Managing & Processing Digital Images

Or, How to Partner with Our Computers

Al Siegel – January 6, 2010

Agenda

- Assumptions
- How Far Technology Has Progressed
- Take the Picture
- Managing All Those Images
  - Options For Better Image Management
- Getting the Pictures into the Computer
  - Software Tools to Manage Them
- Work flows
- Backup – Insurance You Must Have

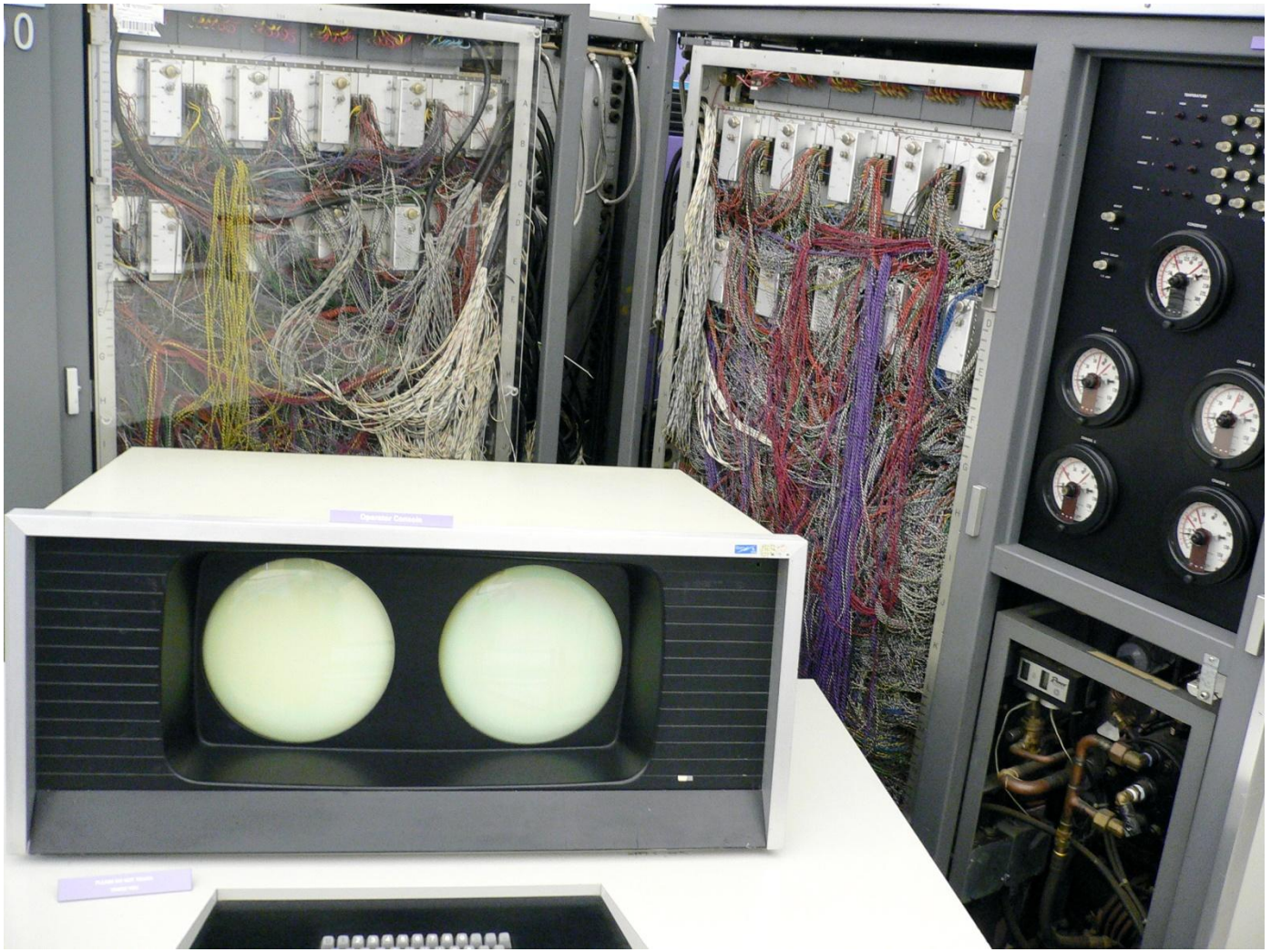
Assumptions

- This talk is mostly about computers and how they relate to photography
- There will be no discussion of esthetics
- This is a PC oriented presenation, but most of this talk is platform independent, MAC specific questions may be referred to the MAC users here tonight
- Please ask questions for clarification only as they arise, but it would be good get through the whole presentation
- Most of this is my view of these issues is based on more years than I will admit to using computers
- This Power Point presentation will be posted as a .PDF on the club web site with the Internet links for the items discussed
- This presentation is not about Photoshop CSx, as it or the Photoshop Elements photo editor are callable by the image management alternatives we will be discussing.

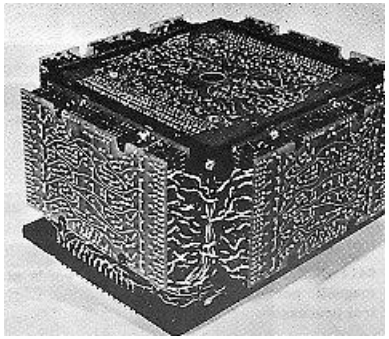
How Far Technology Has Progressed

- Comparing Computing in 1966 to Today
- In 1966 Battelle bought a Control Data 6400
  - It was close to state-of-the-art in scientific computing
  - It cost about $2,000,000
  - It was housed on a raised floor computer room
  - It was water cooled
  - It needed 400 hertz motor generators for to provide it's electrical power
  - It weighted about 1.5 Tons!
  - It had no integrated circuits i.e. It only had transistors

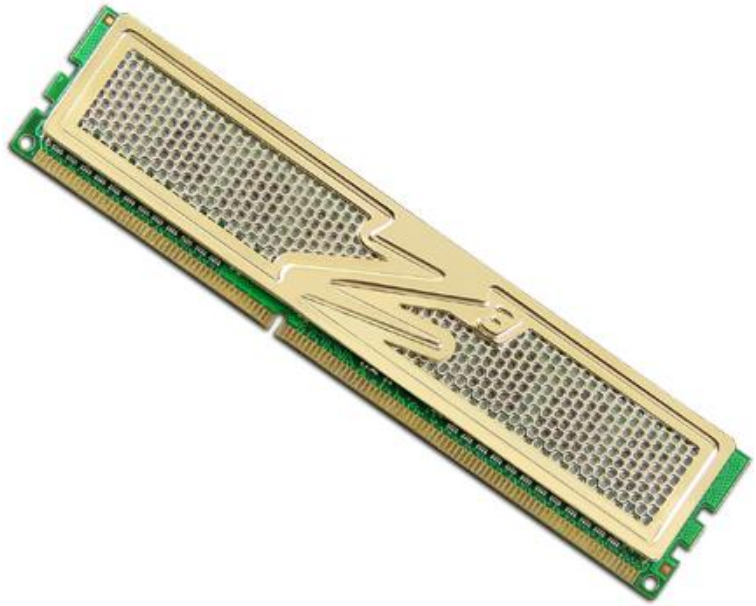
CDC 6400



Memory Technology Comparison



CDC 6400 4096 Word
Memory Module

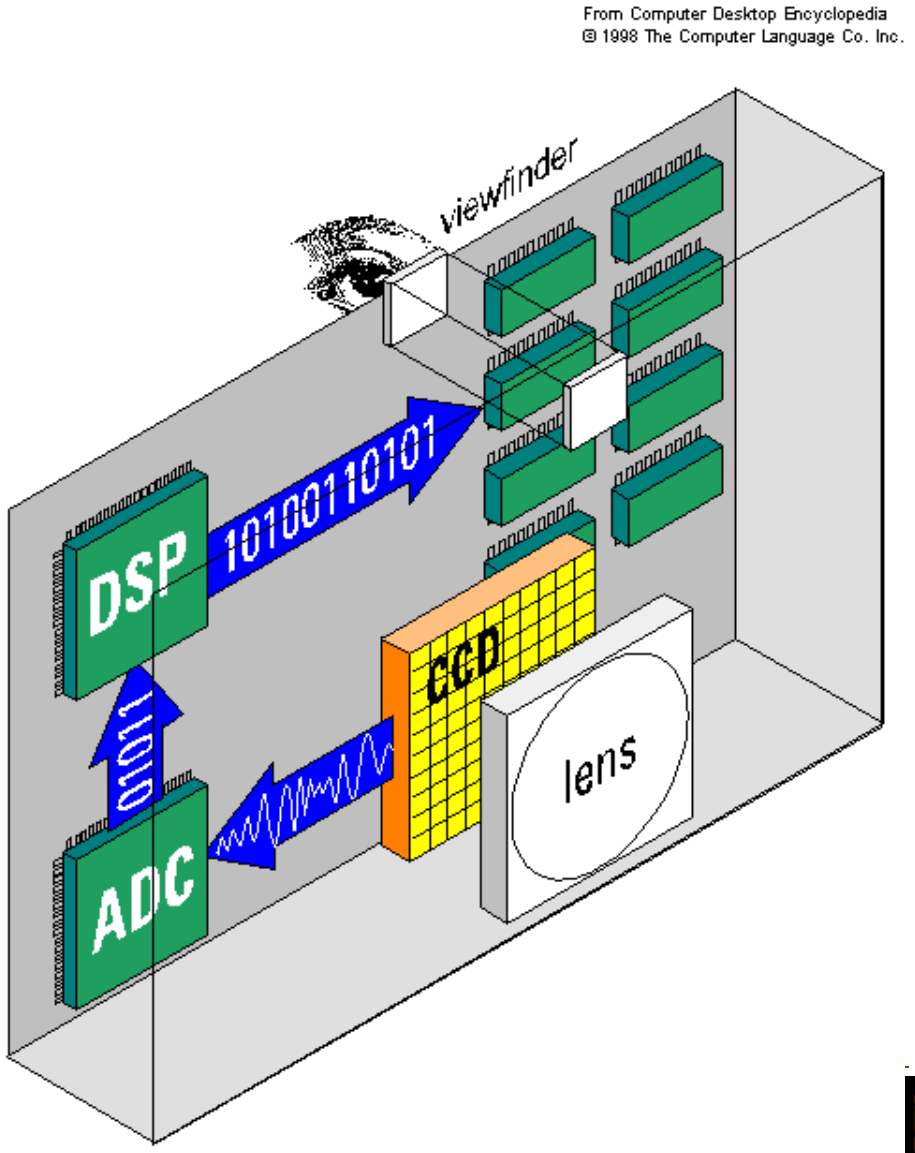


2 Gbyte
Memory Module

Some Comparisons to Computers Today

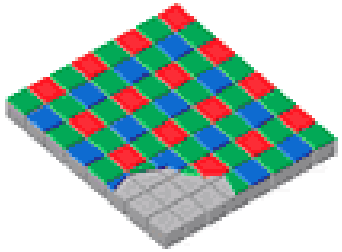
Item	CDC 6400			Personal Computer			Difference		
	Size	Speed	Cost	Size	Speed	Cost	Size	Speed	Relative Cost
CPU	1	10 million operations per second	$1,200,000	8	2.8 Billion operations per second * 8 Processors	$230	8	280	5,217
Memory Module	4096 12 bit words	1 million reads per second	$20,000	2,147,483,648 bytes	1.6 billion reads per second	$65	524,288	1,600	161,319,385
Disks	1,860 Mbytes	1 million bytes per second	$180,000	1,500,000 Mbytes	6 million bytes per second	$99	806	6	2,233,251
Console	N/A	N/A	$75,000	N/A	N/A	$250	N/A	N/A	300

Digital Camera: The first computer that processes your image

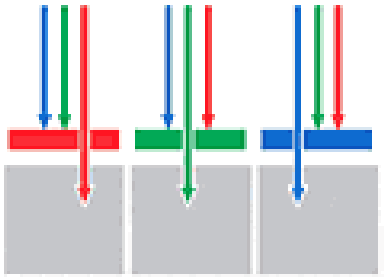


Types of Image Sensors

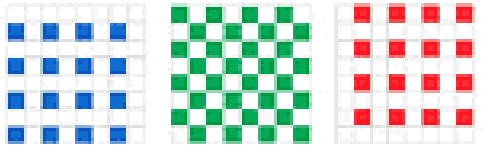
Mosaic Capture



In conventional systems, color filters are applied to a single layer of photodetectors in a tiled mosaic pattern.

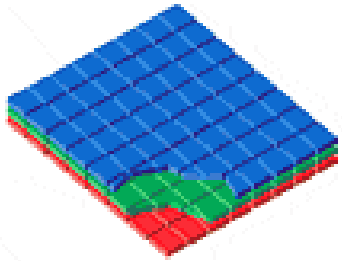


The filters let only one wavelength of light - red, green or blue - pass through to any given pixel, allowing it to record only one color.

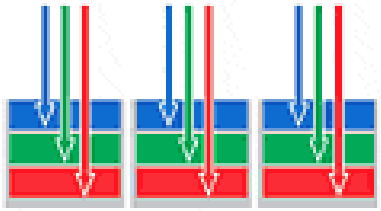


As a result, mosaic sensors capture only 25% of the red and blue light, and just 50% of the green.

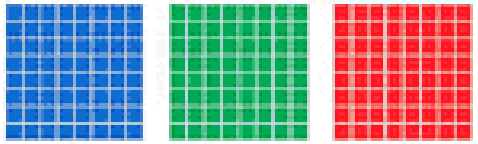
Foveon® X3™ Capture



A Foveon® X3™ image sensor features three separate layers of photodetectors embedded in silicon.



Since silicon absorbs different colors of light at different depths, each layer captures a different color. Stacked together, they create full-color pixels.



As a result, only Foveon X3 image sensors capture red, green and blue light at every pixel location.

The Computers in Your Camera

- It starts with the image sensor which is the "film" of these cameras and is located in a lightproof chamber.
- Some built-in light meters have a database of a 100,000 scenes to help set the exposure
- Some cameras are capable of tracking a moving subject and keeping it in focus
- The camera central computer interacts with the photographer via a menu and produces the images based on the camera settings.
- Capture speeds of 6-10 images a second are possible in DLSR's. (Think about the capture speed and data rates of a Professional high-end Hollywood Movie Camera, then think about "Avatar" and all the images and computers used to produce that movie)

What is a RAW Digital Image?

- It is a representation of the light and color detected by the image sensor
- For each color, a value represents the relative "intensity or brightness" detected by each sensor position
- In addition, it contains metadata which describes many attributes of the image including most of the camera settings, time of image capture, and optional photographer information. If your camera has a GPS, it can contain the position of the camera (More on Metadata) later
- A Small JPG image for previews
- Also called a Digital Negative

Now the Question: RAW or JPG?

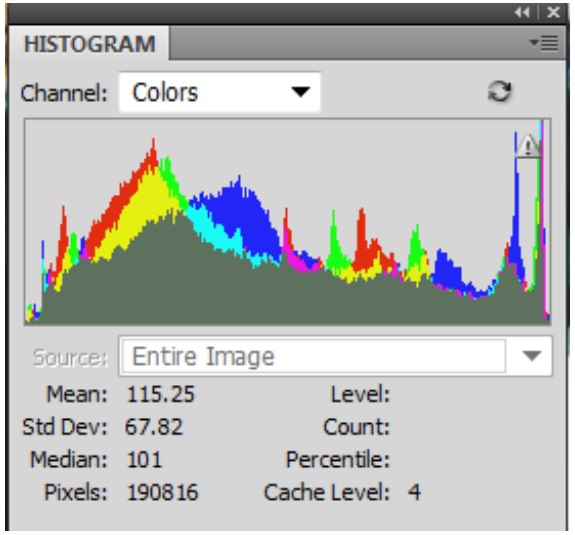
- How many of us have 12 megapixel cameras?
- How many of those don't use RAW?
- So, why did we buy a 12 megapixel camera if we are not going to use it to its full extent?
- A typical high-end image sensor collects 12 to 14 bits of information per pixel/color.
- At 12 bits, this means there are 4096 levels per color channel, 14 bits it's 16,384 (4.4 trillion colors)
- A JPG file uses 8 bits per channel or 256 levels per color channel (68.7 billion colors)
- A JPG file is a compressed and processed image which does not contain all that is found in the RAW image

Now the Question: RAW or JPG? (cont)

- Printers are usually only 8-bit capable
- JPG files are smaller, take up less disk space
- Many Photoshop operations only work on 8-bit color spaces, (i.e., most of the filters)
- RAW images take longer to process in the camera, thus decreasing the multiple speed image capture rate
- If the image is properly exposed, JPG files will do just fine for many applications
- RAW images give the photographer another shot at improving the quality of the picture, especially in light of the speed and costs of PC's (and MACs). It allows us amateur photographers to recover from lots of amateur problems.
- A conservative approach is to shoot RAW.
- Professional photographers are moving to RAW with the exception of sports and some wedding photographers, studio & Landscape photographers almost all shoot RAW or film.
- Your choice

Histograms – A Key Metric

- An image histogram acts as a graphical representation of the tonal distribution in a digital image. It plots the number of pixels for each tonal value. By looking at the histogram for a specific image the photographer will be able to judge the entire tonal distribution at a glance.
- Image histograms are present on many modern digital cameras.
- The horizontal axis of the graph represents the tonal variations, while the vertical axis represents the number of pixels in that particular tone.
- The left side of the horizontal axis represents the black and dark areas, the middle represents medium grey and the right hand side represents light and pure white areas.
- The vertical axis represents the sum of the pixels that is captured in each one of these zones.
- **The photographer needs to frequently look at the just produced image histogram to assure the photographs are well exposed. The preview image is NOT the best thing to make that decision.**



Histograms

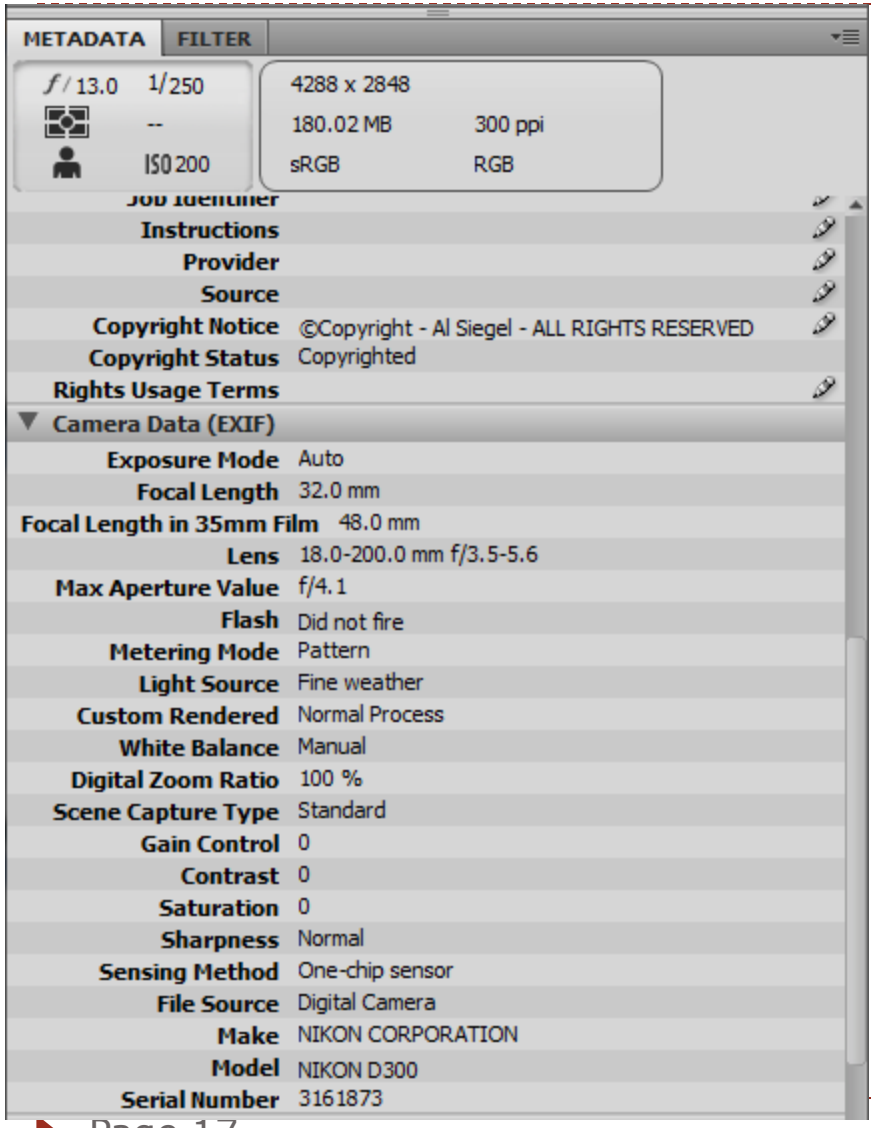

Water Sector
Kingstown

HISTOGRAM
Channel: Colors
Source: Entire Image
Mean: 115.25
Std Dev: 67.82
Median: 101
Pixels: 190816
Level:
Count:
Percentile:
Cache Level: 4

Metadata

- Metadata is a set of standardized information about a photo, such as the author's name, resolution, color space, copyright, and keywords applied to it.
- Most digital cameras attach information about the image, such as height, width, file format, and the time the image was taken.
- Many attach more detailed information about the image such as precise exposure, lens, lens settings, flash, metering and much more.
- The metadata standard includes entries for descriptions, keywords, categories, credits, and origins.
- You can use metadata to streamline your workflow and organize your files.

Metadata Example



The most important metadata modification you can make is to copyright all your digital images. It is easy to do in your camera and/or when you import your images.

Example:

©Copyright - Al Siegel - ALL RIGHTS RESERVED

All Rights Reserved

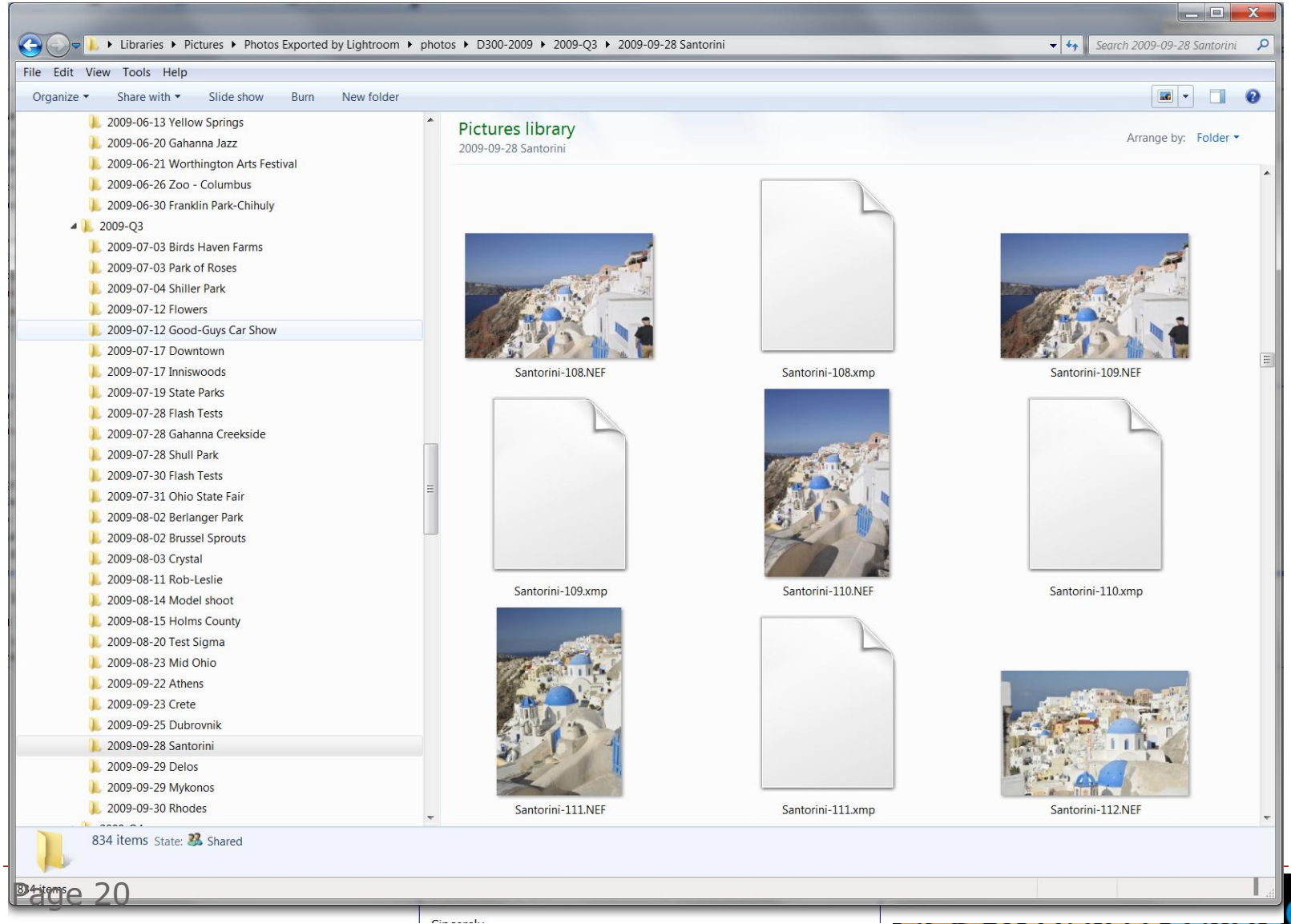
Managing All Those Images

Is this where we used to keep all those Negatives and Slides?

Where to Put Them

- File and Folder Naming – One Basic Approach
  - Location – PC's or MAC's
    - Base Folder should either be in User Account space (My Pictures etc.) or on another disk.
    - Keep levels of directories to low
    - Use Year as top level – Possibly use Quarter
      - **2009**
        - **Q1-2009**
    - Name Picture Folder starting with date of format YYYY-MM-DD to allow the operating system file viewer to sort by date
    - Add Subject matter to folder name:
      - **2009-09-30 Park of Roses**
    - Rename and sequence files with subject matter using File Import rename feature. You may want to start numbers at 100 as some import programs don't zero fill.

Example Folder / File Naming Using Windows File Explorer

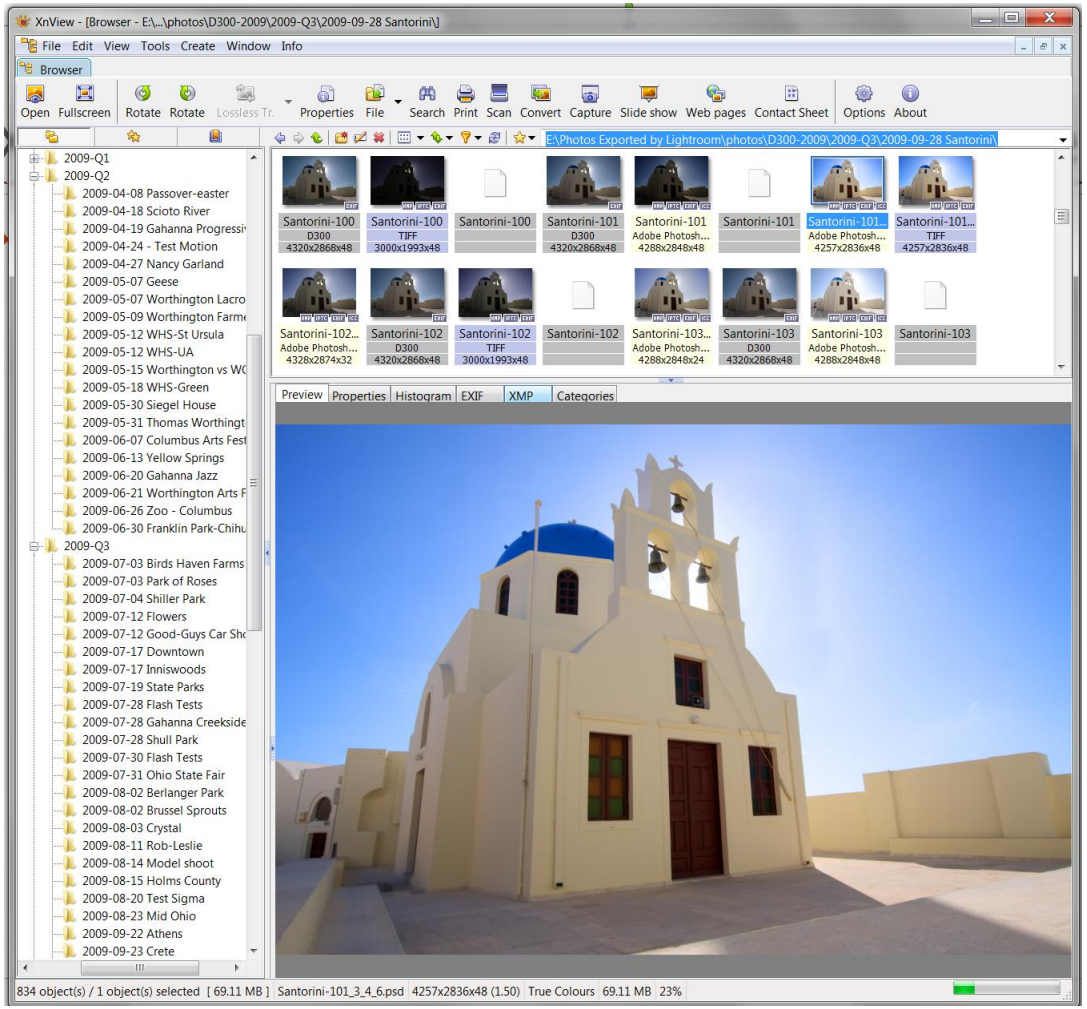


Fast Picture Viewer Codec

- The FastPictureViewer Codec turns the Windows Explorer into a raw image viewer, and is available in both 32 and 64-bit flavor for Win7, Vista and XP SP3.
- This means it will work with most image viewers that run in Windows. (Does not work in MACs, but I suspect there are ones that do)
- It's Freeware! However, they ask send them what you think it is worth, please do.
- The URL is:
  http://www.fastpictureviewer.com/codecs/

XnView – An Open Source Image Viewer

- It even displays Photoshop .PST files!
- Very Useful for all those image files already on your computer!



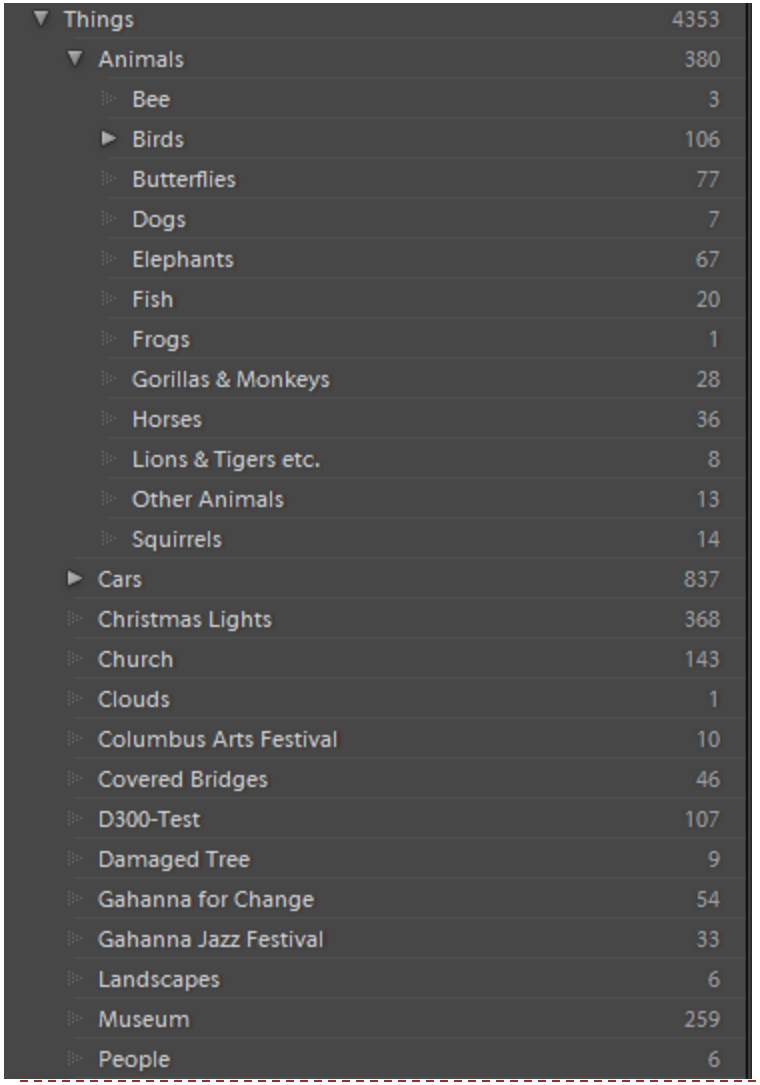
XnView – An Open Source Image Viewer

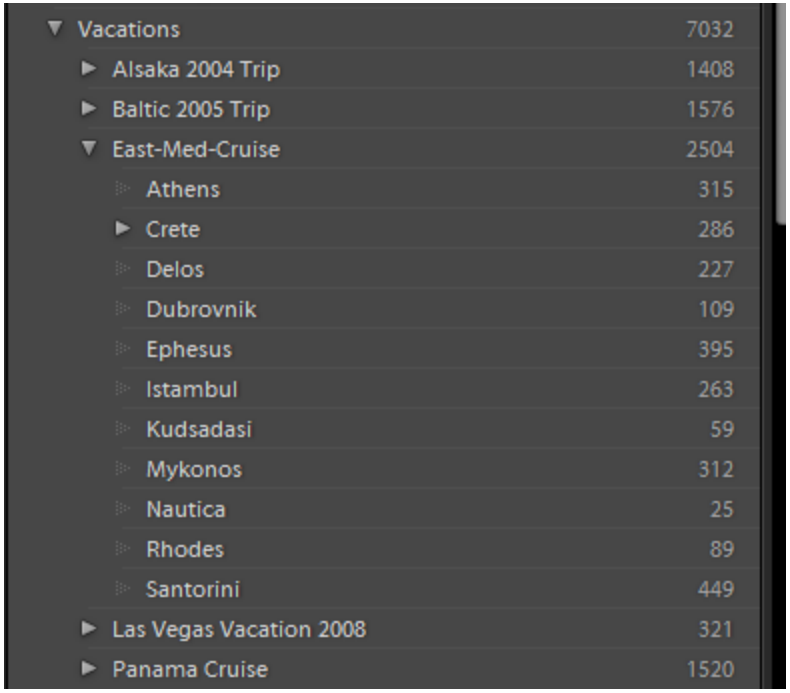
- An excellent standalone image viewer with some basic image manipulation features
- Displays Meta Data and Histograms
- Even displays Photoshop .PST files
- Works on PC's and MAC's
- Freeware
- URL: http://xnview.com/en/xnview.html

How to Index Image Files – Keywords

- Keywords are index terms you can easily add to image meta data to allow you to easily categorize and search your photographs.
- Think of it as being able to "Google" your pictures to find just the right photograph.
- The best time to add keywords is when you Import your images or when you first view them.
- You can create a hierarchy of keywords.
- Photoshop Elements and Lightroom have excellent tools to assist you if you use them to import your images. Both have a "catalog" that "knows" about all your images.
- It takes dedication to do this every time you import images, but it will pay big dividends down the road.
- In addition to keywords, you can search most of the rest of the meta data in images.
- Photoshop Elements 7 & 8 can search images for faces and then you can add the names to the images.
- Photoshop Elements 8 has an excellent section in their HELP file called "*Tagging and organizing photos and videos*"

How to Index Image Files – Keywords - Example

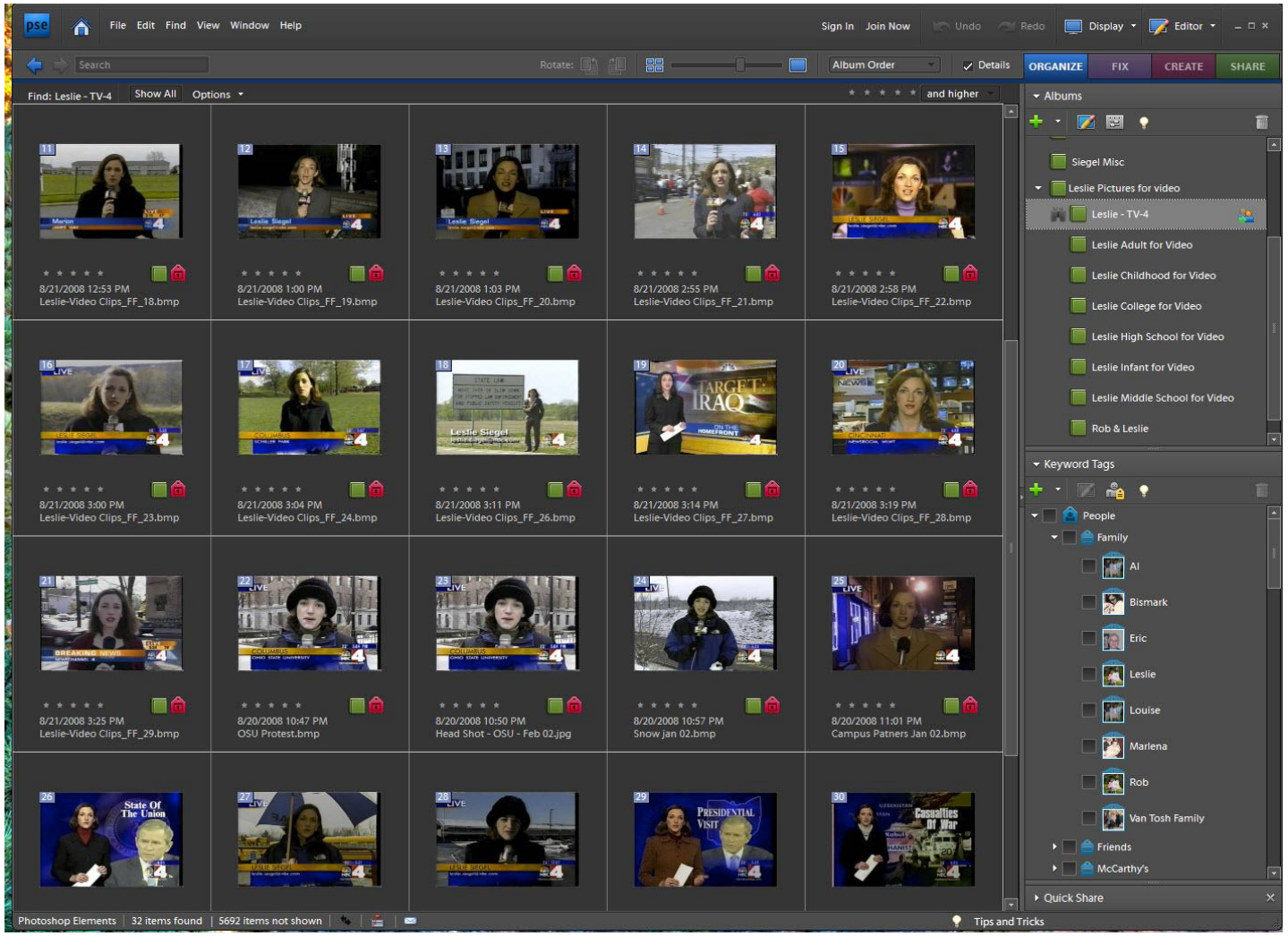




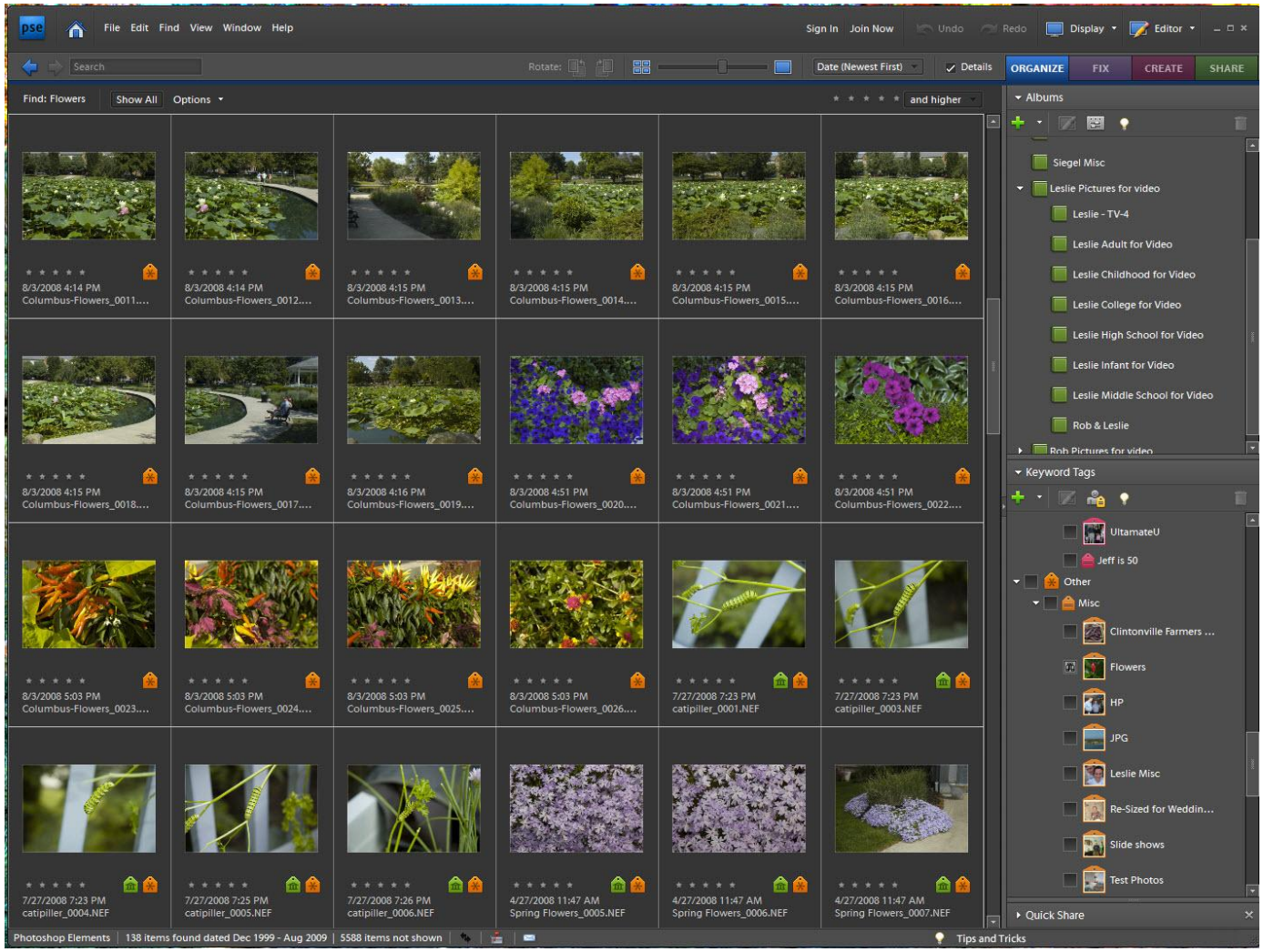
Collections (Lightroom and Bridge) or Albums (Photoshop Elements)

- Collections and PSE Albums are extremely similar, we'll call them Collections from now on.
- Collections allow you to gather selected images from among all your images in your computer or in the case of Adobe Bridge, from the current images in view.
- Smart Collections automatically gather images as they are added or specified meta data etc. is added to an image(s)
- Great tool to use when dealing with a large number of pictures such as wedding, sports, vacation, presentation or event pictures.
- They are also work well to help find those old images you want.

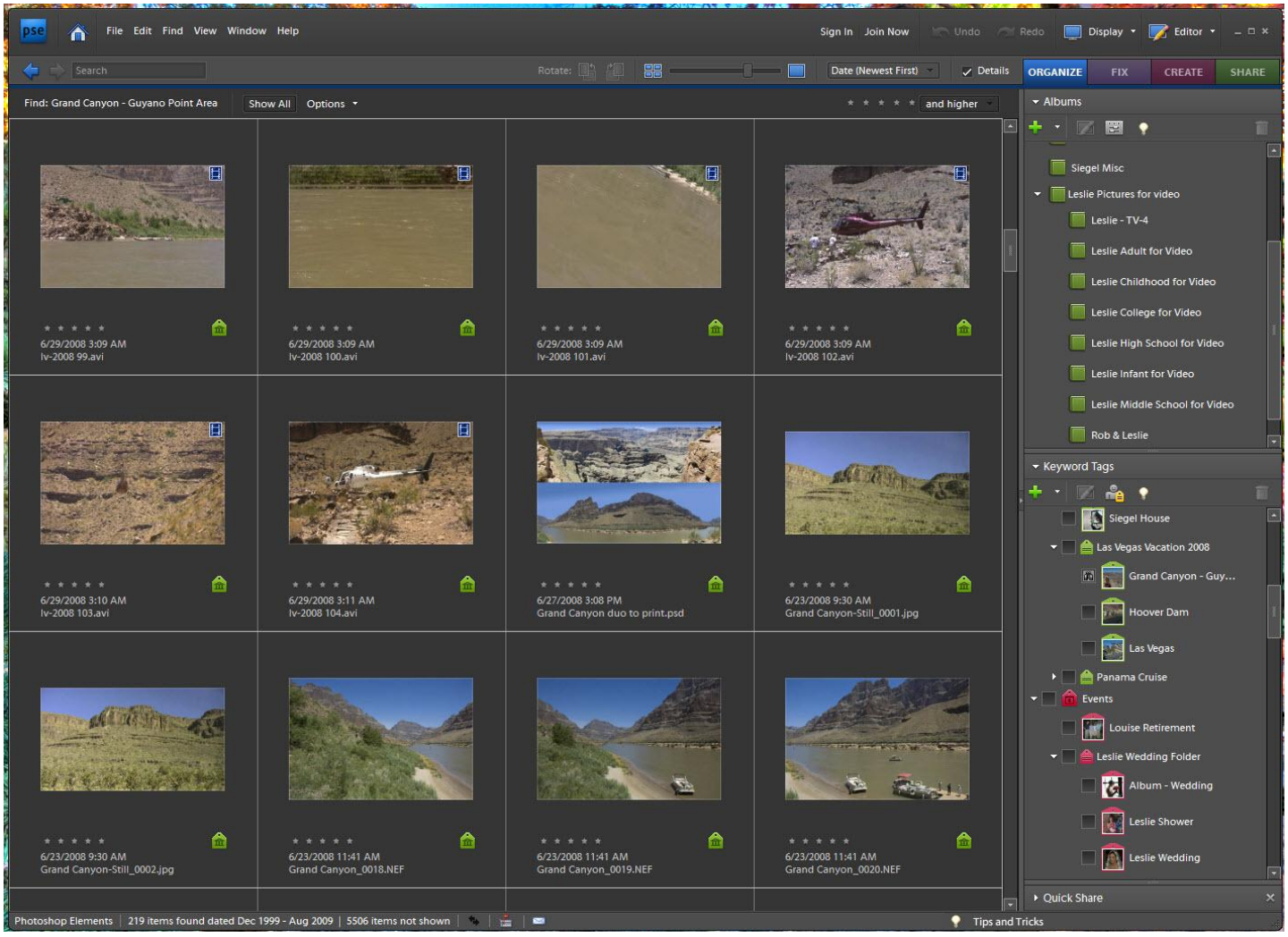
PSE, Collections & Keywords



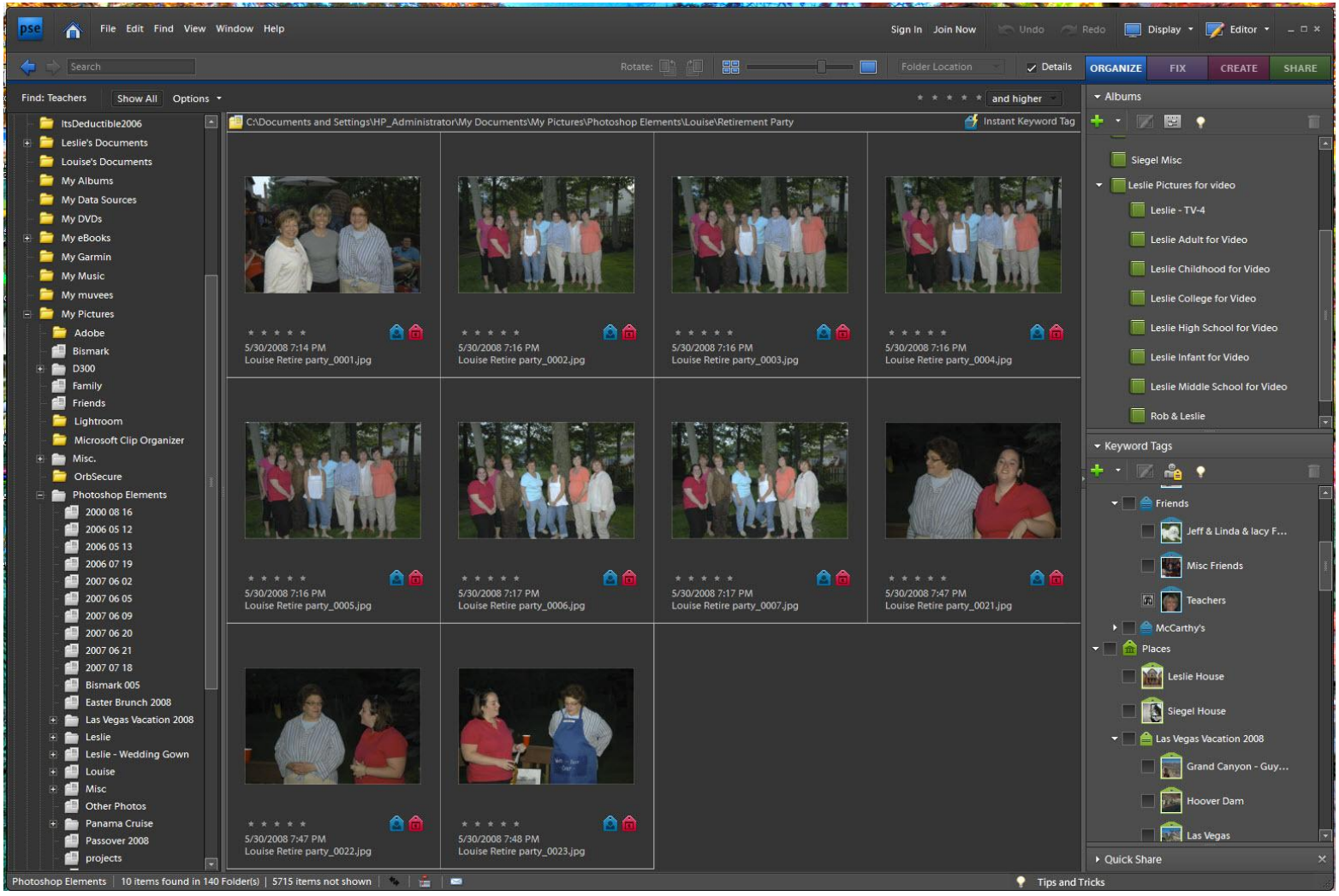
PSE, Collections & Keywords



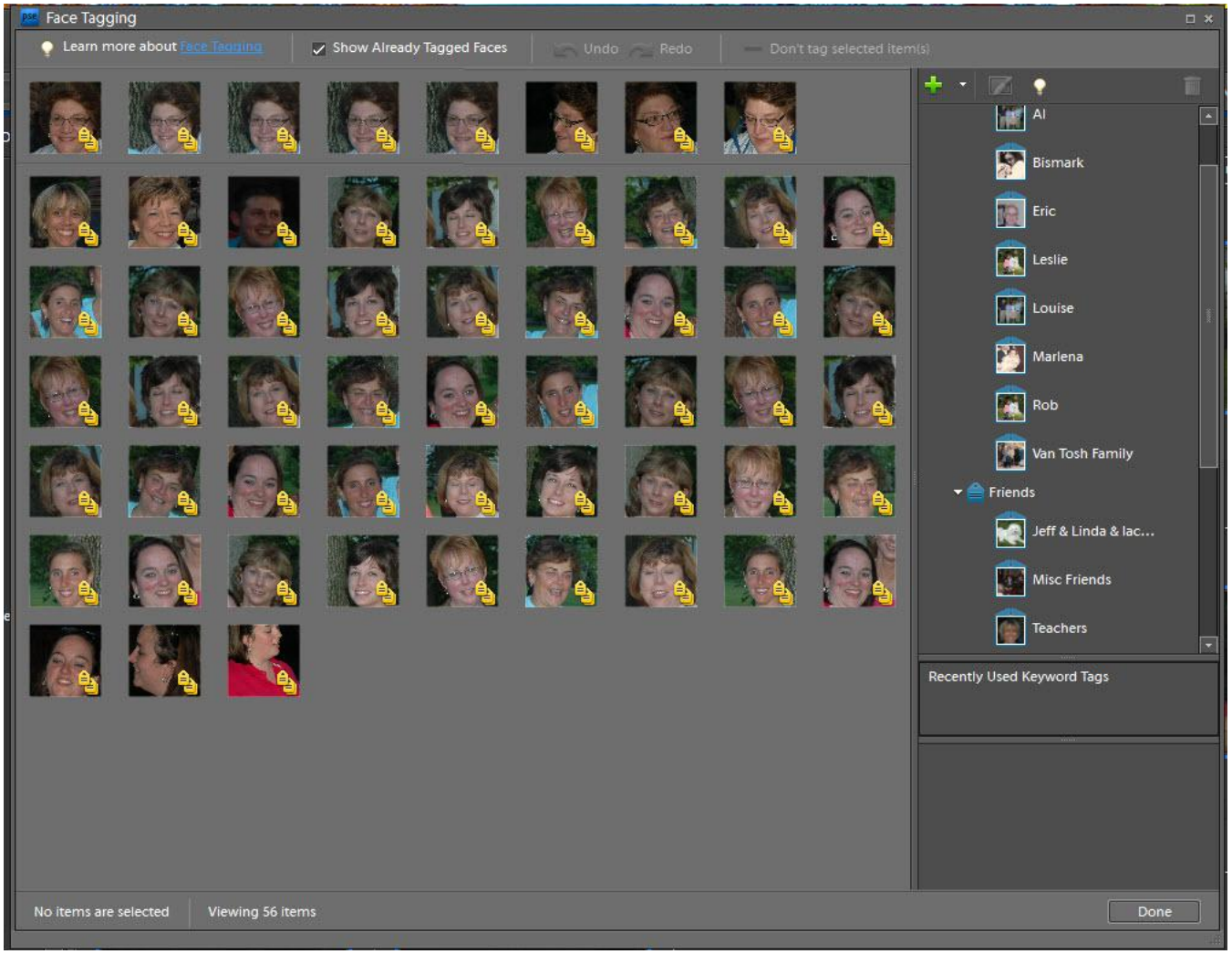
PSE, Collections, Keywords & Video



PSE Find Faces & Keywords



PSE Find Faces & Keywords



Collections & Keywords - Summary

- Think about how many images you have in your computer today
- How easy is it to find specific or subject matter pictures from your growing volume of images?
- For example, my D300 is one year old, the current click count (found in the metadata) is 14,285.
- Keywording has saved me quite a bit of time.
- Again, it takes some discipline, but once the habit is formed, it's easy and pays off.
- Start today with your new images and go back and index as you view old images
- Collections are enhanced by keywords, but there is much you can do without having keywords.

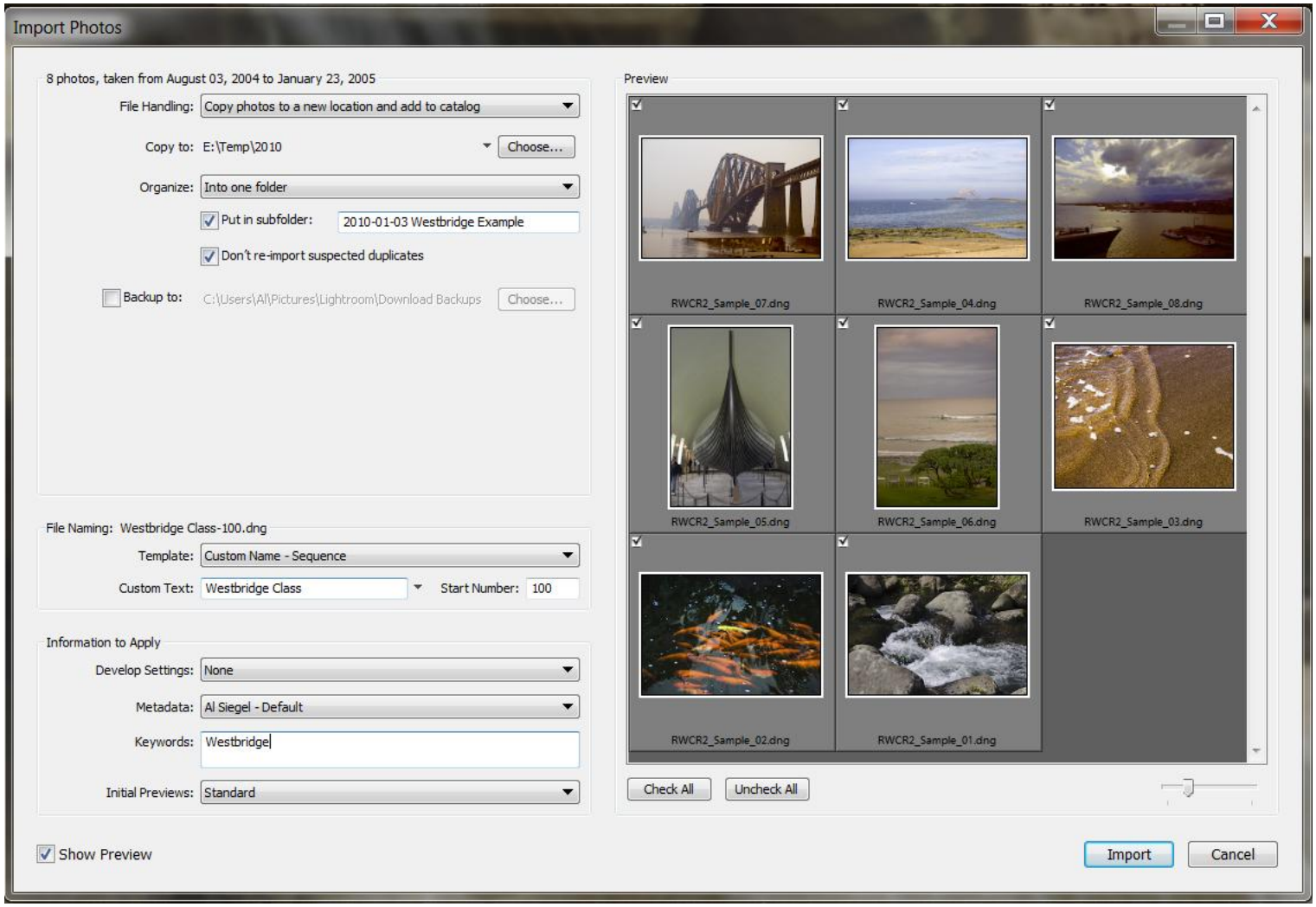
Importing Your Images

- Set appropriate defaults to import in program options screen. (e.g. DNG or native RAW format.) I use native RAW (.NEF) as it takes less room.
- Select the files to import.
- Use your file and folder naming conventions to specify storage location.
- Rename the files to something meaningful and sequence them.
- Apply your personal metadata with your copyright and other personal info you want included in each image.
- Add keywords appropriate to all the files.

Importing & Managing Your Images – What to use?

- Possible Options:
  - Photoshop Elements 7 or 8 **Organizer**
  - Lightroom
  - Adobe Bridge (Comes with Photoshop CS2 or 3 or 4)
  - Manufacturer's Proprietary Software
  - Windows (or Mac) file functions
- Best are Photoshop Elements **Organizer** or Lightroom
  - Both have good interface for keywords, PSE is better.
  - Both use a catalog to keep track of all the images you have for fast and easy searches.
  - Both interface well with Photoshop CS. PSE also has it's own version of the Photoshop editor, which has almost all the photo editing capability any of us need.
  - Both allow you to physically relocate images, rename images, and folders. (I used Lightroom to move all my images to my new computer.)
  - PSE also allows you to "pin" a photo to Yahoo maps and then you can search based on location.
  - PSE can generate very good slide shows with pan & zoom and music. (If we have time, we'll play a short slide show made by PSE.)

Importing Your Images (Lightroom Example)



Work Flow

- You've just returned with 750 pictures.
- We often say digital pictures are free, but the disk space they occupy is not and neither is our time to have to deal with so many images.
- Once they are in the computer, now what?
- We first quickly rate and reject images during our first look at them. Ratings include 1 to 5, other rating tags (varies based on software in use), and reject "bad" images. Also, now is the time to add those additional image specific keywords.
- Then delete all the rejected images and free up the disk space.
- The next pass through the images, "develop" or enhance the images. PSE and especially Lightroom are good for this.
- Next edit those needing Photoshop
- Finally output them for printing or web uploading

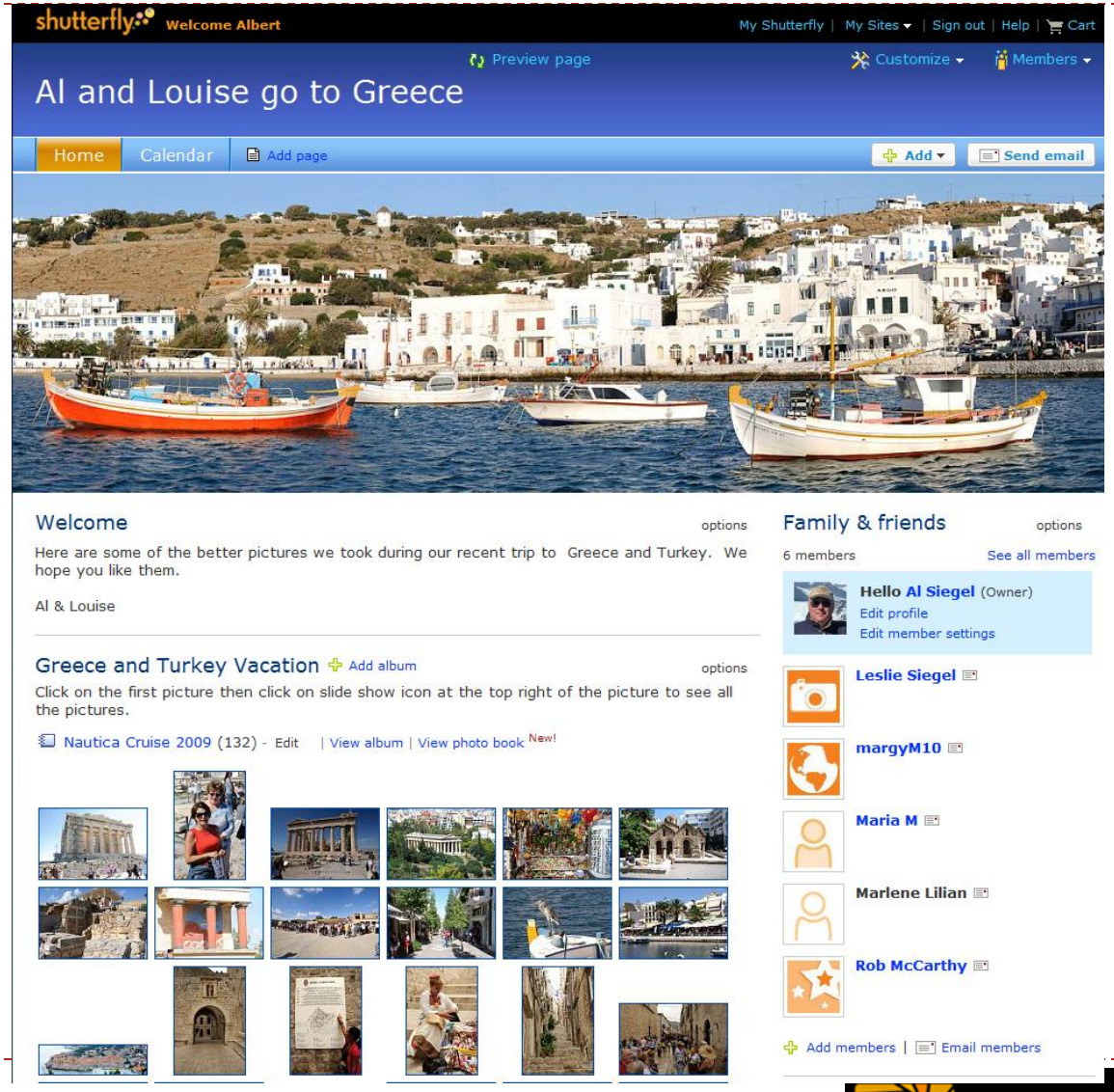
Why Lightroom?

- In case you haven't guessed, I like Lightroom.
- Lightroom was developed for the professional photographer whose time is valuable and needs to process images quickly but in a quality manner.
- It does have a learning curve.
- In many ways, PSE 8 Organizer is just as good or better and has a much more "user-friendly" interface. Without some study or training in Lightroom, one sould use PSE Organizer and did for about two years. One would not use Adobe Bridge with its present functionality if they were using keywords
- Lightroom's features of note:
  - Image organization tools
  - Develop module
    - Fix one picture, copy that fix to the others that have it
    - It has most of the image adjustment capabilities of Photoshop editor
  - Non-destructive editing, your digital negative does not change, there is a change file "sidecar." Can always remove changes and "go back,"
  - Virtual copies to allow trial of changes or cropping various parts.
  - Provides folder and file physical moves and renames
  - Integration with Photomatix
  - Presets

Sharing Images on the Web

- There are lots of good sites to use for sharing your images.
- In a prior presentation we learned that people are taking many more pictures, but printing them less.
- They stay in our computers or get shared on the Web.
- A couple of typical free web sites (OK, they want to sell you pictures and albums, but the sites are free.):
  - FLICKR
  - Shutterfly
  - Snapfish
- It's amazing how quick one can set up a web site.
- One caution, be careful about image ownership, for example, FLICKR seems to be talking about ownership of their members' images.
- Also, make sure your copyright is in the metadata

Shuterfly Example – Setup in Less Than Five Minutes

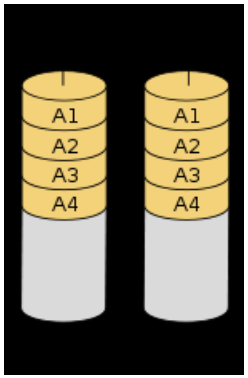


Backup

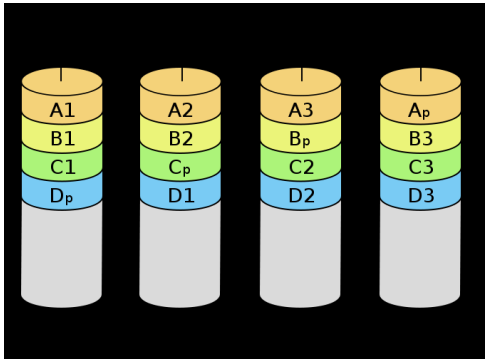
- If you are not doing it, odds are high that you will lose files or your whole system at some point in time.
- Risks:
  - Fat Fingers – Operator Error – You Did it!
  - Operating system bugs
  - Viruses
  - Hardware failure
    - Disk crash
    - CPU failure that results in bad data written to disks.
    - Loss of data in transmission (subtle and hard to find)
  - Property loss (file or theft)

Backup (continued)

- Hardware Solution (Data Redundancy)
  - RAID Disks
    - Multiple disks joined to share the data.
    - Supported by hardware and Operating Systems (Windows & MAC)
    - RAID 1 - Mirrored Disks
      - Two disks with identical information.
      - If one breaks, the other will have the information
      - Reading is faster as two disk available to satisfy read Request
    - RAID 5 – 3 or more disks with data and recovery information spread on all disks.
      - If one fails, the data can be recovered and then restored back on a replacement disk.
    - Still needs to be backed up to protect from some of the risks.



Raid 1



Raid 5

Backup (continued)

- Back alternatives
  - Back up images as special case
    - Back them up to DVD or Blu-ray optical drives when you import them or when finished initial processing.
  - Back up critical data – images, financial data, documents etc.
    - Use backup utilities provided with OS or purchased
    - Need auxiliary disk of sufficient size to hold backup image
  - Back up the whole system
    - Use backup utilities provided with OS or purchased
    - Need auxiliary disk of sufficient size to hold backup image, will have to be at least double size of data backed up or have multiple back up disks. If not, what happens if doing backup on drive after freeing space for new backup?

Backup (continued)

- Backup Media alternatives;
  - We used to think about using tapes, but given the current sizes of PC disks as well as long-term viability and cost of tapes, this option is best left behind.
  - Buy an external backup disk.
    - Available in 1 to 2 Terabyte sizes now
    - Costs $100 to $200 based on size.
    - Use eSata interface if available on you PC/MAC, otherwise use Firewire or USB. USB is slow, but backup drives will hardly be used for normal processing
  - Optical Drives (DVD's and Blu-Ray)
    - Write once, read when needed, uses removable media
    - Good for specialized photo image backups by project
    - Inexpensive
    - Long shelf life
  - On-Line
    - Attractive as the data is somewhere other than where your computer is.
    - Costs need to be understood, but this is an established technology
    - Network bandwidth is an issue. How fast & reliable is your Internet service?
    - Available anywhere there is an Internet connection and with appropriate security, available to upload to other computers

Backup - Optical Media Longevity

	CD-R	CD-RW	DVD-R	DVD-R 2X	Blu-Ray
Capacity	720 MB		4.2 GB	8.4 GB	25 GB
Media Cost	$.25	$.50	$.18	$1.00	$9.00
Cost / GB	$.34	$.68	$.04	$.12	$.36
Manufacturers' estimated recorded life span (years)	50-200	20-100	30-100	30-50	25-200

Source: Optical Storage Technology Association

Questions?

Thank You!