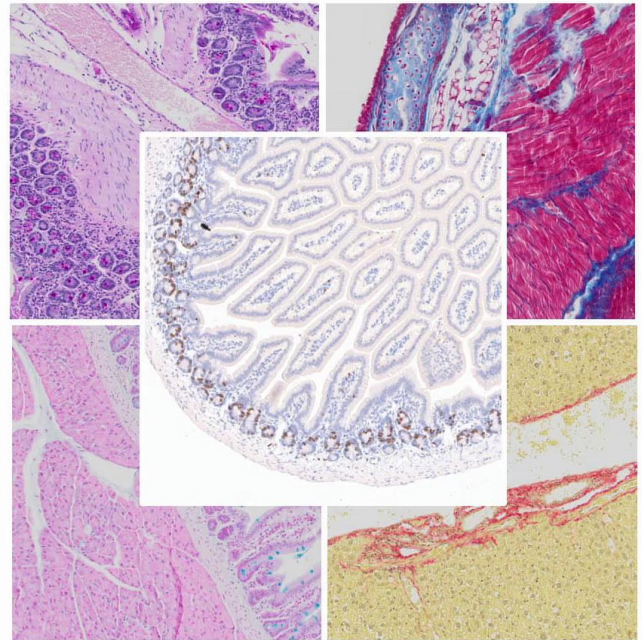


(Immuno)histochemistry Staining



Hello there! Histochemistry and ImmunoHistochemistry Stainings are widely used and very colorful.

Notes

Summary



0m 05s



- Color & Color Models
- Color Deconvolution
- Whole Slide Image Analysis

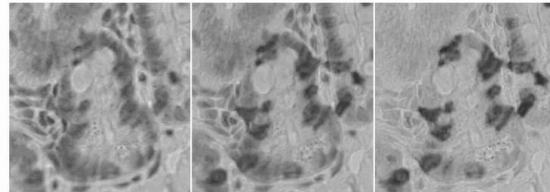
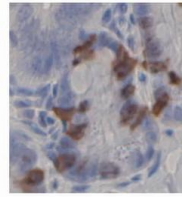
In this video, we will look one more time to colors, and more precisely to some color spaces, different from the classic RGB. Then we'll have a look to the Color Deconvolution principle, before we conclude with a new challenge uprising in the last years: the Analysis of a Whole Slide Images.

Notes

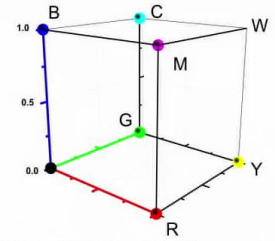
Summary



0m 12s



R, G, B



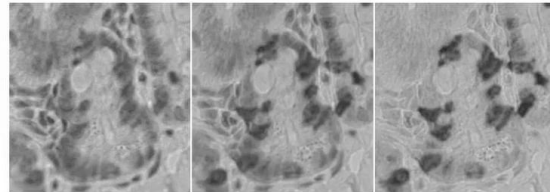
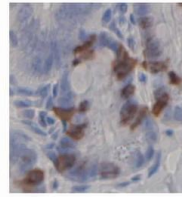
You are now familiar with the RGB color space that defines an image in Red, Green and Blue components.

Notes

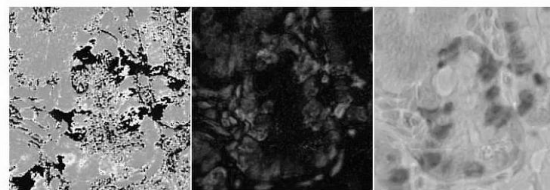
Summary



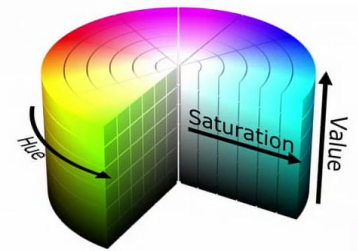
HSB (Hue, Saturation, Brightness)



R, G, B



H, S, B



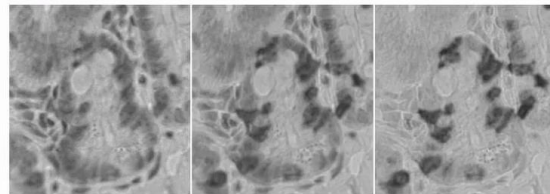
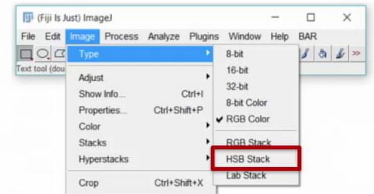
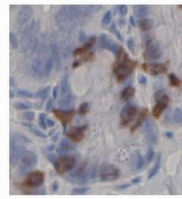
But other Color Spaces exist, like the HSB (also called HSV for Hue, Saturation and Brightness or Value). Instead of a cubic color space, we now have a cylindrical one. With the Hue (the color if you prefer) as an angle, The saturation (purity of the color) as the radius, and the Brightness (or the value between dark and bright as the height. You can see the result of such a decomposition and you can appreciate how easy it is to get the Cell (with higher saturation) and the Brown signal (the Darker pixels in the Brightness component).

Notes

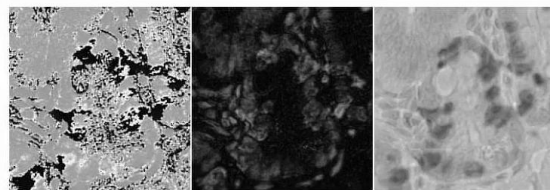
Summary



0m 41s



R, G, B



H, S, B

This transformation can be found in Fiji in the menu 'Image>Type>HSB stack' You will also find here another converter, to the Lab color space.

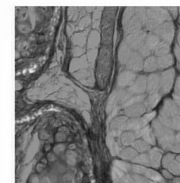
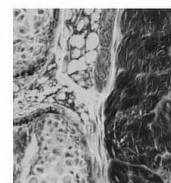
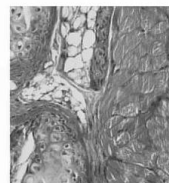
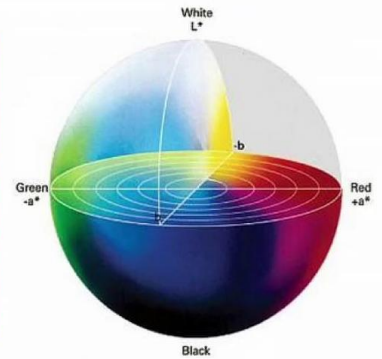
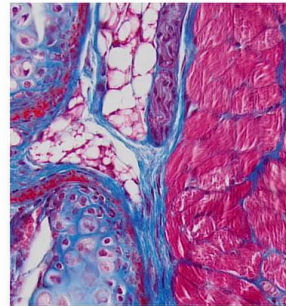
Notes

Summary



1m 25s

LAB (Luminance, A, B)



L, A, B

In that case, it can be seen as a sphere. One arbitrary diameter, we set a Green to Red gradient, on an orthogonal diameter, a yellow to blue gradient. And finally, on the last orthogonal diameter, a white to black gradient. This Color space can be useful for some images like the one here. It's a Masson Trichrome that highlights Collagen fibers in blue, and cells, like muscle cells, in red.

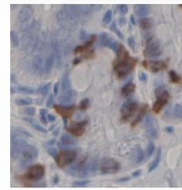
Notes

Summary



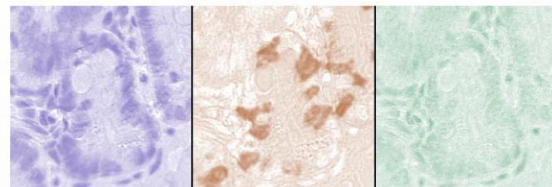
1m 38s

Colour Deconvolution



Colour deconvolution: H DAB

Colour_1 R: 0.6500286, G: 0.704031, B: 0.2860126
Colour_2 R: 0.26814753, G: 0.57031375, B: 0.77642715
Colour_3 R: 0.7110272, G: 0.42318153, B: 0.5615672



Color1,
Color2,
Color3

- Sensitive to :
 - Defined Vectors
 - White balance

An alternative to this “simple” color space transformation is the Color Deconvolution. It will decompose the image you have into 3 different colours of your choice. Here you can see how it is efficient to extract the blue and the brown component. Nevertheless, there is are a couple of factors to consider. Indeed, this method is sensitive to the vectors you used. And, as a consequence, the White Balance is also important.

Notes

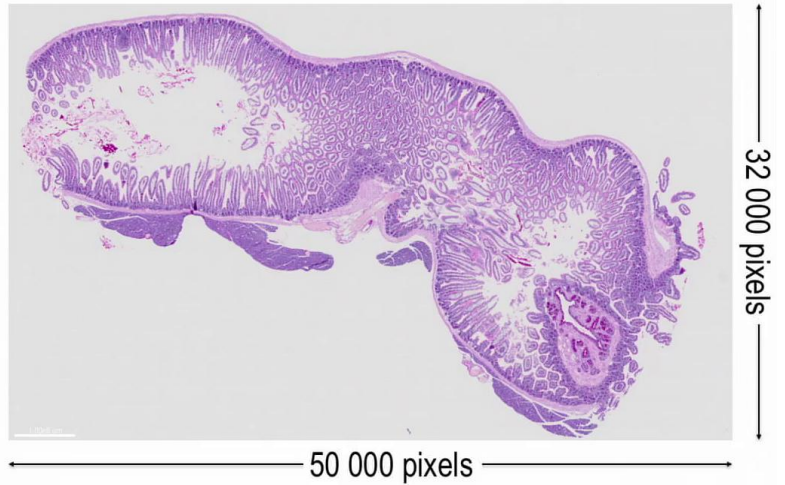
Summary



2m 08s

Whole Slide Images

40x Objective



1.6×10^9 pixels

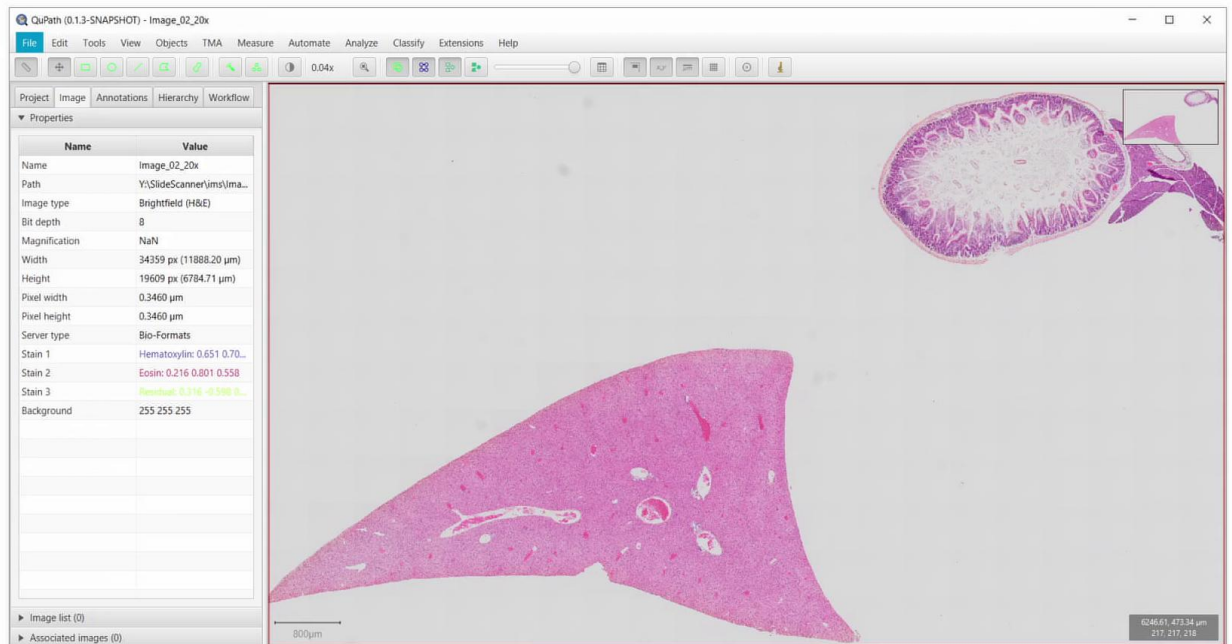
Nowadays, specialized microscopes (often call whole slide scanners) are accesible and can generate gigantic images. For example, this sample (a mouse intestine), acquired with a 40x objective, will generate an image containing around 1.5 Billion Pixels in a single plane. which is beyond what ImageJ was built for.

Notes

Summary



2m 37s



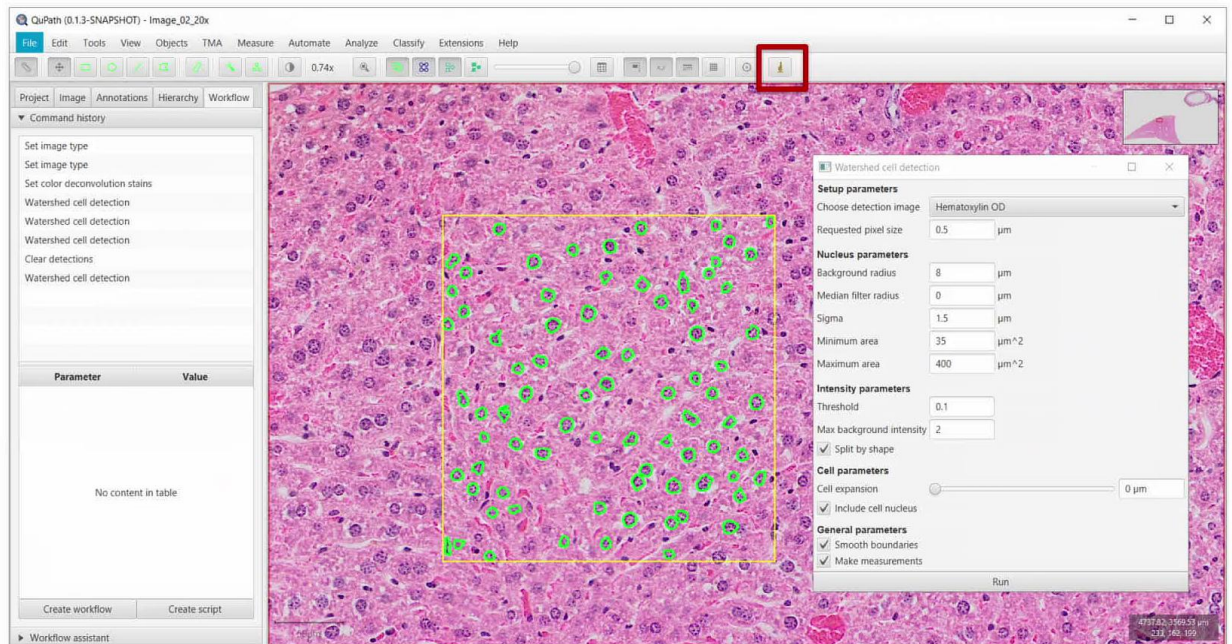
Fortunately, some other tools exist, like QuPath. It's an Open-Source software, freely available.

Notes

Summary



3m 01s



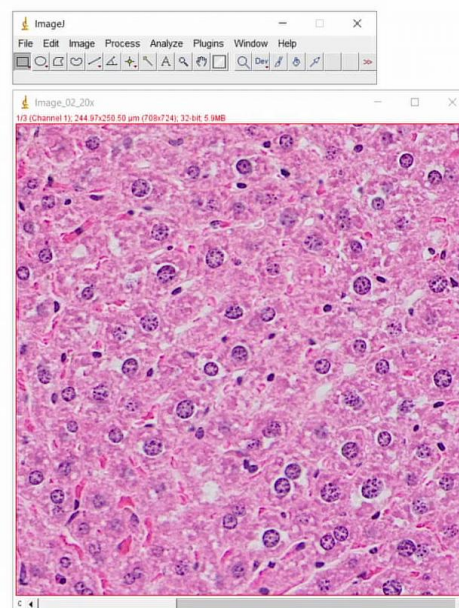
Using this tool you can define a region, also named Annotation; and you can detect individual cells with a dedicated plugin, as Detections.

Notes

Summary



3m 08s



You can also send a small piece of your image to ImageJ, and even use Macro Language scripts if the processing you want to do is not already implemented in QuPath.

Notes

Summary



3m 19s

Conclusion



- Color Space
 - HSB
 - Lab
- Color Deconvolution
 - Own Vectors
 - Color Balance
- Whole Slide Image with QuPath
 - Very Large Image
 - Interoperability with ImageJ

That's all for this video. We saw that other Color Spaces exist and can be efficient to separate different colors in different colored images. We had also a look to the Colour Deconvolution Plugin, and saw the pros and cons. Finally, we saw that QuPath can be a good tool when you have to deal with Whole Slide Images that are now existing. See you and take care.

Notes

Summary



3m 30s