

# Photo Restoration and Retouching: The Digital Basics

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Notes available from: [www.thenerdworks.com](http://www.thenerdworks.com)

This demonstration uses Photoshop Elements 14, Canon Lide500F scanner and a Spyder4Pro Colorimeter.

This video editing laptop has a 2-GHz i7 Quad-Core CPU, 16GB RAM, 2 SSDs & Windows 10 Pro (64-bit)

## Things worth knowing:

- **“Re-Photography”** – Using a digital camera to re-photograph prints/negatives/slides;
- Scanning Software: **Scanner Driver** vs. **Dedicated Scanning Software** (i.e. VueScan/Silverfast);
- “64-bit” CPU/OS/Software allows the use lots of RAM for speed with HUGE files;
- **Bit Depth:** 8bit vs. 16bit (the amount of data the scanner collects);
- Use the Histogram •Edit with Layers •Make Selections •Calibrate monitor with a Colorimeter;
- **Resolution** (scanner samples per inch vs. printer dots per inch vs. monitor pixels per in);
- **Scanning Resolution** depends on the type and size of **input** & the type and size of **output**;
- **Output Resolutions:** Prints 300dpi Canon/HP, 360dpi Epson, Display Online 72-96dpi;
- Scan and save for editing using the file formats “tiff” or “PSD”.

## Workflow:

1. Preparation;
2. Scanning; - using Levels in the scanner driver for each colour channel and scan at 16-bits.
3. Editing; - software intensive/expensive with lots of RAM for 64-bit software and many **“Layers”**
4. Production;
5. Archiving.

### 1) Preparation

- Calibrate Monitor for accurate colour reproduction using colorimeter;
- Clean scanner platen and cover plate. Do NOT remove mounted prints, scan whole mount;
- NO Liquid cleaning of prints, VERY GENTLE cleaning with a SOFT CLEAN brush;
- Sort most important photos into groups with similar issues that can then be gang scanned;
- Re-Photograph “unscannable” mounts. Use 2 lights at 45 degree angles to subject. Also use a tripod, self-timer and a Polarizing filter to reduce any possible glare. (tilt tarnished photos away from camera)

### 2) Scanning

Scan mostly in Colour Mode; Scan at 16-bits per channel; Use the scanners levels controls; Scan resolution depends on the size of original & desired output size; Use Digital I.C.E., R.O.C. & G.E.M. on supported scanners; save scans as 16-bit Tiff, PSD or DNG; organize scans by using Tags & Keywords. Remember to scan with the emulsion side facing down! (The emulsion side is the less glossy side)

### 3) Editing Working order is 1,2,3,4,5 but your time invested is 3,4,5, 2,1.

Clean-up	1 Exposure	2 Colour	3 Minor Damage	4 Major Damage	5 Uneven Damage
<b>Scans</b>	Underexposed	Casts *	Spots	Missing Emulsion	Tarnish
	Overexposed	Shifts	Stains	Torn Pieces	Bleached Spots
	Uneven	Fades	Tears		

\* Remove a Colour Cast by Adding some of its Opposing Colour

Remove a Colour Cast		Make a Layer copy then use this technique:	
Red	←→	Cyan	1) Filter>Blur>Average
Green	←→	Magenta	2) Filter>Adjustment>Invert
Blue	←→	Yellow	- Blend mode “Overlay or Color” 30-40%

Clean-up	1 Exposure	2 Colour	3 Minor Damage	4 Major Damage	5 Uneven Damage
<b>Tools</b> Use the Scan tools when scanning	Layer Blend Mode	Levels	Spot Healing Brush	Clone Stamp	Levels per channel
	Dodge Burn Tool	Smart Brush	Healing Brush	Selection Brush and Move tool	Selection brush & Layers
	Enhance lighting	Enhance color	Clone Stamp		Convert to B & W

#### 4) Production

- Export files: for online viewing as jpegs, for printing as Tiff or PSD;
- Files for a digital photo frame can be copied onto an SD card;
- Printing Service vs. DIY printing;
- NOTE: Colour Printers do NOT make very good B&W prints. (3 Black inks are required)

#### 5) Archiving

##### “3, 2, 1 style Backups”:

3 copies on at least 2 different media with 1 copy stored off-site

##### Keeping files intact:

Access the files regularly to ensure that they are still intact. Have, and know how to use, **image recovery software** for lost image files.

##### Keeping files readable:

Safeguard against **digital obsolescence** by ensuring that files are readable by keeping them in a **current format**, like Adobe Digital Negative (DNG) or TIFF, and check them regularly.

##### Keep the files accessible:

Back up your files regularly. Verify the backups. USB 3.0 disc drive docks work well.

##### Long Term Storage:

DVD's not properly stored can be subject to mold, fungus and heat. As well, Felt Tip Ink markers contain alcohol, which can leech through the plastic layer and damage the dye layer. **Use CD/DVD safe markers to label your disks!**

Prints, Write Once Optical media ([MDISC](#)), LTO-6 Tape Drives (Linear Tape Open) and Hard Drives are all good for long term storage. The equipment used, as well as the process used, is mostly referred to as “Archival preservation”.

#### Resources:

- The Epson Perfection V600 is a very good flatbed scanner for the work you have seen here.
- [www.Photo-repair.com](http://www.Photo-repair.com) – Restoration services offered by Ctein.
- [spyder.datacolor.com/display-calibration/](http://spyder.datacolor.com/display-calibration/) to see Colorimeters;
- VueScan ([www.hamrick.com/](http://www.hamrick.com/)) and Silverfast ([www.silverfast.com/](http://www.silverfast.com/)) are two prominent scanning specific packages for those dedicated to the task.
- [www.dpreview.com](http://www.dpreview.com) and [www.filmscanner.info/en/](http://www.filmscanner.info/en/), as well, you can go to the film scanner page of PhotographyReview.com ([www.tinyurl.com/34m424](http://www.tinyurl.com/34m424)) for finding information regarding cameras, scanners, etc... Just don't be overcome by “sticker shock” when you see prices!
- [www.scancafe.com](http://www.scancafe.com) does your scans for you (though you have to UPS to them). Although I have never used them, I have heard and read nothing but good reviews. Still, if you choose the service route it would be prudent to send them a small sample of the work you want done, as a test.
- Do a Google search for “**Polaroid Dust and Scratch Removal**” and download the tool. It is quite amazing in what it can do!

#### Books:

- Digital Restoration from Start to Finish – Ctein, Focal Press, ISBN: 9780240812083, \$42.95.
- Adobe Photoshop Restoration & Retouching - Katrin Eismann ISBN – 9780321701015, \$56.57
- The VUESCAN Bible\_- Sascha Steinhoff - ISBN – 9781933952697, \$45.50
- Scanning Negatives and Slides - Sascha Steinhoff - ISBN – 9781933952307, \$35.39

## **Scanning Tips and Tricks: Computer, Software, Scanner & Methods of work**

### **Computer Tips:**

- Use a 64-bit CPU of 3 GHz or faster
- Use a 64-bit Operating System so that you can use a lot of RAM (computer memory)
- Put as much RAM into your computer as possible (this aids speed)
- Purchase and install in the computer a large capacity hard drive for your images (1 TB or more)
- Regularly calibrate your monitor with a colorimeter like the SpyderX (<https://spyderx.datacolor.com/>)
- If using a laptop calibrate often, and work at the same distance with the monitor at a consistent angle

### **Software Tips:**

- Use the software that came with your scanner (update it to the most current version)
- If the scanner software does not meet your needs try software like VueScan (from [www.hamrick.com](http://www.hamrick.com))
- Editing software, like Photoshop Elements, makes quick work of cleaning up and restoring your scans
- Learn about Layers, and tools like the “spot-healing” brush and the “clone-stamp” tool;
- Learn how to make selections and how to use the “Move” tool;
- Specialized editing software, called “plug-ins”, work with Photoshop and offer many alternative and effective capabilities

### **Scanner Tips:**

- Flatbed scanners can make excellent scans (Epson Perfection V600 is about \$250.00 with software)
- You need to be fastidious about cleaning the glass platen of the scanner to get a good scan
- Let the scanner warm up if it is older than a few years
- DO NOT sharpen during the scanning stage
- If your scanner can do Infra-Red Dust and Scratch removal (Digital I.C.E.) use that feature











- Re-Photography of slides/negatives using an adapter attached to the end of the lens

### **Workflow Suggestions**

- Sorting is your first step:
  - Sort your photos into groups that are the most important to scan;
  - Sort into Types (i.e. Prints, Negatives, Transparencies, Re-Photography);
  - Sort into like groups (i.e. faded group, colour cast group, tarnished group);
- Clean negatives/slide/print very gently with a soft brush, never with wet cleaning;
- Scan with the emulsion side of negative/slide facing down;
- Batch scan several photos from the same group at one time to save working time;
- Scan in 16/48-bit mode if possible;
- Scan in full RGB colour mode, even if you are scanning B&W;
- Use the Histogram of the scanner driver to fine-tune the scan for maximum quality;
- Use the “divide scanned images” command to separate the group into individual image files;
- Save scans as either Tiff or PSD. Only when you are done with restoring should you consider JPEG.

## Bit Depth Sample Images

<p>8-bit 16.7 million colours</p>	 A high-resolution, full-color image of a tabby cat with white paws, lying down and looking slightly to the right. The image shows fine details in the fur and background.	<p>7-bit 2.1 million colours</p>	 A slightly lower resolution image of the same cat, with some loss of fine detail compared to the 8-bit version.
<p>6-bit 262 Thousand colours</p>	 An image where the color palette is more limited, resulting in some visible banding and loss of subtle color variations.	<p>5-bit 33 Thousand colours</p>	 An image with significant color loss, showing large areas of uniform color and a noticeable loss of texture.
<p>4-bit 4096 colours</p>	 An image with a very limited color palette, appearing almost like a dithered or posterized version of the original.	<p>3-bit 512 colours</p>	 An image with extremely limited color, appearing as a high-contrast, almost black and white image with very few shades of gray.
<p>2-bit 64 colours</p>	 An image with a very limited color palette, appearing as a high-contrast, almost black and white image with very few shades of gray.	<p>1-bit 2 colours</p>	 A binary image where the cat is represented as a white shape against a black background, with no gray tones.

# 3,2,1...Backup strategy

**3** Copies of every photograph



**2** different types of storage media

(Prevents loss from obsolescence of technology)



**1** set photos at different location



# Losing Photographs: Film vs Digital Loss

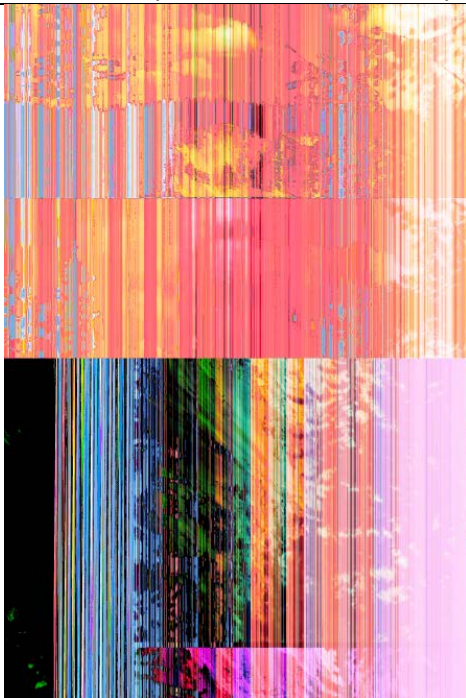
Regular 3,2,1 Backups and Prints are your safest way of protecting your treasured photographs!



Print from the early 1970's has faded slowly.



Print scanned and "Restored" to correct the flaws.



A digital image that was corrupted. Lost instantly. No hope of being "restored".



The image, recovered from a backup. Backups need to be done regularly & need to be validated!

# Pixels and Histograms



## To the Left:

Pixels are very small, and do not become visible unless we enlarge them significantly.

These are the pixels from a TV image, similar to the pixels that make up a digital photograph.

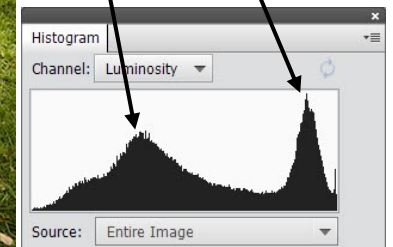
## To the Right:

The Histogram is a graph of the colours of each pixel in the image, and how many of that colour. Histograms **DO NOT** give the location of colours. Dark pixels on the Left, Bright ones on the Right.



Green Grass

White Dress



## Histograms Explained

The Histogram is the best way to confirm that your image has been exposed/processed properly. They describe image brightness.

After the sensors' pixels record the light, the onboard image processor calculates a graph of the exposure. This graphical representation of the pixels tones vs amounts is what is called a "Histogram".

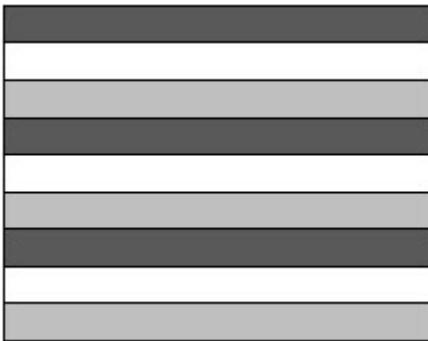
The various tones that were captured are represented along the Bottom Axis. The left starts with the darkest tones moving to the right for the brightest tones. Hence the phrase "Left to Right, Dark to Light".

The vertical axis is simply the amount of each of the tones recorded.

### ACTIVITY:

Below are three images, and below them a Histogram. Which of the 3 images does the Histogram represent?

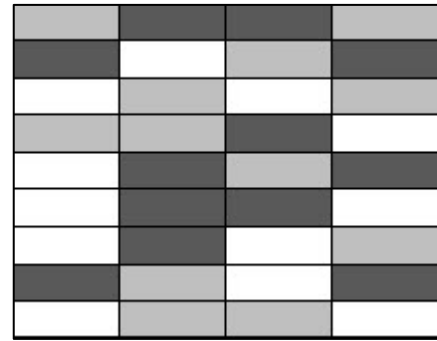
HINT: Count the tones, count the amount.



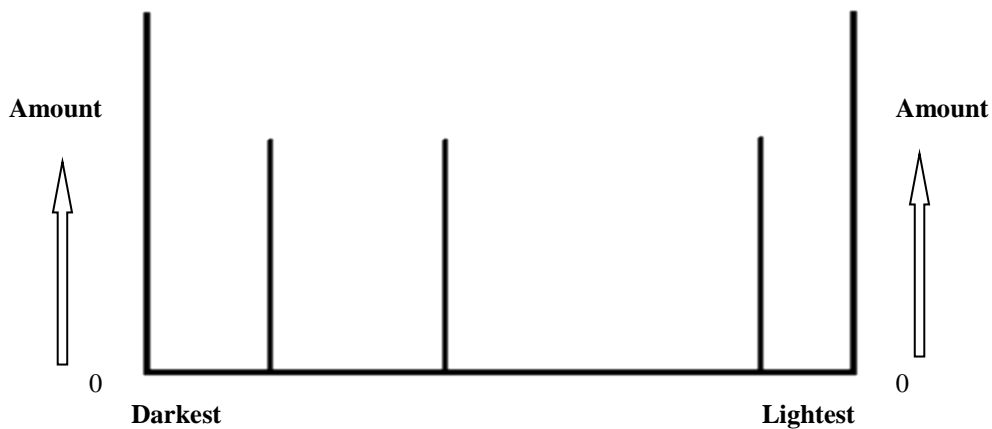
**Image 1.**



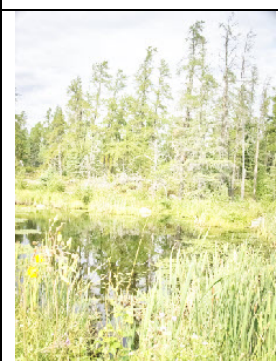
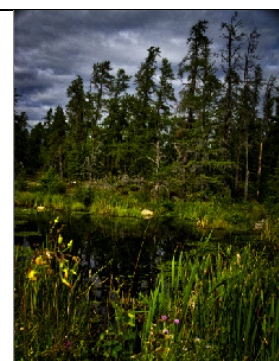
**Image 2.**



**Image 3.**



To ensure you get the best exposure/processing possible, always check your Histogram.

Over Exposed	Under Exposed
 <p style="font-size: small;">Pixels are distributed along the Histogram based on their Brightness value. Pixels stacked up on the very right indicate possible overexposure...</p>	 <p style="font-size: small;">Pixels stacked up on the left of a very dark image indicate possible underexposure...</p>

Since Images 1,2 & 3 each have the same \*amount\* of the three tones, all are correct!  
 The Histogram is about \*how much\* of each tones are present, not \*where\* they are located.