

## Topic 05 – Brightness and Contrast Adjustments

### Solution 5.1 – Linear display-adjustments

a)



Figure 1: The input image for the b&c-adjustment.

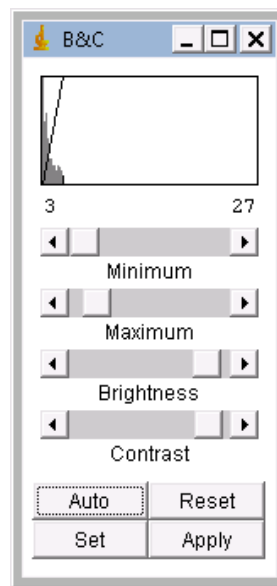


Figure 2: The brightness and contrast adjustment-tool.



Figure 3: The image after brightness and contrast have been adjusted.

- b) Changing the brightness only affects the display. The measured values remain the same (399804).
- c) Pressing the apply-button will replace each gray-value in the image by the displayed intensity. The intensity-value measured now is different (2937972 if the auto-adjustment is used, i.e. min=3 and max=27).
- d) Pressing the auto-button multiple times will augment the contrast more and more. After it reaches a maximal it drops down to the initial value again. When selecting different regions the auto-adjustment has a different result. It takes into account the histogram of the selection and applies the adjustment to the whole image. If you have an image with large background regions you should select a region with mainly foreground and a little bit background to get a good auto-adjustment.
- e) Moving the brightness slider in a direction moves the line into the opposite direction. Moving the contrast slider to the the right will result in a bigger slope and moving it to the left in a smaller slope.



f) Level 15 and window 20 corresponds to min 5 and max 25.

### Solution 5.2 –Non linear display-adjustments

a)

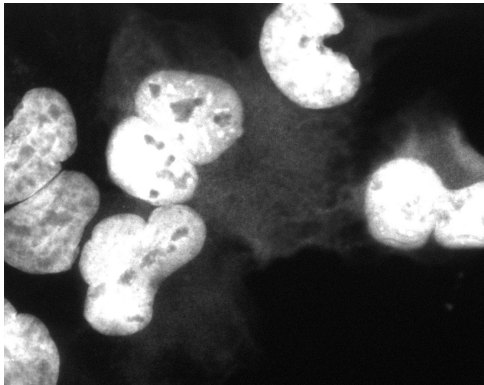


Figure 4: A linear adjustment saturates high values before low values become visible.

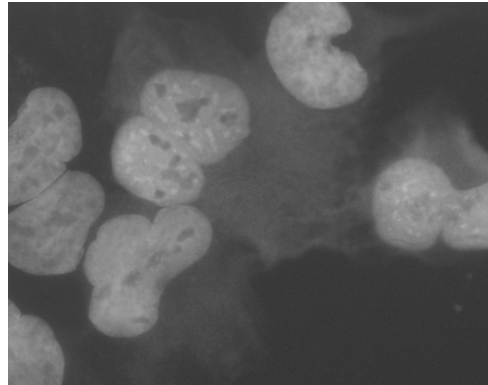


Figure 5: A gamma-correction can augment low values more than high values.