



Imaging and Scanning

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1. Course objectives.
 - a. To provide the class with an in depth exploration of picture and graphic manipulation on PCs using a variety of software through lecture, discussion and exercises.
 - b. To explore scanner and digital camera options and capabilities.
 - c. To develop computer literacy.
 - d. **To address the *class'* questions.**

Pre-seminar homework

- a. Please feel free to contact Jim via Bridget Doyle or via jim@crowleycomputers.com, let me know what your projects are, what your problems are, what you need from the seminar.
- b. Bring a picture you want to manipulate with you!
- c. Bring "problems" and questions

2. Schedule

9:00	Registration
9:30	Session 1 - who, what and why, scanner and camera basics
10:00	Play time!
10:30	Session 2 - digital image basic concepts
11:30	Play time!

12:00	Lunch
1:00	Session 3 - image manipulation
2:00	Play time!
2:30	Session 4 - buying tips
3:30	Completed, but available for questions

Contents

Course objectives.
Schedule
Introductions
Pictures say 1000 words.
Photo apps are designed to adjust photos.
Paint apps are designed to draw objects.
Applications - *INTEREST?*
Basic scanning
Basic digital camera use
Playtime!
Digital image basics....
Definitions
Resolution
Color depth
Format
Examples of resolution, color depth and format:
Suggested resolutions, color depths and formats:
Other scanning notes
Playtime!
Lunch
Basic image manipulation
Saving images
Photo manipulation - some basic tool hints:
Printing
Play Time!
Scanning and more scanning - It doesn't look right
Layers involved in a "simple" scan
Advanced scanning stuff - have fun with it and play! Just save good ones before continuing.
Scanners
Digital cameras
Exposure
Digital Video (DV) cameras
Printer
Read your reviews!
Storage space!
Other software to mention:

3. Introductions

- a. Misc: bathroom, breaks, coffee / soda
- b. Quiz
 - i. PC
 - ii. Hardware
 - (1) Scanner
 - (2) Camera
 - (3) Video
 - (4) Other hardware
 - iii. Software
 - (1) Photo editor
 - (2) Drawing
 - (3) OCR
 - (4) Other

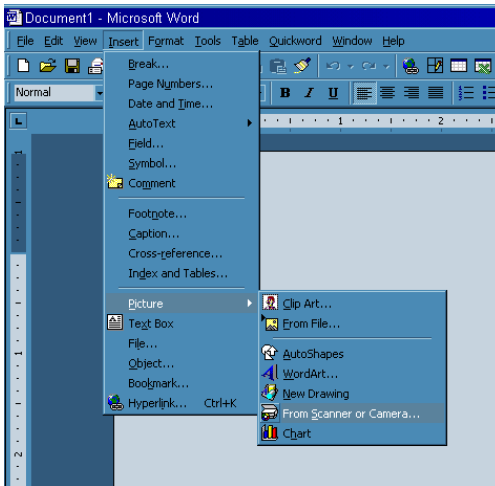
4. Pictures say 1000 words.

- a. What are you trying to say?
- b. The medium of delivery is the first key!
- c. What is your goal?

see Section 1 - intro,
apps, repair eg.ppt

includes Stacy repair

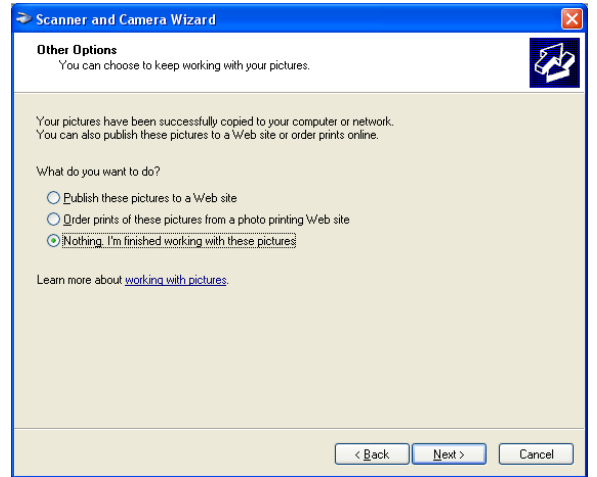
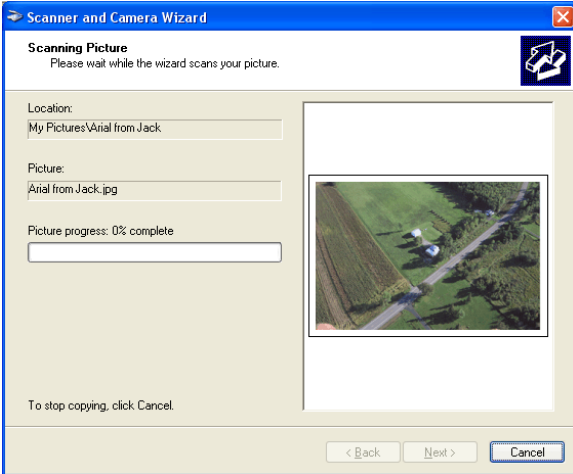
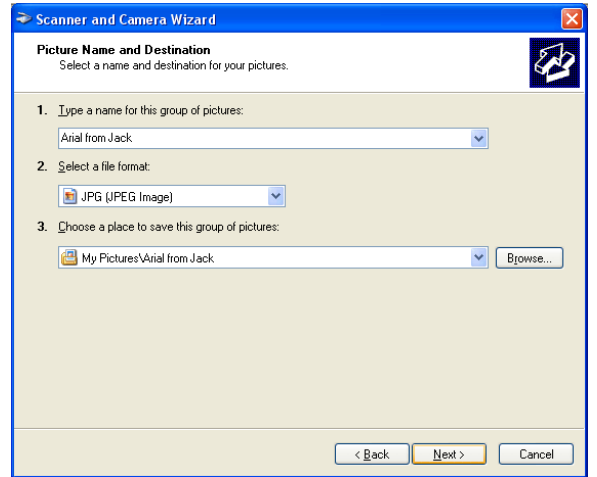
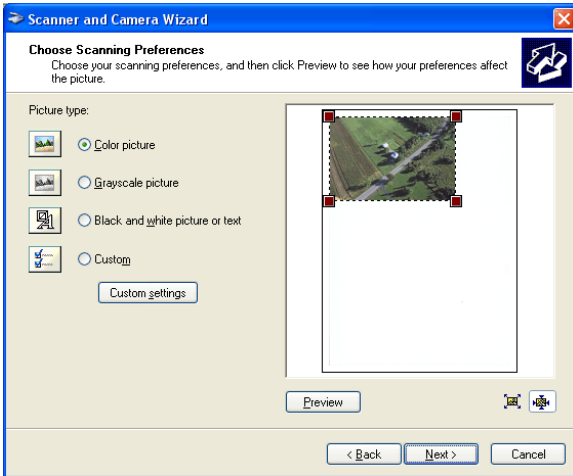
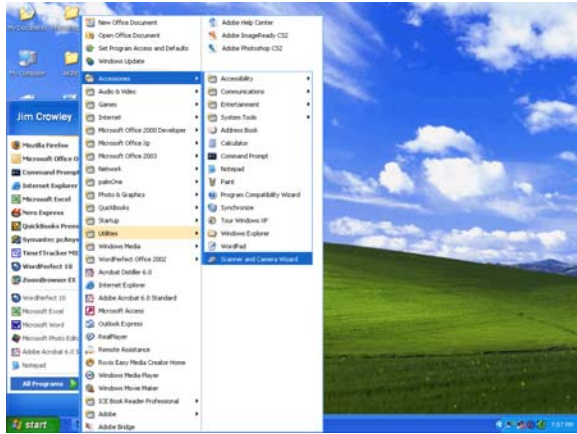
5. Basic scanning



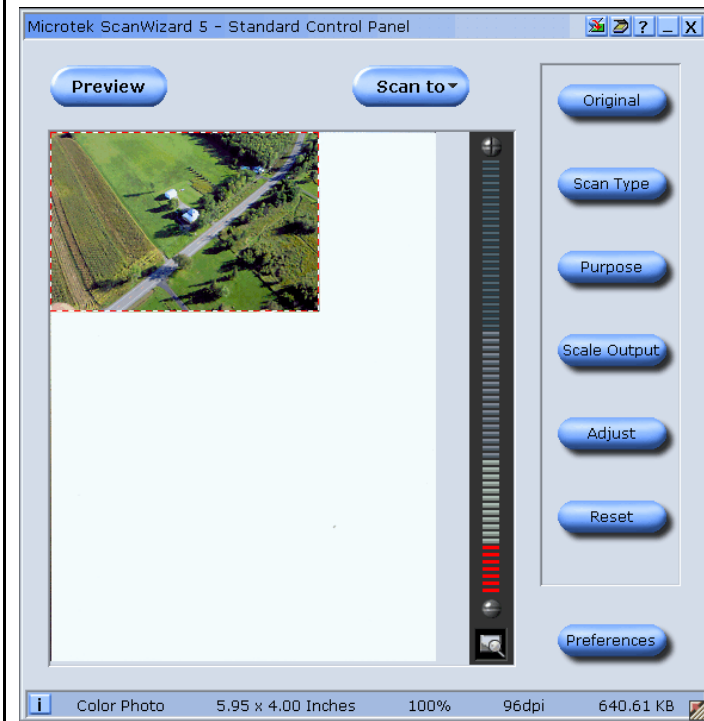
- a. How scanners work...
- b. What is your target?
- c. Select your application
- d. If your scanner is new or you have multiple scanners, be sure you have the right scanner selected, ie select source.
- e. Start the TWAIN interface, ie Scanner and camera wizard or Aquire image
- f. Place image on scanner
- g. Review basics of your settings
- h. Preview image
- i. Adjust settings
- j. Scan

How scanners
work.ppt

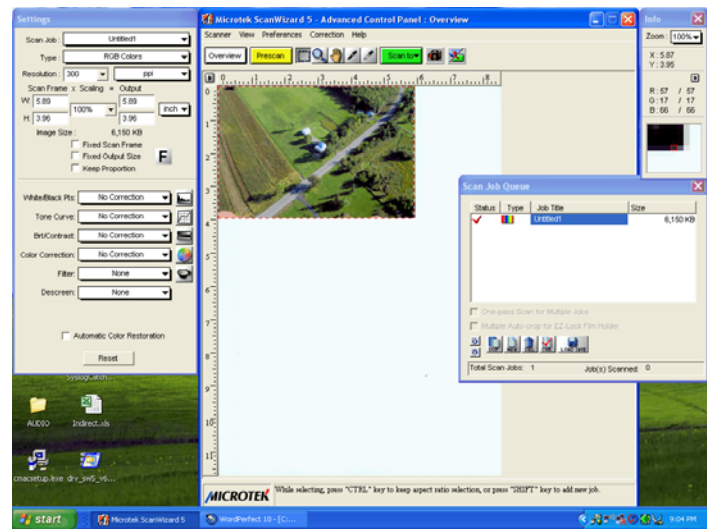
Windows Xp Scanner and Camera Wizard



Scanmaker 5 - basic interface



Scanmaker 5 - advanced interface



6. Basic digital camera use
 - a. How digital cameras work...
 - b. Point and shoot!
 - c. Basic functionality
 - i. Shutter
 - (1) Halfway to set focus, exposure, auto flash...
 - (2) Full to take photo
 - ii. Zoom - optical vs. digital
 - iii. Display and menu

How digital cameras work.ppt

7. Playtime!

8. Digital image basics....

Digital image basics.ppt

9. Think output...

- a. Photographs
 - i. High quality
 - ii. Fun
 - iii. Web sites
- b. Artistic development

- c. Repair
- d. Document assembly
- e. On screen galleries
- f. Email
- g. Other?

10. Applications - *INTEREST?*

- a. Photo editor
 - i. Adobe
 - (1) Photoshop
 - (2) Photoshop Elements
 - ii. Corel Paint Shop Pro
 - iii. Microsoft Picture It!
 - iv. Ulead PhotoImpact
 - v. Picassa
 - vi. There are many, many options at many, many price points...
- b. Paint
- c. Draw
- d. Photo album
- e. Video editing
- f. Screen capture
- g. Optical Character Recognition

Photo vs. Paint applications

- 1. Photo apps are designed to adjust photos.
- 2. Paint apps are designed to draw objects.

11. Definitions

- a. Bitmap = pixel by pixel picture
- b. Vector = picture created by a series of formulas, not our focus...
- c. Pixel = a single dot that makes up the photos
- d. Resolution = dots per inch
- e. Color depth = number of colors per pixel

12. Resolution

- a. Usually measured in dots per inch (dpi)
- b. More is not always better
- c. Double the resolution is quadruple the file size and probably nearly quadruple the scanning time!
- d. How big are we talking about? 5x7" photo at 600x1200 dpi is nearly 74MB.

13. Color depth

- a. Measured in number of colors or number of bits possible per pixel
- b. Again, more is not necessarily better due to file size and duration of scan. Doubling the number of colors will not double the file size though, the scanner will only pass along colors used in that picture.
- c. Color stats:
 - i. VGA color (16 colors) is what you see if your computer goes into safe mode. Everything "looks funny."
 - ii. SVGA used with a grey palette is perfect for black and white pictures. With a color palette background objects may look funny.
 - iii. The human eye normally perceives somewhere around 32 bit color
 - iv. 30 and 36 bit scanners are supposed to be more accurate than 24 bit scanners, but much of this is theoretical and often not perceivable.

	Colors	Bits
B&W	2	1
VGA	16	4
SVGA	256	8
High color	65,536	16
True color	16,777,216	24
	1,073,741,824	30
***	4,294,967,296	32
	68,719,476,736	36
	1,099,511,627,776	40
	4,398,046,511,104	42
	1,125,899,906,842,6xx	50

14. Format

- a. There are many types of formats to store color pictures in. The popular ones are the ones used by most programs, but superior formats often become popular based on their strengths. I.e. TIFF vs. JPEG.
- b. Bitmaps - store individual colors for each pixel
 - i. Uncompressed bitmaps can be huge - BMP
 - ii. Compressed lossless formats save space and do not lose information - TIF & GIF
 - iii. Compressed lossy formats save even more space but lose some detail of the photo - JPEG (or JPG)
 - iv. Paint packages like Corel PhotoPaint and many others.
- c. Vector - define image as a series of formulas. These are useful for logos and other images that will be scaled, they will always look correct as it is made larger and smaller.
 - i. CAD style programs
 - ii. Draw packages like Corel Draw.

15. Examples of resolution, color depth and format:

Source	Color depth (bits)	Resolution (dpi)	Size (MB)
4x6" b&w photo	8	300	2.2

4x6" color photo	24	72	0.360
4x6" color photo	24	300	6.5
8x10" color photo	24	600	84.4

16. Suggested resolutions, color depths and formats:
(this is worth the price of admission)

Usage	Resolution	Color	Format
Snapshot size print out	300dpi	30 bit	TIFF
On screen, email, Web page	72 or 100dpi	8 bit	JPEG
Small original to larger size	maximum resolution	30 bit	TIFF

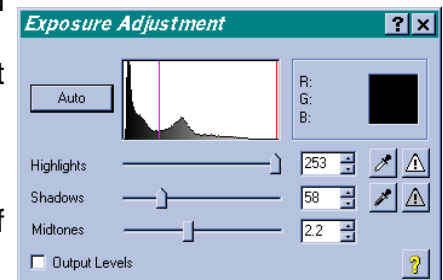
17. Other scanning notes
- a. Scanning film (negatives) is superior to scanning photos!
 - i. Most photo paper is about 200 to 300dpi equivalent, 35mm film is 3000dpi!
 - ii. No paper grain
 - iii. Light passes through image rather than reflecting off image
 - iv. Requires film scanner
 - b. JPG and any other lossy compression scheme results in more corruption of a files with *each* consecutive save of the image!

18. Playtime!

19. Lunch

20. Playtime!

21. Basic image manipulation
- a. What have you got? File Properties
 - i. Check image properties for image and file size, color depth and ????
 - b. Format
 - i. Dimensions - altering image size or dimensions
 - ii. Brightness & Contrast - use your previews!!!
 - (1) Brightness - amount of light transmitted or reflected by a pixel
 - (2) Contrast - difference in tone between light and dark areas
 - (3) Gamma - alters midtone colors without affecting extremes of spectrum
 - iii. Histogram
 - (1) Better than adjusting contrast
 - (2) Defines black and white and midpoint of colors.



- (3) Better scanner apps automatically adjust histogram.
 - iv. Color balance allows you adjust specific amounts of specific colors. Uses Color models which provide various methods to define colors, each model defining colors through the use of specific color components. This gets ugly - don't sweat it!
 - (1) RGB - Red Green Blue, additive, defines transmitted light, useful on monitors
 - (2) CMYK - Cyan Magenta Yellow Black, subtractive, defines reflected light, useful for printing
 - (3) HSB - Hue Saturation Brightness, color sphere
 - (4) Grayscale - has equal value on RGB scale
 - v. Focus
- c. Selection
 - i. Tools
 - (1) Basic shaped selection tools (square, ellipse...)
 - (2) Lasso - manual irregular shapes
 - (3) Magic! Use combo of computer power and user to define edges of color.
 - ii. Modifying tools - watch for tool modifier buttons or hints in status bars.
 - iii. Handles
- d. Edit
 - i. Crop - cut excess from edges
 - ii. Rotate and Flip

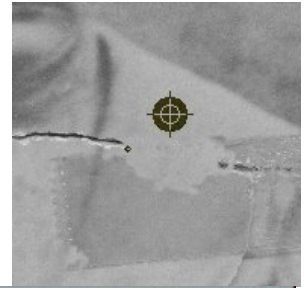
22. Saving images

- a. Where????
- b. Size????
- c. Save vs. Save As

23. Photo manipulation - some basic tool hints:

- a. Zoom!
- b. Scroll!
- c. Usual pattern for working:
 - i. Select tool
 - ii. Select image or section of image
 - iii. Work tool
- d. Misc tools
 - i. Soften
 - ii. Sharpen
 - iii. Texture
- e. Red eye
 - i. Select red eye
 - ii. Zoom to proper magnification so you can select just the pupil
 - iii. Select the area
 - iv. Engage the tool to remove / blacken all red
- f. Copying and moving
 - i. Select original (learn your tools!)
 - ii. Cut (to move) or Copy (to copy)
 - iii. Select new location (possibly after paste)

- iv. Paste
- g. Clone tool
 - i. Select clone tool
 - ii. Select location of good picture
 - iii. Select where you want center of good area to be on copy
 - iv. Drag around
 - v. You can reselect center and go at it more!
- h. Brushes
 - i. Size
 - ii. Edge
 - (1) Hard vs. soft



- 24. Printing
 - a. Paper
 - i. Plain
 - ii. Ink jet
 - iii. High resolution
 - iv. Glossy photo paper
 - v. Super glossy photo paper
 - vi. Fun stuff
 - (1) T-Shirt transfers
 - (2) Labels
 - (3) Transparencies
 - vii. Not all manufacturers are created equal!
 - b. Matching image resolution need to the printers capability.
 - i. Experience counts
 - ii. Try lower resolution, regular paper tests
 - iii. Double check your settings as you go

25. Play Time!

- 26. Scanning and more scanning - It doesn't look right
 - a. Screen resolution?
 - b. Screen color depth?
 - c. Reflective surface?

27. Layers involved in a "simple" scan

Scanner
layers.shw

Layer	Hardware / Software	Example	Description
Application	S	OmniPage, Pagekeeper, Paint Shop Pro, PhotoDraw PhotoImpact, Photoshop, Photo Paint...	The program that will actually be used to store and manipulate the picture.
Windows	S	Windows 3.x / 9x / NT / 2000	Your operating system provides the basis for all your software to operate. It provides the photo application with display, keyboard, mouse...
TWAIN	S		TWAIN is a standard interface between your scanner and Windows. Prior to TWAIN scanner companies had to write nearly ALL the software to use the scanner.
Interface	H	SCSI, Parallel, USB	How the computer connects to the scanner.
Scanner / Camera	H	Microtek X6, Hewlett Packard ScanJet...	The part you think your paying for and here to learn to use, but it isn't.

28. If your application doesn't have a scanner option?

Option A	Option B
a. Run a scanner enabled application	h. Run your scanner application
b. Scan your image	i. Scan your image
c. Make any needed adjustments	j. Make any needed adjustments
d. Select the entire / desired image	k. Save it to disk
e. Copy the image	l. Open the un-scanner enabled application
f. Select the un-scanner enabled application	m. Open the image
g. Paste the image	

29. Advanced scanning stuff - have fun with it and play! Just save good ones before continuing.

- a. Original image quality
 - i. Newspaper
- b. Surface texture

30. Scanners

- a. Manufacturer
 - i. Quality of hardware
 - ii. Quality of software
 - iii. Such a thing as too cheap
- b. Type
 - i. Flatbed
 - (1) Best quality scans

- (2) Least damage to document
 - (3) Transparency, Autofeed, Slide / Negative adapters
 - ii. ~~Handheld~~
 - ~~(1) Not very popular anymore~~
 - ~~(2) Very inexpensive~~
 - ~~(3) Poor scans due to irregular speed~~
 - iii. Paper fed
 - (1) Less expensive
 - (2) Unsteady feed leads to small distortions
 - (3) Good for OCR and occasional fun
 - iv. Photo
 - (1) Designed to scan photographs only
 - (2) Possible built in repair tools
 - v. Film
 - (1) Small scan mechanism, very high resolution
 - (2) Expensive
- c. Scanning mechanism
 - i. CCD - Short for charge-coupled device, an instrument whose semiconductors are connected so that the output of one serves as the input of the next. Digital cameras, video cameras, and optical scanners all use CCD arrays.
 - (1) Older technology
 - (2) Expensive to manufacture, most scanners over \$100 have CCD scan heads.
 - ii. CMOS - Abbreviation of complementary metal oxide semiconductor. Pronounced see-moss, CMOS is a widely used type of semiconductor. CMOS semiconductors use both NMOS (negative polarity) and PMOS (positive polarity) circuits. Since only one of the circuit types is on at any given time, CMOS chips require less power than chips using just one type of transistor. This makes them particularly attractive for use in battery-powered devices, such as portable computers. Personal computers also contain a small amount of battery-powered CMOS memory to hold the date, time, and system setup parameters.
 - (1) New technology as used in scanners
 - (2) Cross talk in scan head is improving, but can lead to fuzzy scans. Very inexpensive to manufacture, in the future this will likely replace CCD. Careful about going too cheap..
 - (3) Now used in less expensive cameras. Great possibilities.
- d. Interface
 - i. ~~Proprietary = prior to SCSI, no longer used~~
 - ii. ~~Serial = inexpensive, extremely slow, not used much anymore except in cheap cameras~~
 - iii. Parallel = inexpensive, pokey, can cause printer problems, easy setup
 - iv. USB = inexpensive, fast, must be newer computer with Windows 98, newest connection technology, easy setup
 - v. SCSI = expensive, up to 3 to 10 times faster getting data from scanner to PC, easy on computer, oldest connection technology, difficult setup
- e. TWAIN, which comes from the saying "Ne'er the twain shall meet" because the Data Source Manager sits between the driver and application, is the de facto interface standard for

scanners. Nearly all scanners come with a TWAIN driver, which makes them compatible with any TWAIN-supporting software. Unfortunately, not all scanner software is TWAIN-compatible but in the year 2000 almost all is. Spending much of today with TWAIN.

- f. Windows hosts interface for all Windows compliant software, including things like keyboard, mouse and display.

31. Digital cameras




Camera samples.shw

- a. Body styles
 - i. Compact - flexible and reasonably priced
 - ii. Ultra compact - tiny, expensive, sometimes compromise optics
 - iii. Enthusiast - full sized body, more gitchies for photographer hobbyists
 - iv. Superzoom - compact and enthusiast style with 10x or higher zoom
 - v. D-SLR - professional cameras, often the same as the big 35mm, very expensive
- b. Pixels - not dots per inch, but a fixed number of pixels make up the image

Horizontal	Vertical	Total pixels	Cost May 02	Usage
320 640 800 1,024	240 480 600 768	76,800 307,200 480,000 786,432	< \$75	Below 1 megapixel, fixed lens, non replaceable memory, fully automatic, often made for kids
11,52 1,600 2,240	872 1,200 1,500	1,004,544 1,920,000 3,420,000	\$100 -	1 to 3 megapixel, some with zoom, mainly automatic, removable memory. 3MP can be pushed to 8x10 prints.
2,272 2,560	1,704 1,960	3,871,488 5,017,600	\$200 - 1500	4 & 5 megapixel - current "sweet spot" of performance and price. Lots of toys, range of features.
3,456	2,304	7,962,624	\$700 +	8 megapixel - prints to 10 x 16
				beyond 8 megapixel - professional use and professional prices

- c. Sensor - just like scanners!
 - i. CCD - older, proven, more expensive technology
 - ii. CMOS - new, inexpensive technology, not as clear, but it is catching up to and will likely replace CCD technology except in most expensive cameras
- d. Lens
 - i. Plastic - inexpensive cameras, make pictures foggy
 - ii. Aspherical glass - more expensive cameras use glass that is not circular to reduce distortion
 - iii. Threaded for accessories
- e. Zoom
 - i. Optical
 - ii. Digital
- f. Storage

- i. Drive
 - (1) Floppy
 - (2) Hard drive
 - (a) IBM microdrive - 340MB, 1GB coming
 - (b) Iomega Click! - 40MB
 - (3) Mini-CD
 - (4) Mini-DVD
- ii. Memory

		
<p>Secure Digital or MultiMediaCard up to 4GB King of the mountain</p>	<p>CompactFlash up to 8GB has controller builtin can contain drive</p>	<p>xD-Picture Card up to 8GB some complain it's too small</p>
		
<p>Mini SD fits inside an SD holder</p>	<p>Memory Stick and Duo up to 2GB Sony format</p>	<p>SmartMedia up to 128MB DOA</p>

g. Transfer

- i. Floppy
- ii. Memory adapter
- iii. Cable
 - (1) Serial
 - (2) Parallel
 - (3) USB
- iv. Dock
- v. Video out to TV / VCR
- h. Storage by JPEG, sometimes TIFF
- i. Others
 - i. Physical size
 - ii. AA or rechargeable Lithium Ion batteries most common
 - iii. LCD size
 - iv. Flash
 - v. Recycle time
 - vi. Macro mode (up close)
 - vii. Video
 - viii. Audio



- 32. Exposure
 - a. Shutter - opens (thousandths of a second) to let light onto sensor
 - b. Aperture - size of opening to control amount of light
 - c. White balance - what is white? Sunlight? Incandescent lights? Fluorescents?
 - d. Control
 - i. Fixed in inexpensive cameras
 - ii. Automated and/or presets in moderate cameras
 - (1) sports
 - (2) night
 - (3) snow and sand

- 33. Digital Video (DV) cameras
 - a. Advantages over analog (S-VHS and Hi-8) cameras
 - i. Better resolution
 - ii. Better signal to noise ratio
 - iii. Signal bandwidth
 - iv. Color quality
 - v. Transfer to PC via IEEE1394 (firewire) with no loss of quality is easy
 - vi. No degeneration over time or use
 - b. Standard components not in analog cameras
 - i. Infrared filter for B&W or color video in near total darkness
 - ii. Zoom with telescopic and wide angle capabilities
 - iii. Auto exposure for existing white
 - iv. Video storage on DV tape
 - v. Still storage in many different factors
 - vi. Manual and auto shutter speeds

- vii. White balance
- c. Prices in the \$500 to \$5000 - coming down fast!

34. Printer

- a. Type
 - i. Inkjet - affordable, ink bleed, \$0.08 per page and up
 - ii. Laser - expensive, expensive supplies, \$0.50 per page and up
- b. Resolution
 - i. 300, 360, 720, 1200 and 1400 are all common now
 - ii. Which is better 1200x1200 or 720x1440? 1,440,000 dpi or 1,036,800?
- c. 3 color vs. 4 color vs. 6 color
- d. Ink quality
 - i. Better inks will make up for lower resolutions
 - ii. Better inks are brighter and dry faster therefore bleed less
- e. Supply costs
 - i. Separate ink tanks for each color?
 - ii. Is the print head replaced with the ink tank?

35. Read your reviews!

- a. There are bargains and there is garbage!
- b. If an article is three months old, it is useless! Be sure to compare it's information with what is current!
- c. A few extra pixels won't make up for:
 - i. Garbage lens
 - ii. Lack of zoom
 - iii. Lack of storage
 - iv. Difficulty to access photos
- d. Recommended web site from ZDNet <http://www.zdnet.com/special/filters/sc/camera/reviews/>

36. Storage space!

- a. Image size
- b. Storage locations
 - i. Hard drive
 - ii. Jaz / Zip drives
 - iii. CD-RW
 - iv. DVD-RW
 - v. USB key
 - vi. Floppy drives

Storage type	Max capacity	Drive cost	Media cost	Cost/MB	Plus	Minus
Hard drive	400GB	\$150	\$150.00	\$0.0004	fast, reliable, easy to use, capacity	fixed media
Zip	250MB	\$139	\$19.00	\$0.0760	easy to use	cost, not universal

Storage type	Max capacity	Drive cost	Media cost	Cost/MB	Plus	Minus
DVD-RW	4.7GB	\$60	\$2.00	\$0.0004	reliable, huge, easy to share	not simple to use
CD-RW	680MB	\$205	\$3.50	\$0.0171	reliable, capacity, easy to share	not simple to use
CD-R	680MB	\$205	\$3.00	\$0.0146	reliable, capacity, easy to share, permanent	not simple to use
Floppy drive	1.44MB	\$20	\$0.25	\$0.0125	easy to use, easy to share	low capacity

c. Backup, backup, backup

37. Other software to mention:

- a. Vector drawing packages
- b. Photo album
- c. Optical Character Recognition
- d. Electronic photo delivery services
- e. Video editing
- f. Screen capture
- g. Mapping

Works Cited

Corel Draw clip art collection
 Family PC
 Internet.com Webopedia
 PC Magazine, www.pcmag.com
www.howstuffworks.com
 Ziff Davis Network, Help and How To, www.zdnet.com