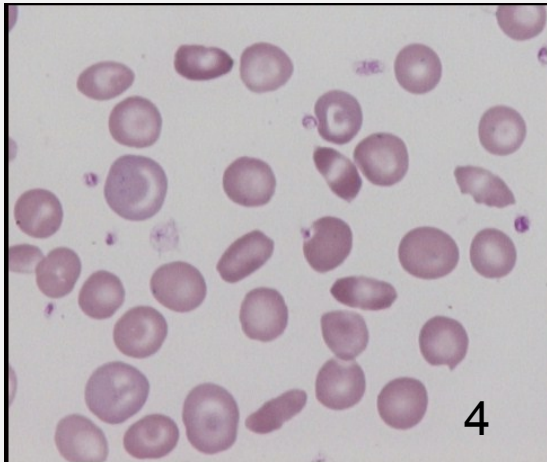
4. THE IMAGE

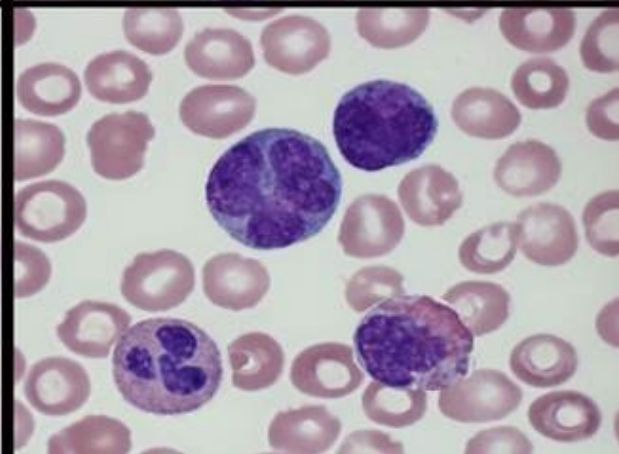
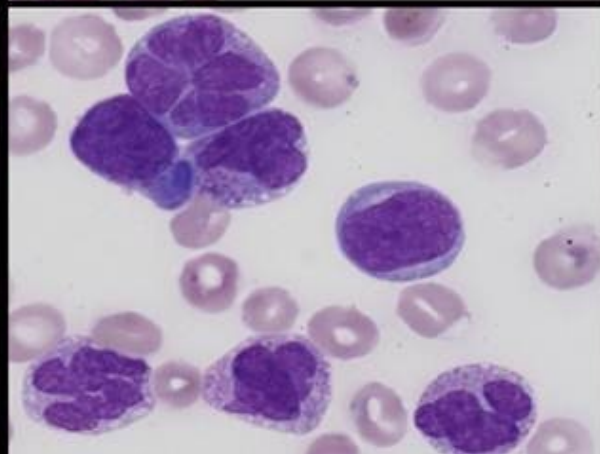
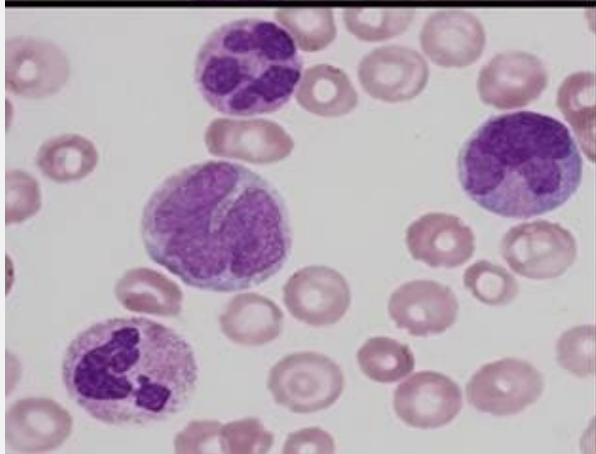
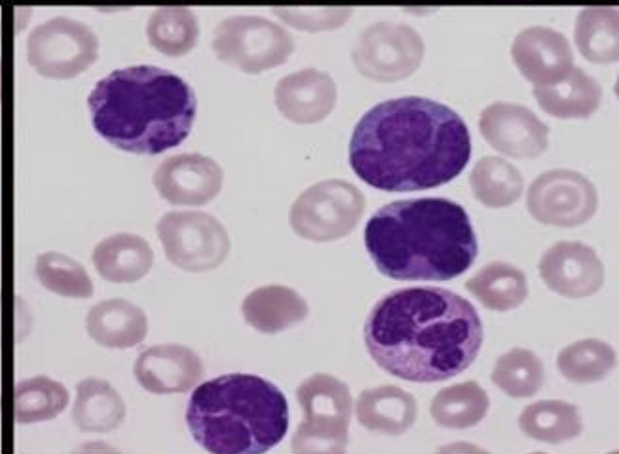
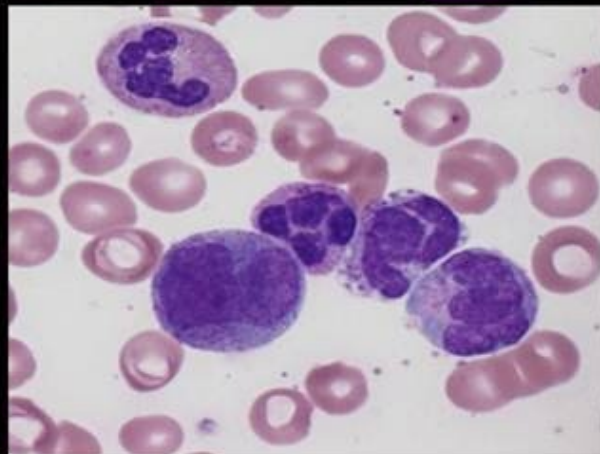
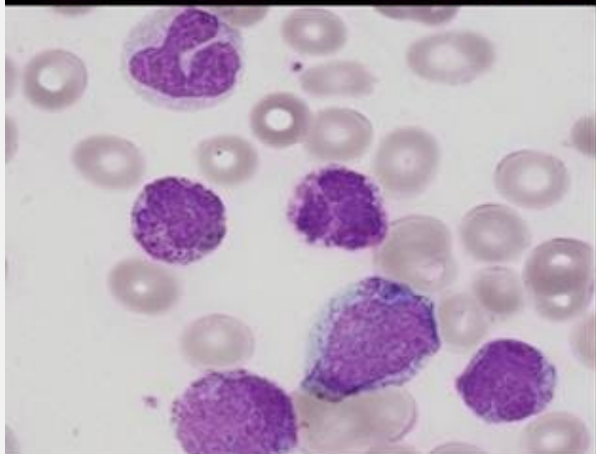
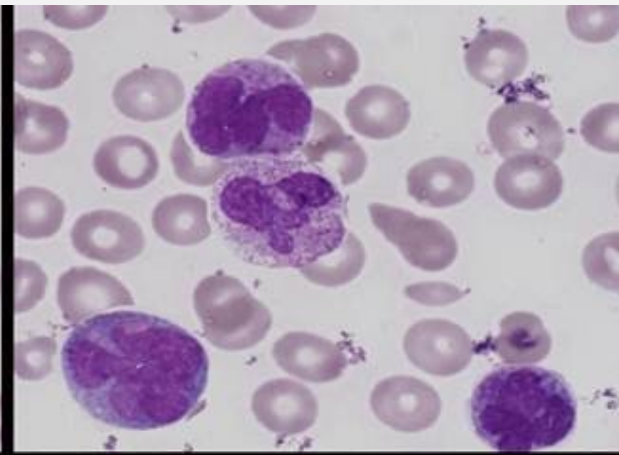
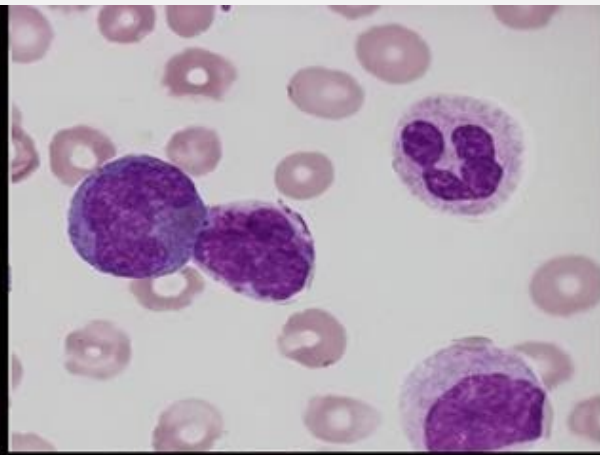
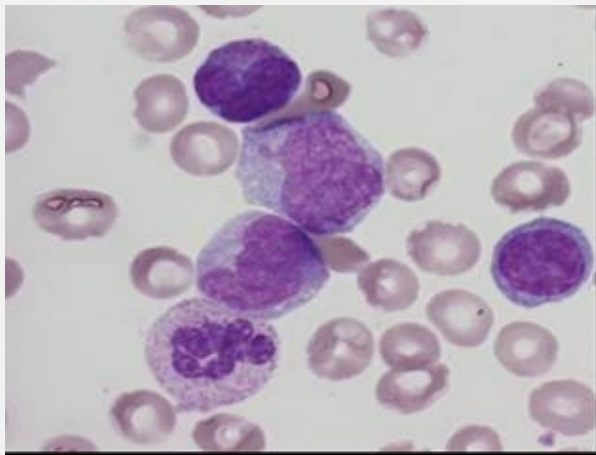
The heart of the issue

The importance of getting the starting material right

“Rubbish in”

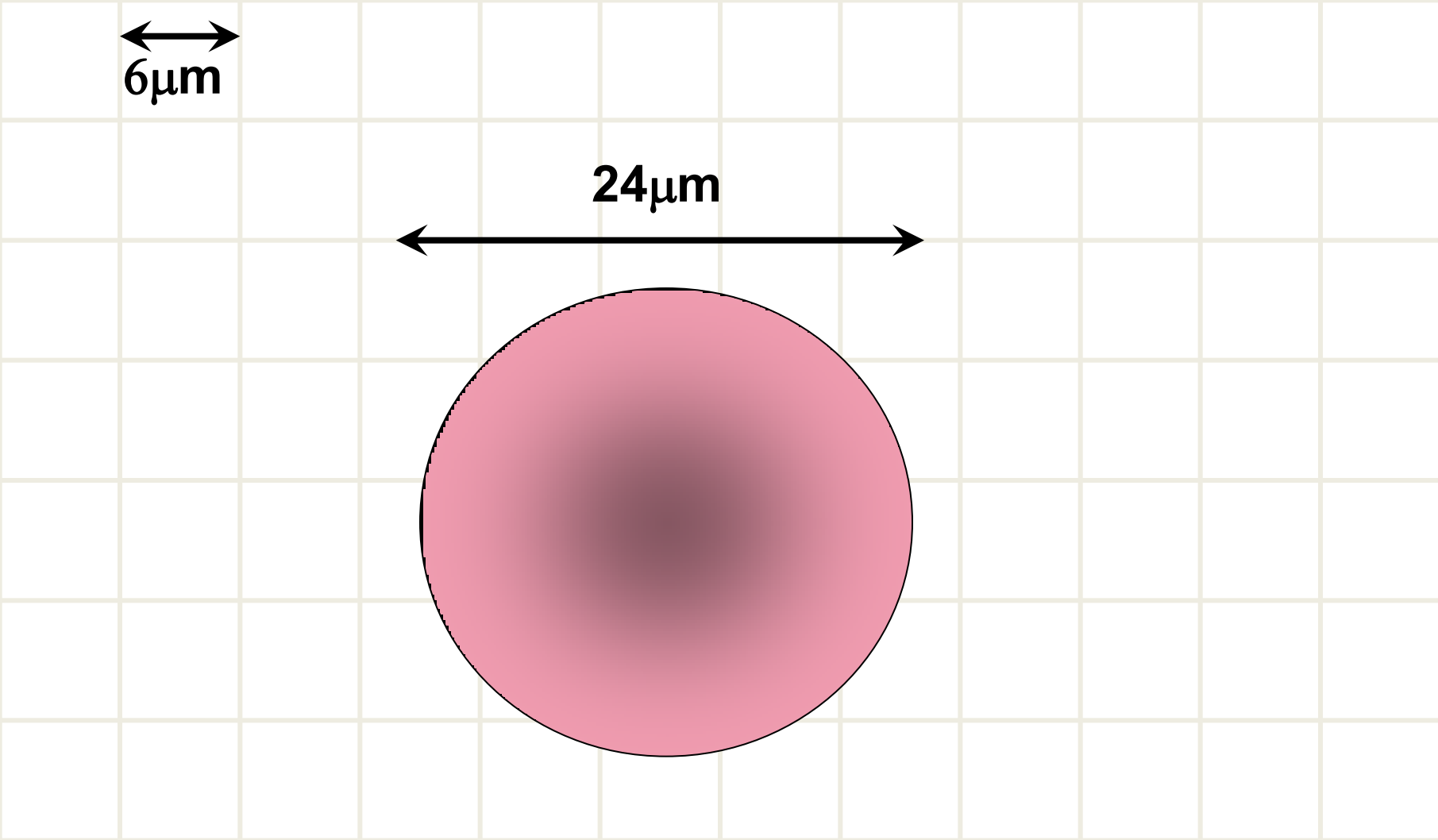
A lesson from DM scheme – people are much more critical of an image than a glass slide – this starts with the sample. Practically this is important.





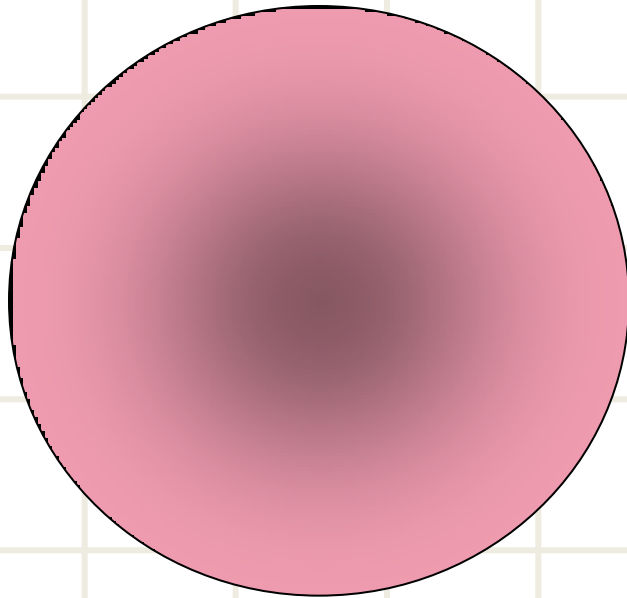
Digital imaging as an analytical tool for sample quality improvement

Assessing resolution of diagnostic elements

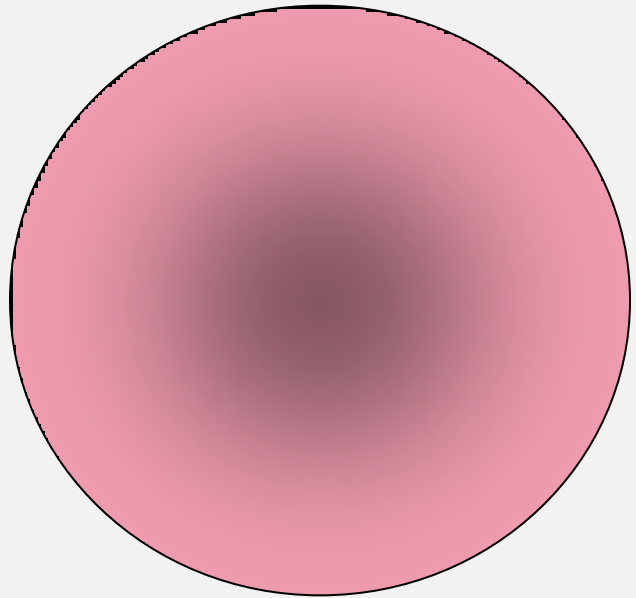
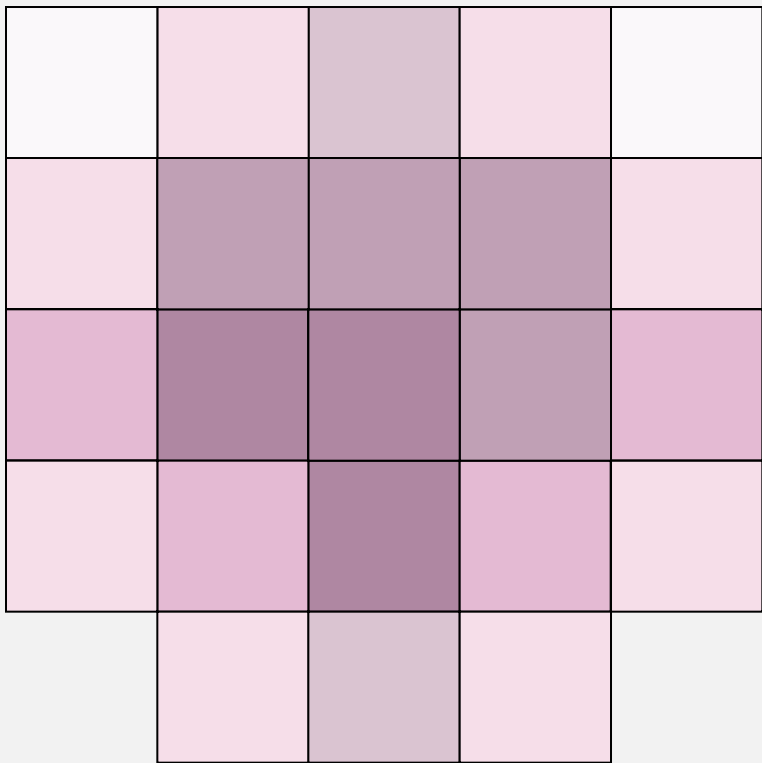


6 μ m

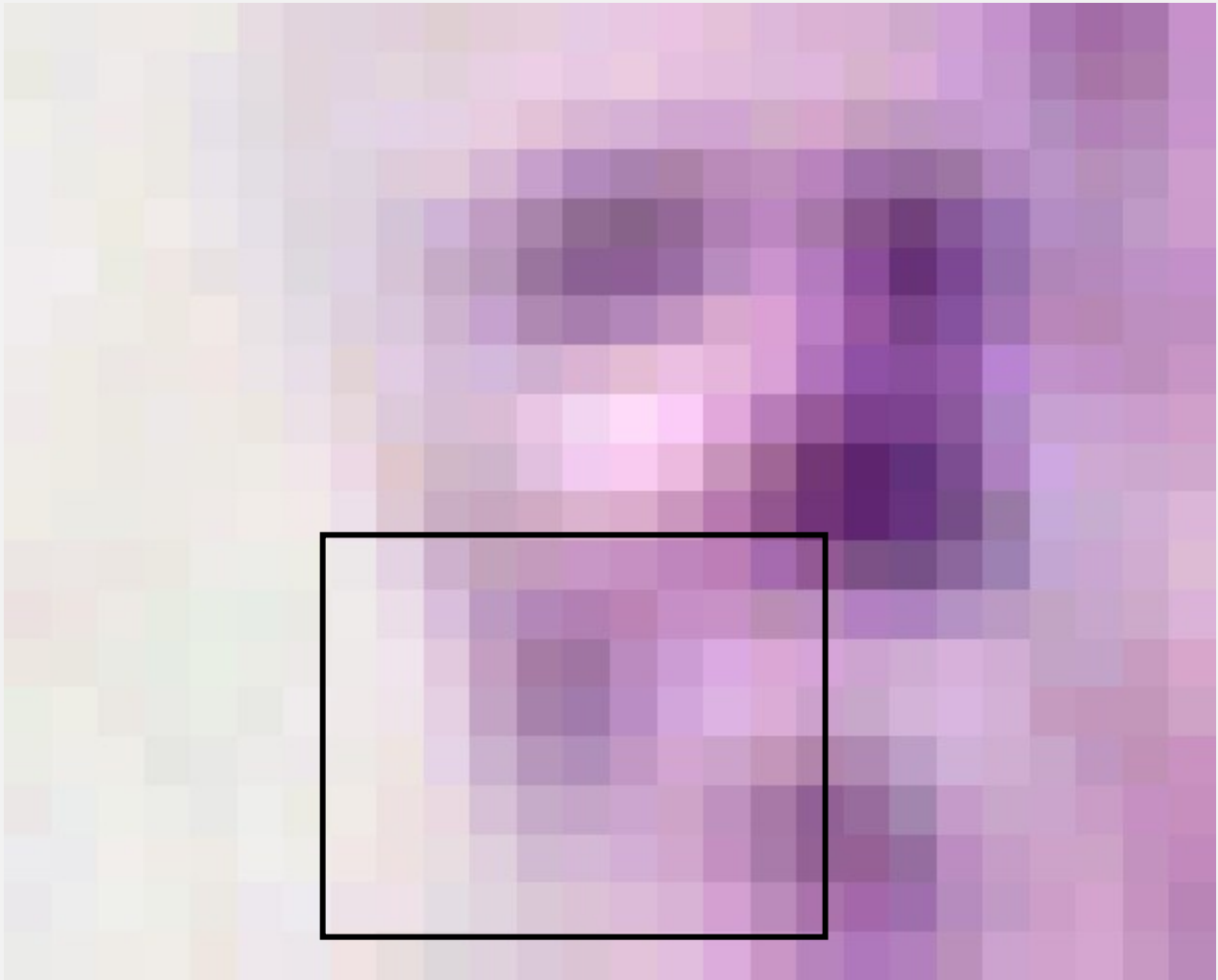
24 μ m

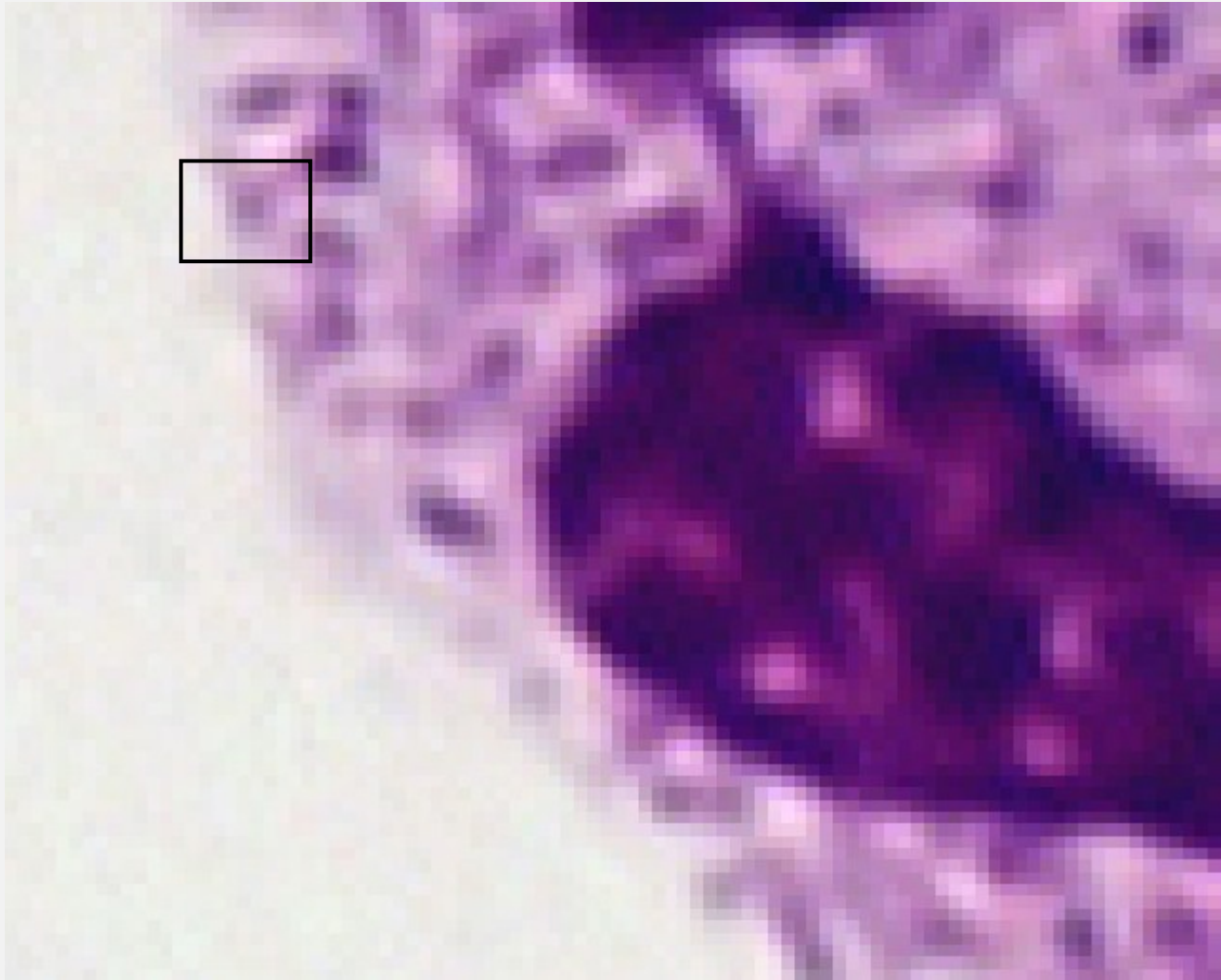


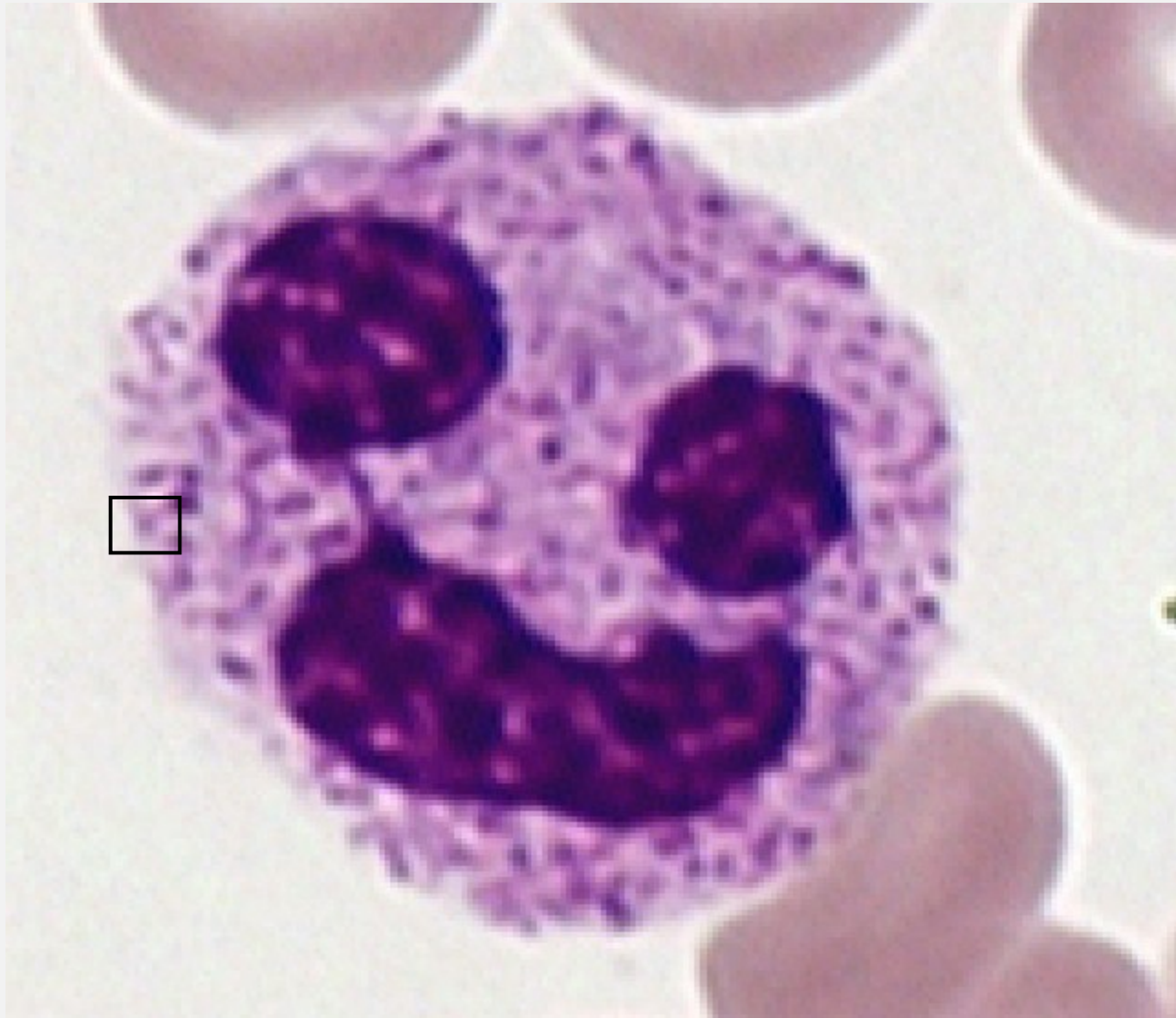
A small neutrophil granule can be readily resolved by a high quality lens and is projected across 16-25 pixels on a CCD chip





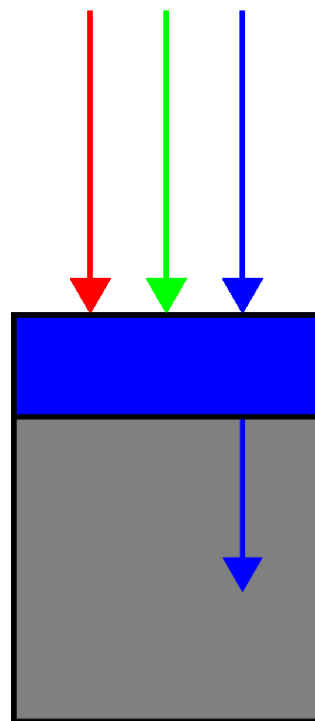
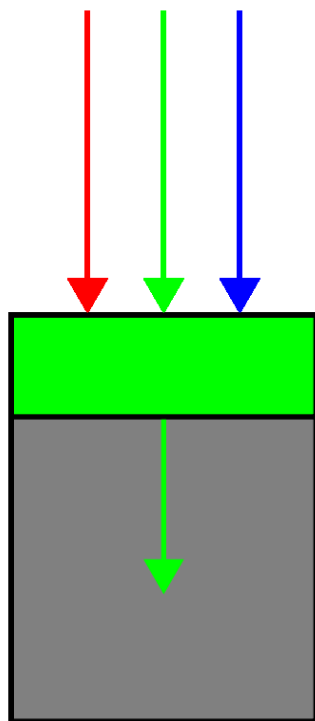
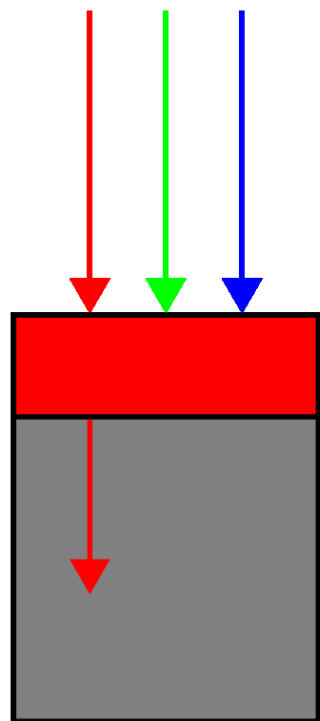






Your stain (photographed appropriately) should resolve small neutrophil granules as distinct structures: standard materials should allow you to ask the question is my stain adequate

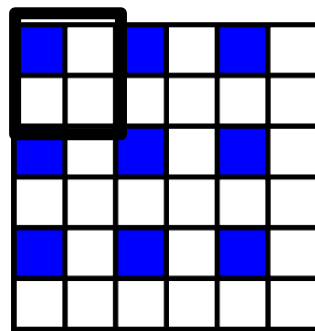
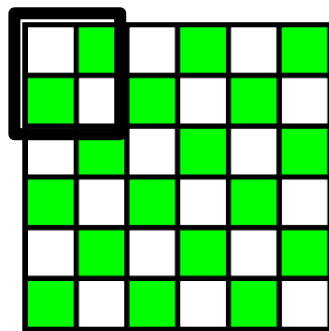
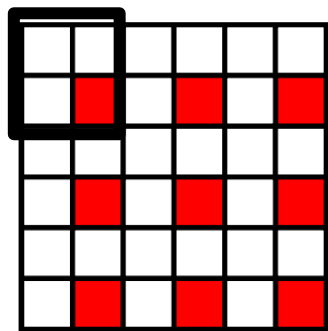
Assessing stain colour



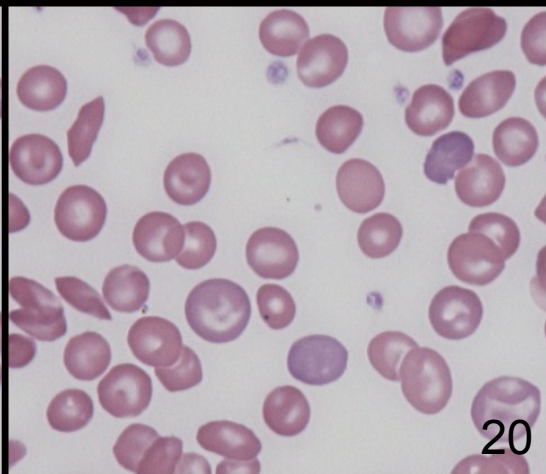
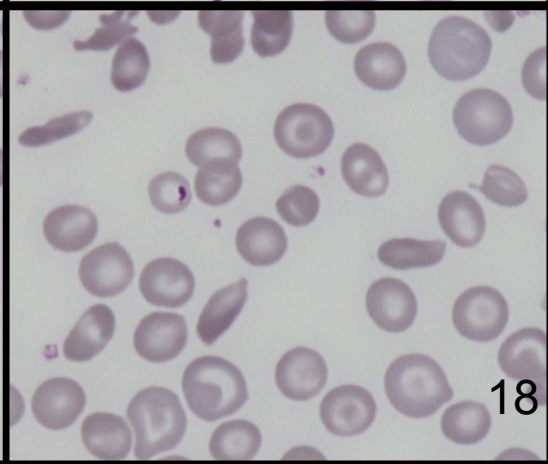
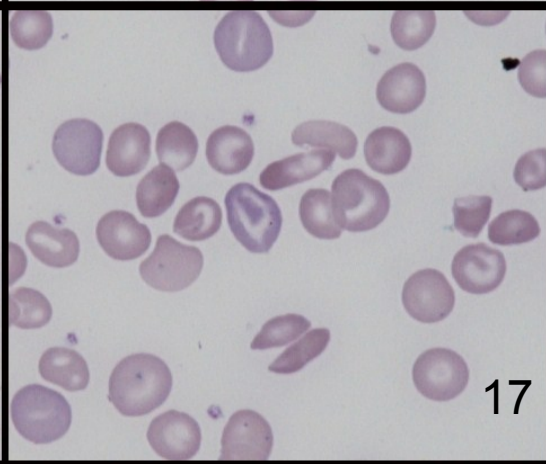
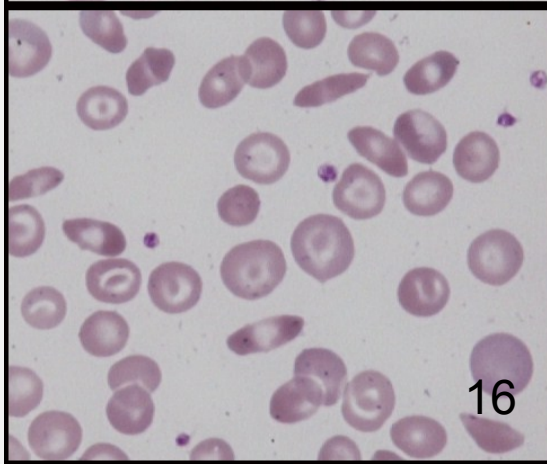
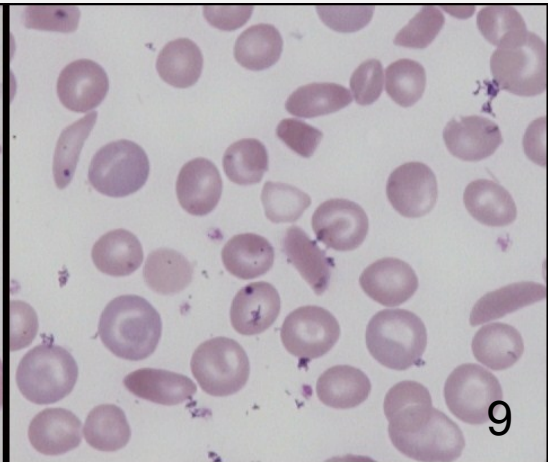
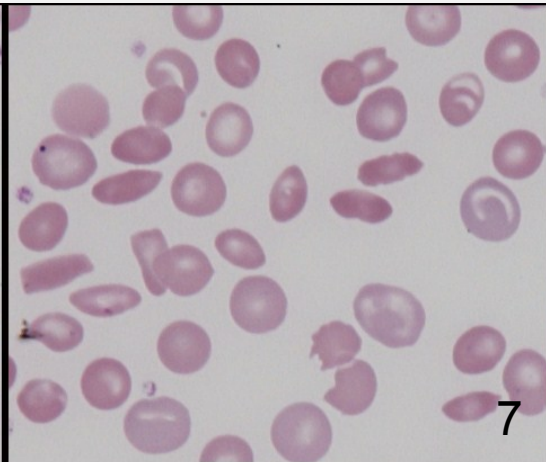
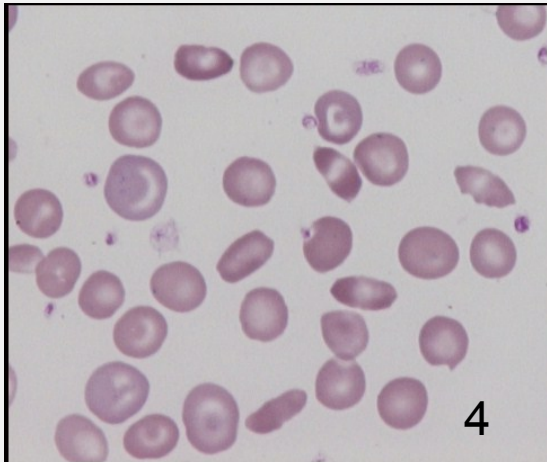
Incoming light

filter layer

Sensor array



Resulting pattern



Open ▾

eLive

Quick

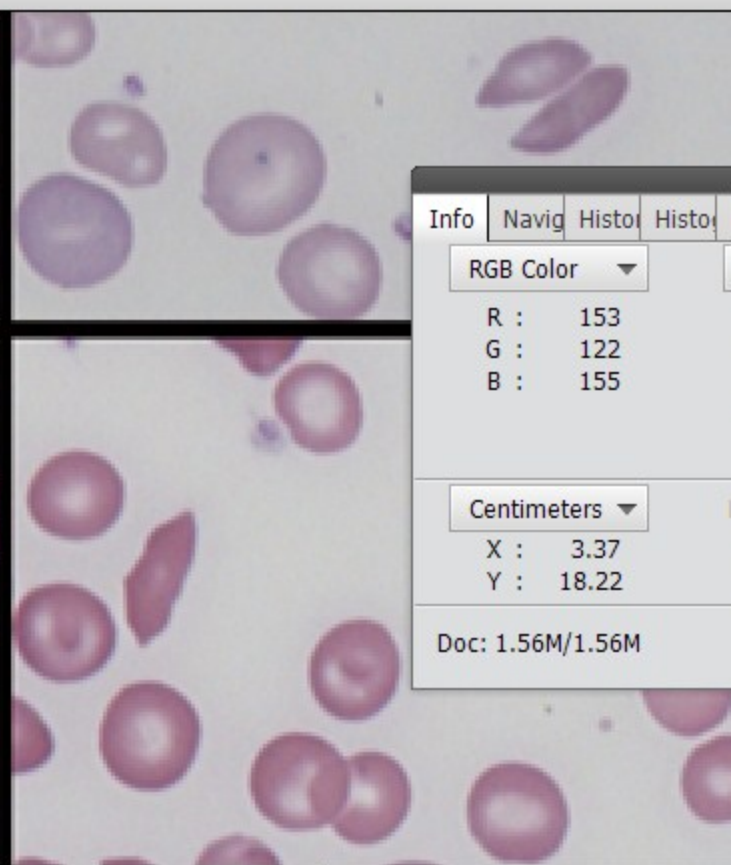
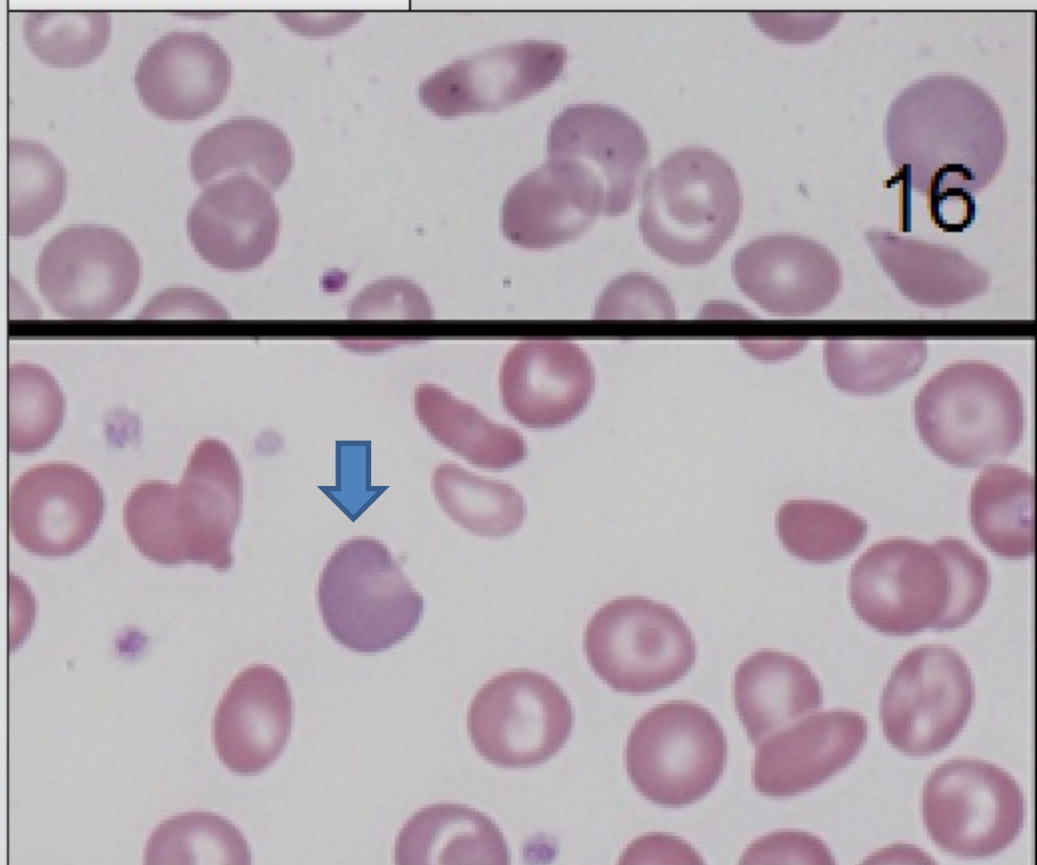
Guided

Expert

Untitled-1 @ 200% (RGB/8) * x

Tools palette:

- Search, Hand
- Move, Crop
- Zoom, Magic Wand
- Layers, Eraser
- Fill, Stamp
- Watercolor, Blur
- Brush, Clone
- Eraser, Gradient
- Text, Pencil
- Selection tools



Info panel:

Info	Navig	Histo	Histo
RGB Color ▾			
R :	153		
G :	122		
B :	155		
Centimeters ▾			
X :	3.37		
Y :	18.22		
Doc: 1.56M/1.56M			

200%

Doc: 1.56M/1.56M

Magic Wand

Magic Wand tool options:

- Sample All Layers
- Contiguous
- Anti-aliasing

New button with document icons

Tolerance: 32

Refine Edge...

Open ▾

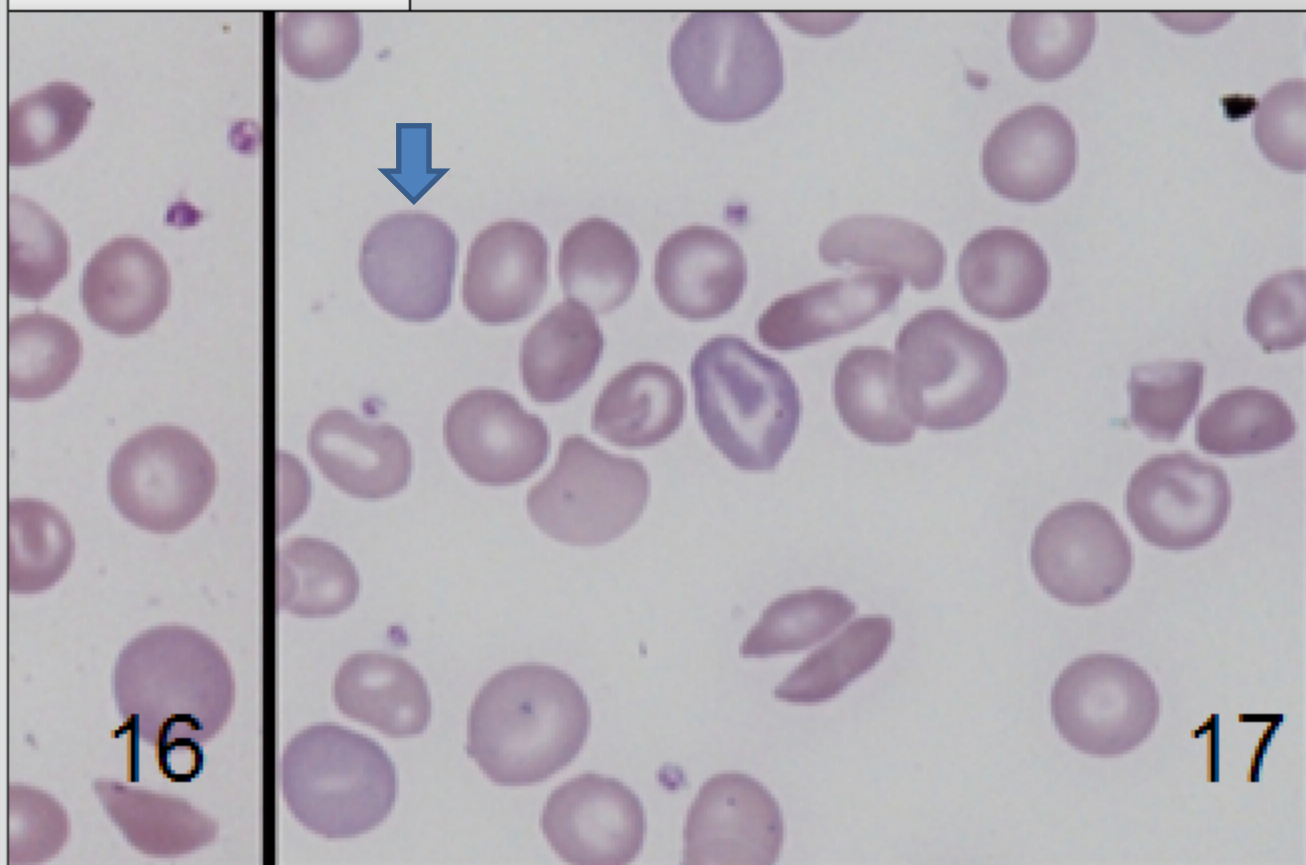
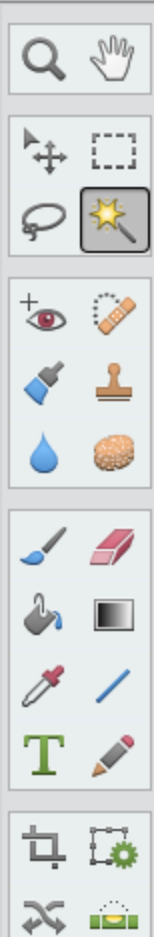
eLive

Quick

Guided

Expert

Untitled-1 @ 200% (RGB/8) * x



16

17

Info	Navig	Histor	Histo
RGB Color ▾			
R :	164		
G :	152		
B :	170		
Centimeters ▾			
X :	10.30		
Y :	10.14		
Doc: 1.56M/1.56M			

200% Doc: 1.56M/1.56M

Magic Wand



New

Tolerance: 32

Refine Edge...

- Sample All Layers
- Contiguous
- Anti-aliasing

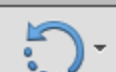


Photo Bin

Tool Options

Undo

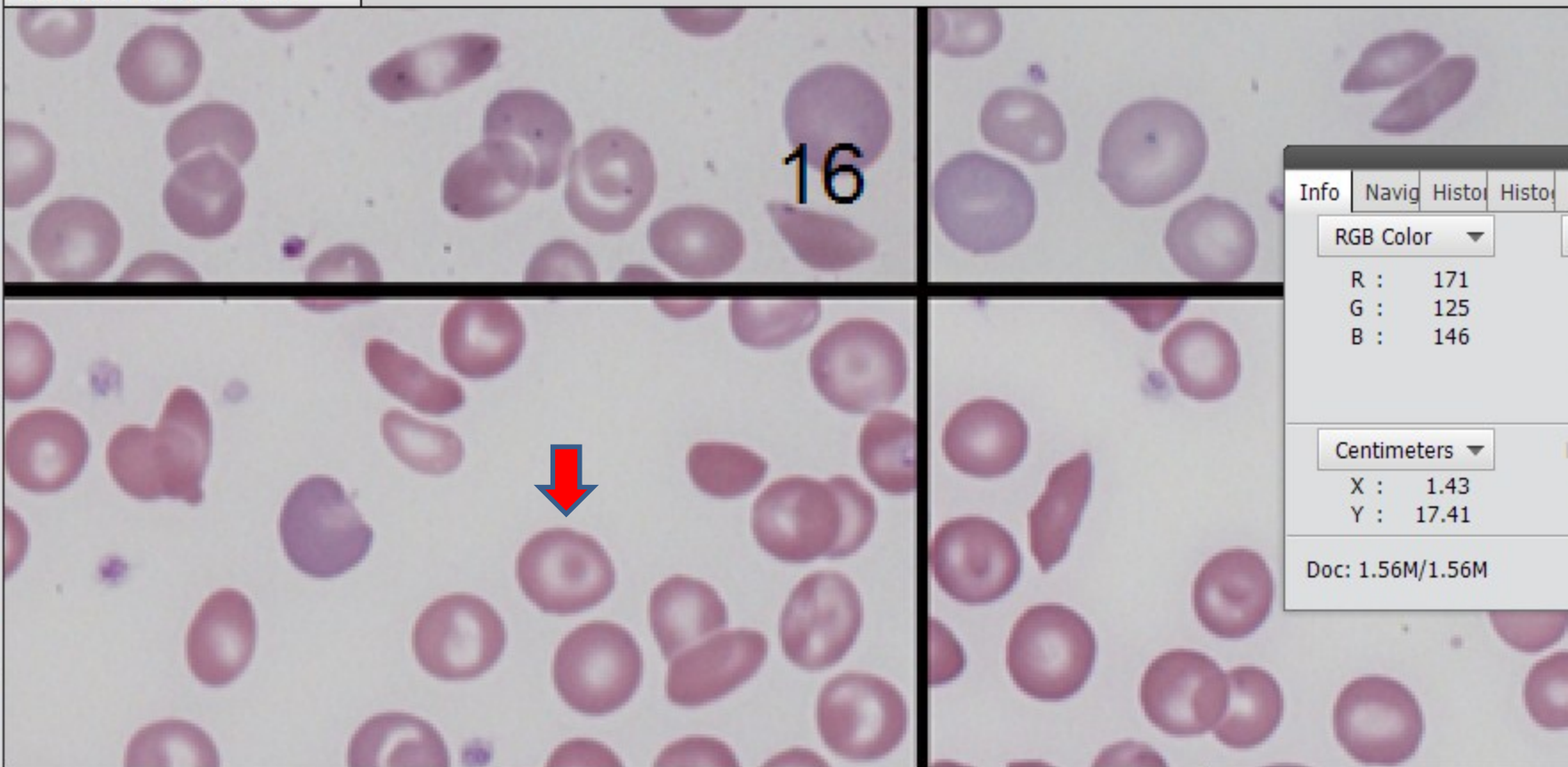
Redo

Rotate

Layout

Organizer

Untitled-1 @ 200% (RGB/8) * x



Info Navig Histor Histor

RGB Color ▾

R : 171
G : 125
B : 146

Centimeters ▾

X : 1.43
Y : 17.41

Doc: 1.56M/1.56M

200% Doc: 1.56M/1.56M

Magic Wand



Tolerance: 32

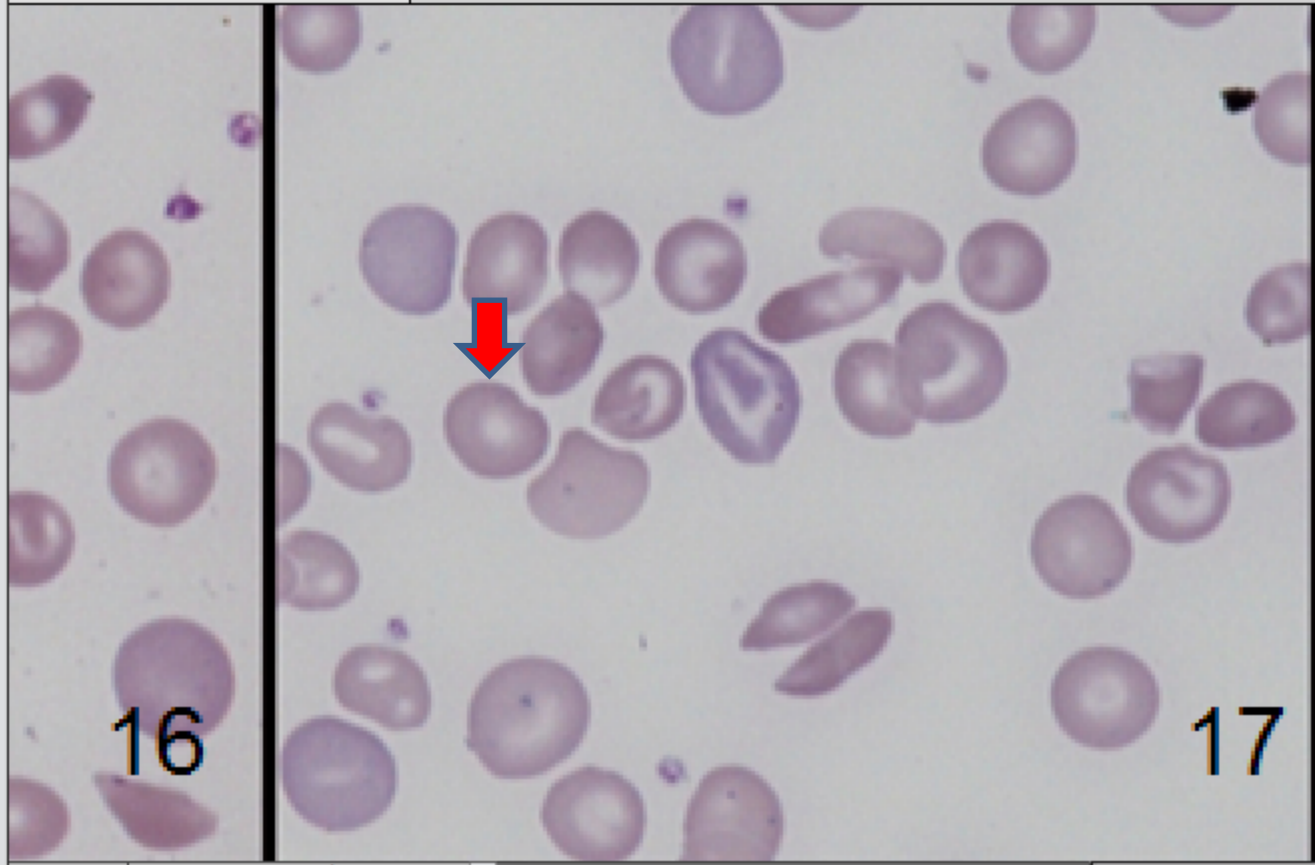
Refine Edge...

- Sample All Layers
- Contiguous
- Anti-aliasing

Untitled-1 @ 200% (RGB/8) * x

Tools palette containing icons for:

- Search and Hand
- Selection tools (Lasso, Rect, Polygon, Magic Wand)
- Layers (Eye, Hide, Lock, Hide All, Show All)
- Fill (Color, Pattern, Gradient)
- Painting (Brush, Pencil, Eraser, Rubber Stamp)
- Text (Text, Paragraph)
- Transform (Move, Rotate, Scale, Skew, Perspective, Distort)



Info panel showing color and position data:

Info	Navig	Histor	Histor
RGB Color			
R :	160		
G :	146		
B :	167		
Centimeters			
X :	10.60		
Y :	10.57		
Doc: 1.56M/1.56M			

200% Doc: 1.56M/1.56M

Magic Wand

Magic Wand tool options:

- Sample All Layers
- Contiguous
- Anti-aliasing

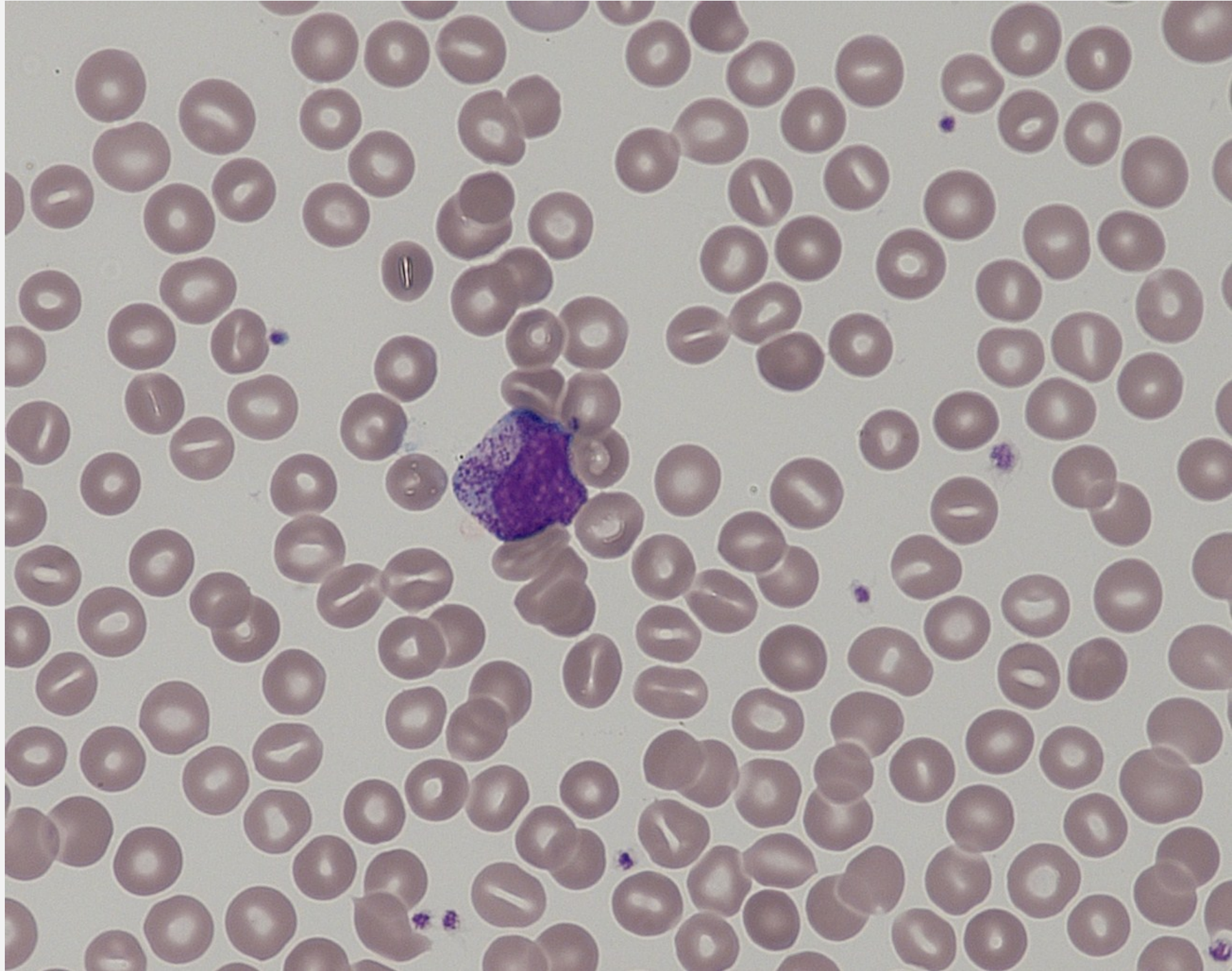
New button with document icons

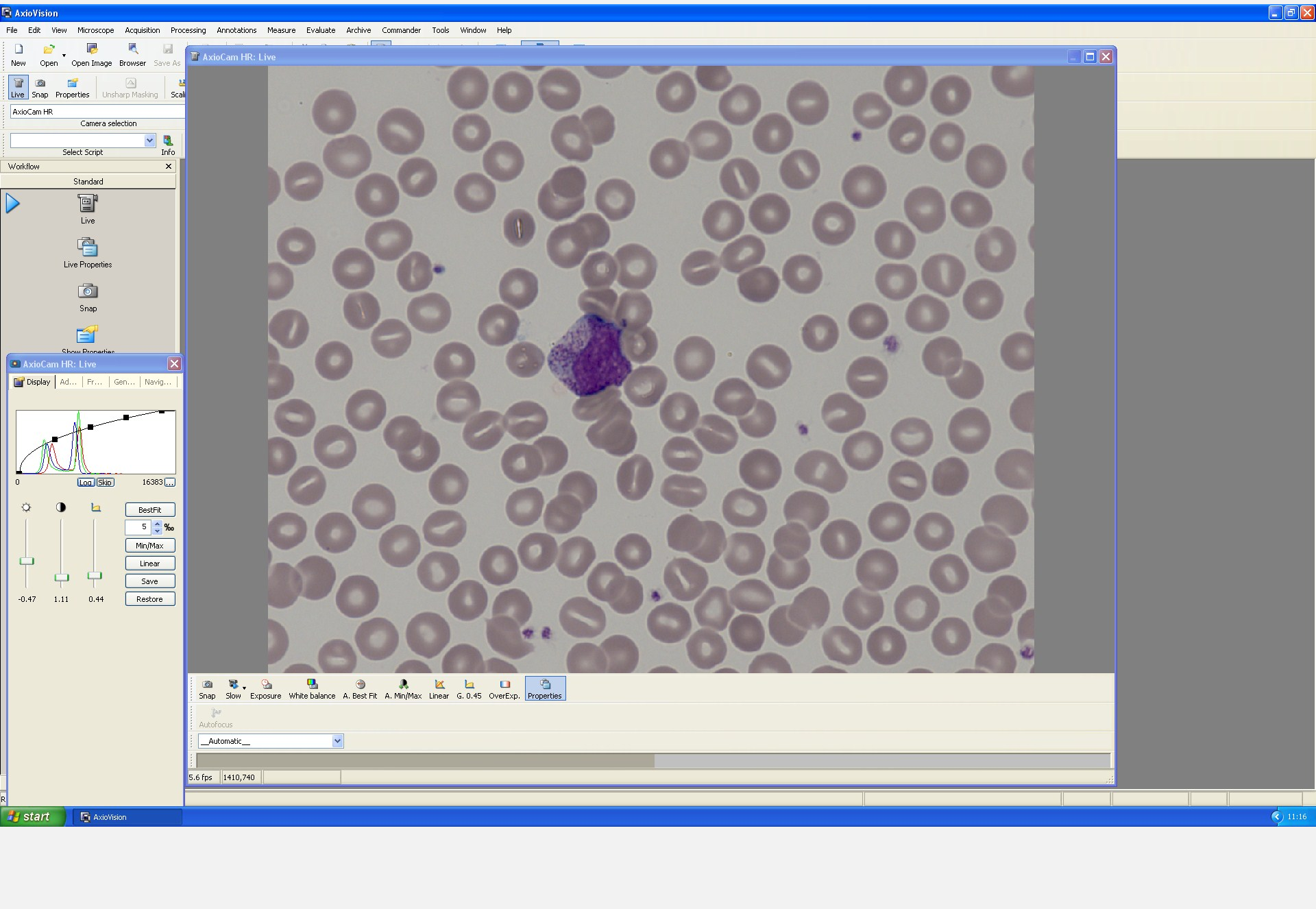
Tolerance: 32

Refine Edge...

Rubbish out

Assessing the microscope and monitor







COLOR SWATCHES STYLES

ADJUSTMENTS MASKS

Add an adjustment

- Levels Presets
- Curves Presets
- Exposure Presets
- Hue/Saturation Presets
- Black & White Presets
- Channel Mixer Presets
- Selective Color Presets

LAYERS CHANNELS PATHS

Normal Opacity: 100%

Lock: Fill: 100%

Background



COLOR SWATCHES STYLES

ADJUSTMENTS MASKS

Add an adjustment

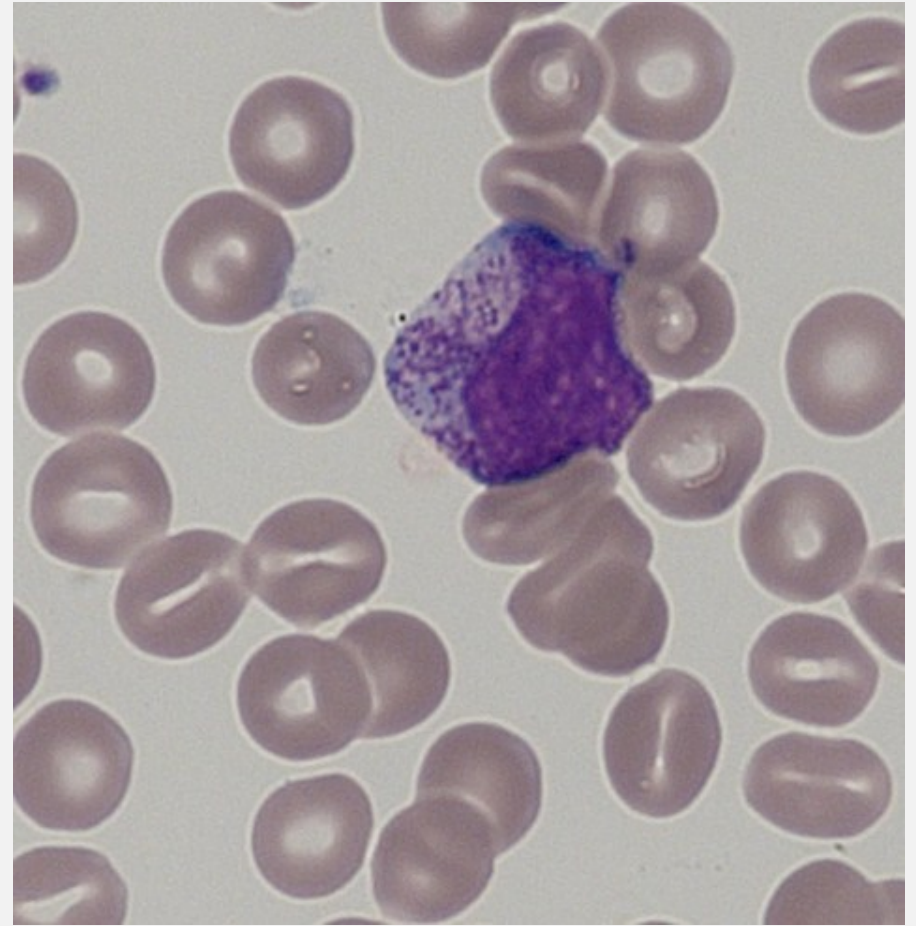
- Levels Presets
- Curves Presets
- Exposure Presets
- Hue/Saturation Presets
- Black & White Presets
- Channel Mixer Presets
- Selective Color Presets

LAYERS CHANNELS PATHS

Normal Opacity: 100%

Lock: Fill: 100%

Background



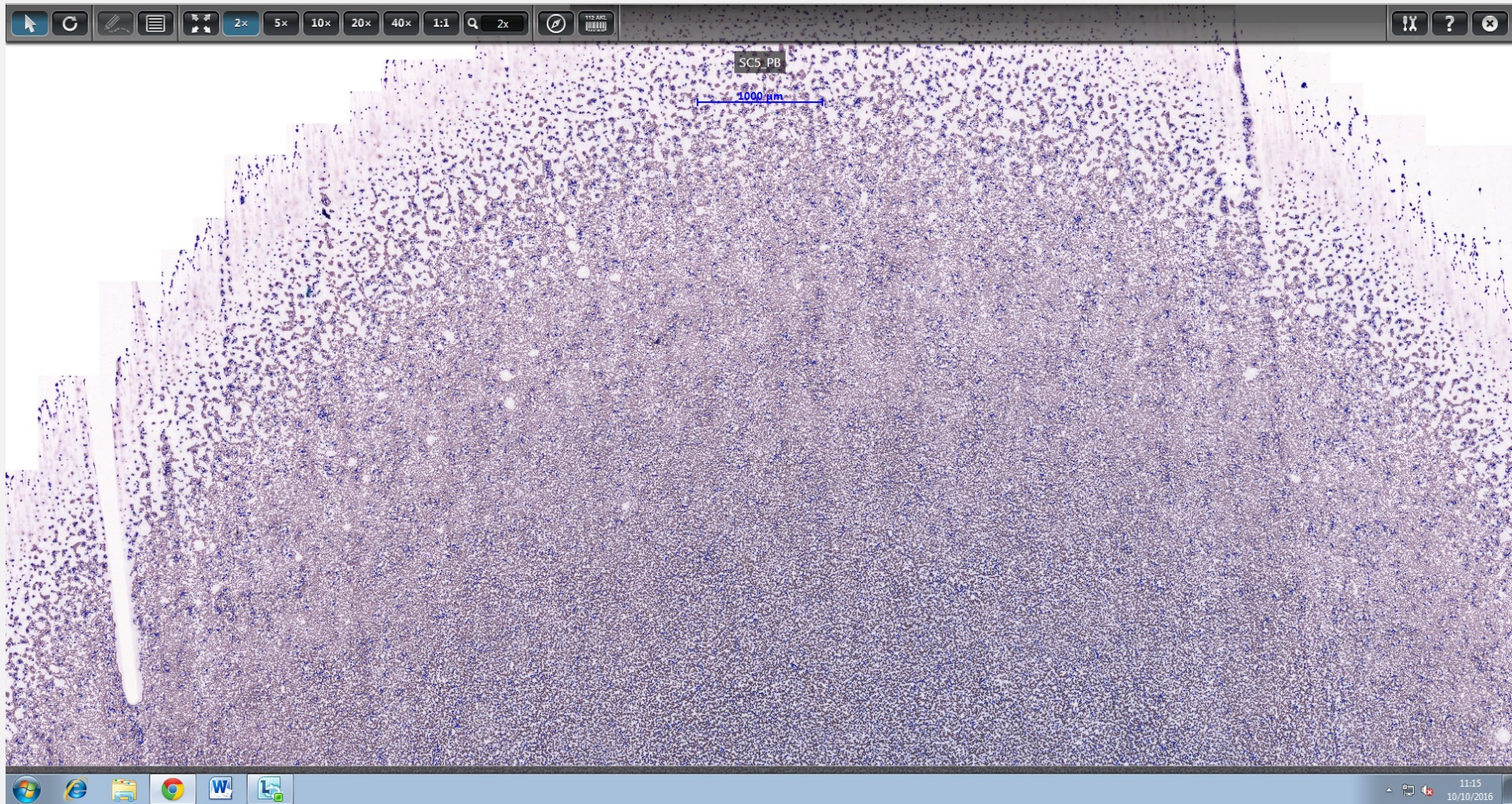
Provision of a standard – well fixed preparation allows assessment of imaging quality – lens, camera, monitor: MINIMUM STANDARDS

For radiology quality is simple – minimum electronic image and monitor standards

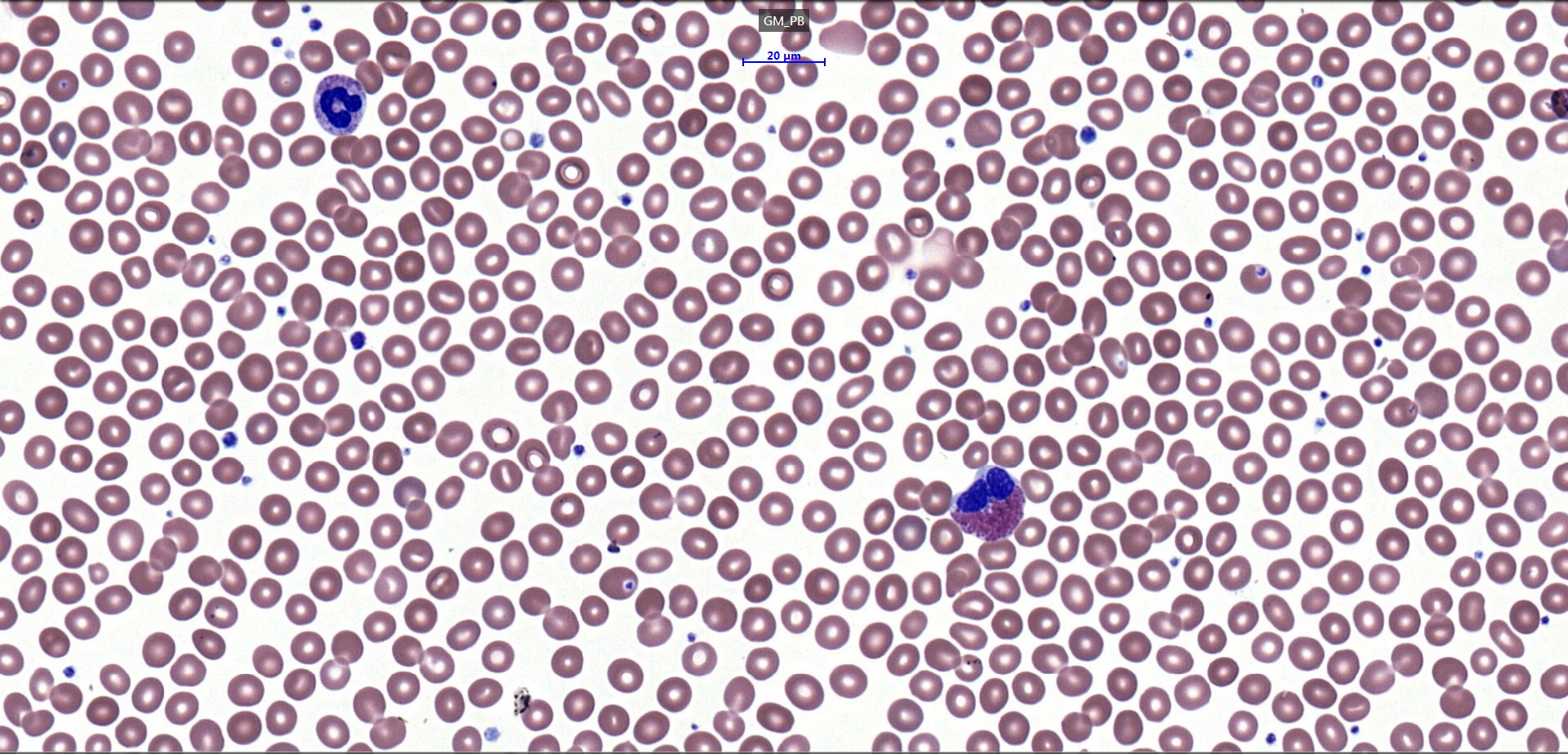
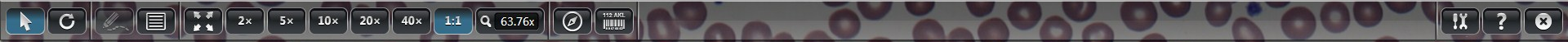
For haematology more is required – there are a range of largely uncontrolled factors out there – should we address them?

If asked why did you report that image – what do you say?

Looking at the bigger pictures

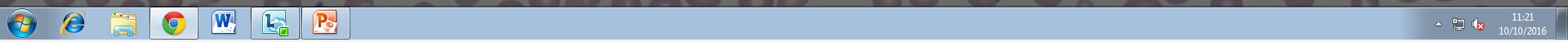


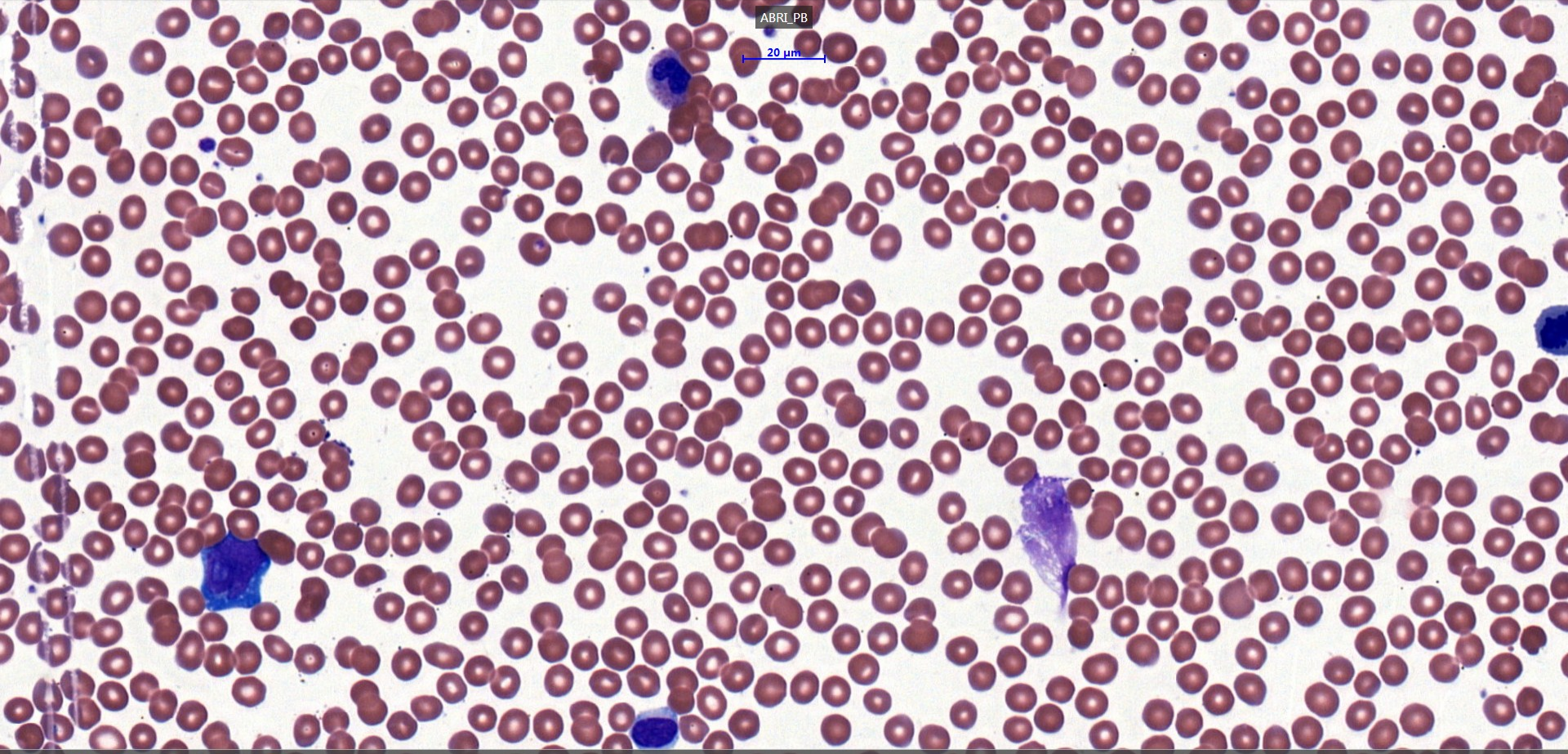
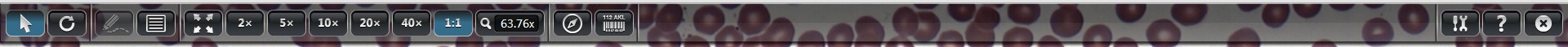
TRADE OFFS: Do we really need a whole slide? How much manipulation? Focus and plane?



GM_PB

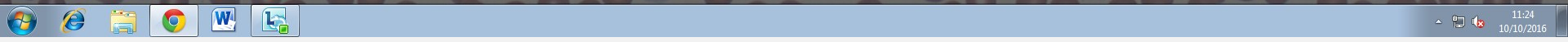
20 μ m





ABRI_PB

20 μ m

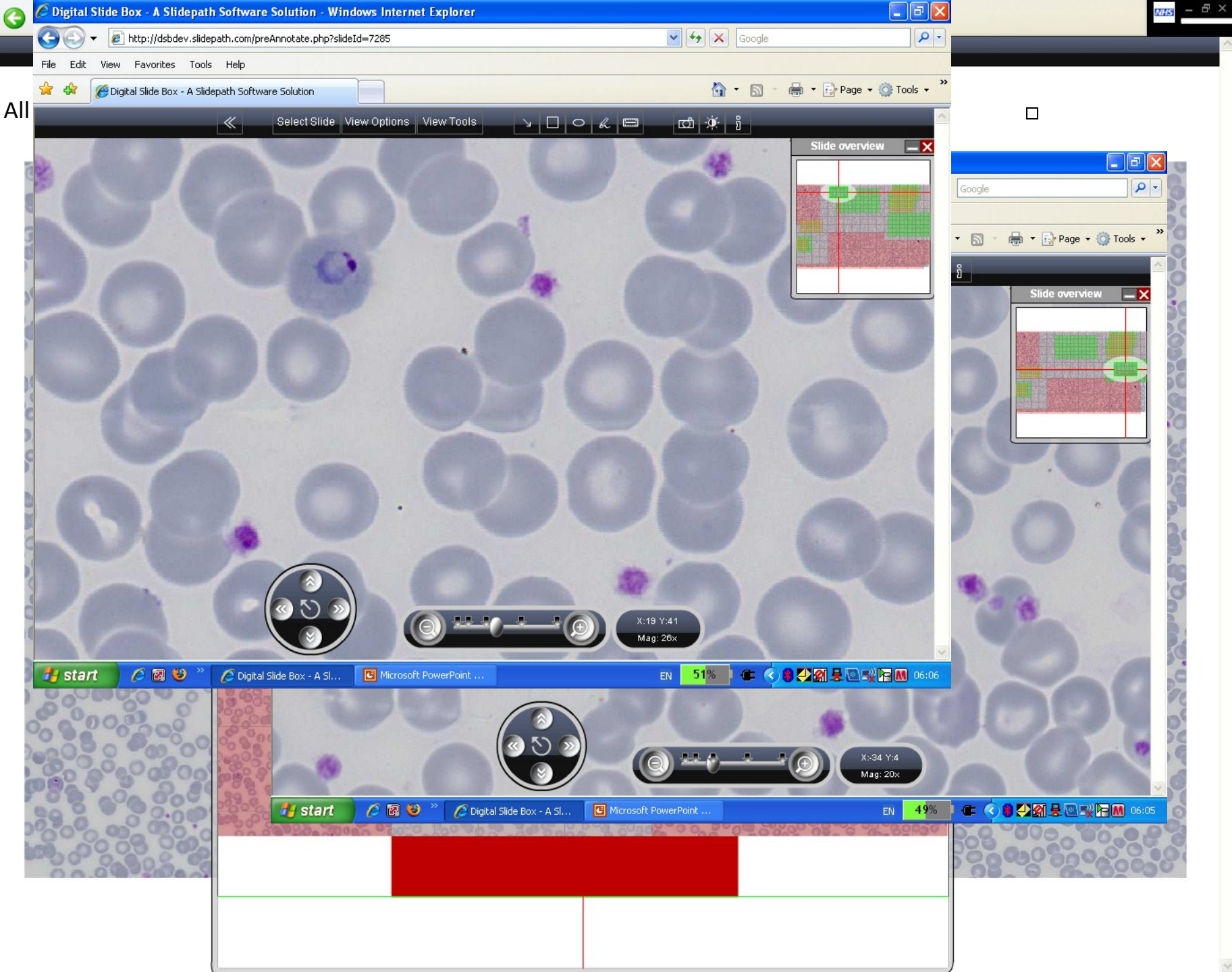


Added value

1. Am I right?
2. Where did I go wrong?
3. Can I get help?

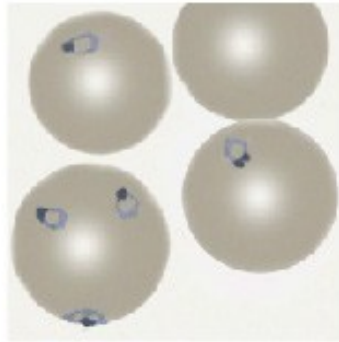
A microscopic view of a blood smear. The field is dominated by numerous red blood cells, which appear as small, pinkish-purple discs. In the center, there is a single, larger cell with a dark purple, granular cytoplasm and a nucleus that is partially obscured by the granules. A white text box with the question "Is this a blast?" is overlaid on the right side of the image. The background is a light, uniform color.

Is this a blast?

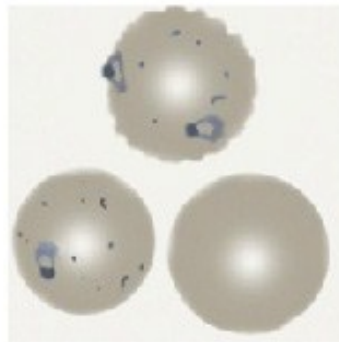


All

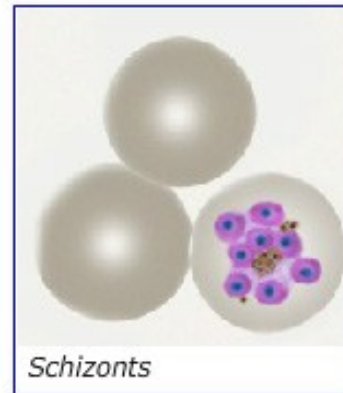
Plasmodium falciparum - Quick diagnosis guide



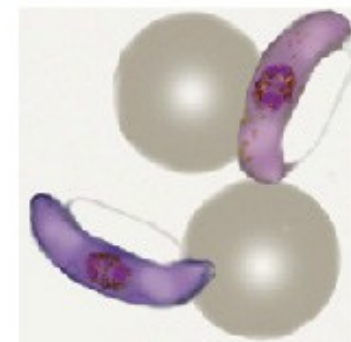
Early trophozoites



Late trophozoites

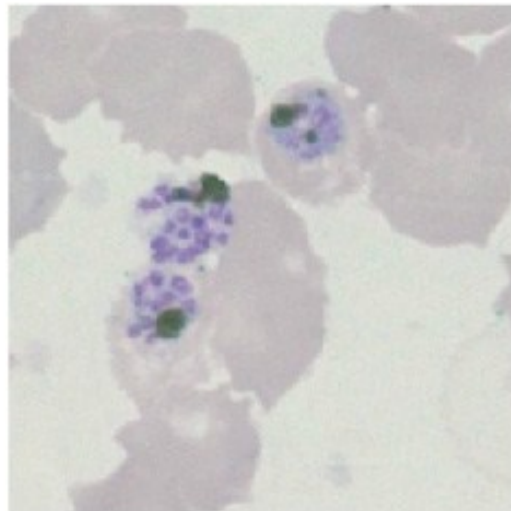


Schizonts



Gametocytes

Schizonts



CHARACTERISTICS

Erythrocytes: Not enlarged

Parasites: 8-16 loosely arranged merozoites

Added dots: Maurer's dots and clefts

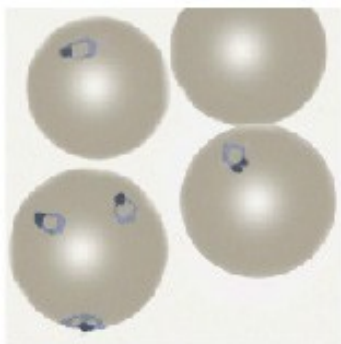
Pigment: Clumped, may be central or peripheral

Notes: Rare in peripheral blood except in severe infection



Blood Cell Gallery Homepage

Plasmodium falciparum



Early trophozoites

Welcome to the Peripheral Blood Gallery, a collaboration between Manchester Metropolitan University, The World Health Organization and the United Kingdom National External Quality Assessment Scheme for General Haematology (UKNEQAS (H))



Gametocytes

Schiz



UK NEQAS
Haematology and Transfusion

argued

ly

dots

may be

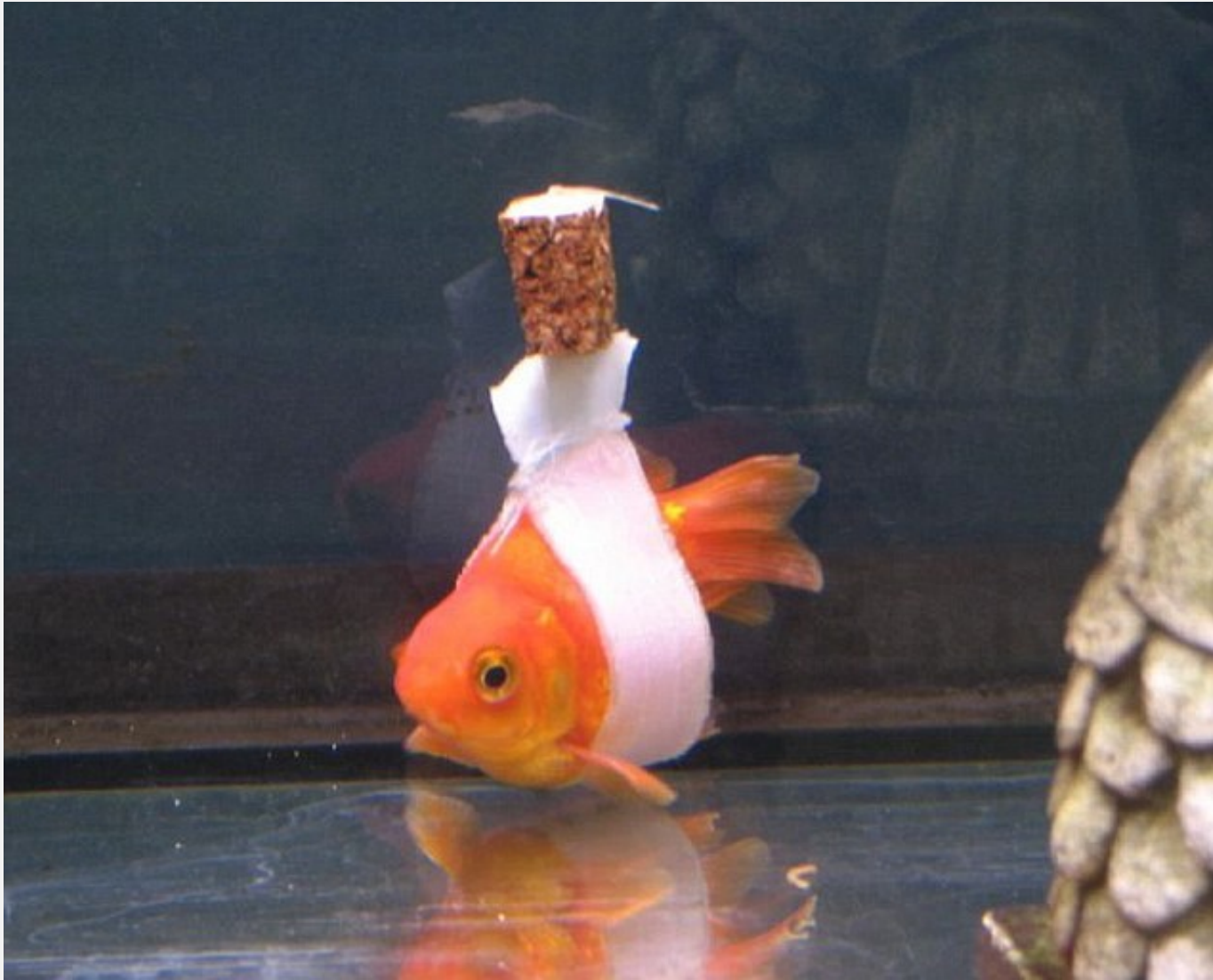
eral blood
tion

John Burthem 2011

Enter



Finally.....



Not just because we can



The permanent record

HERE'S TO
Flexible
WORKING



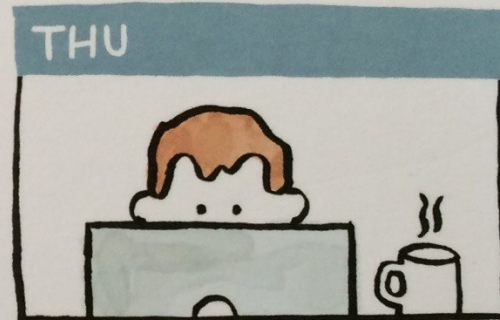
Why travel in, when you can dial in.
High quality, no-fuss conference calls anytime, anywhere.

POWWOWnow

Conference Calling

Lifestyle choices

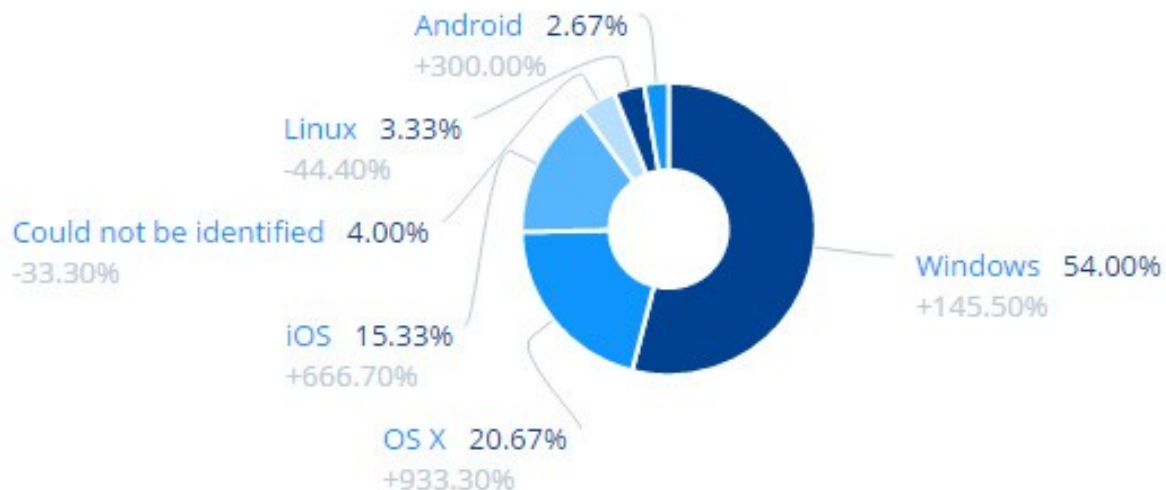
SOCIAL CALENDAR



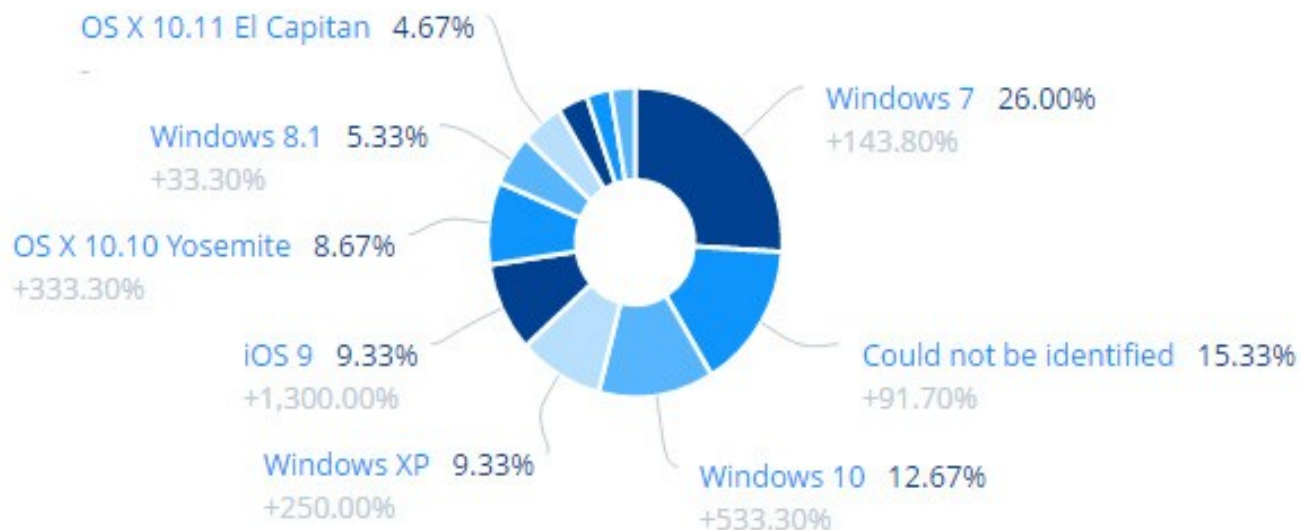


Lifestyle choices

Operating systems (by impressions)



Operating system versions (by impressions)



Summary

Quality is our responsibility and our friend - we can use DM to drive this:

- Sample quality
- Equipment quality
- Added features
- Decision support
- Personal audit

Note

- There is a patient at the end of the system
- A poor system is not your friend
- Quality can support you