

A photograph of a lush aquarium. The foreground is dominated by a dense cluster of bright green, lanceolate leaves, possibly a species of Sagittaria or similar. In the lower-left corner, there are several thin, grass-like blades. To the right, there are plants with reddish-brown, serrated leaves. In the background, there are taller, feathery plants with a yellowish-green hue. The water is dark, and the overall scene is vibrant and detailed.

Digital Photography and the Aquarium

By Mike Cameron

Dallas - Fort Worth
Aquatic Plant Club

Overview

- Why *digital* photography?
- What is important in choosing a camera?
- How do you make good images?
- Digital darkroom tips and tricks



Why Digital?

- The downside – high initial cost
 - Camera
 - Memory cards
 - Camera accessories (flash, tripod, adaptors)
 - Computer (if you don't already own one)
 - The technical learning curve
 - Electronics are always cheaper tomorrow



Why Digital?

- The upside
 - Speed
 - Quick turnaround, which promotes fast learning
 - Easy to experiment
 - Low cost after initial investment
 - No film costs
 - Don't pay for "bad" pictures
 - Technology has matured, less likely to become obsolete



What's Important

- Megapixels Megapixels Megapixels
 - The measure of how many pixels make up the sensor in a camera
 - Higher megapixels = more detail and larger prints
 - Higher megapixels means more storage is required, both in your flash card (“digital film”) and hard drive
 - 3 MP camera is a good compromise for most people between print quality, storage, & cost, but purchase as high as your budget allows
 - 5-6MP is the best in consumer level digital cameras
 - 6-14MP is state-of-the-art in professional grade gear



Resolution and Printing

- It is generally accepted that you need 300dpi (dots per inch) for a high quality print, although some experts indicate 200 to 240dpi is enough.
- 2 MP = 1600 x 1200 image size in pixels
 - $1600 / 300 = 5.33$ inches
 - $1200 / 300 = 4.00$ inches
 - 2MP will make excellent 3x5 or 4x6 prints
- 3MP = 2160 x 1440 -> 7.2 x 4.8 inches
 - Excellent 5x7, Good 8x10
- 6MP = 3072 x 2048 -> 10.24 x 6.82 inches
 - Excellent 8x10



Digital Film

- How does the camera store its files
 - Compact flash, SmartMedia, SecureDigital, MemoryStick (Sony), floppy disk, CD



- Floppy disks sound appealing, but are too restricting. The camera applies too much compression to fit images on the disk, and image quality suffers
- You will want a larger flash card than provided with the camera – at least 64MB or 128MB



What's Important

- Macro focus capability (get close to your subject)
- External flash
 - allows you to move the flash away from the lens and prevent reflections
 - Either use flash in hot-shoe or on off-camera cord
- Fast Aperture lens
 - allows you to use a faster shutter speed in low light to prevent motion blur
 - F/2.8 is fast . . . F/5.6 is slow
- Adjustable ISO (sensitivity to light)
 - Increasing ISO allows you to take pictures in lower light, but you will see more noise in the picture



How to make good images

- The common sense stuff
 - Clean the glass, inside and out! You won't see the spots on the camera's tiny review screen.
 - Turn off the filter (prevents water/plant movement)



This picture looks good on my monitor, but when I printed it, it showed a lot of areas where I missed cleaning algae off of the glass!



Flash Reflections

- Flash Reflections
 - Keep the lens close to the glass
 - Keep the flash away from the lens



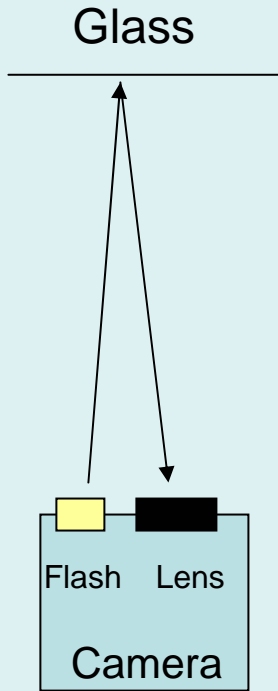
This was my first digital camera, a 3.3 megapixel Nikon Coolpix 990. It is a great camera with excellent macro capability, but the flash is very close to the lens. When the flash is used, it often shows up as a bright “starburst” in the glass.

Flash Reflections

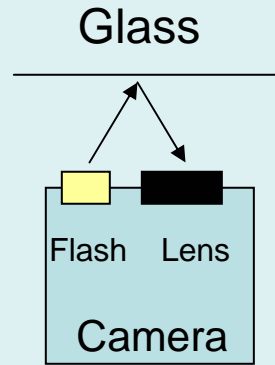
My current camera, a Canon D60 digital SLR, has an external flash. This allows the flash to be a large distance from the lens, and thus minimizes the flash reflection seen with the Coolpix 990.



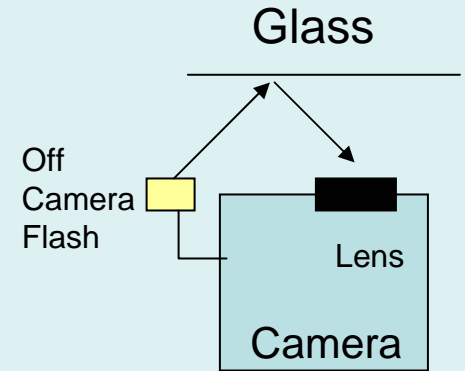
Flash Reflections



Flash close to lens
Lens far from glass
Bad



Flash close to lens
Lens close to glass
Better



Flash far from lens
Lens close to glass
Best Case



Reflections

- Other reflections and distortions
 - Keep the room dark to minimize other reflections (windows, room lights, etc)
 - Make sure the aquarium hood is tight and not “leaking” light
 - Shoot straight through the aquarium glass (out of focus areas and the “rainbow” effect)
 - Thinner glass = less distortion



Reflections



Not too bad, but I missed the reflections of the window behind me when I took this image.

50mm lens

F/8.0

1/30sec

ISO400

Camera on Tripod

Flash over top of tank



Reflections

Here is my setup for the picture on the previous page.

1. Flash on top of tank w/diffuser
2. Camera near glass



How to make good images

- Use a tripod for stationary subjects to eliminate camera shake
 - Plants, Tanks, etc. . .
- Make sure your subject is parallel to the camera if you want all of it in focus.
- Take **lots** of pictures. . . Remember, they're **free!** Pro-photographers shoot 10's and 100's of images for a “keeper”



Exposure

- Exposure
 - **#1 Digital No-No:** Don't over-expose your images (i.e. make them too light)
 - If detail is lost in the white areas of your image, it is gone forever
 - If detail is under-exposed, you may be able to recover it using Photoshop levels and/or a contrast masking/digital blending technique.
 - Use the histogram review on your camera if it is available.



Exposure

- Automatic vs Manual Exposure
 - In automatic mode, the camera makes all of the decisions for you
 - If you learn to use the manual modes of your camera, you can control many more aspects of your images
 - Aperture mode (You select aperture, camera selects shutter speed)
 - Shutter mode (You select shutter speed, camera selects aperture)
 - Full Manual (You select both)



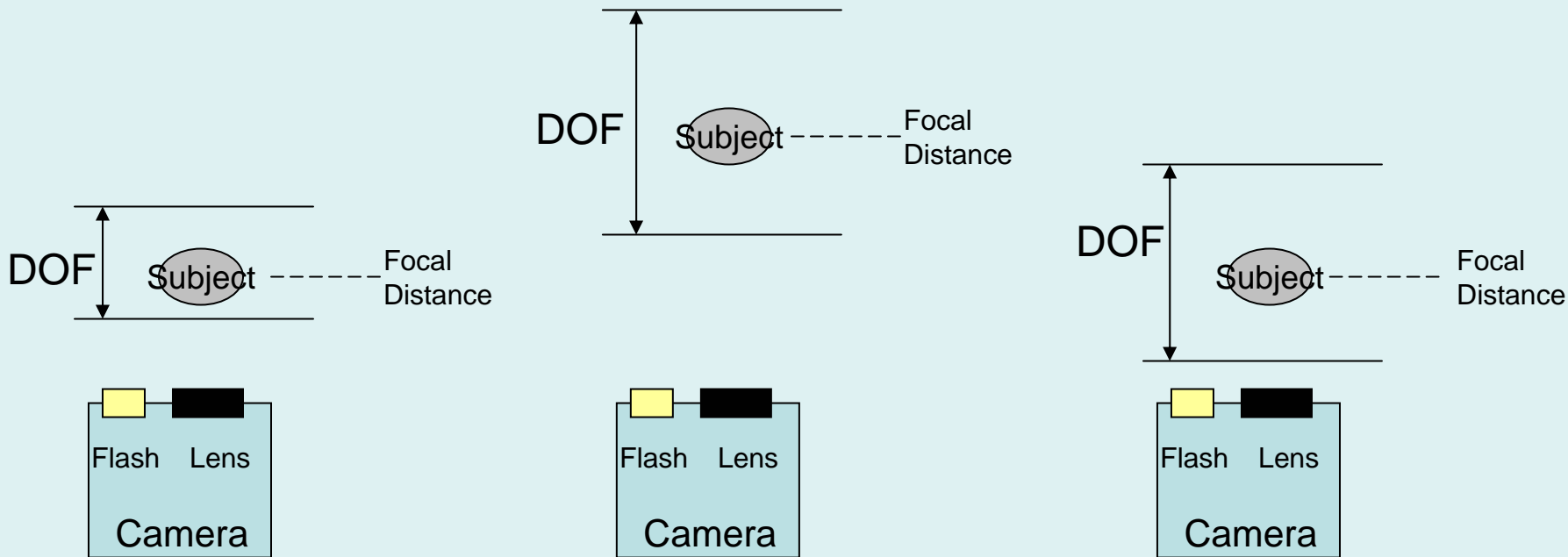
Aperture and Depth of Field

- Aperture controls the amount of light entering the camera
 - Wide apertures (around F/2.8) let a lot of light in and allow fast shutter speeds to stop the action, but have a small depth of field
 - Narrower apertures (F/4, F/5.6, F/8, . . .) restrict light, necessitating slower shutter speeds (fast objects blur), but have a larger depth of field



Aperture and Depth of Field

- DOF depends on distance to subject and aperture size
- Subjects in the range of DOF appear in focus



Wide Aperture (F/2.8)
Short Distance to Subject
Small DOF – Fast Shutter

Wide Aperture (F/2.8)
Long Distance to Subject
Larger DOF – Fast Shutter

Narrow Aperture (F/8)
Short Distance to Subject
Larger DOF – Slower Shutter



Aperture and Depth of Field



Aperture and Depth of Field



Aperture and Depth of Field



Aperture and Depth of Field

Ludwigia repens



As another demonstration of DOF, here is a picture of the aquatic plant *Ludwigia repens*. The top leaves are in sharp focus, while the lower leaves are progressively out of focus as the stem descends to the back of the tank.



Aperture and Depth of Field

Here is a picture of a black ruby barb. The shallow DOF draws attention to the eyes and mouth, given this a portrait-like quality. This is a common use of shallow DOF

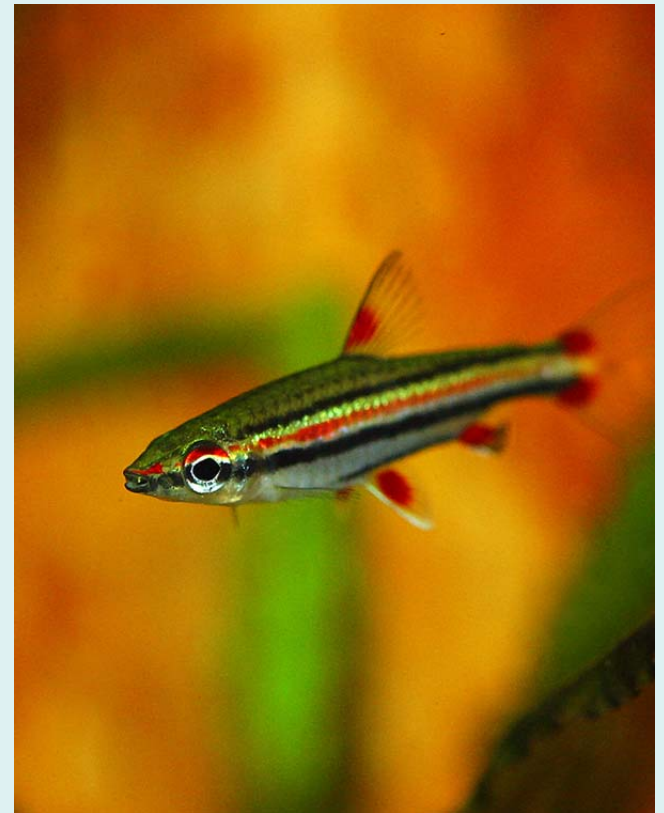


Aperture and Depth of Field



Here the fish, a three line pencil fish, is parallel to the camera, and is entirely in focus.

Which picture is better depends on your taste and the image's purpose.



Here the fish is at an angle to the camera, and only the eye and head are in sharp focus.



Aperture and Depth of Field

- When shooting with available light (i.e. no flash), I use aperture priority on my camera. In this mode, the user picks the aperture, and thus the depth of field, and the camera calculates the shutter speed in order to get a good exposure. I use the camera's exposure compensation dial to tweak the final output.
- When using an external flash, I usually use full manual mode on my camera to set both the aperture (for DOF) and shutter speed (to control blur), and the automatic exposure system powers the flash to light the scene appropriately. However, a flash has limits on the light it can produce, and this will limit your aperture and shutter speed settings.

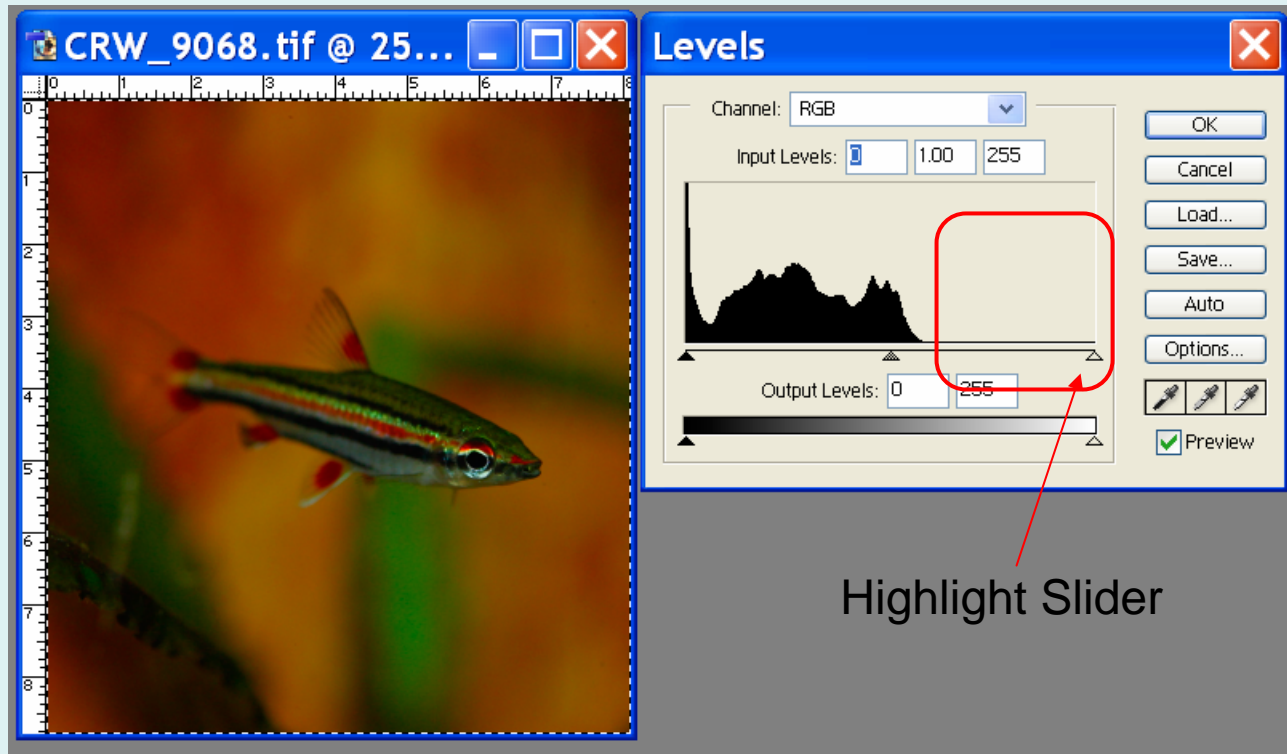


What about shutter speed?

- Choosing a small aperture for a large DOF means you will have a slow shutter speed
- Rule of thumb to avoid blur due camera shake:
Shutter Speed = $1/\text{focal length}$
 - 50mm lens means you want faster than $1/50\text{sec}$
- Use a tripod for stationary subjects
- Increase your ISO setting (the light sensitivity of your camera's sensor)
 - There is a downside to this. As ISO increases, noise also increases



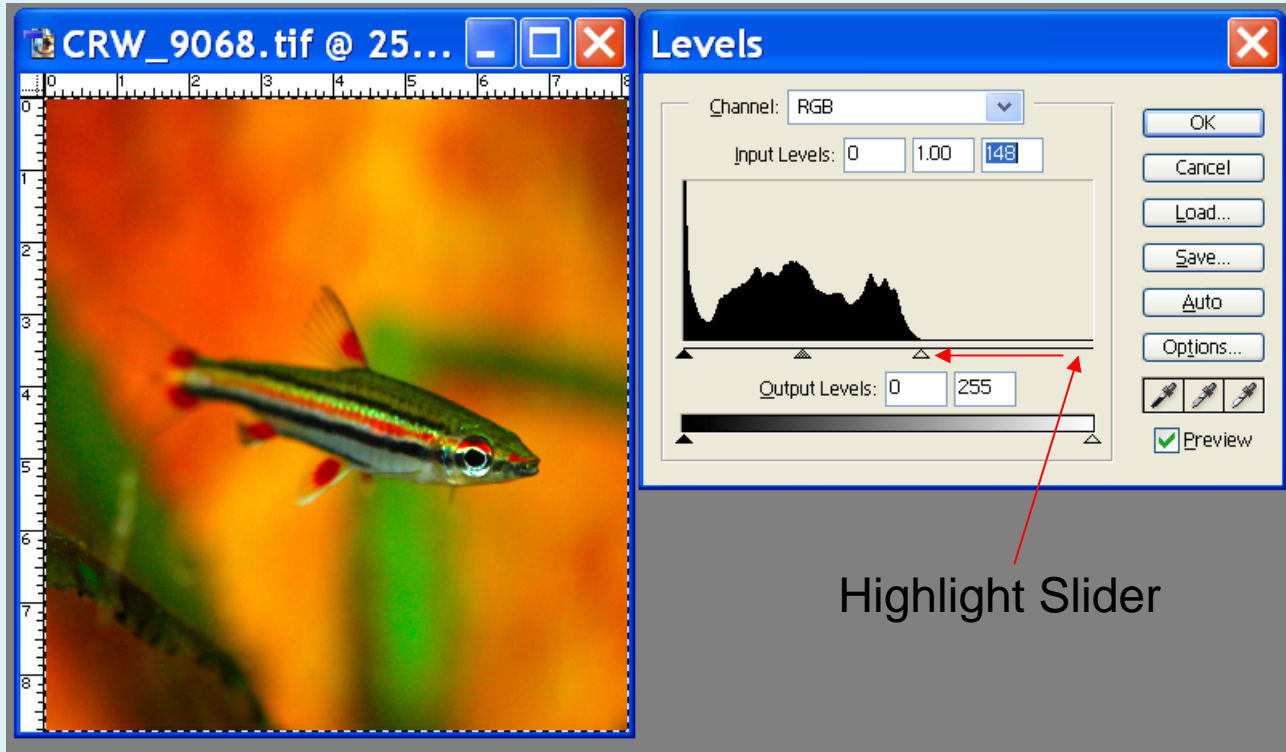
Photoshop - Levels



There are no colors in the upper end of the histogram, indicating the photograph is under-exposed. Sliding the highlight slider to the left will lighten the image.



Photoshop - Levels



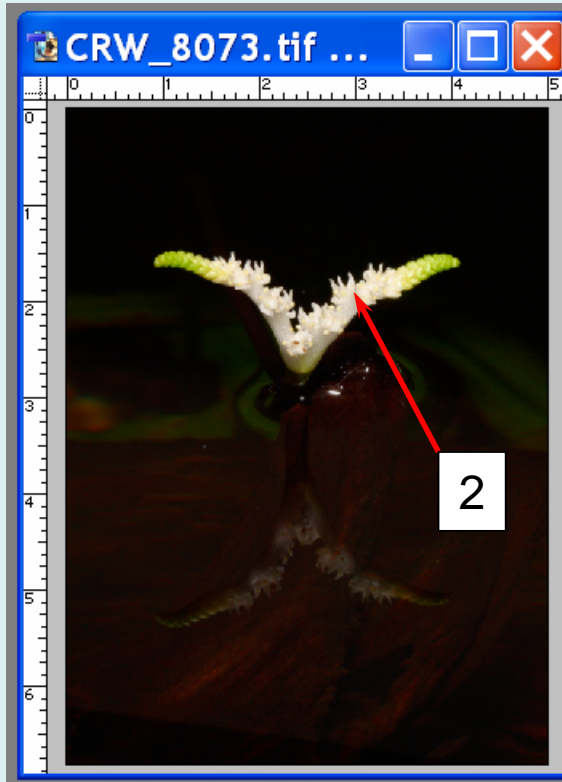
Highlight Slider

If there was a color cast to this image, we could click on the highlight eyedropper, and then click on an area in the image that was white (as in the next example).

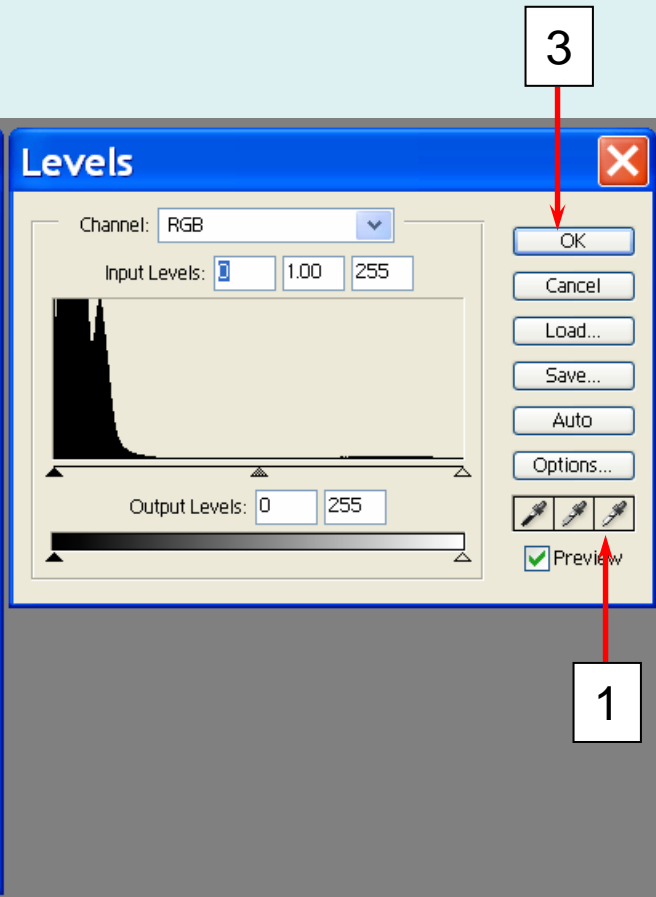
Photoshop - Levels

Removing a color cast using levels and a white area on the image

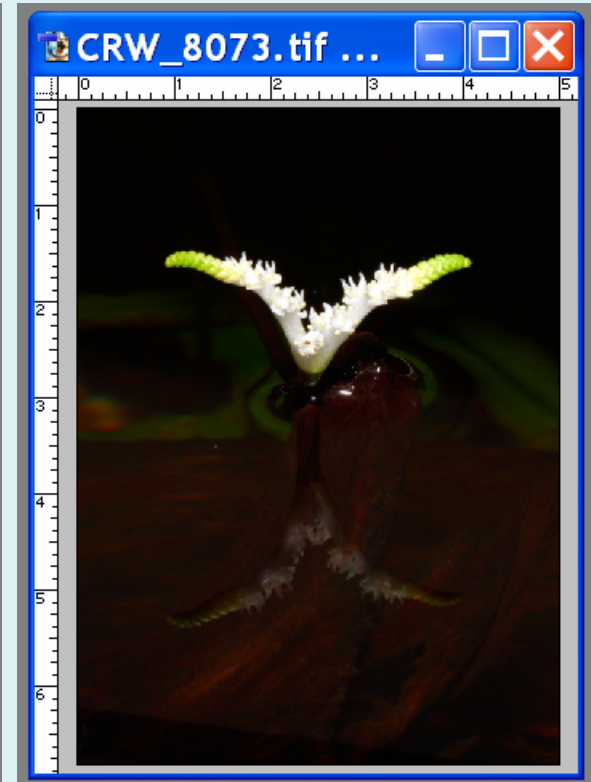
Before



Yellow Cast

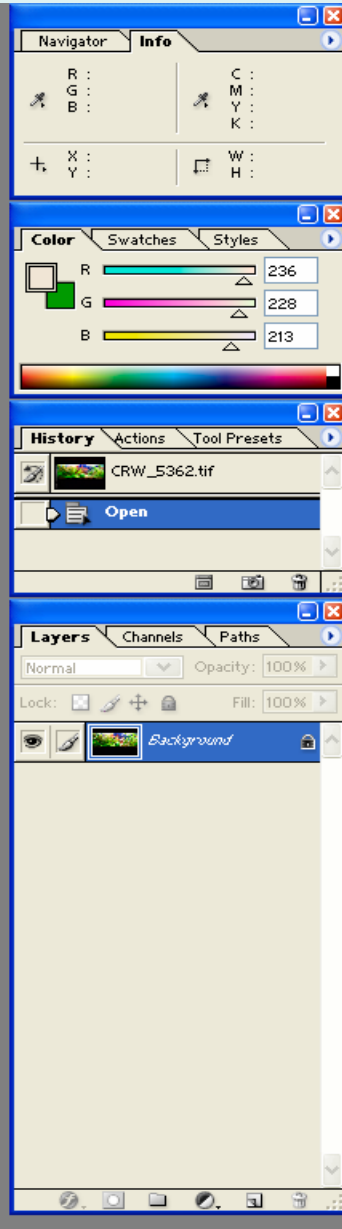
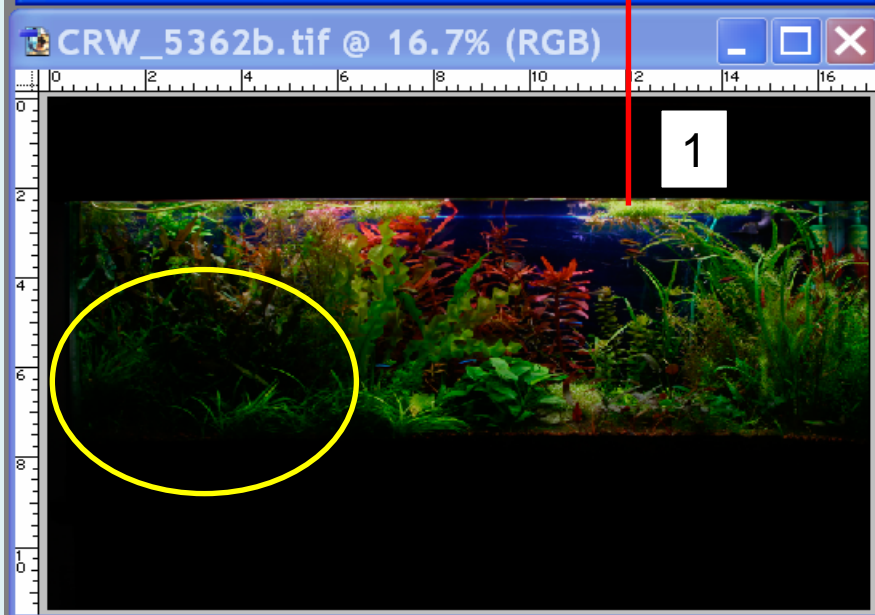
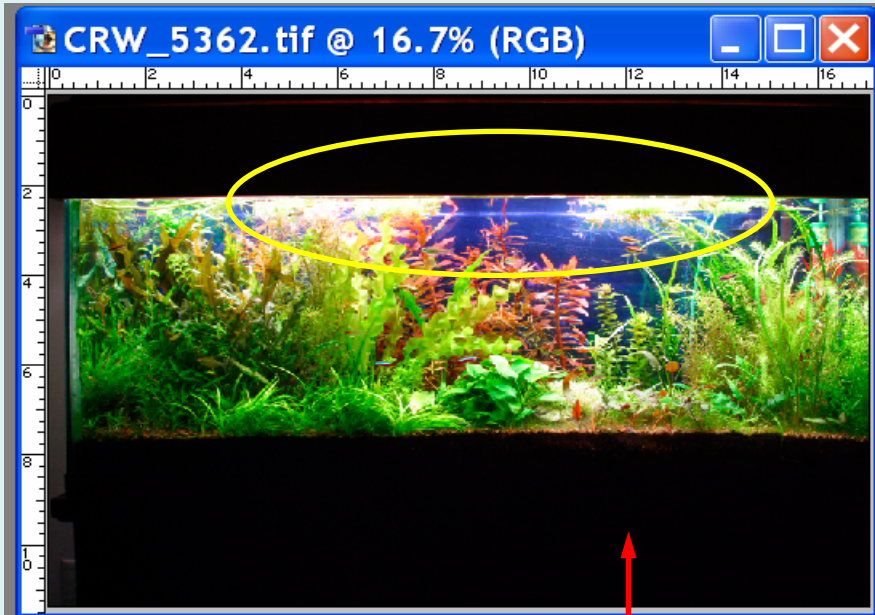


After



White





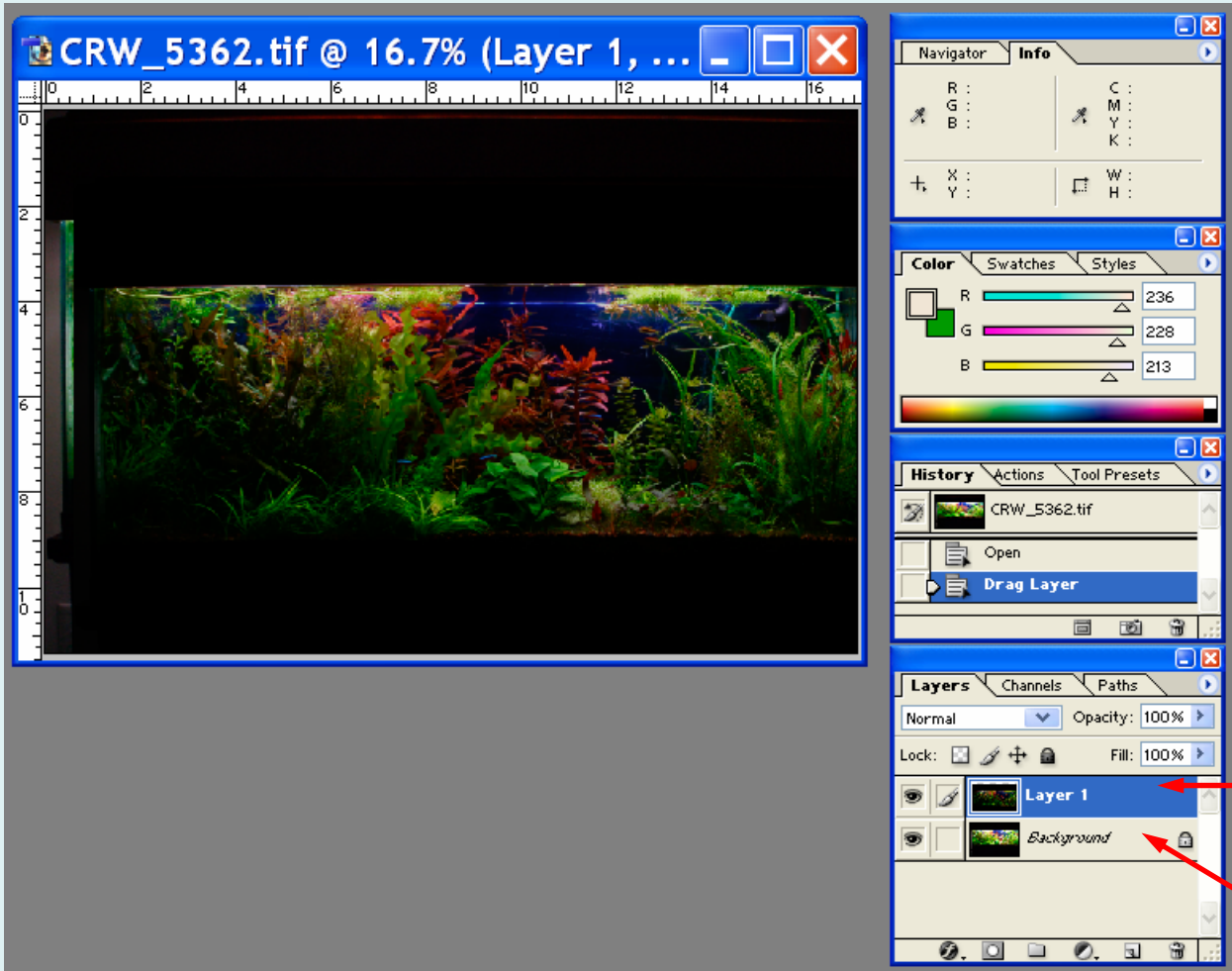
1. Drag the dark image onto the light image

The top image is over-exposed: the highlights are burnt out, but the dark areas show good detail.

The bottom image is under-exposed. The highlights have good detail, but the dark areas are black and featureless.



DIGITAL PHOTOGRAPHY AND THE AQUARIUM



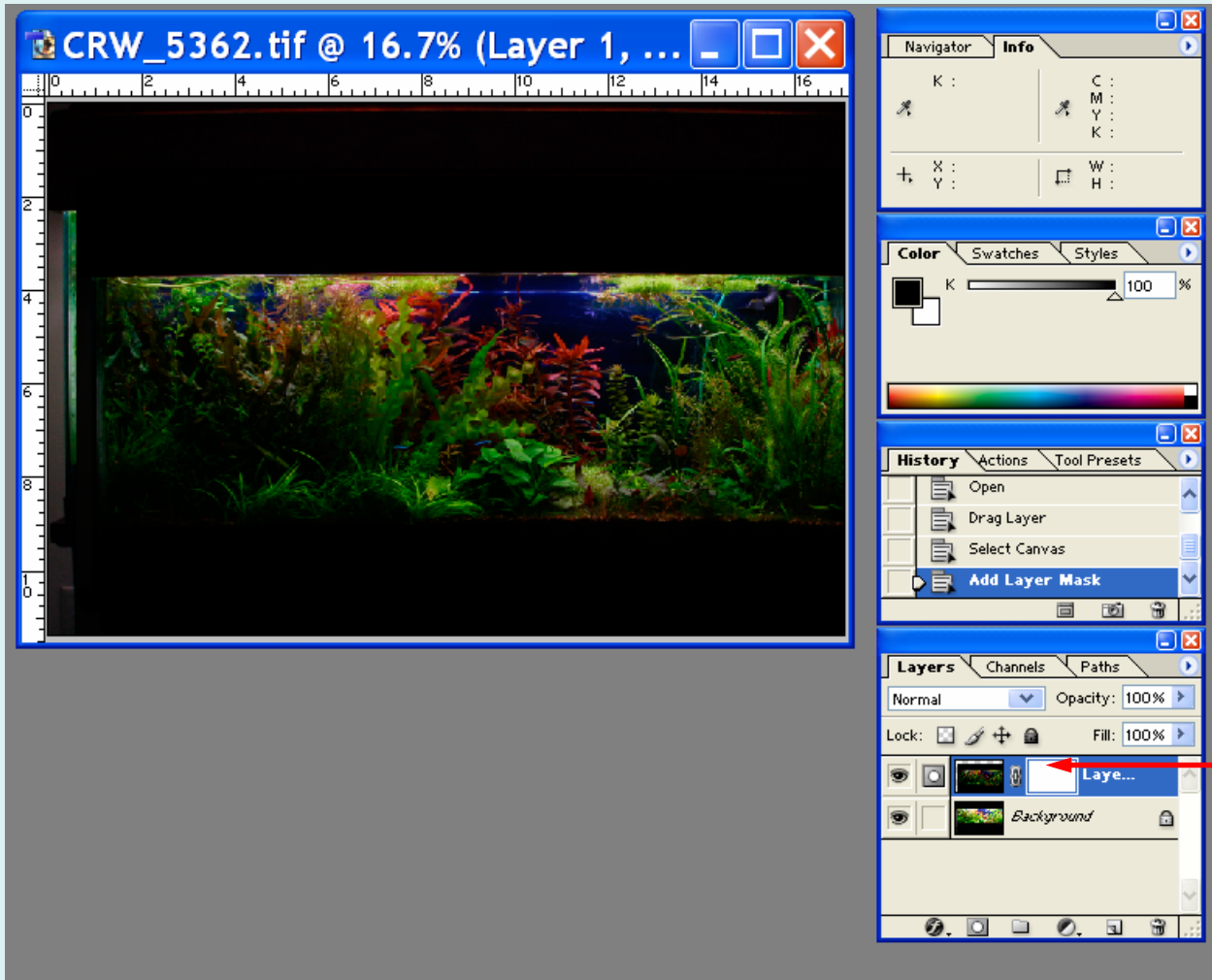
1. Click on new layer (the dark image)

2. Click on layer mask

3. Click on "light" layer
CTRL-A (select all)
CTRL-C (copy)

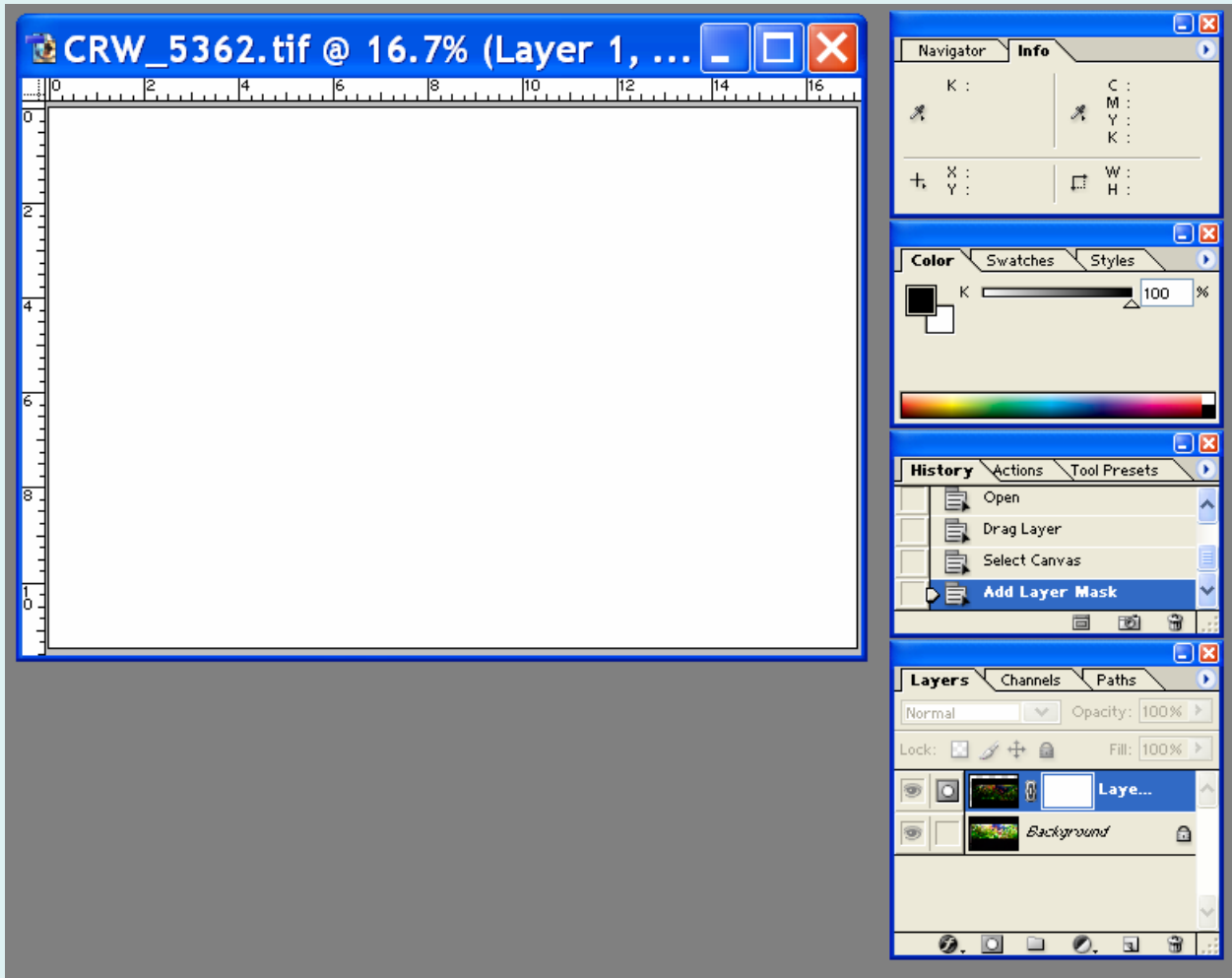


DIGITAL PHOTOGRAPHY AND THE AQUARIUM



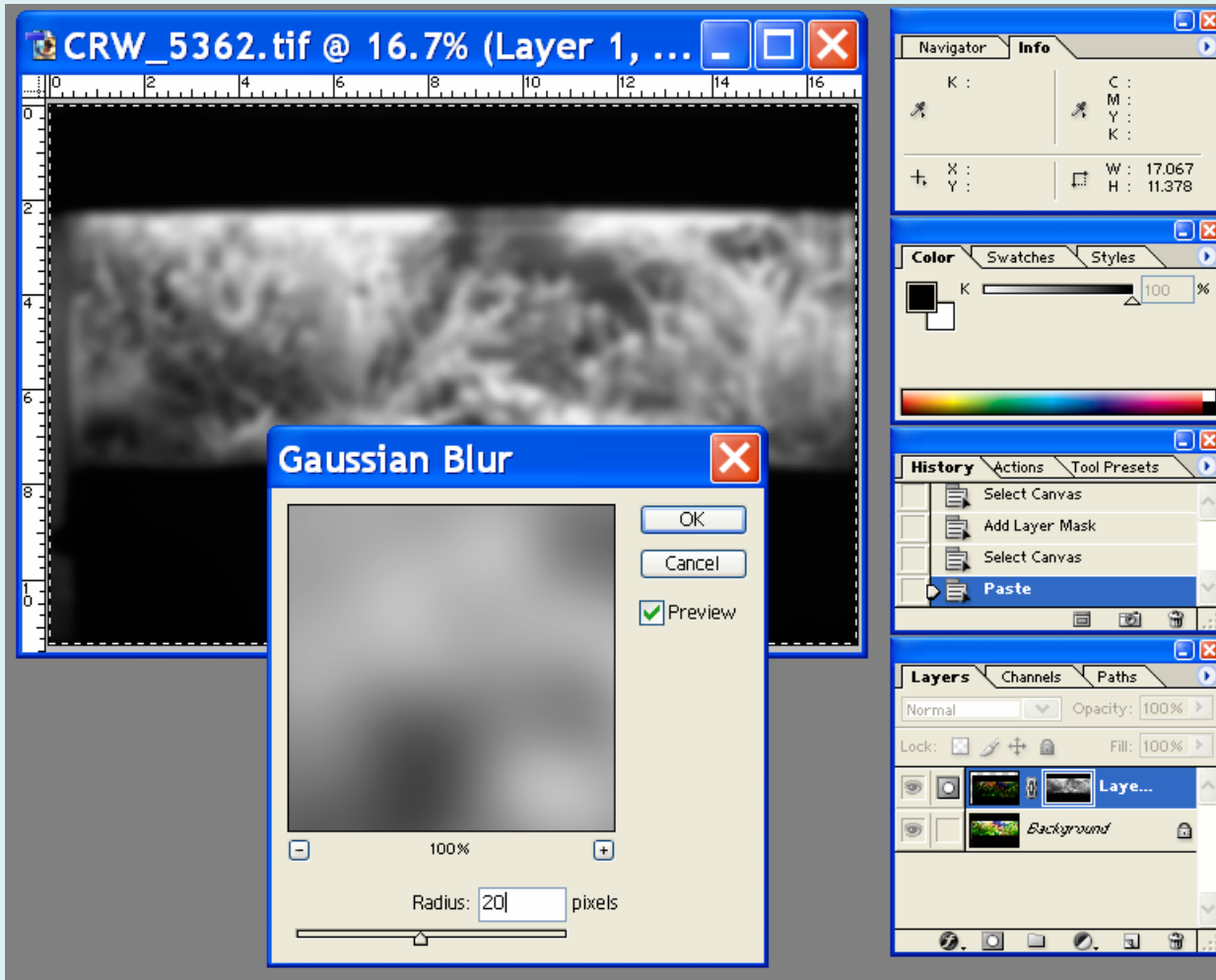
1. ALT-CLICK on the layer mask (the white rectangle)





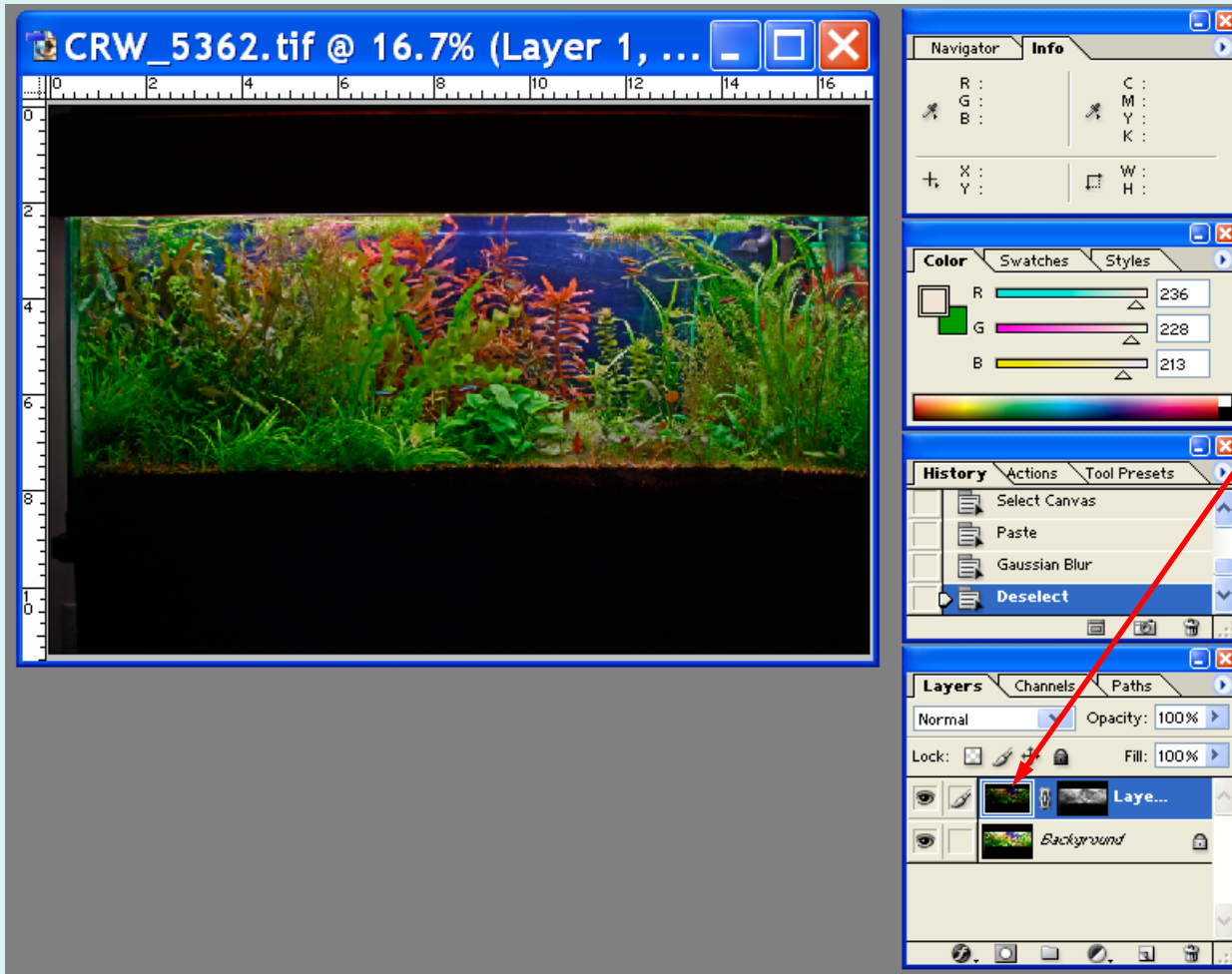
1. CTRL-V to paste the light image here (it will paste in greyscale)





1. Set radius to somewhere between 20 -50 depending on the level of detail in the image
2. Click OK





1. Click here

You can now flatten the image to remove the layers (Layers-> Flatten Image).

Then crop and adjust the levels to taste.

We now have a composite image that has both the highlight detail and the shadow detail.



Photoshop - Digital Blending



The Finished Image



Photoshop – Contrast Mask

- A method to bring out detail in shadow areas of an image
- Can be used on a single exposure
- The steps:
 - Duplicate the image on a layer (Layer->duplicate Layer)
 - Desaturate the duplicate (Image -> Adjustments ->Desaturate)
 - Invert the duplicate (Image -> Adjustments -> Invert)
 - Click on duplicate thumbnail and select blending mode then overlay
 - Use gaussian blur on the duplicate layer (small amount). You will have to experiment to see how much is enough.
 - Adjust the opacity as desired (duplicate thumbnail)



