

Computer Graphics and Human Computer Interaction

Lecture 5 Graphics and Sound

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About this course

► Purpose

This subject examines the design, evaluation and implementation of interactive computing systems for human use (HCI) and the major phenomena surrounding them. Also considered are joint performance of tasks by humans and machines, structure of human machine communication, social and organizational interactions with machine design, human capabilities to use machines including their learn ability, engineering concerns that arise in designing interfaces, the process of specification design, implementation and evaluation of interfaces and design tradeoffs.

► Assessment

- Individual courseworks (40%)
- Quiz (10%)
- Final (50%)



About this course

► Topics

- ▶ Introduction
- ▶ Frameworks for Cognition and Theories
- ▶ Usability
- ▶ Graphics and Sound
- ▶ Design Methods and Process
- ▶ Usability testing
- ▶ CSCW
- ▶ Mobile and Ubiquitous Interaction

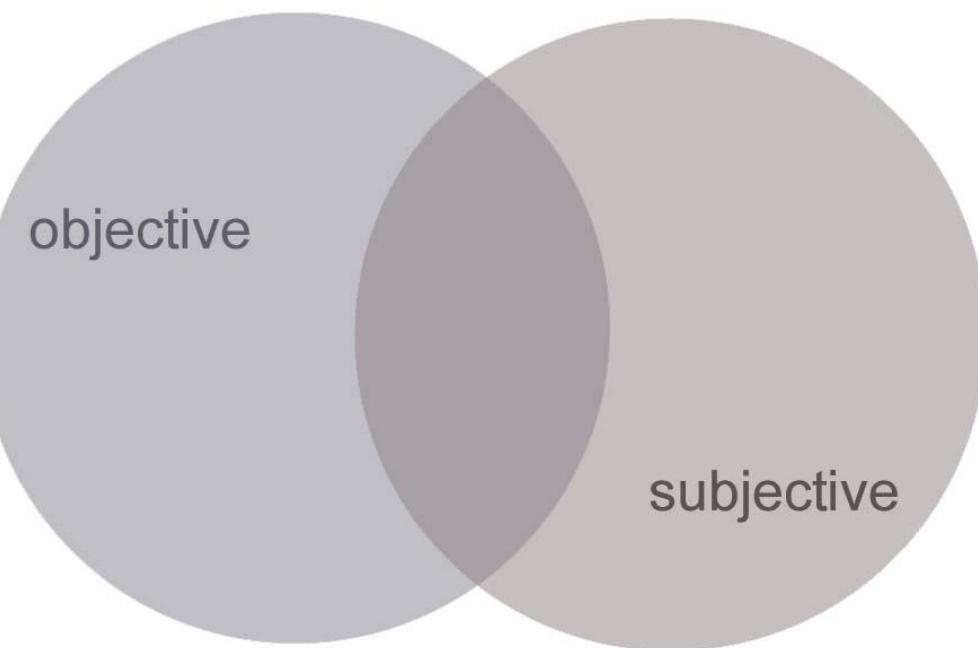
Graphic Design

The “look & feel”

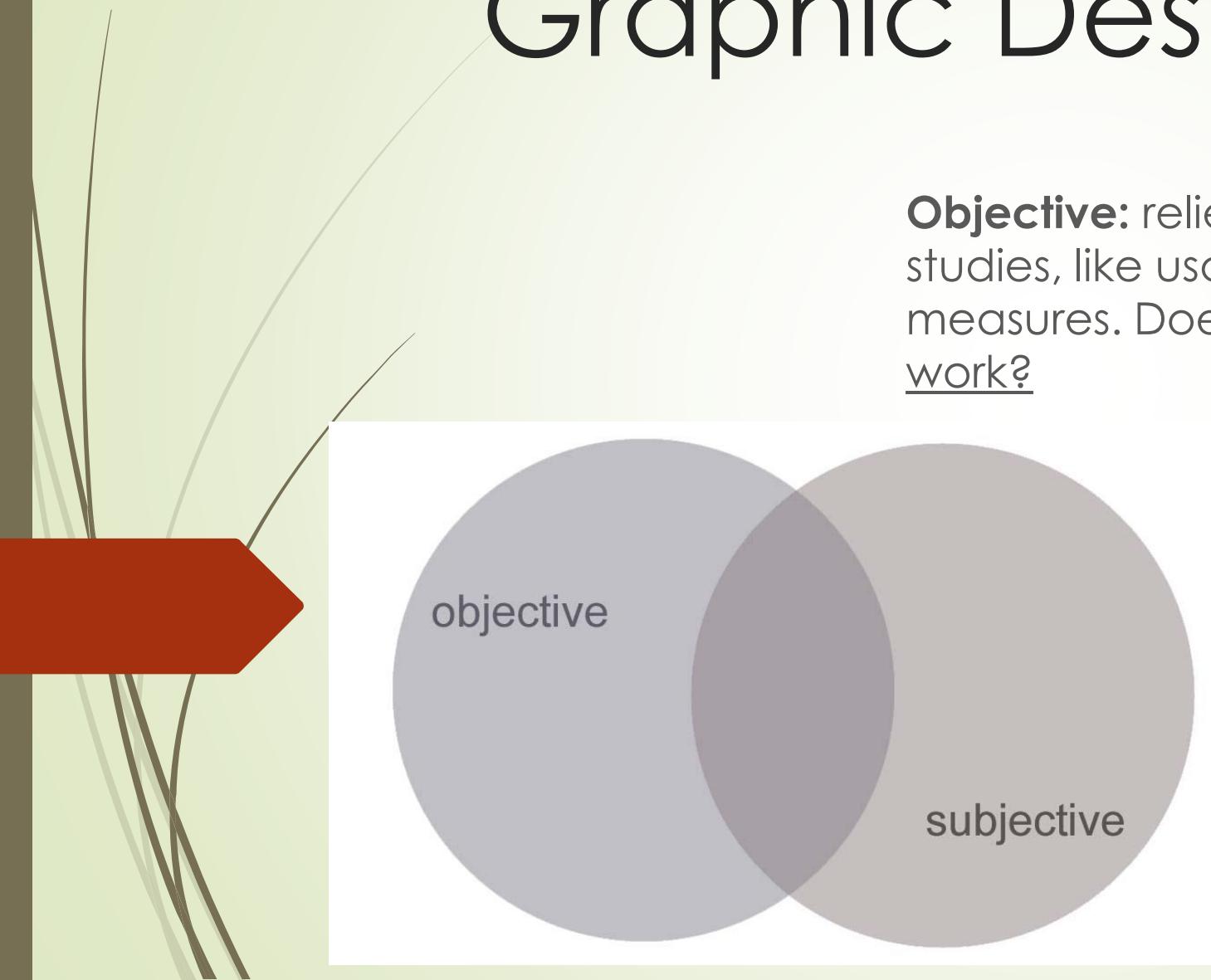
It shares aspects of engineering,
but with aesthetic, communicative
aspects and consumer appeal.

Graphic Design

It relies on a BALANCE and integration of:



Graphic Design



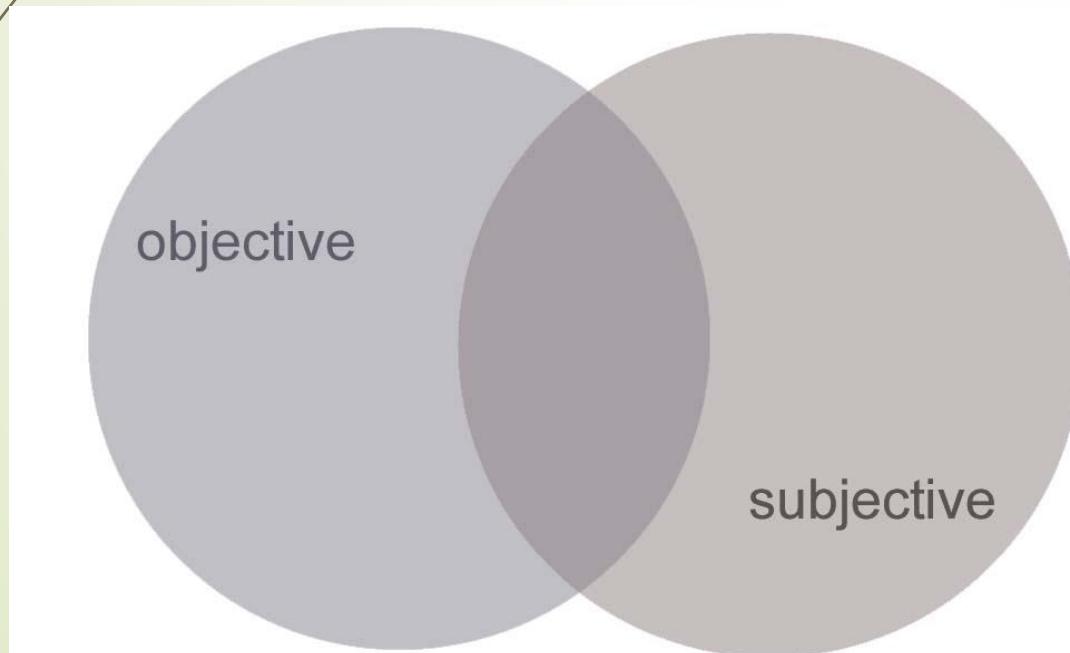
Objective: relies on quantitative studies, like usability and legibility measures. Does the “look and feel” work?

objective

subjective

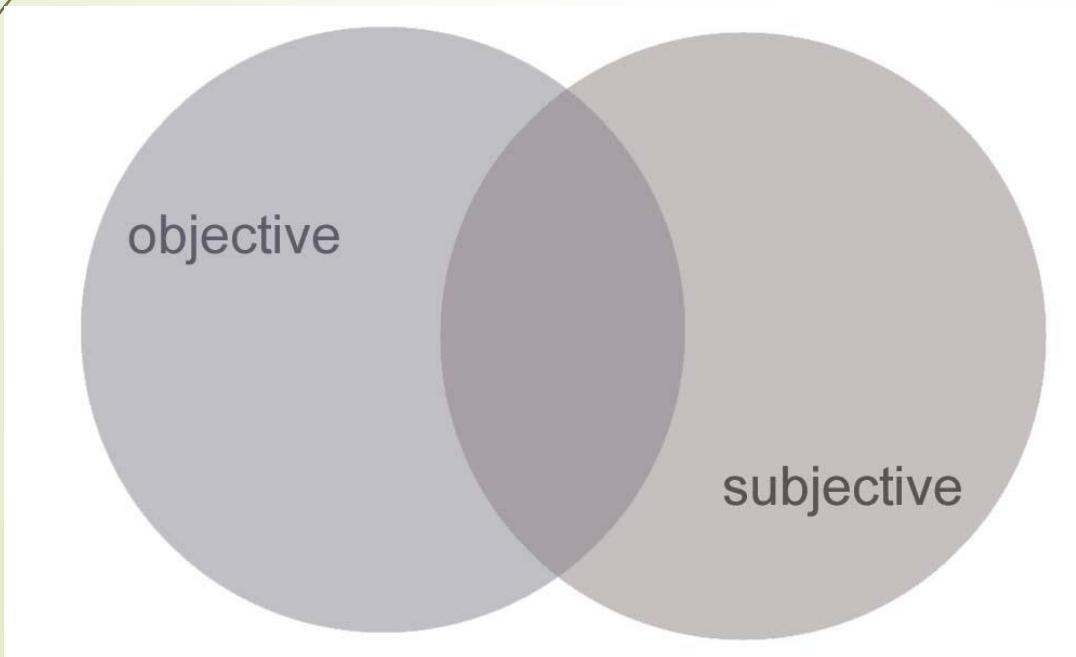
Graphic Design

Subjective: “look and feel” relies on subjective judgement by experts, depends on contextual factors.



Graphic Design

Subjective: “look and feel” Culture is learned, cultural meanings change, meanings can be multiple. Uniqueness is valued (not programmable).



Graphic Design

So what?

Deploying graphic design principles will:

- enhance your ability to communicate w/designers
- enable you to create more user-friendly interfaces
- enhance the knowledge base of HCI, which is increasingly necessary with millions of users

& feel

Role of Graphic Design

- ▶ The “look and feel” portion of an interface:
- ▶ What someone initially encounters
 - ▶ Sets a framework for understanding content
 - ▶ Conveys an impression, mood

Role of Graphic Design

- ▶ The “look and feel” portion of an interface:
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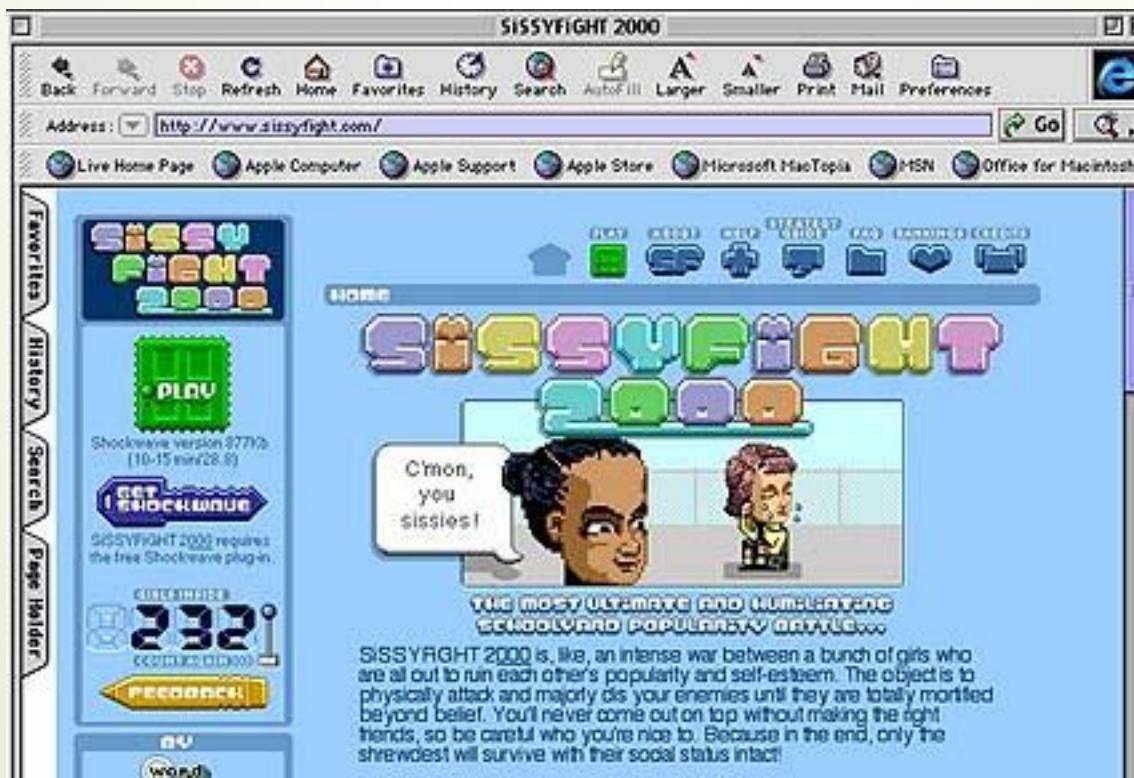
Role of Graphic Design

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Principles of Graphic Design

17

- ▶ Concept/Metaphor
- ▶ Hierarchy
- ▶ Clarity
- ▶ Consistency
- ▶ Alignment
- ▶ Proximity
- ▶ Contrast

Principles: Concept/Metaphor

- ▶ **Concept:** what is the main idea that every visual aspect of the interface relates to? (It MUST be relevant)
- ▶ Apple: accessible, fun, familiar; “for the rest of us”
- ▶ **Metaphor:** (Means of “explaining” concept If you’re building an interface for a grocery application, maybe mimic a person walking through a store with a cart. **desktop metaphor**)

Principles: Hierarchy

- ➡ What are the relative “levels” of importance?
- ➡ What should the user see first? Second?

Principles: Hierarchy

- ▶ What are the relative “levels” of importance?



Principles: Hierarchy



Principles: Clarity

- ▶ Every element in an interface should have a reason for being there
 - ▶ Make that reason clear!
- ▶ Less is more

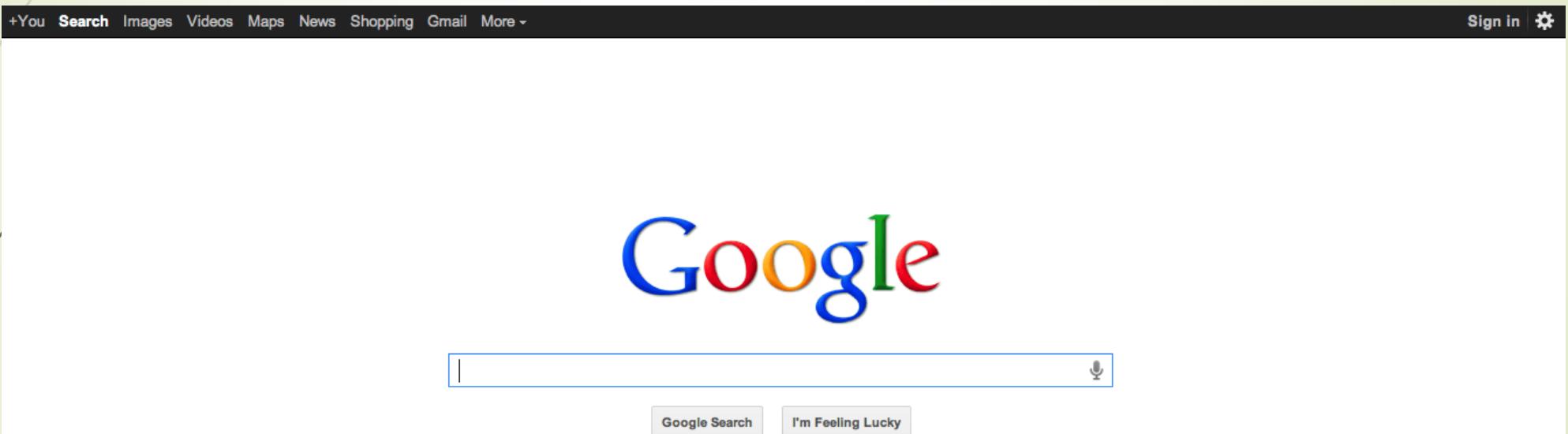
Principles: Clarity

► White space

- ▶ Leads the eye
- ▶ Provides symmetry and balance through its use
- ▶ Strengthens impact of message
- ▶ Allows eye to rest between elements of activity (increases legibility)
- ▶ Used to promote simplicity, elegance, refinement

Principles: Clarity

► White space



Principles: Clarity

► White space

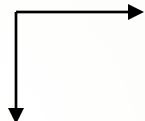


Principles: Consistency

- ▶ **Be consistent in every aspect:**
- ▶ In layout, color, images, icons, typography, text
- ▶ Within screen, across screens
- ▶ Stay within metaphor everywhere
- ▶ Platform may have a style guide -- follow it!

Principles: Alignment

- Western world
 - Start from top left
- Allows eye to parse display more easily



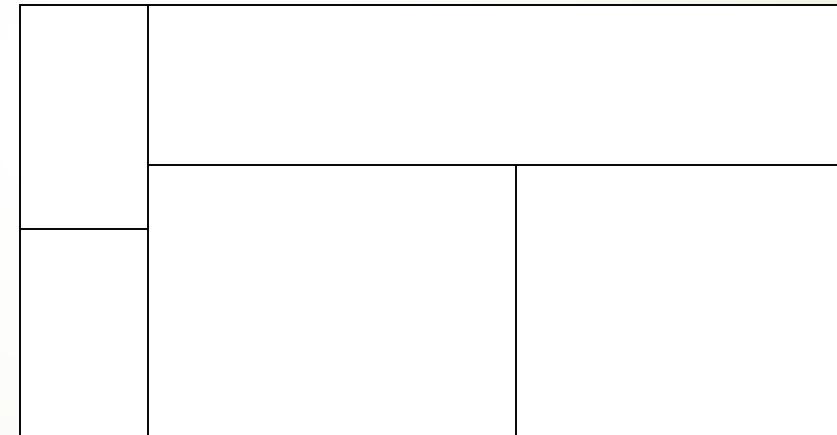
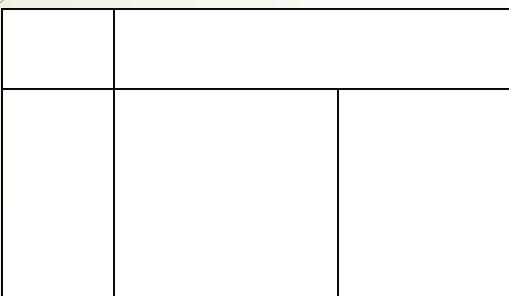
Principles: Alignment

► Grids

- (Hidden) horizontal and vertical lines to help locate window components
- Align related things
- Group items logically
- Minimize number of controls, reduce clutter

Principles: Alignment

- Grids - use them



Principles: Alignment

► Grids

- (Hidden) horizontal and vertical lines to help locate window components
- Align related things
- Group items logically
- Minimize number of controls, reduce clutter

Principles: Alignment

- ▶ Left, center, or right

Here is
some
new text

Here is
some
new text

Here is
some
new text

- ▶ Ragged right or justified
- ▶ Choose one, use it everywhere
- ▶ Novices often center things
 - ▶ Hard to read!
 - ▶ No definition, calm, very formal
 - ▶ Use only in small quantities

Principles: Proximity

- ▶ Items close together appear to have a relationship
- ▶ Large distance implies -- no relationship



Time

Principles: Proximity

- ▶ Items close together appear to have a relationship
- ▶ Large distance implies -- no relationship

Time



Principles: Contrast

- ▶ Pulls you in
- ▶ Guides your eyes around the interface
- ▶ Supports skimming

- ▶ Take advantage of contrast to guide user through hierarchy of information; add focus; or to energize an interface with “texture”
- ▶ Can be used to distinguish active control

Principles: Contrast

- ▶ Can be used to set off most important item
 - ▶ Allow it to dominate
- ▶ Ask yourself what is the most important item in the interface, highlight it
- ▶ Use geometry to help sequencing

Animation/Rollovers

- ▶ **Blinking**
 - ▶ Good for grabbing attention, but easily becomes obnoxious; use very sparingly
- ▶ **Reverse video, bold**
 - ▶ Good for making something stand out

Typography: White space

- ▶ **White space**
- ▶ Leads the eye
 - ▶ Provides symmetry and balance through its use
 - ▶ Strengthens impact of message
 - ▶ Allows eye to rest between elements of activity (increases legibility)
 - ▶ Used to promote simplicity, elegance, refinement

Typography: Hierarchy

- ▶ How do you lead the user through visual information (by visual means)?
- ▶ **Some traditional navigation devices (conventions):**
 - ▶ Size
 - ▶ Color
 - ▶ Composition (where it is on the rectangle)
 - ▶ Page numbers
 - ▶ Type and Image emphases

Typography

- ▶ Characters and symbols should be easily noticeable and distinguishable
- ▶ AVOID HEAVY USE OF ALL UPPERCASE
- ▶ Studies have found that: mixed case promotes fastest reading and that 55 characters per line is optimal

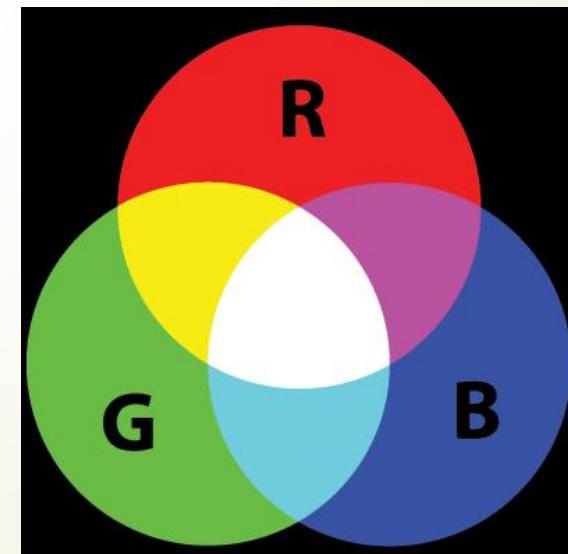
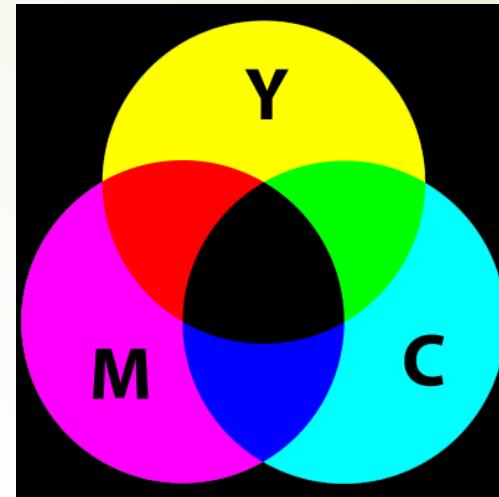
Types of Colour Theories

1. Subtractive Theory

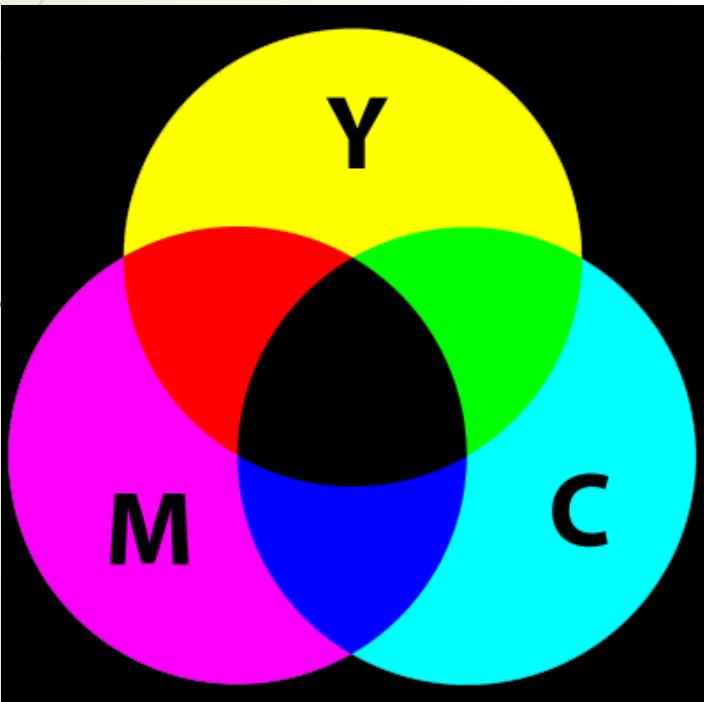
- The **subtractive**, or **pigment** theory deals with how white light is absorbed and reflected off of coloured surfaces.

2. Additive Theory

- The **Additive**, or **light** theory deals with radiated and filtered light.

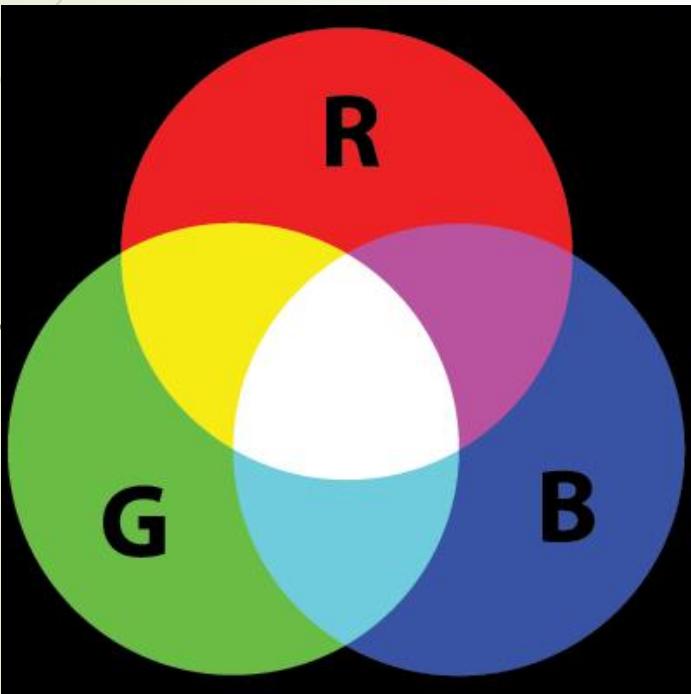


Subtractive Theory



- ▶ Black absorbs most light
- ▶ White reflects most light
- ▶ Coloured Pigments absorb light and reflect only the frequency of the pigment colour.
- ▶ All colours other than the pigment colours are absorbed so this is called subtractive colour theory.
- ▶ The primary colours in Subtractive Theory are:
 - ▶ Cyan (C)
 - ▶ Magenta (M)
 - ▶ Yellow (Y)
 - ▶ Black (K)
- ▶ Subtractive or Pigment Theory is used in printing and painting.

Additive Theory



- ▶ Black radiates no light
- ▶ White (sun) radiates all light
- ▶ Video is the process of capturing and radiating light, therefore it uses Additive (Light) Theory not Subtractive (Pigment) Theory.
- ▶ The primary colours in Additive Theory are:
 - ▶ Red (R)
 - ▶ Green (G)
 - ▶ Blue (B)
- ▶ The primary colours add together to make white
- ▶ Light Theory is also called Additive Theory.
- ▶ Light Theory is used in Television, theater lighting, computer monitors, and video production.

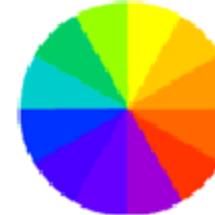
วงจรลี (Colour Wheel)



PRIMARY COLORS
Red, yellow and blue

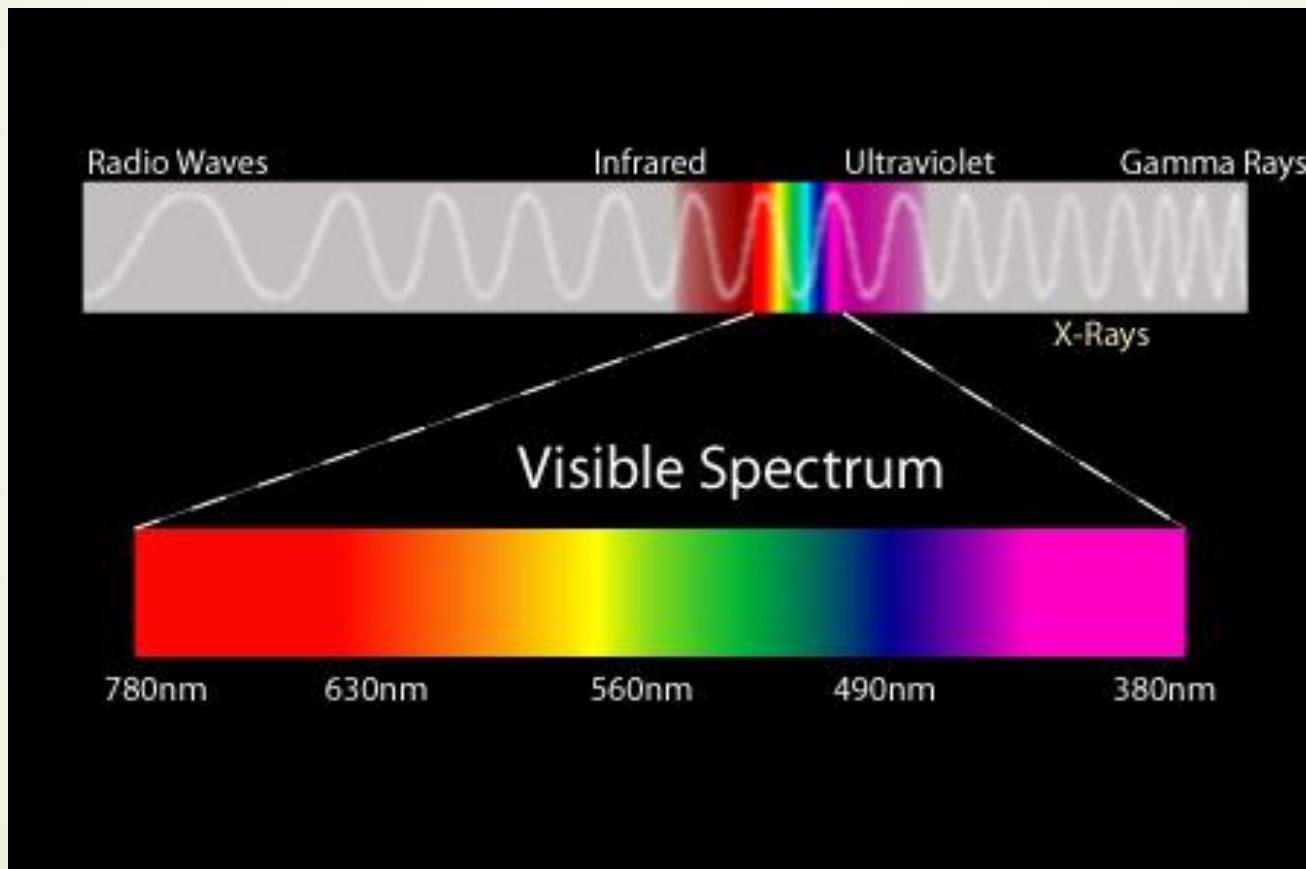


SECONDARY COLORS
Green, orange and purple



TERTIARY COLORS
Yellow-orange, red-orange,
red-purple, blue-purple,
blue-green and yellow-
green.

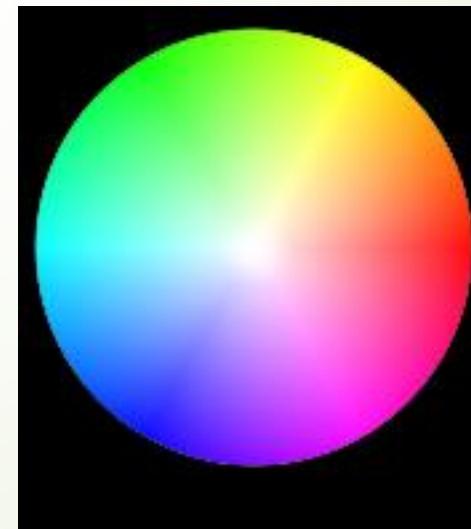
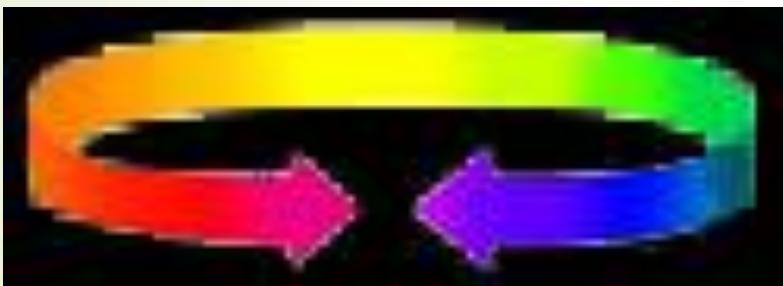
The Visible Spectrum

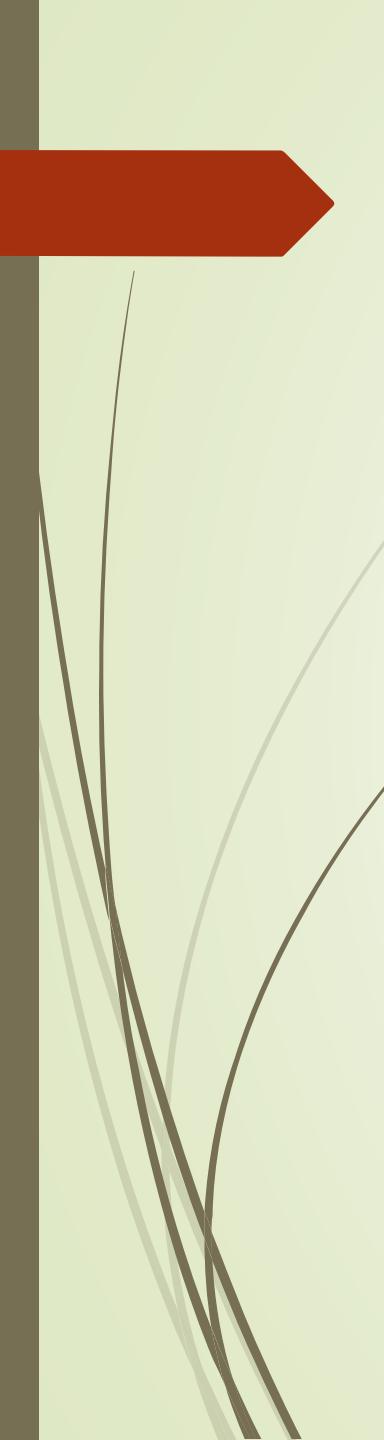


The Colour Wheel



If the ends of the spectrum are bent around a colour wheel is formed:

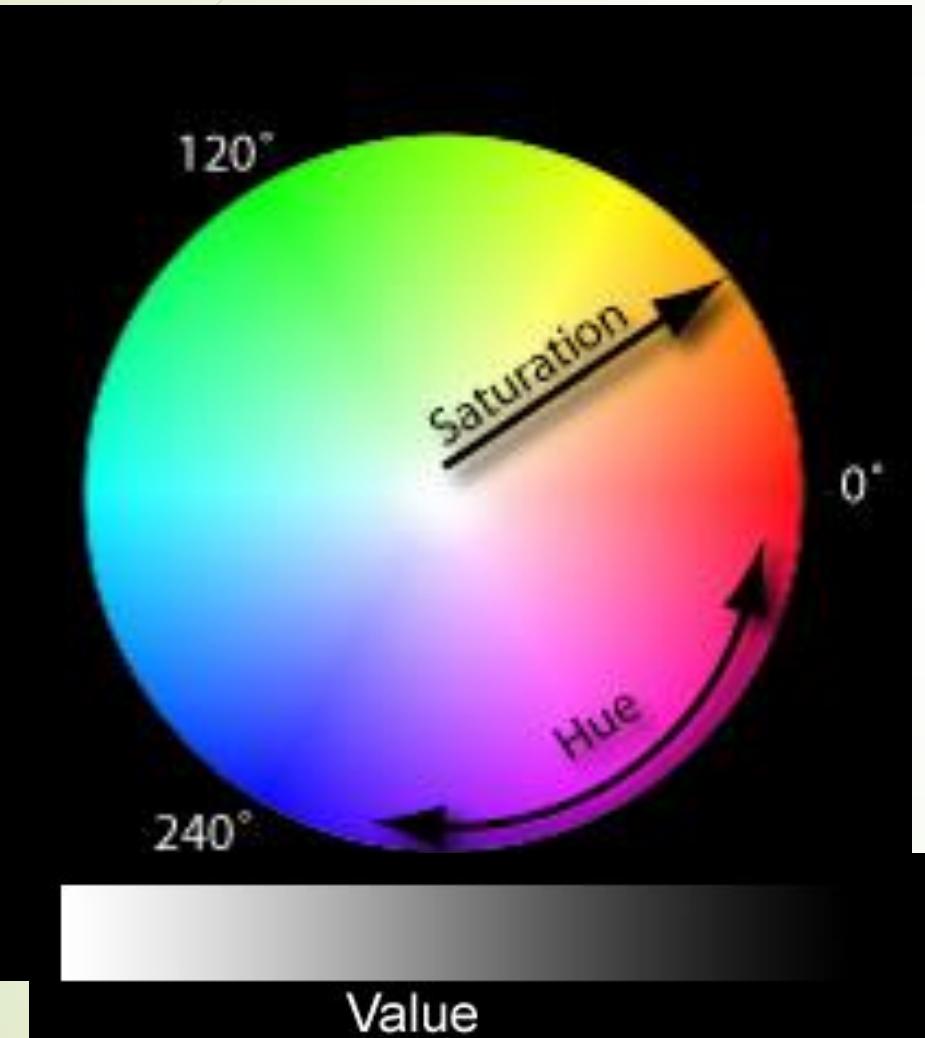




Color definitions

- ▶ **Hue** is another word for color.
- ▶ **Chroma** is the intensity or purity of color.
- ▶ **Tint** is a color mixed with white.
- ▶ **Tone** is a color mixed with gray.
- ▶ **Shade** is a color mixed with black.

The Colour Wheel

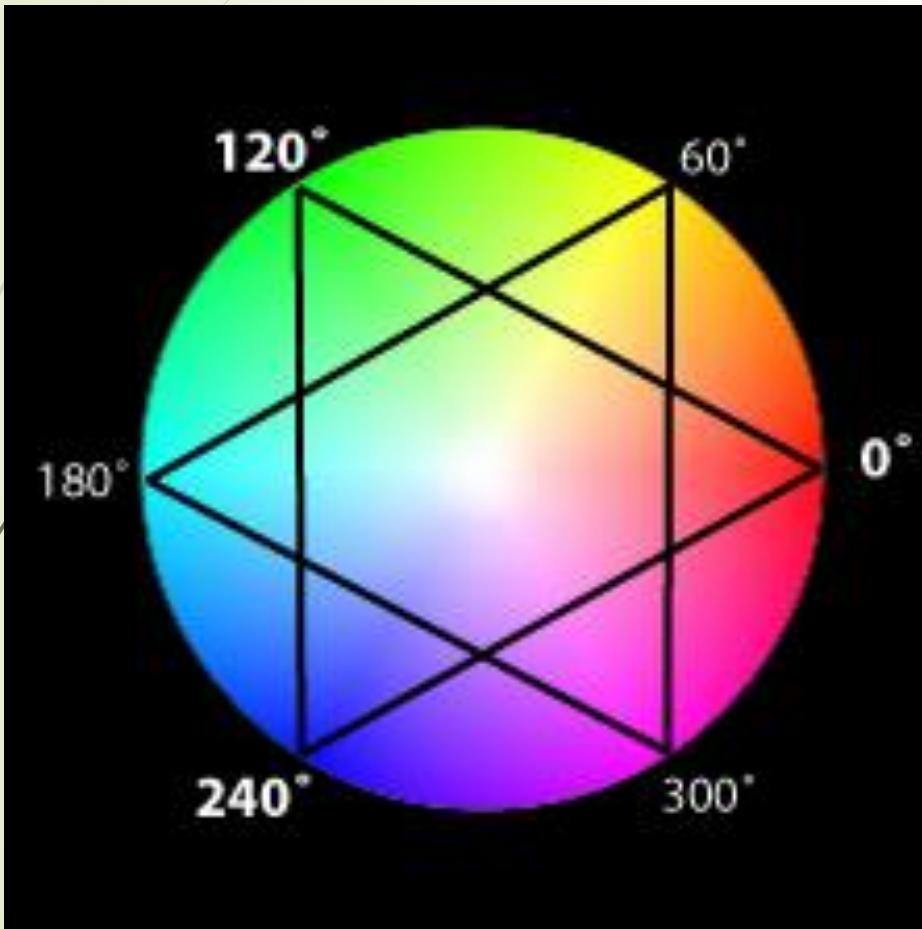


► Colours on the wheel can be described using three parameters:

1. **Hue**: degrees from 0° to 360°
2. **Saturation**: brightness or dullness
3. **Value**: lightness or darkness

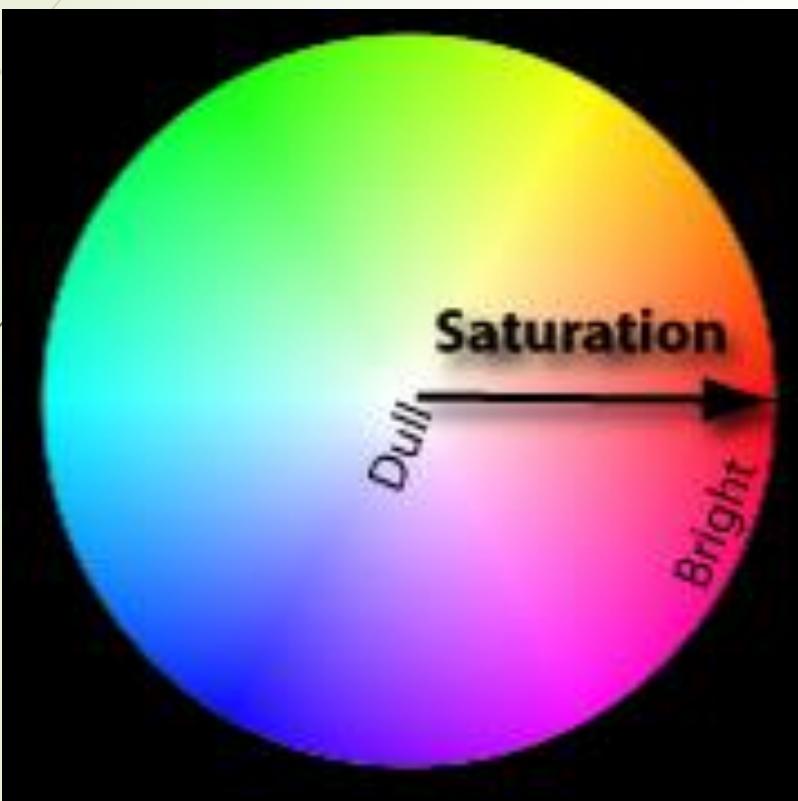
(As suggested by Henry Albert Munsell in *A Colour Notation*, 1905)

The Colour Wheel: Hue



- ▶ Hue or Spectral Colour is represented as an angle.
- ▶ **Primary Colours:**
 - 0° = Red
 - 120° = Green
 - 240° = Blue
- ▶ **Secondary Colours:**
 - 60° = Yellow
 - 180° = Cyan
 - 300° = Magenta

The Colour Wheel: Saturation



- ▶ Saturation or Chroma is the intensity of a colour.
- ▶ A highly saturated colour is bright and appears closer to the edge of the wheel.
- ▶ A more unsaturated colour is dull.
- ▶ A colour with no saturation is achromatic or in the grey scale.

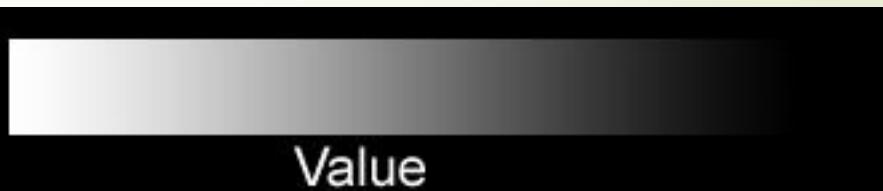
The Colour Wheel: Value



"the quality by which we distinguish a light colour from a dark one."

- Albert Henry Munsell
A Colour Notation 1905

Value represents the luminescent contrast value between black and white

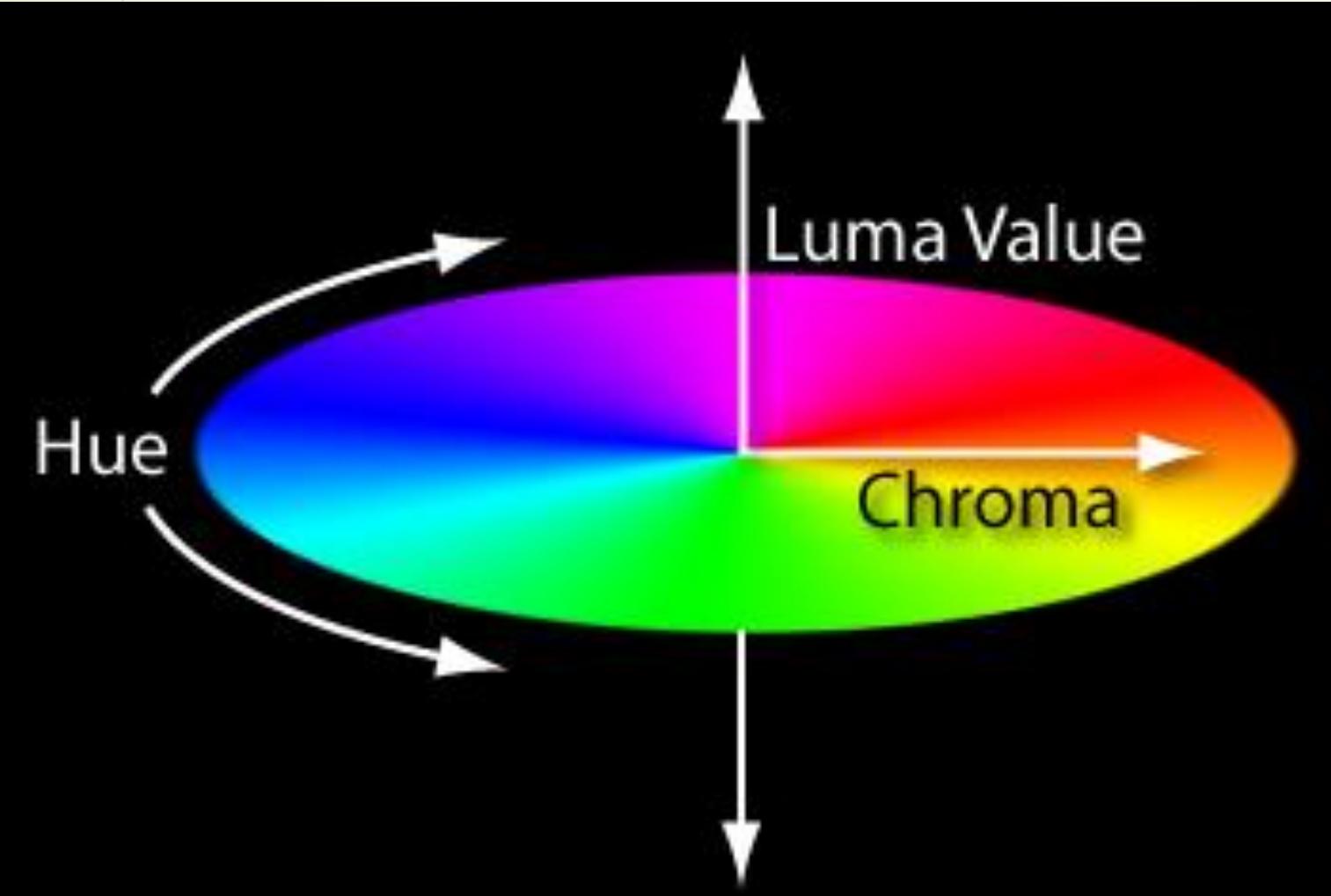




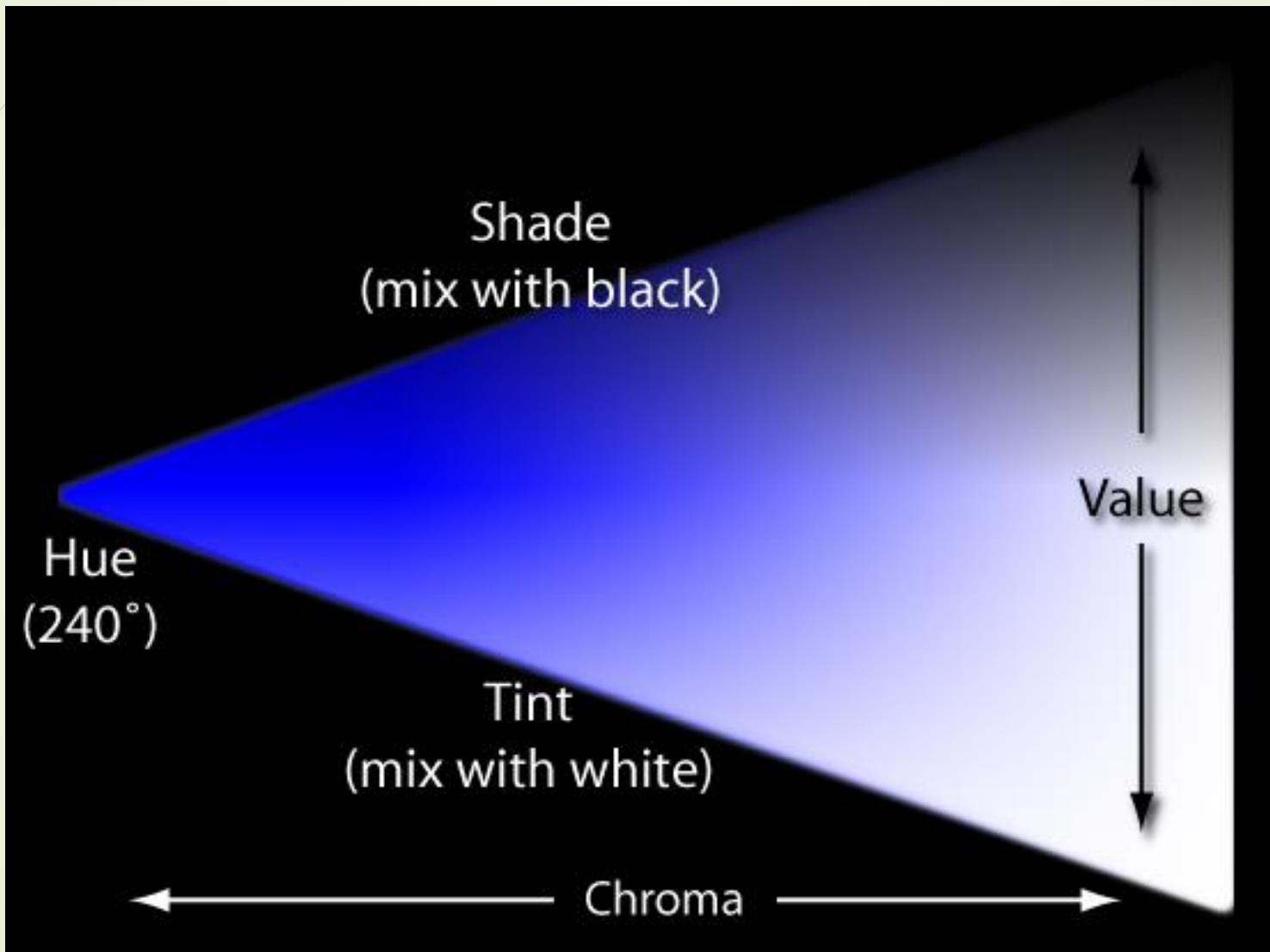


The Colour Wheel 3d

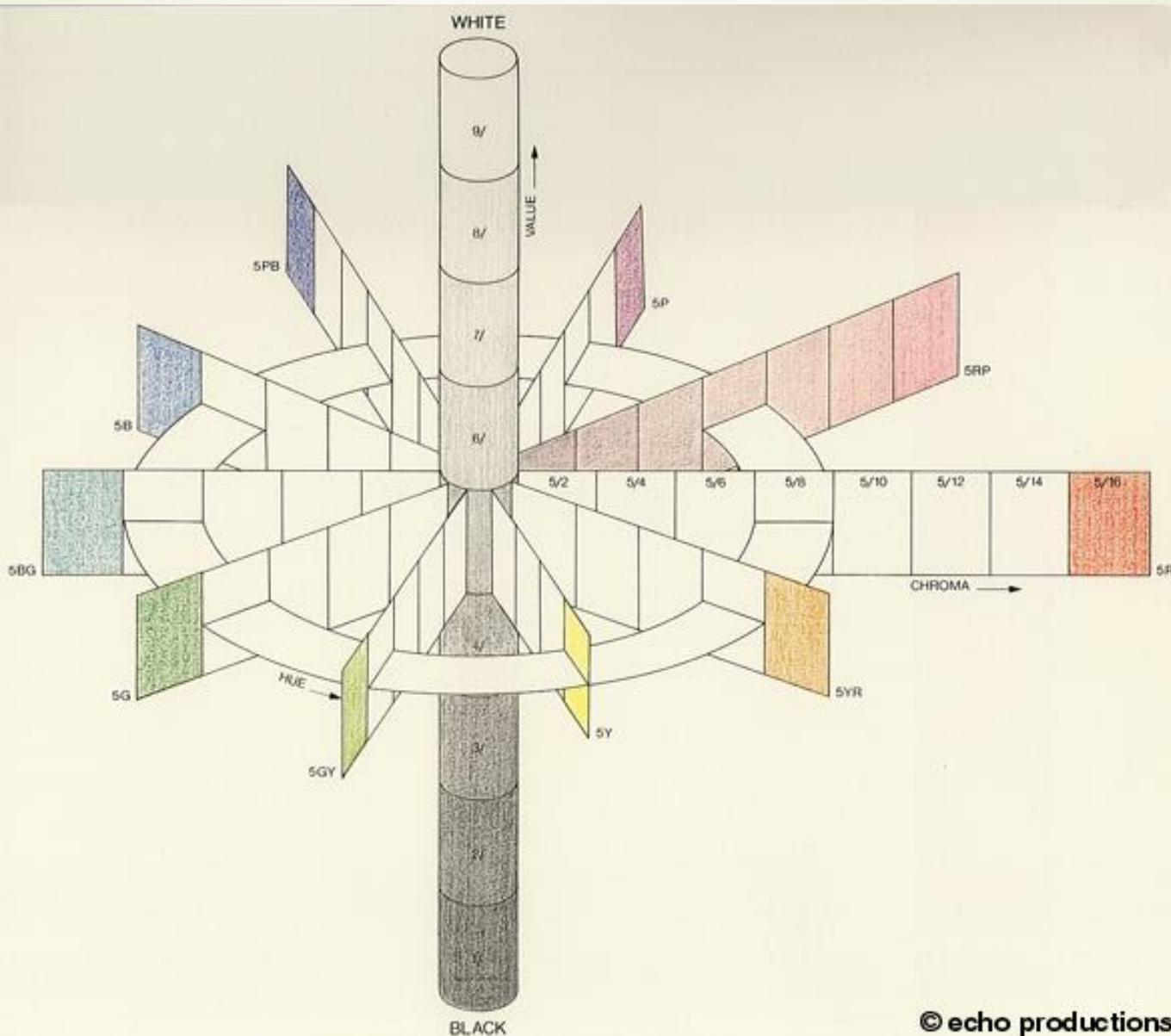
Three parameters to describe a colour: Hue
Chroma Value



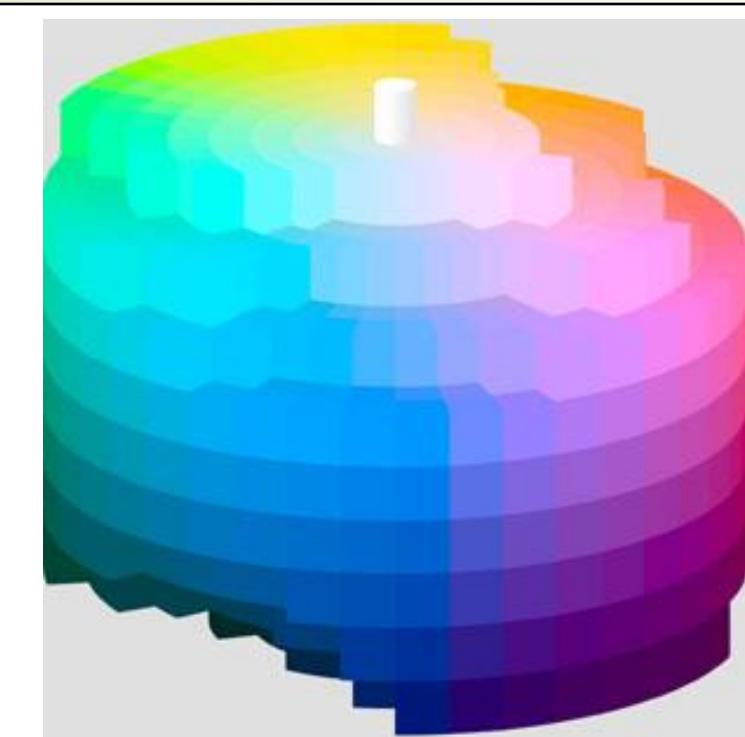
Tone = Shade + Tint



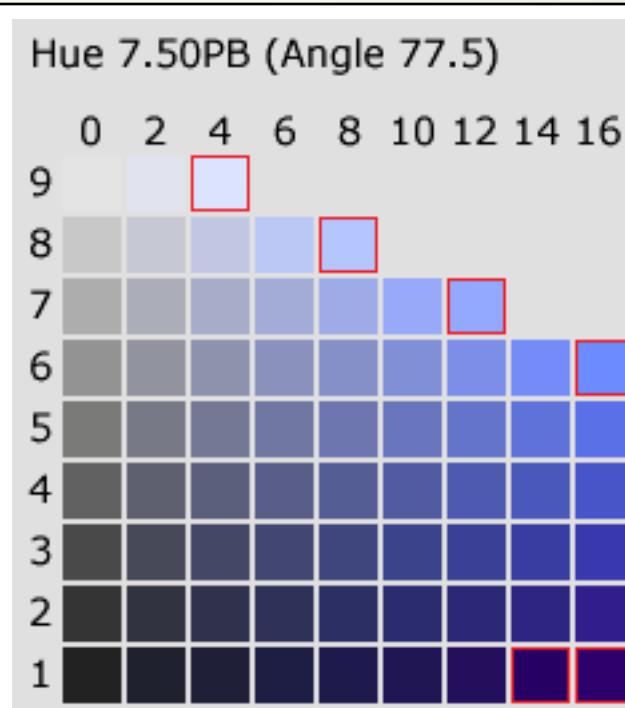
MANY more scientific models based on different colour theory: (Example: Colour Tree by American artist Henry Albert Munsell from *A Colour Notation*, 1905.)



More Illustrations of the Munsell System



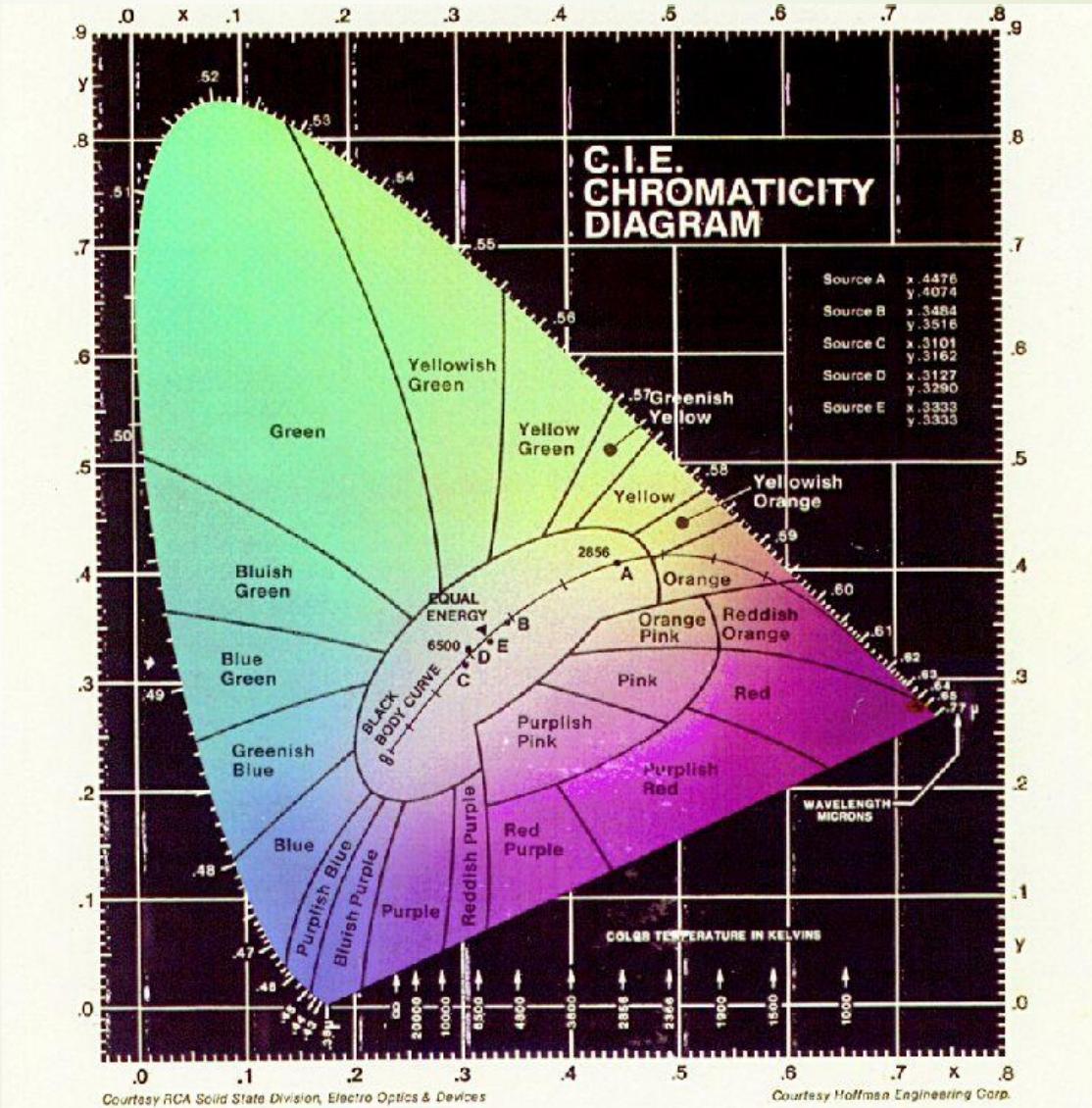
3D representation of the Munsell color model. The vertical axis represents value (or brightness) and ranges from 0 (black) to 10 (white). Distance from the center represents chroma (or saturation). Values start at 0 (gray) and go to anywhere from 4 to 30, depending on how saturated the color can get. The angle around the middle represents the hue (or color).



One wedge of the Munsell color model. Chroma increases horizontally, and value vertically. Colors with a red border indicate paint colors that cannot accurately be reproduced on an RGB monitor (approximated colors are shown). These diagrams only extend to a chroma value of 16 despite some colors extending well beyond this limit.

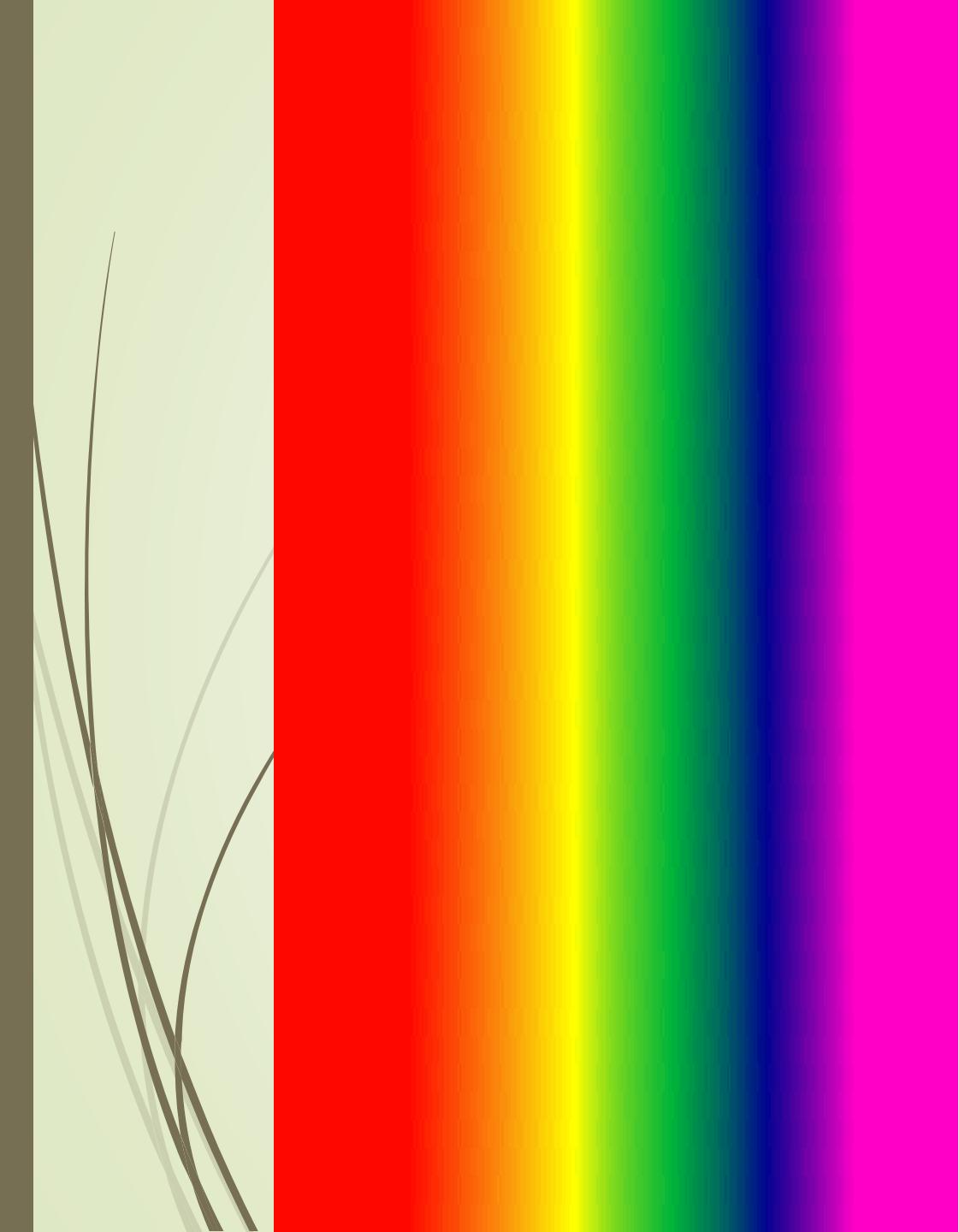
Scientific & Industry-specific Color systems

- ▶ CIE (Commission internationale d'éclairage),
- ▶ and MANY others



Using Color--

- ▶ blue in large regions, not thin lines
- ▶ red and green in the center of the field of view (edges of retina not sensitive to these)
- ▶ black, white, yellow in periphery
- ▶ [Color Brewer](#)
- ▶ [Pantone](#)



Colour Schemes

Systematic ways of selecting colours

- ▶ Monochromatic
- ▶ Complimentary
- ▶ Analogous
- ▶ Warm
- ▶ Cool
- ▶ Achromatic
- ▶ Chromatic Grays

Colour Schemes: Monochromatic



Artist: Marc Chagall
Title: Les Amants Sur Le Toit



► **Monochromatic:**
One Hue many values of
Tint and Shade

Colour Schemes: Complementary (note spelling--NOT complimentary)



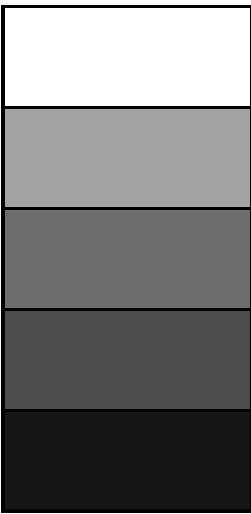
Artist: Paul Cezanne
Title: La Montagne Sainte-Victoire
Year: 1886-88



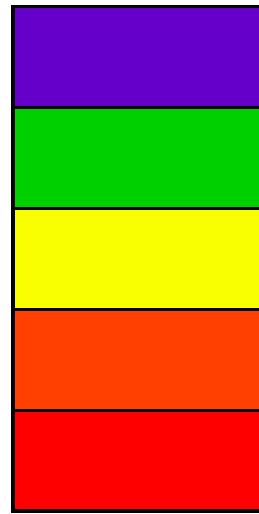
► **Complimentary:** Colours that are opposite on the wheel. High Contrast

Color for Categories and Sequences

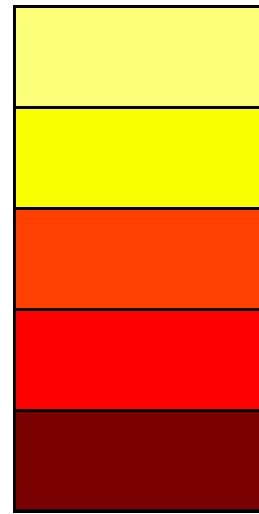
Gray scale



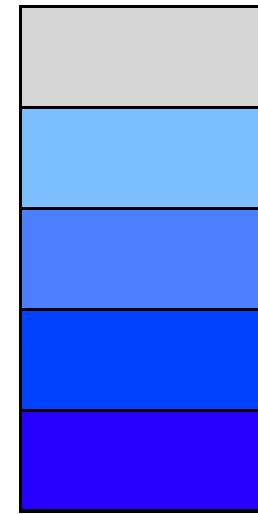
Full spectral scale



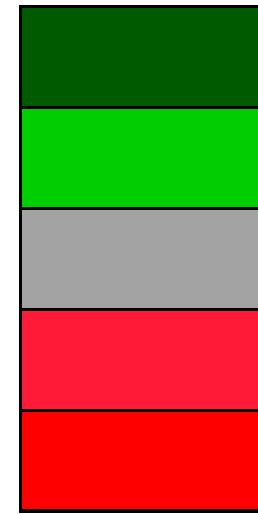
Single sequence
part spectral scale



Single sequence
single hue scale



Double-ended
multiple hue scale



Colour Schemes: Analogous



Artist: Vincent van Gogh
Title: The Iris
Year: 1889



► **Analogous:** A selection of colours that are adjacent. Minimal contrast

Colour Schemes: Warm



Artist: Jan Vermeer
Title: *Girl Asleep at a Table*
Year: 1657

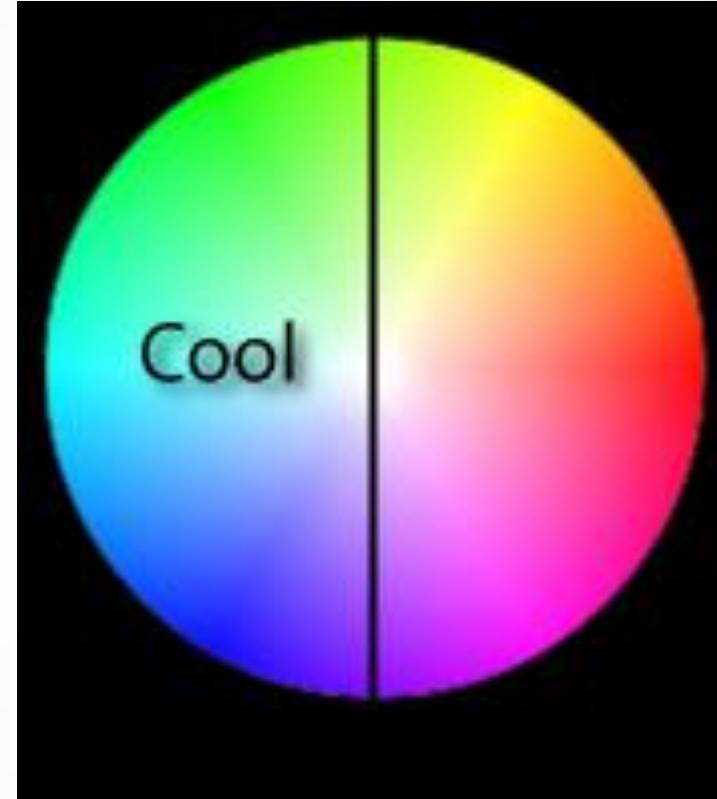


Warm: First half of the wheel give warmer colours. The colours of fire.

Colour Schemes: Cool

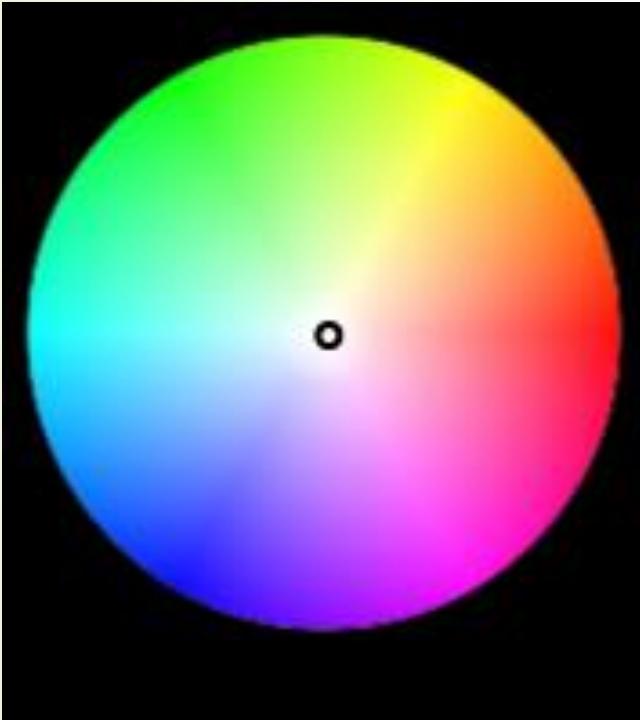


Artist: Pablo Picasso
Title: Femme Allongée Lisant
Year: 1939



Cool: Second half of the wheel gives cooler colours

Colour Schemes: Achromatic, Chromatic Grays



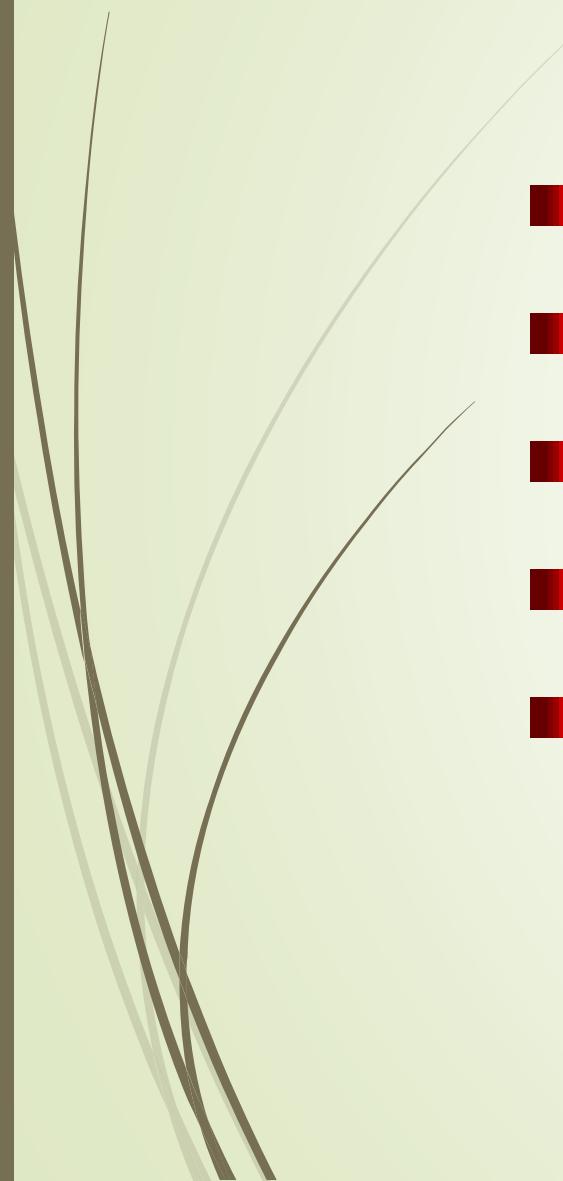
Achromatic: Black and white with all the grays in-between.



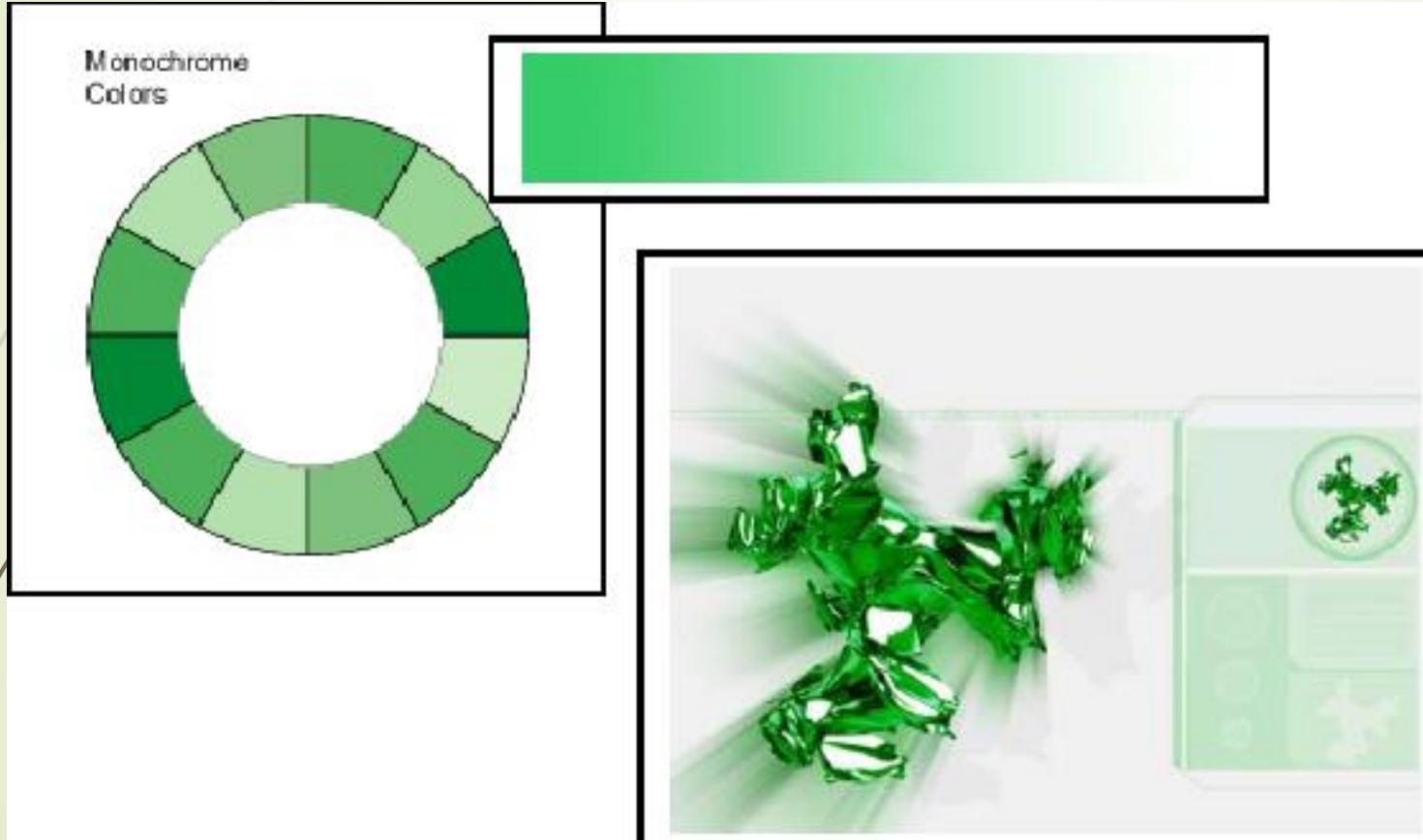
Chromatic Grays: Also called neutral relief. Dull colours, low contrast.



การวางแผนสี Colour Schematic

- ▶ Monochrome
 - ▶ Analogus
 - ▶ Dyads
 - ▶ Triads
 - ▶ Tetrad
- 

Monochrome



การวางแผนสี (Color Schematic)

- ▶ การวางแผนสี คือการจับคู่สี หรือเลือกสี เพื่อใช้ร่วมกันในภาพ เพื่อให้ภาพออกมาดูดี ดูน่าพอใจ
- ▶ **Monochrome** คือการมีเนื้อสีเดียว แต่ให้ความแตกต่างด้วยน้ำหนักสี การใช้สีแบบนี้ให้อารมณ์ความรู้สึกสุขุม เรียบง่าย เป็นลากล ไม่ฉุดราดสะกดตา



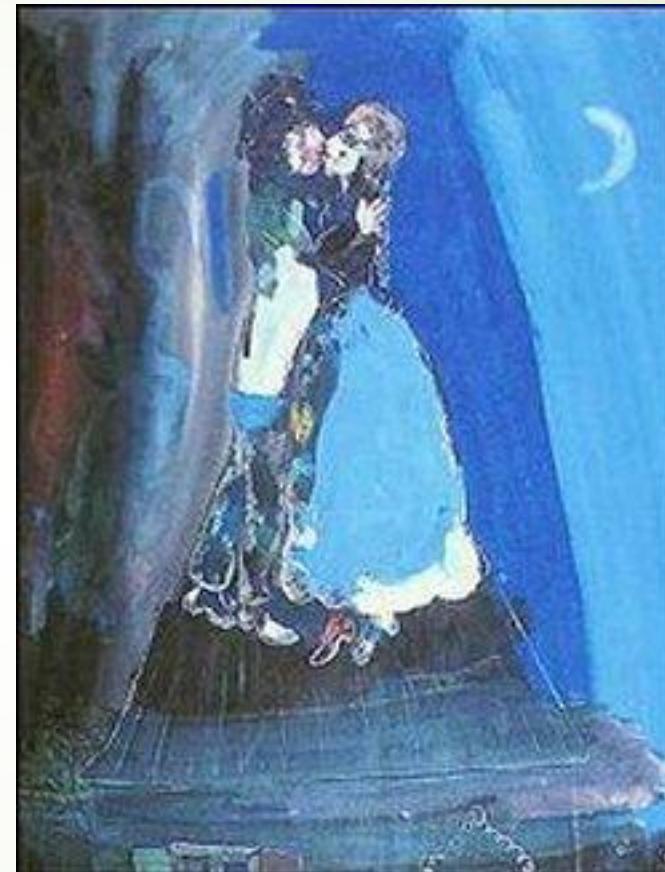
ตัวอย่างภาพแบบ Monochromatic

Artist: Marc Chagall

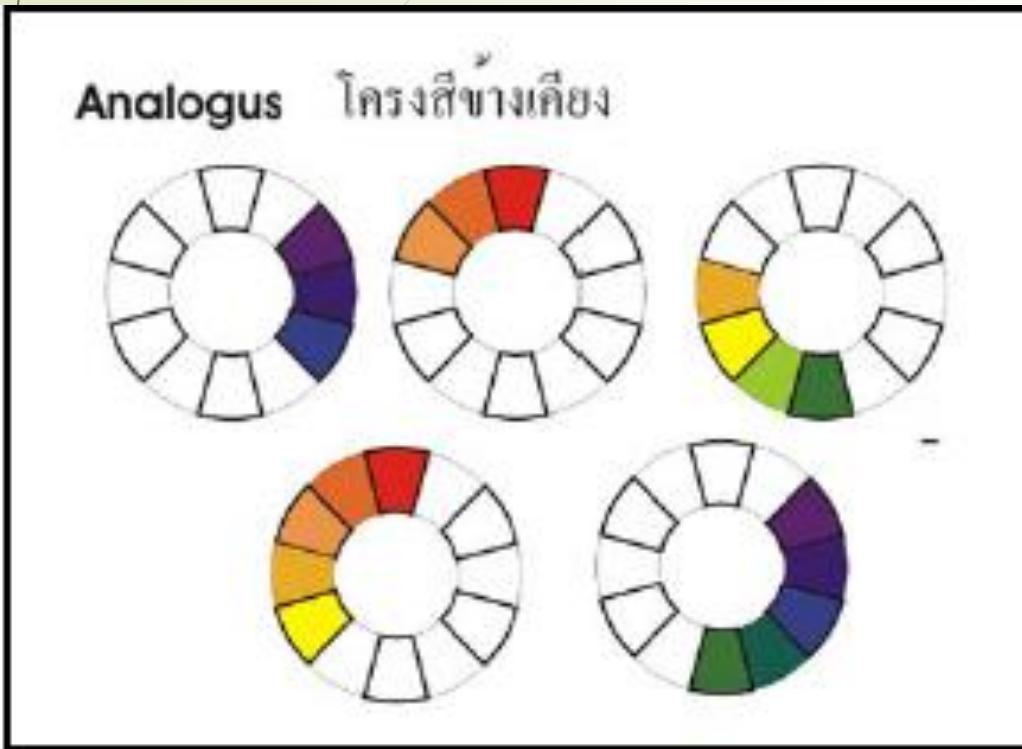
Title: Les Amants Sur Le Toit

Form of Art: abstract

Color Scheme: **monochromatic**
(blue and values)

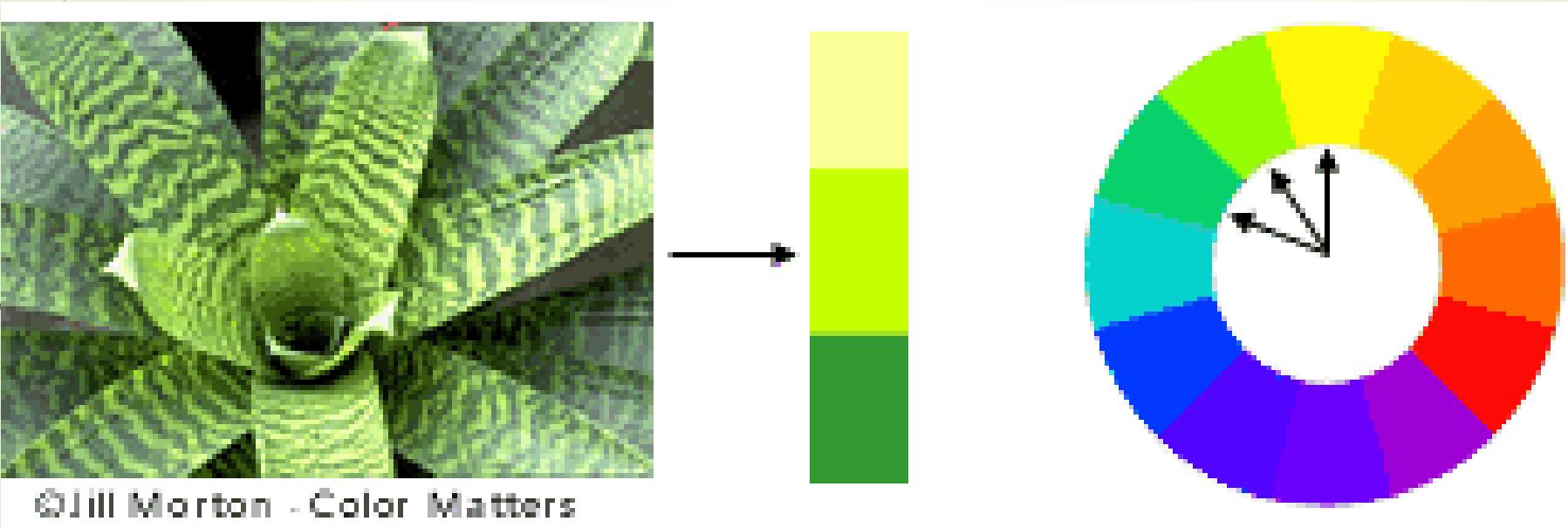


Analogus

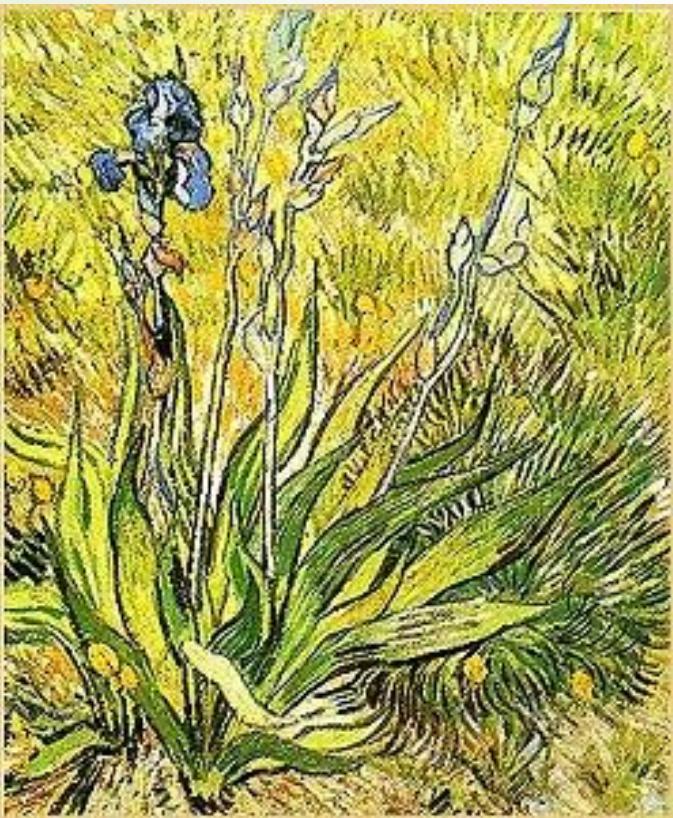


การวางแผนสี (Color Schematic)

► Analogous หรือโครงสีข้างเคียง คือสีที่อยู่ติดกันในวงจรสี จะเป็นทีละ 2 หรือ 3 สี หรืออาจจะถึง 4 สี จะทำให้ภาพโดยรวม ได้อารมณ์ไปในกลุ่มโทนสีนั้น และไม่ดูดูดตาดเกินไป



ตัวอย่างภาพแบบ Analogous



Artist: Vincent van Gogh

Title: The Iris

Year: 1889

Form of Art: realistic

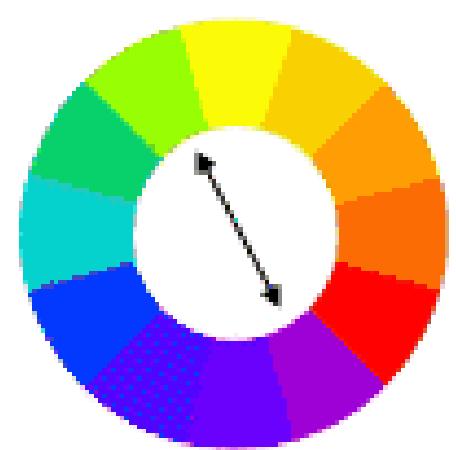
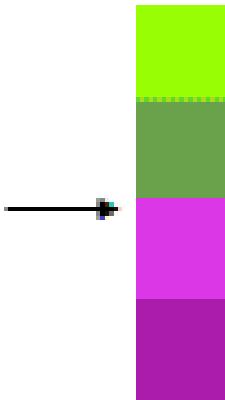
Color Scheme: **analogous (yellow, yellow-green, green, blue-green and values)**

Dyads

- ▶ คือโครงสร้างของ Complementary Colour คือสีที่อยู่ตรงข้ามกันในวงจรสี การเลือกใช้สีคู่ตรงข้ามจะทำให้งานที่ได้มีความสดุดတาในการมอง
- ▶ ควรแบ่งพื้นที่ของสีในภาพของการใช้สีได้สีหนึ่งมากกว่าอีกสีหนึ่ง โดยประมาณมักจะใช้สีหนึ่ง 70% อีกสีหนึ่ง 30% ภาพที่ได้ก็จะคงความมีเอกภาพอยู่ และยังมีความเด่นลับดุดတาไปได้ในตัว

การวางแผนสี (Color Schematic)

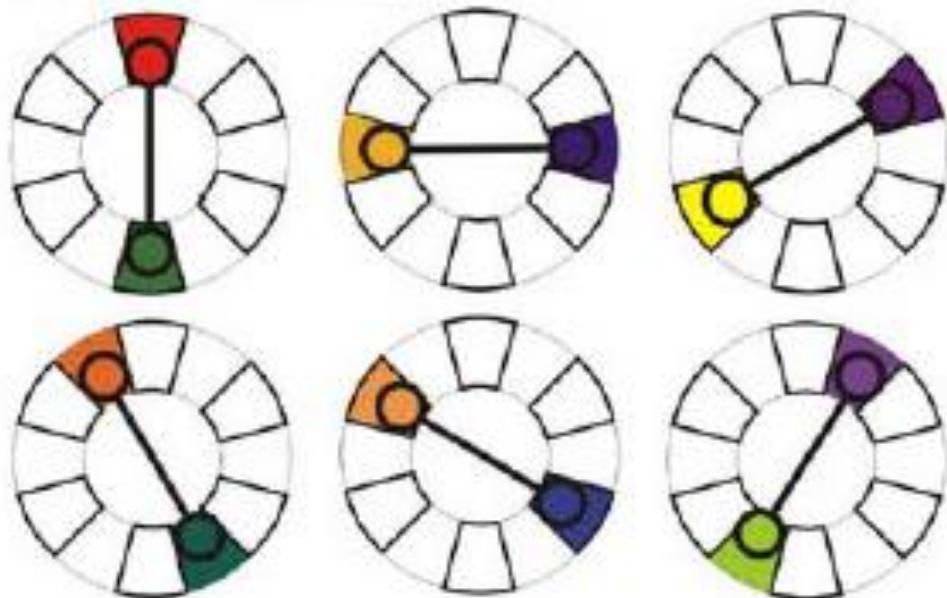
- ▶ Complementary Color คือการใช้คู่สีตรงข้าม คือสีที่อยู่ต่ำงกันในวงจรสี การเลือกใช้สีคู่ตรงข้ามจะทำให้งานที่ได้มีความลึกดูด ในการมอง แต่ควรระวัง ถ้าใช้สีคู่ตรงข้ามในพื้นที่ใกล้เคียงกัน งานนั้นจะดูไม่มีเอกภาพ โดยทั่วไปควรจะใช้สีหนึ่งประมาณ 70% อีกสี 30%



©Jill Morton - Color Matters

Dyads

Dyads โครงสร้างข้าม



ตัวอย่างการออกแบบโดยเลือกใช้สีคู่ตรงข้าม

ตัวอย่างภาพแบบ Complementary



Artist: Paul Cezanne

Title: La Montage Saint Victoire

Year: 1886-88

Form of Art: abstract

Color Scheme: **complementary**

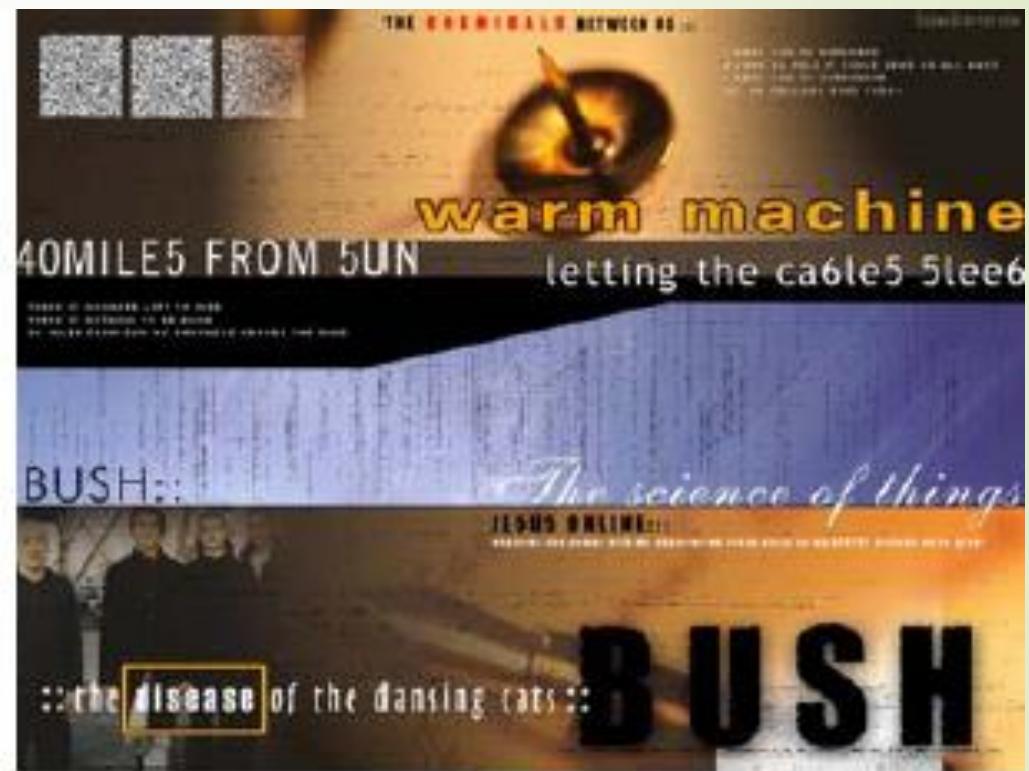
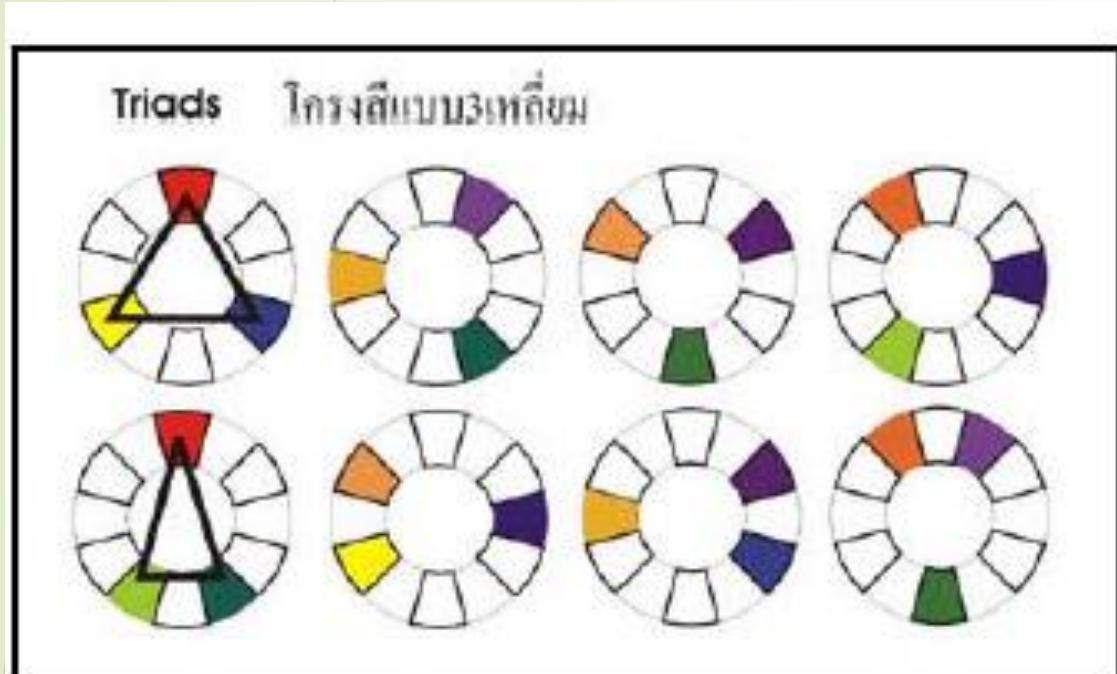
(blue, orange and values)

Triads

Triads หรือโครงสร้าง 3 สี คือ

1. เผื่องการใช้สี 3 สี ในช่วงห่างระหว่างลีทั่ง 3 เท่ากัน ถ้าเราลากเลี้นระหว่างลีทั่ง 3 สี เราจะได้สามเหลี่ยมด้านเท่า
2. เผื่องการใช้สี 3 สี ในช่วงห่างระหว่างลีทั่ง 3 ไมเท่ากัน คือ มีช่วงห่าง 2 ช่วงเท่ากัน แต่กับอีกด้านหนึ่งช่วงห่างจะมีความยาวกว่า ถ้าลากเส้นระหว่างลีดังกล่าวแล้วจะได้รูปสามเหลี่ยมหน้างี้

Triads



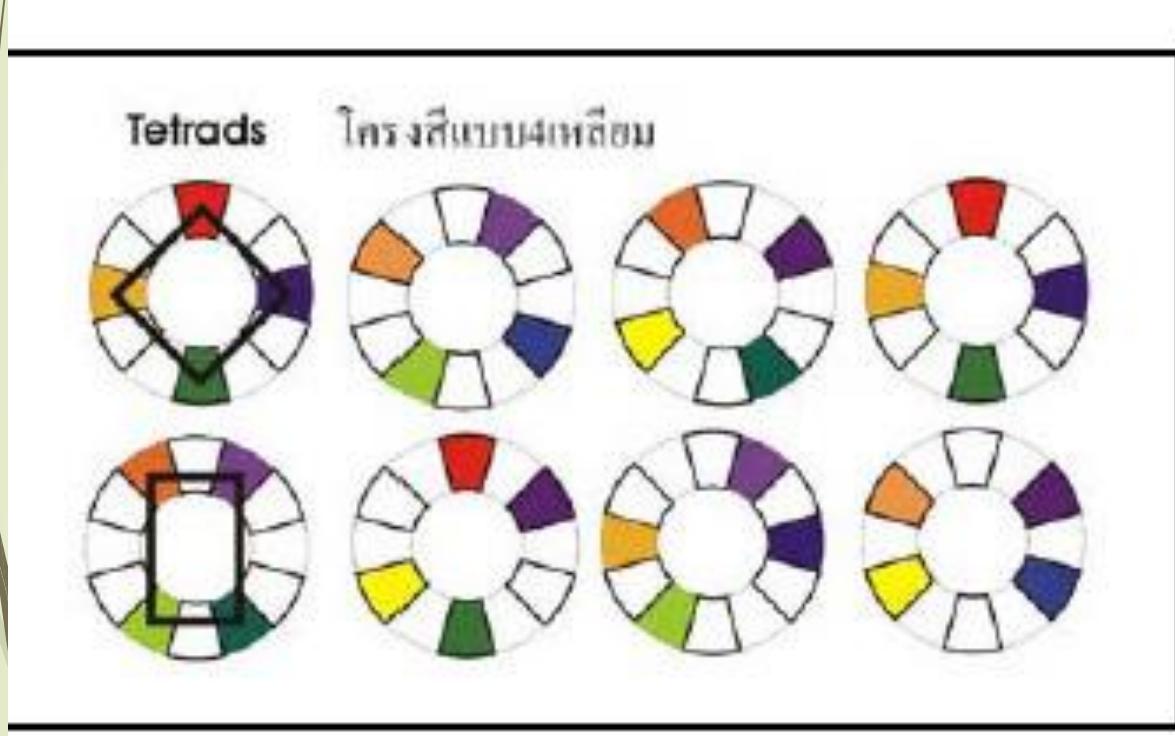
ตัวอย่างการออกแบบโดยเลือกใช้โครงสร้าง 3 สี

Tetrads

► Tetrads หรือโครงสร้าง 4 สี คือ

1. การใช้สีในวงจรสี 4 สี โดยเลือกสีที่มีช่วงห่างระหว่างสีเท่ากันหมด กล่าวคือต่อๆ กันๆ นั่นเชื่อมสีทั้ง 4 และว่าจะได้สีเหลี่ยมจัตุรัส
2. การใช้สีในวงจรสี 4 สี โดยเลือกสีที่มีช่วงห่างระหว่างสีไม่เท่ากัน โดยช่วงห่างของ 2 สีเป็นช่วงสั้นและอีก 2 สีเป็นช่วงยาว กล่าวคือต่อๆ กันๆ นั่นเชื่อมสีทั้ง 4 และว่าจะได้สีเหลี่ยมผืนผ้า

Tetrads



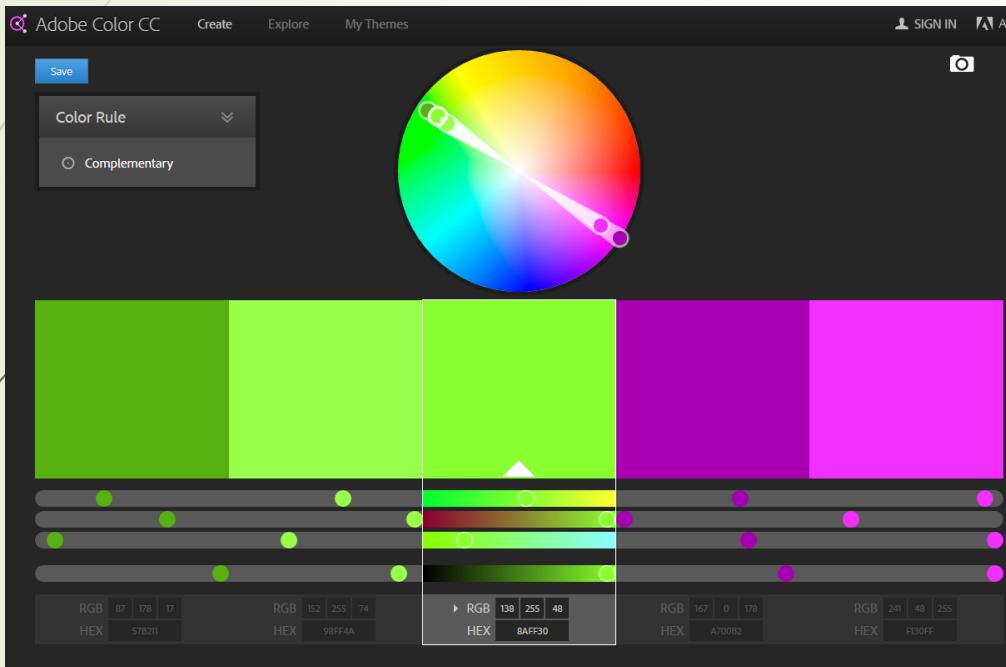
ตัวอย่างการออกแบบโดยเลือกใช้โครงสร้าง 4 สี

Tool for choose the right colors for template

► <http://www.checkmycolours.com/>



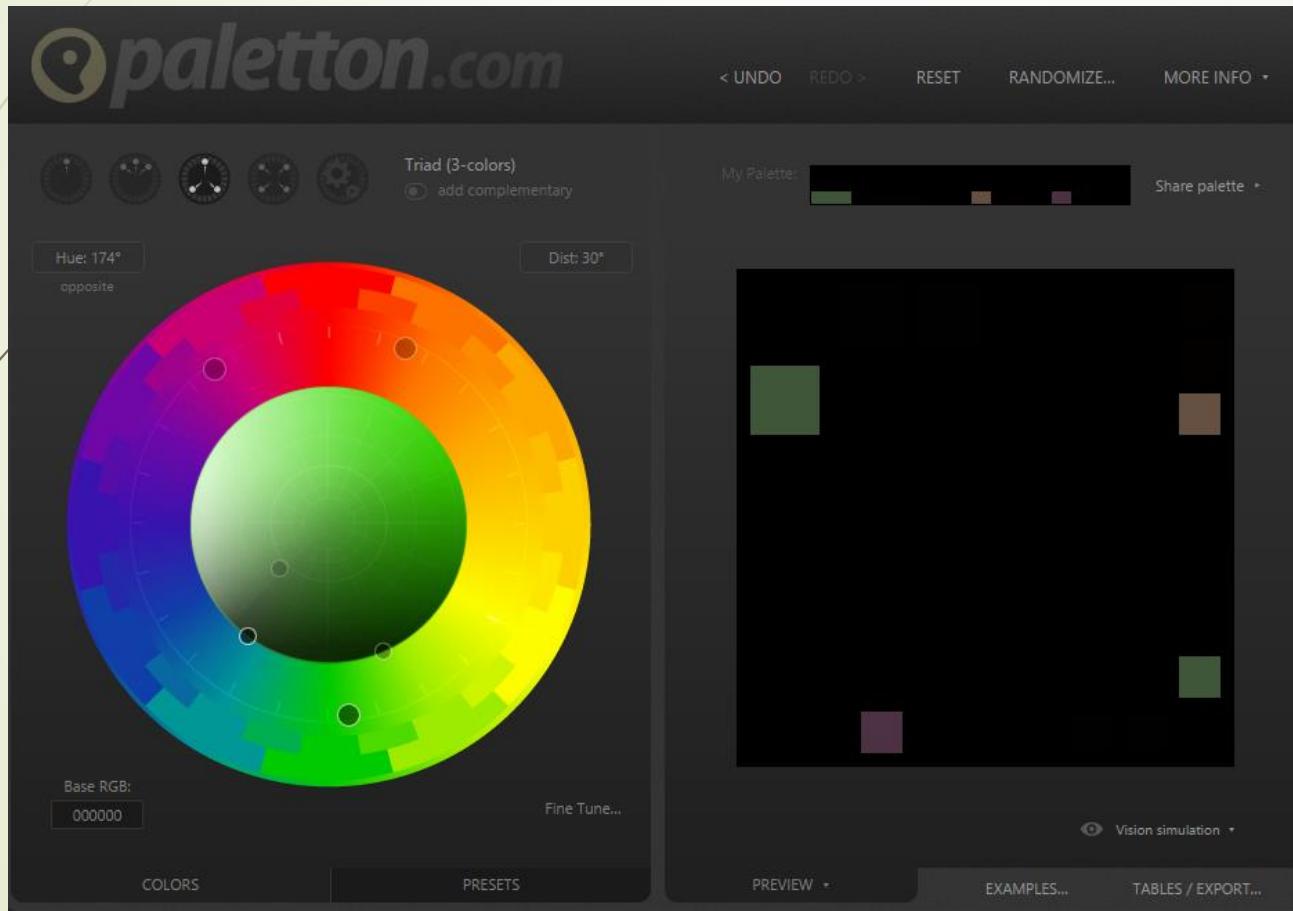
Tool for choose the right colors for template



color-wheel/

Tool for choose the right colors for template

► <http://paletton.com/>



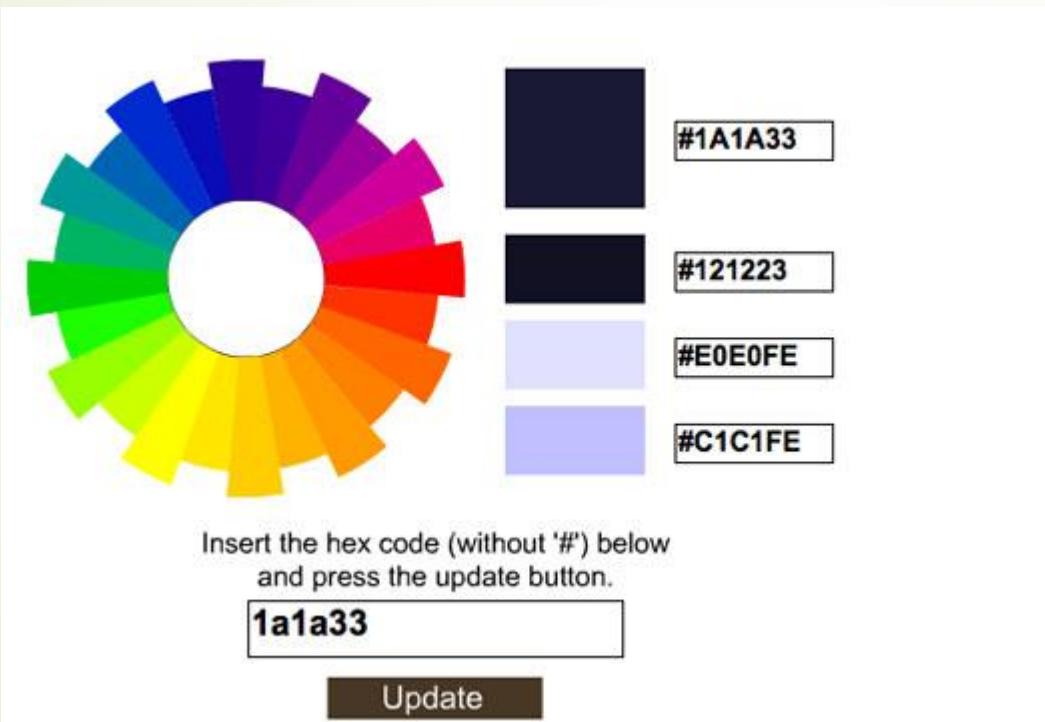
Tool for choose the right colors for template

► <http://labs.tineye.com/multicolr/>

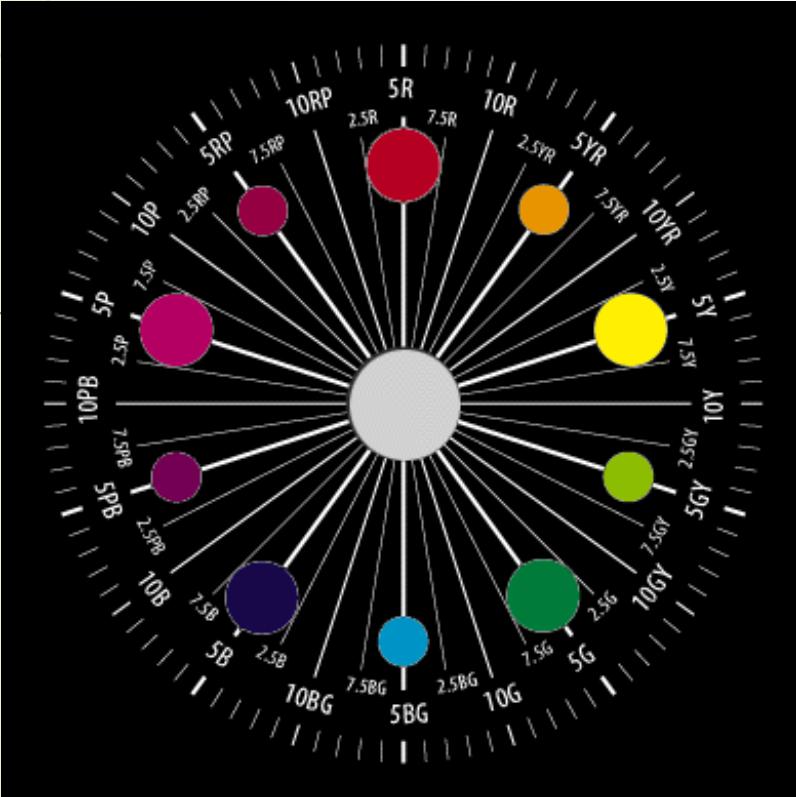
The screenshot shows the TinEye Labs Multicolr Search Lab interface. At the top, there's a navigation bar with 'Home', 'FAQ', and 'Licensing' buttons, and a cartoon robot icon. Below the navigation is a heading 'Multicolr Search Lab powered by MulticolorEngine'. A subtext explains: 'We extracted the colors from 20 million Creative Commons images on Flickr to make the images searchable by color. Enjoy! MulticolorEngine is addictive and very likely the best color search engine in the world*!' To the left is a large grid of colorful images. To the right are three steps: Step 1 (Select up to 5 colors) showing a color palette, Step 2 (Slide dividers to adjust color composition) showing three colored boxes with percentages (33%, 34%, 33%), and Step 3 (Add tags to refine your results) with a text input field labeled 'Type a tag'.

Tool for choose the right colors for template

- ▶ <http://www.2createawebsite.com/build/hex-color-scheme-generator.html>



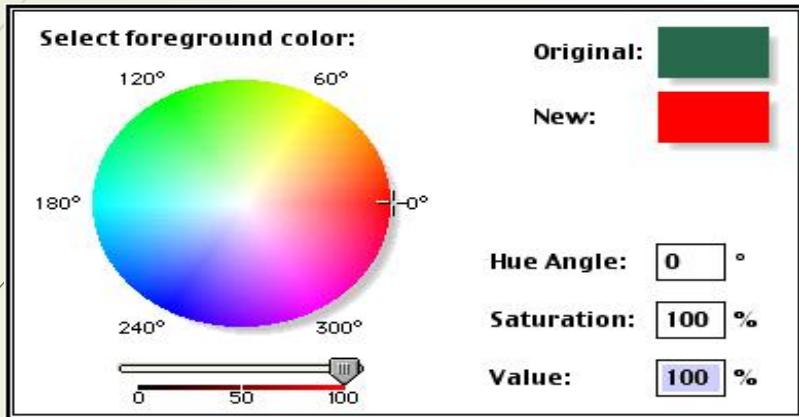
Colour Pickers & Choice of Media



Munsell's notation wheel

- ➡ HSB, HLS, HSV
- ➡ RGB
- ➡ CMYK
- ➡ Others
 - ➡ Lab
 - ➡ PANTONE

Colour Pickers: HSB, HLS, HSV



→ HSV

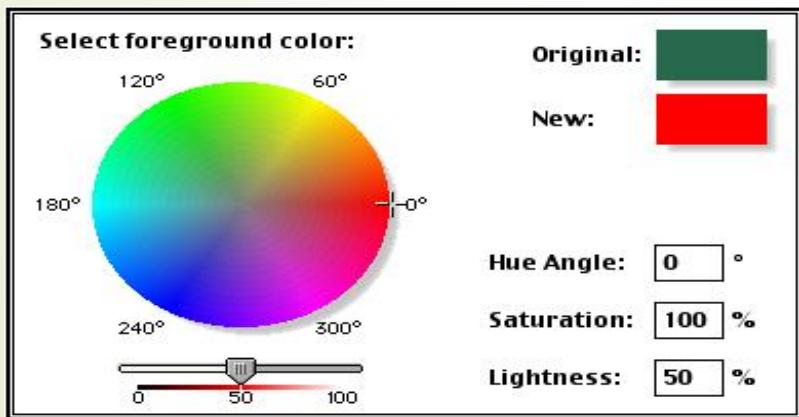
- Hue
- Saturation
- Value

→ HSB (Same as HSV)

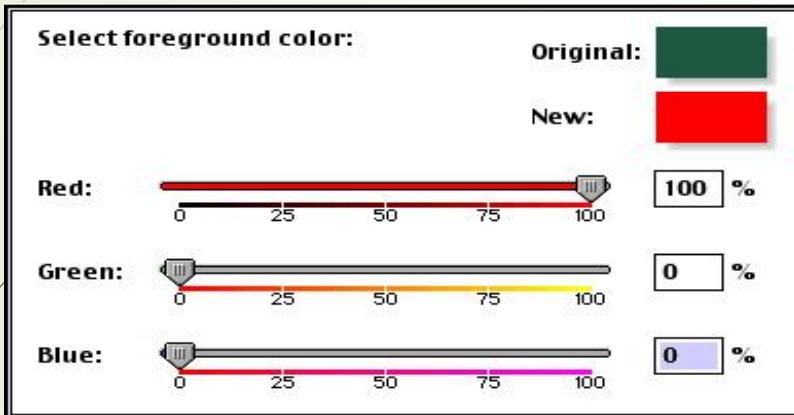
- Hue
- Saturation
- Brightness

→ HLS

- Hue
- Lightness
- Saturation

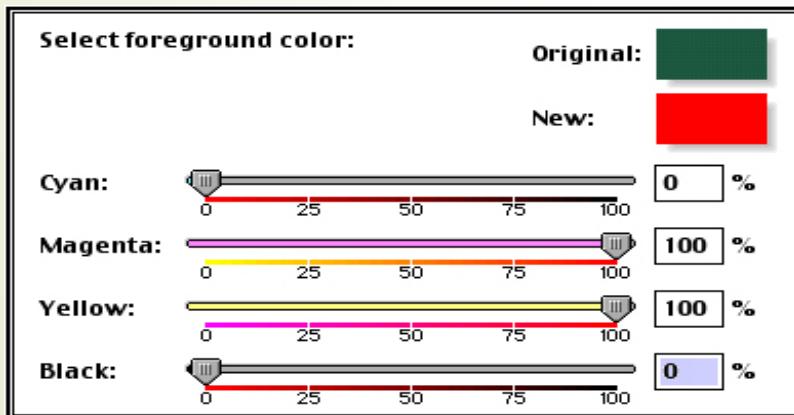


Colour Pickers: RGB, CMYK



RGB

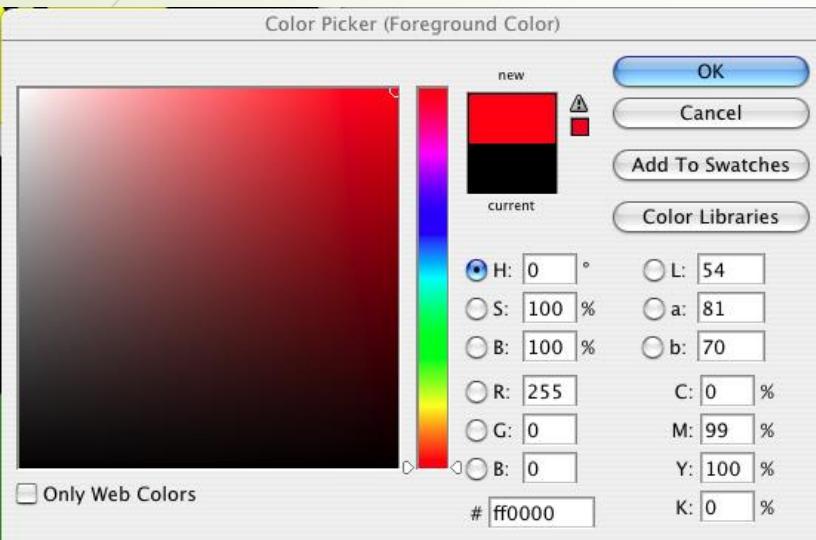
- ▶ Red
- ▶ Green
- ▶ Blue
- ▶ Used in Video and Computer graphics
- ▶ 3 Values in % or between 0-255



CMYK

- ▶ Cyan
- ▶ Magenta
- ▶ Yellow
- ▶ K = Black
- ▶ Used for printing

Photoshop CS3 Picker

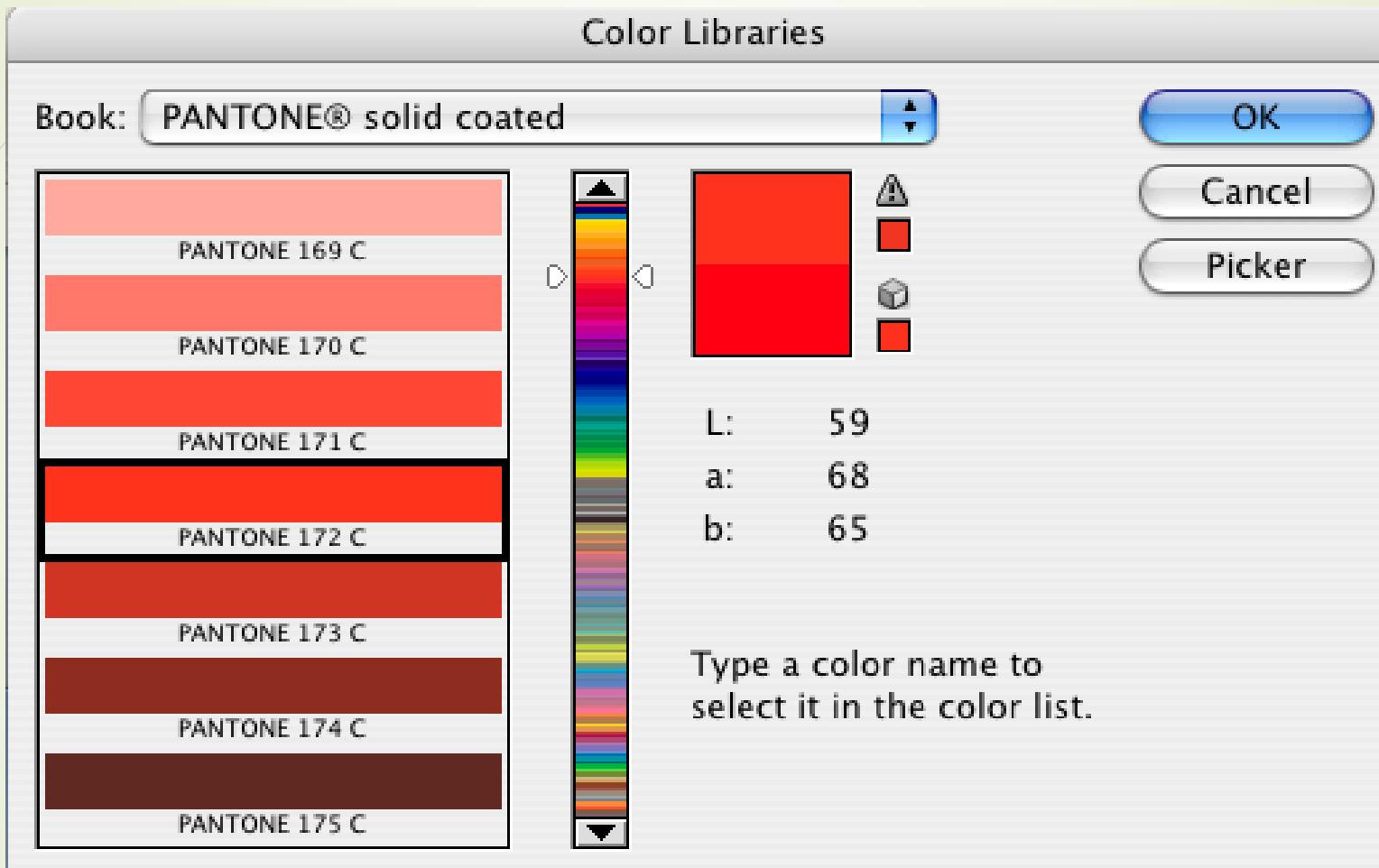


► Combines
HSB,
RGB,
CMYK,
Lab
(Luminance, Red/Green,
Yellow/Blue)

► Adobe

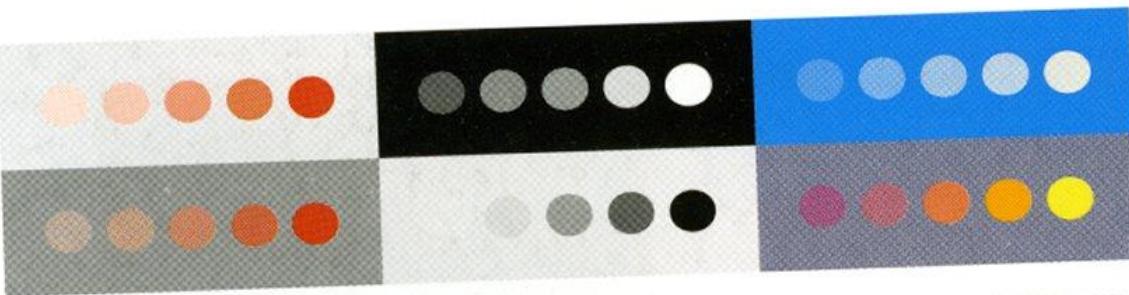
<http://kuler.adobe.com/>

Colour Pickers: PANTONE



► Standard for printing/fastion industry

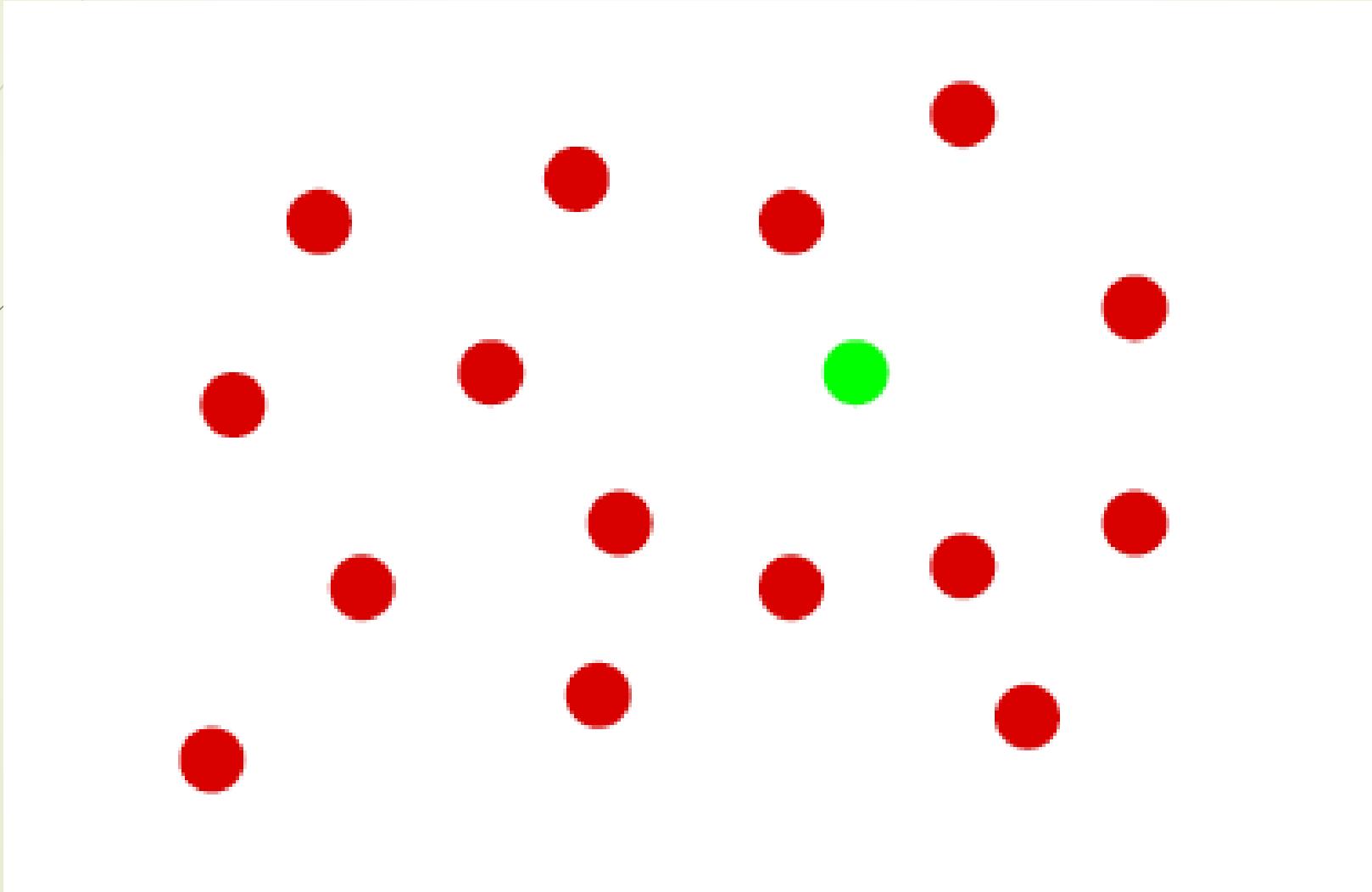
Color and the visual display of information



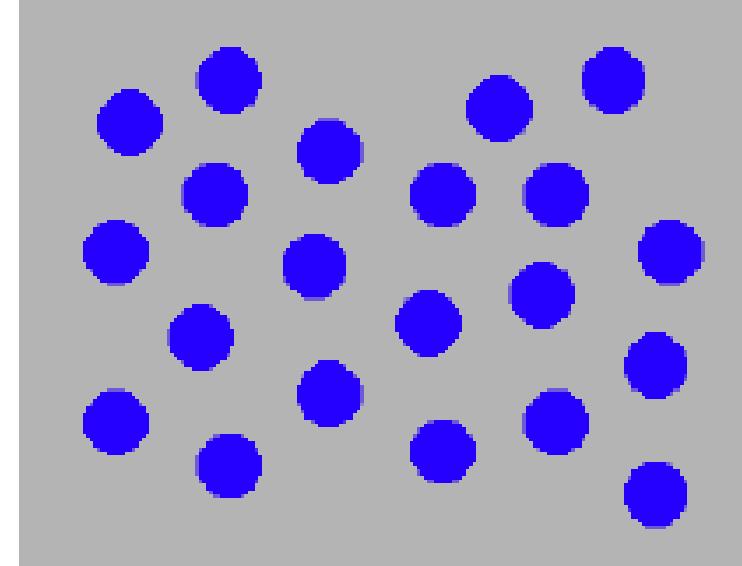
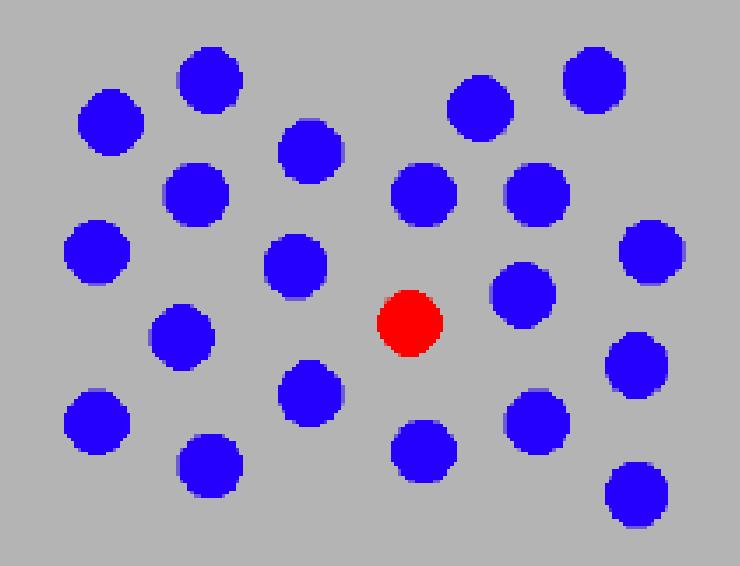
Six different ways of showing greater quantity. All involve increasing the relative difference from the background color.

Ware, p. 84

Colour (hue) and counting or searching

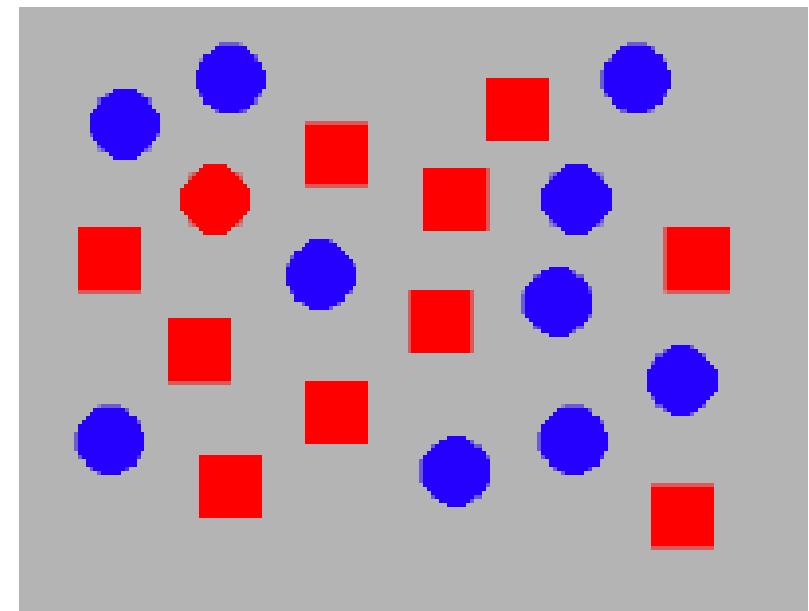
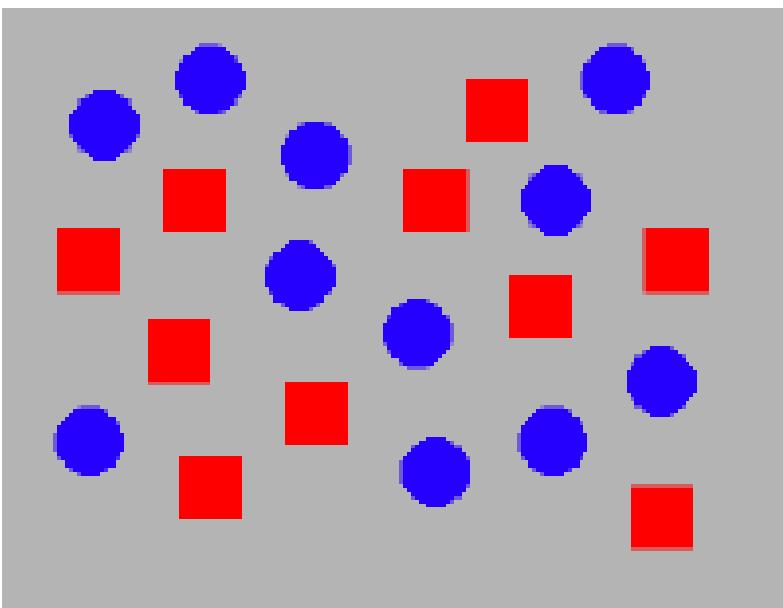


Hue

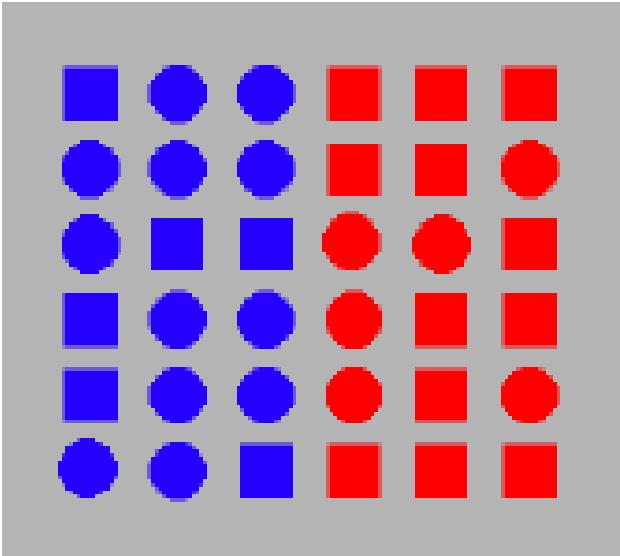


► Not Usually Pre-attentive

Hue & shape

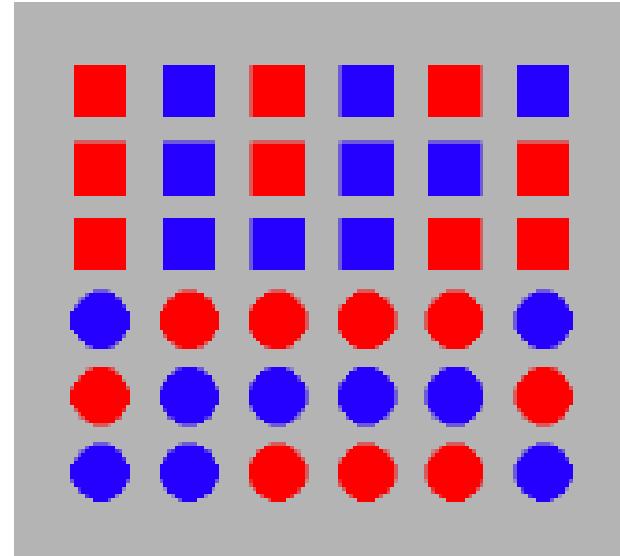


Region Search



Hue boundary identified
pre-attentively

Form variations do NOT
interfere with hue
boundary identification

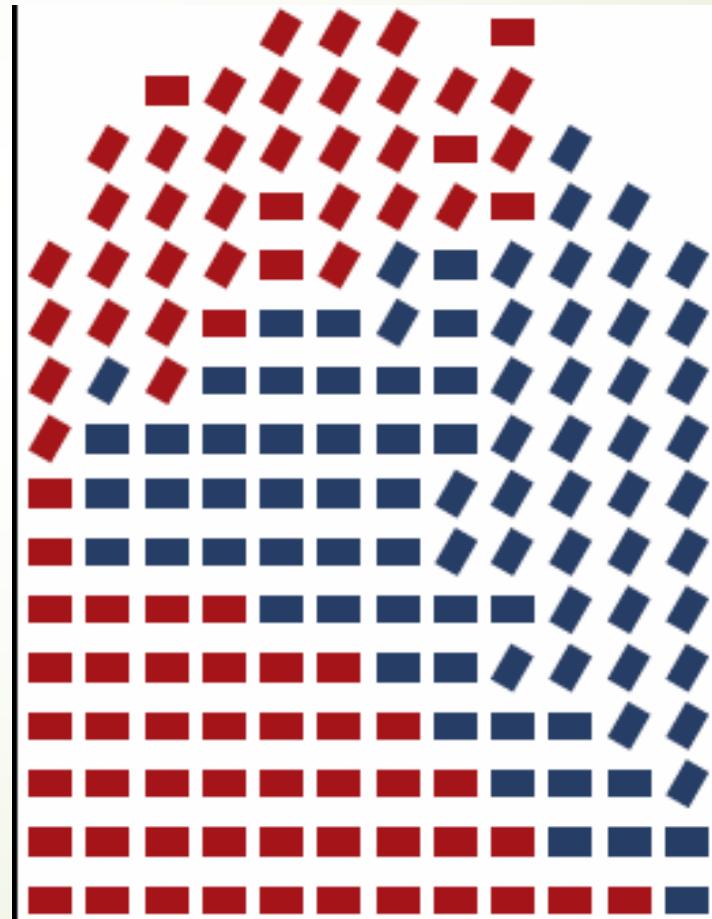
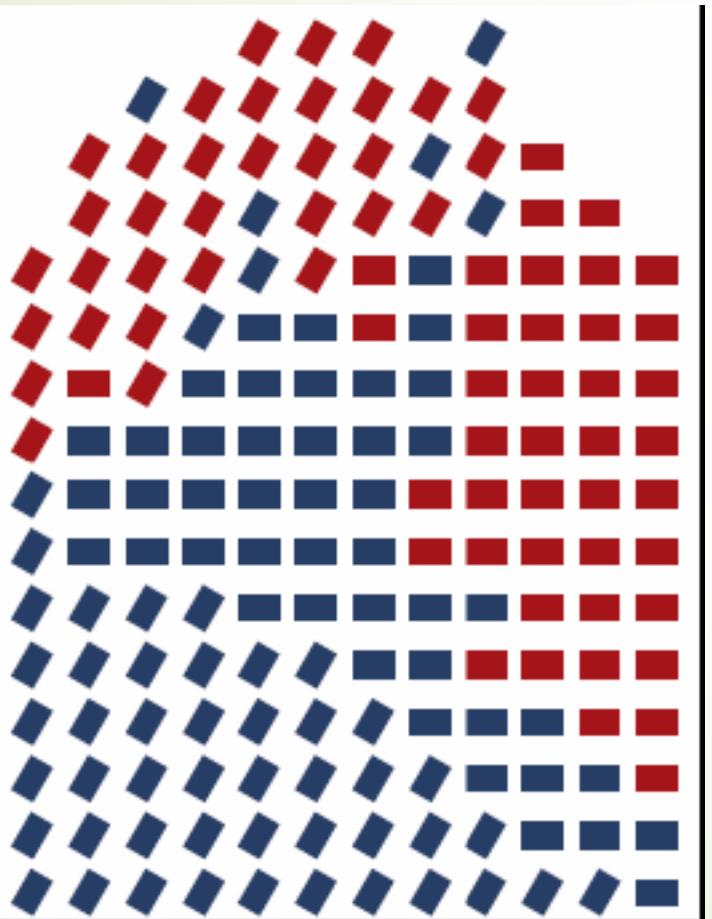


Form boundary NOT
identified pre-attentively

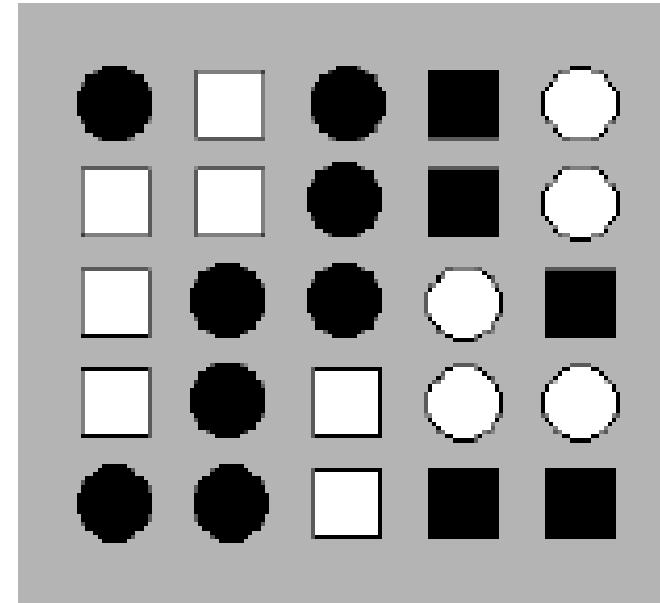
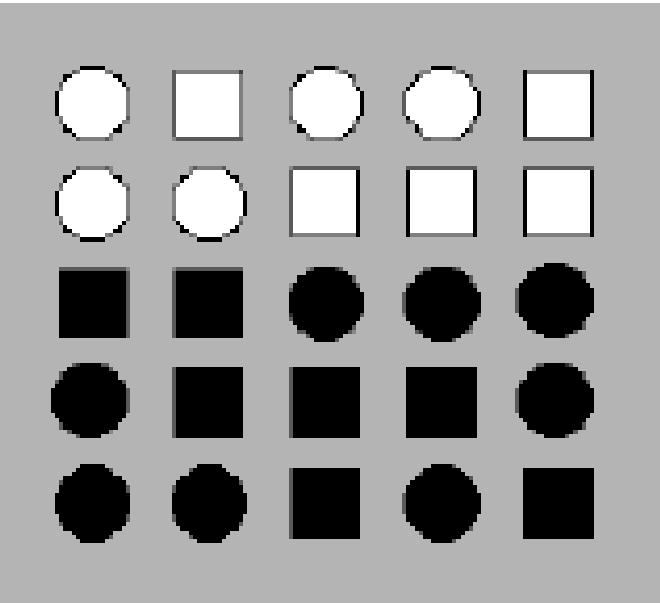
Hue variations interfere
with form boundary
identification

Area Estimation

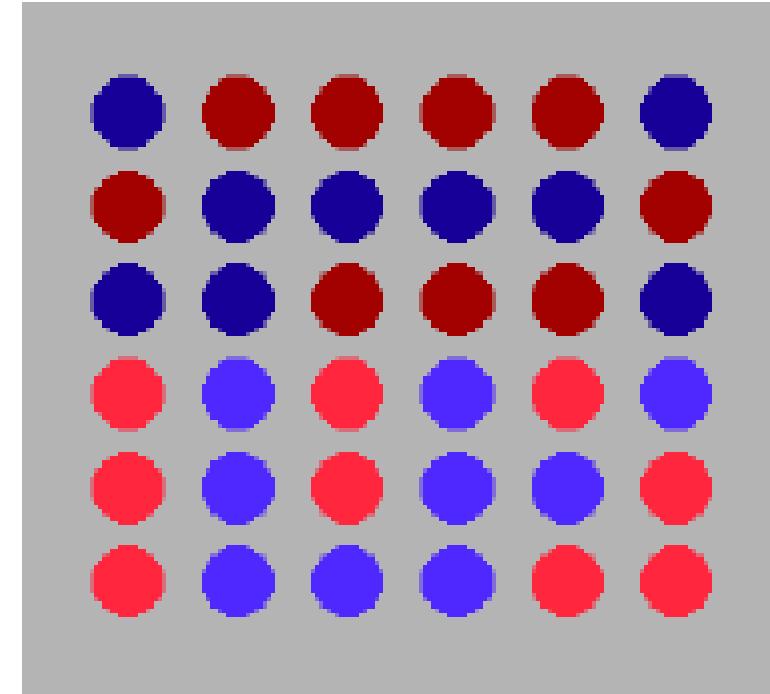
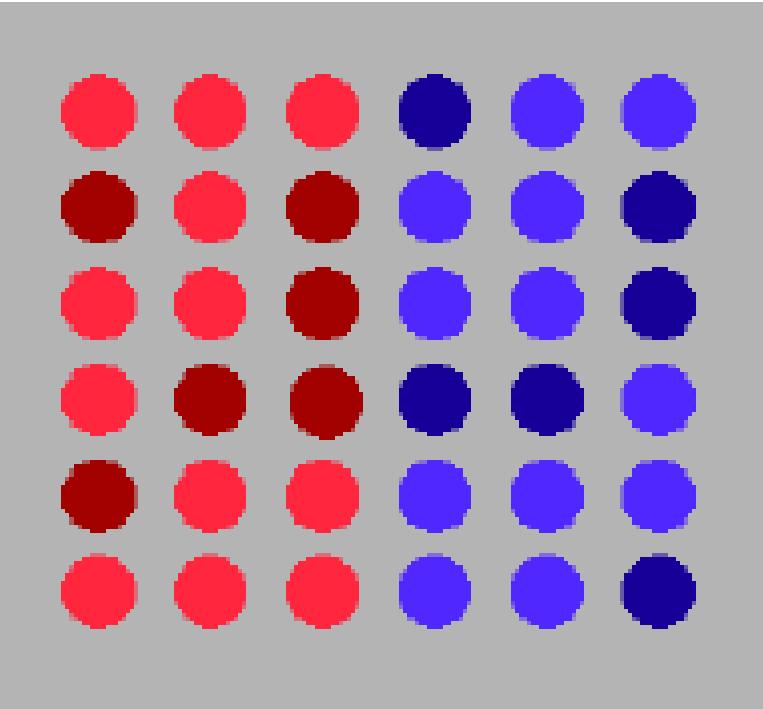
- Blue rectangles? Sloped rectangles?



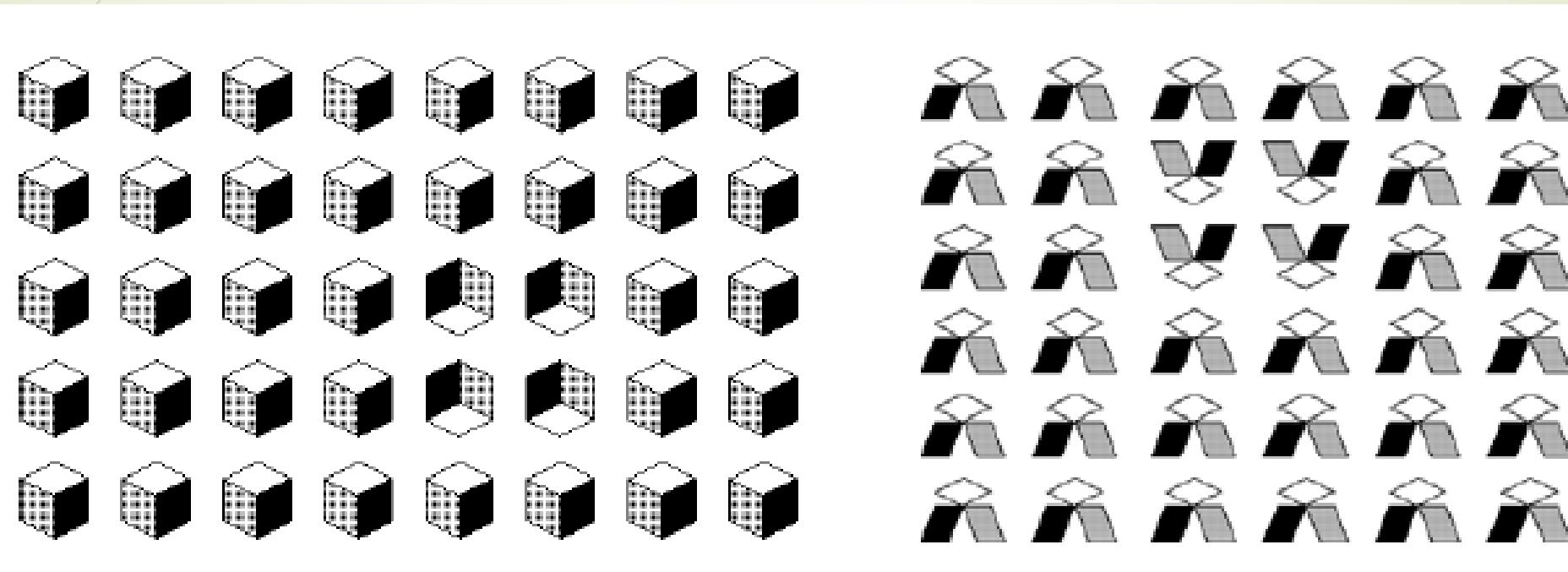
Fill and Shape



Brightnessss



Shape again



Luminance/Contrast

Hello, here is some text. Can you read what it says?

Hello, here is some text. Can you read what it says?

Hello, here is some text. Can you read what it says?

Hello, here is some text. Can you read what it says?

Hello, here is some text. Can you read what it says?

Hello, here is some text. Can you read what it says?

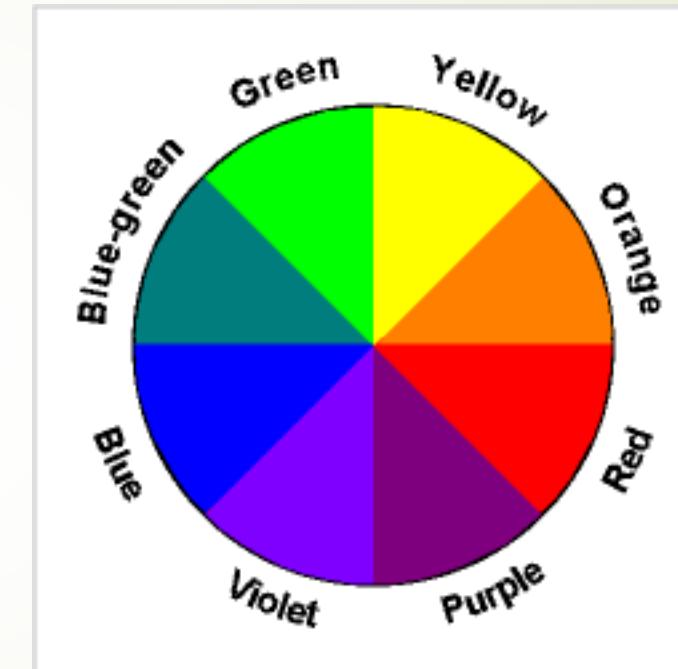
Hello, here is some text. Can you read what it says?

Color and contrast

- Using color can enhance or detract from a composition.
www.lighthouse.org/color_contrast.htm
- Color wheels help determine which colors are in greatest contrast.

Use Kuler from Adobe Labs to try out new color schemes:

<http://kuler.adobe.com/>



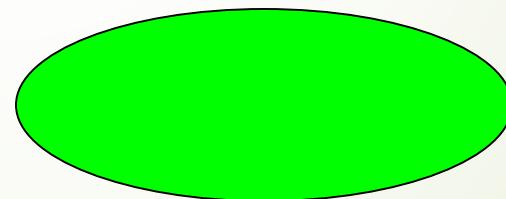
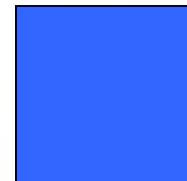


Color in design

- ▶ Use color to label or show hierarchy.
 - ▶ Use color to represent or imitate reality.
 - ▶ Use color to unify, separate, or emphasize.
 - ▶ Use color to decorate.
 - ▶ Use color consistently.
- 

Color

- ▶ Use it for a purpose, not to just add some color in



Color Guidelines

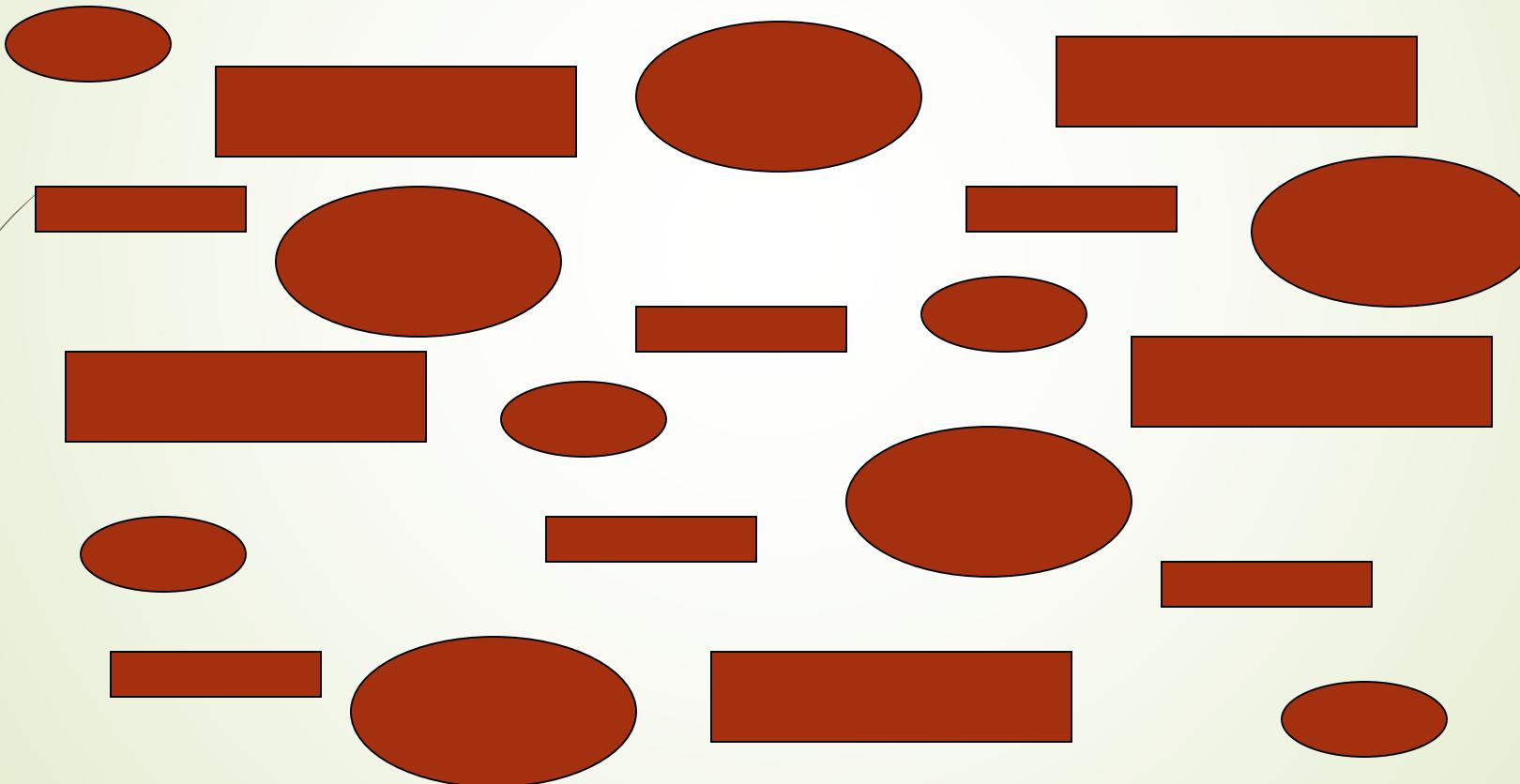
- ▶ Display color images on black background
- ▶ Avoid brown and green as background colors
- ▶ Be sure foreground colors contrast (in both brightness and hue) with background colors

Color Guidelines

- ▶ Use color sparingly--Design in b/w then add color where appropriate
- ▶ Use color to draw attention, communicate organization, to indicate status, to establish relationships
- ▶ Avoid using color in non-task related ways

- ▶ (experiment coming next)

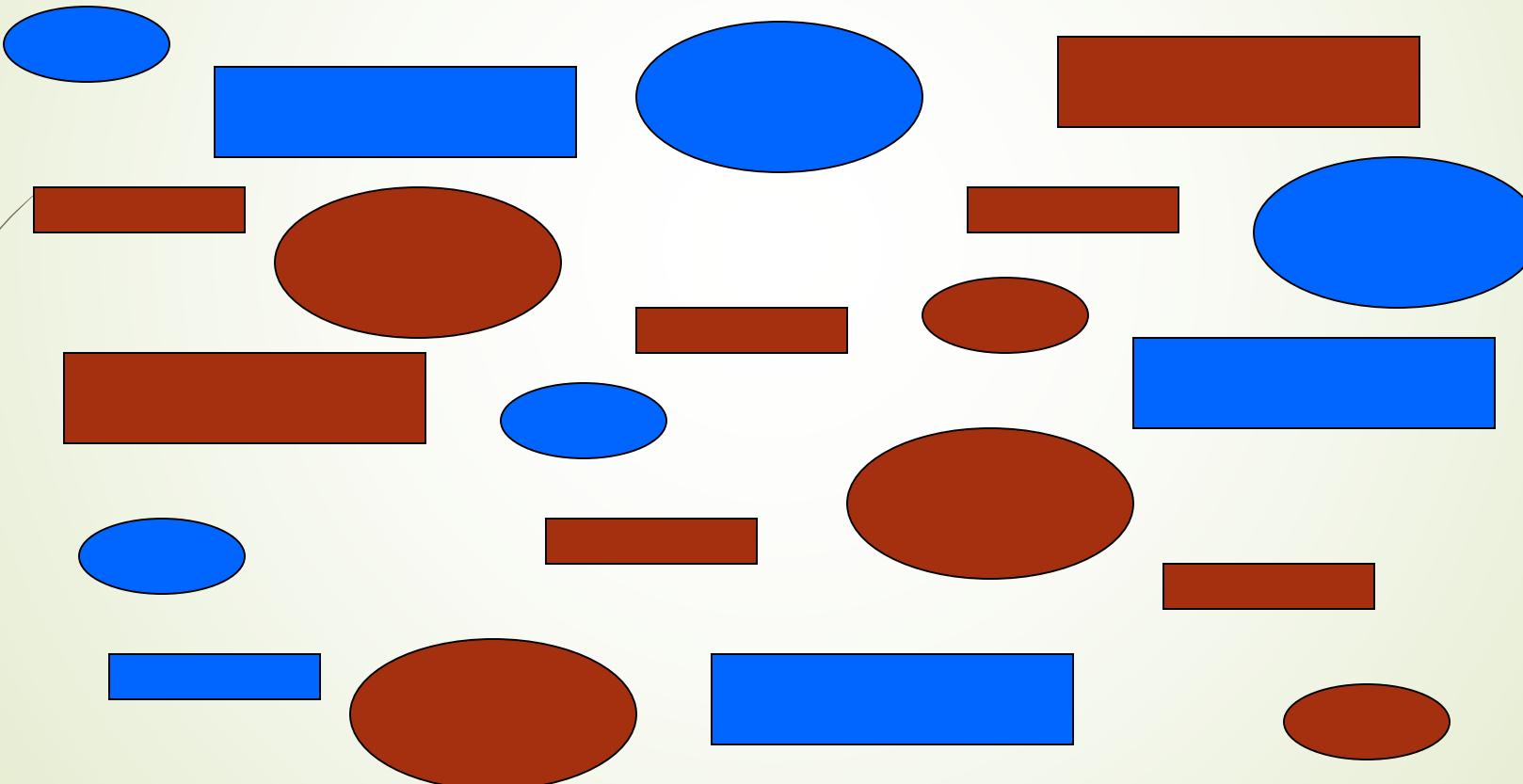
How many small rectangles



How many small ovals



How many small ovals



110

Find the R



111

Find the...

V

C

T

R

F

D

G

A

P

J

Z

W

Find the T



113

Find the...

V

C

T

R

F

Q

D

G

A

P

J

W

Z

Color Guidelines

- ▶ Color is good for supporting search
- ▶ Do not use color without another redundant cue
 - ▶ Color-blindness
 - ▶ Monochrome monitors
 - ▶ Redundant coding enhances performance
- ▶ Be consistent with color associations from jobs and cultures

Color Guidelines

- ▶ Limit coding to 8 distinct colors (4 better)
- ▶ Avoid using saturated blues for text or small, thin lines
- ▶ Use color on b/w or gray, or b/w on color
- ▶ To express difference, use high contrast colors (and vice versa)
- ▶ Make sure colors do not “vibrate”

Color Palette

Example of Color hierarchy



Color Associations

Culturally specific, contextually specific

► Red

- hot, warning,
- aggression, love

► Pink

- female, cute, cotton candy

► Orange

- autumn, warm, Halloween,
- Cell phone

► Yellow

- happy, caution, joy

► Brown

- warm, fall, dirt, earth

► Green

- lush, pastoral, envy

► Purple

- royal, sophisticated, Barney

Color Palettes/Suites

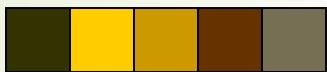
- Designers often pick a palette of 4 or 5 colors



Variations of 2 colors



Monochromatic (variations of 1 color)



Southwestern (culturally evocative)

Icon Design

- Relies on drawing ability -- hire someone to do it
- (here are standards and ways to critique icon design)

- Avoid meaningless, gratuitous use of icons
- Too many icons quickly become illegible

Icon Design

- ▶ Represent object or action in a familiar and recognizable manner



Icon Design

- ▶ Represent object or action in a familiar and recognizable manner



Icon Legibility

- ▶ Limit number of different icons
- ▶ Make icon stand out from background
- ▶ Ensure that a singly selected icon is clearly visible when surrounded by unselected ones

Icon Legibility Settlers III

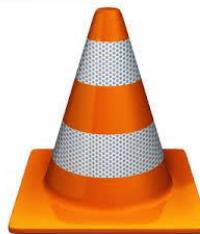


Icon Legibility

- ▶ Make each icon distinctive (legible)
but
- ▶ Make icons harmonious members of icon family
- ▶ Avoid excessive detail
- ▶ Accompany with names
- ▶ (though it shouldn't be necessary)

Icon Design

- ▶ Is the symbolic aspect of the icon meaningful?



Icon Design

- Is the symbolic aspect of the icon meaningful?



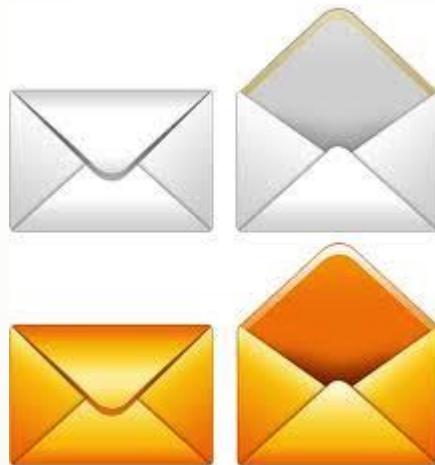
Icon Design

- Is the symbolic aspect of the icon meaningful?



Icon Design

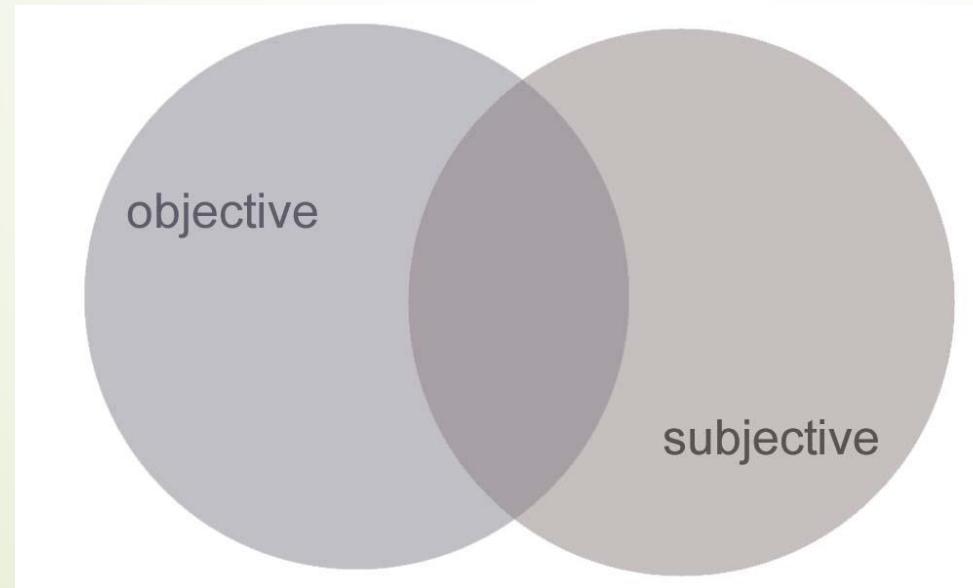
- ▶ Meaning is ASCRIBED to icons -- they don't have an essential, measurable "essence."



Revisit: Role of Graphic Design in HCI

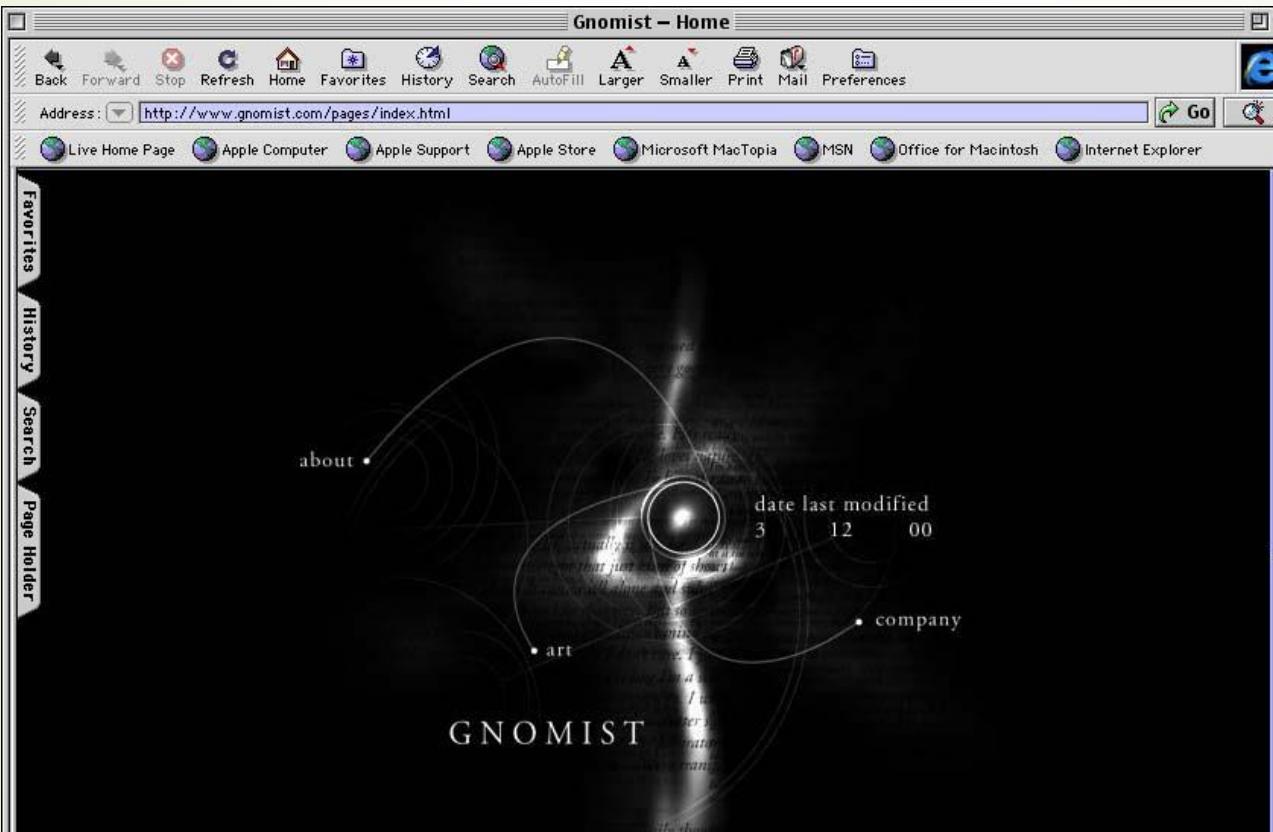
129

- ▶ The “look and feel” portion of an interface:
- ▶ What someone initially encounters
 - ▶ Sets a framework for understanding content



Role of Graphic Design in HCI

- The “look and feel” portion of an interface:
- What someone initially encounters
 - Sets a framework for understanding content



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Graphic Design

- ▶ Like any design job, there must be a logic to the visual design
- ▶ The logic drives
 - ▶ Color scheme
 - ▶ Materials choices
 - ▶ Lighting style
 - ▶ Fonts
 - ▶ etc.



File Formats

Different applications (programs) store data in different **formats**. Applications support some file formats and not others.

Open..., Save..., Save as..., Import..., Export...,
Place...

File formats appear as a (usually) 3 letter suffix or “extension” after the name of the file, e.g., .psd, .doc, .jpg, .pct, .tif, .gif, .ppt, etc.

MacIntosh does not require the file extension after the name, but Windows does. On the Mac choose “append file extension” for easier communication across platforms.

Example:Adobe Illustrator

Save

Save As... .

Save a Copy... .

Save as Template... .

Save for Web... .

Illustrator can save files in the following basic formats:

.ai — Adobe Illustrator, its “native” format

.pdf — Adobe Portable Document Format

.ait — Adobe Illustrator Template

.eps — Illustrator Encapsulated PostScript

.svg — Scalable Vector Graphics

.svgz — SVG compressed

As well as a number of Web compatible formats (.gif, .jpeg, .png-8, .png-24, .swf, .svg., .wbmp)



But. . . , Illustrator can open (import) and export files in many (almost 30) different file formats, however when you **Export**, most formats convert the vector drawing into a bitmap image:

See:

Illustrator Help. . .

Contents. . .

Saving and Exporting. . .

About graphic file formats

Adobe Photoshop

Save

Save As... .

Save a Version

Save for Web... .

Photoshop can save files in many file formats:

.psd — Photoshop Document, its “native” format

.pdf — Photoshop Portable Document Format

.eps — Photoshop Encapsulated PostScript

.tiff — Tagged Image File Format

.gif — Compuserve Graphic Interchange Format

.jpg — JPEG, Joint Photographic Experts Group

.bmp — Windows Bitmap

.png — Portable Network Graphic

etc., etc.



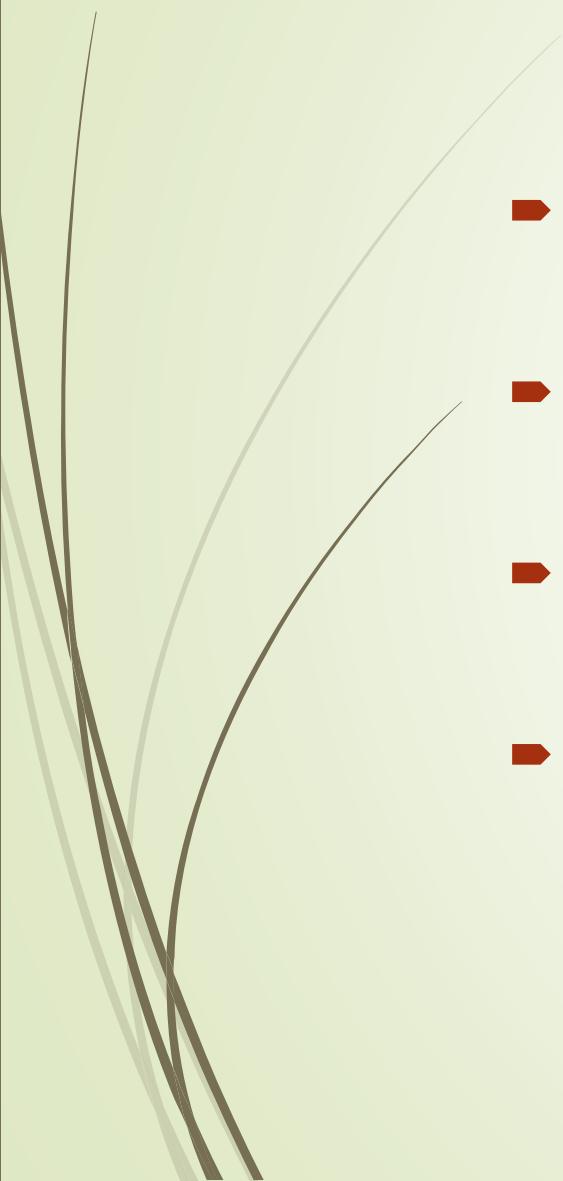
And . . . , like Illustrator, Photoshop can open many (about 25) different file formats:

However, it can import and export fewer file formats.

**See Photoshop Help . . .
Contents . . .
Saving and Exporting Images . . .**



File Formats

- ▶ What are the basic graphic file formats?
 - ▶ Which file formats should you use and why?
 - ▶ How does the format affect the file size?
 - ▶ How does the format handle compression?
- 

EPS

Encapsulated PostScript

- Preferred file format for importing into page layout programs such as QuarkXPress, PageMaker, InDesign, XPress, etc. for subsequent **printing**.
- An object-oriented format.
- Will only print to a postscript printer.
- Uses **lossy** JPEG compression.
- Only save your file as EPS if you need to import it into a page layout program.

TIFF

Tagged Image File Format

- Widely used cross platform file format also designed for **printing**.
- A bitmap image format.
- TIFF supports **lossless** LZW compression which also makes it a good archive format for Photoshop documents.

GIF

Graphics Interchange Format

- Industry standard graphic format for on-screen viewing through the Internet and Web. Not meant to be used for printing.
- The best format for all images except scanned photographic images (use JPEG for these).
- GIF supports **lossless** LZW compression.

GIF Format

- ▶ GIF – Graphics Interchange Format
- ▶ The GIF format is one of the most commonly used graphic file formats, especially on the Internet.
- ▶ The GIF format is exceedingly useful in that it can contain animations. Its internal structure is such that it can store multiple images and the controls to make them appear as real time animation
 - ▶ **animated GIF.**
- ▶ The GIF format also allows a special color as to be specified as "using the background." This results in the image looks like transparent
 - ▶ **transparent GIF.**

Animated GIF

- ▶ Advantages:
 - ▶ No need other software or plugins
 - ▶ GIF is the standard format on the Web.
 - ▶ GIF animated tools are available to use.
- ▶ The file contains layered frames on top of each other.
- ▶ Tips:
 - ▶ Avoid more than one animated GIF on a page.
 - ▶ Avoid animated GIF on text-rich pages.
 - ▶ Examine the pause between repetitions.

Animated GIF



GIF Format

- ▶ GIF is indexed color image.
 - ▶ The color of the image is indexed in a palette (a color table).
 - ▶ The GIF format is only capable of supporting a maximum of 256 colors. This means that you cannot convert directly from a 24 bit file, such as a JPEG, to the GIF format.
 - ▶ You need to convert a 24-bit image to Indexed Color mode first.
 - ▶ Reduce the number of colors to a palette of 256 or less.
 - ▶ Create an “adaptive” palette – a custom palette generated by the most commonly used color in the image.

GIF Format

- ▶ Some conversion software, such as Graphic Workshop and xv can dither a true color JPEG image down to 256 colors.
 - ▶ Note that reducing a true-color image in this way will usually leave you with acceptable images, but they will not be as detailed as the source true-color graphics they were derived from.
- ▶ Note: GIF format was created by CompuServe in 1987. The most popular format is GIF 89a.
 - ▶ **GIF87a:** supports interlacing and storage of multiple files.
 - ▶ **GIF89a:** extends the GIF87a specification and adds transparency, text comments, and animation of text and graphics.

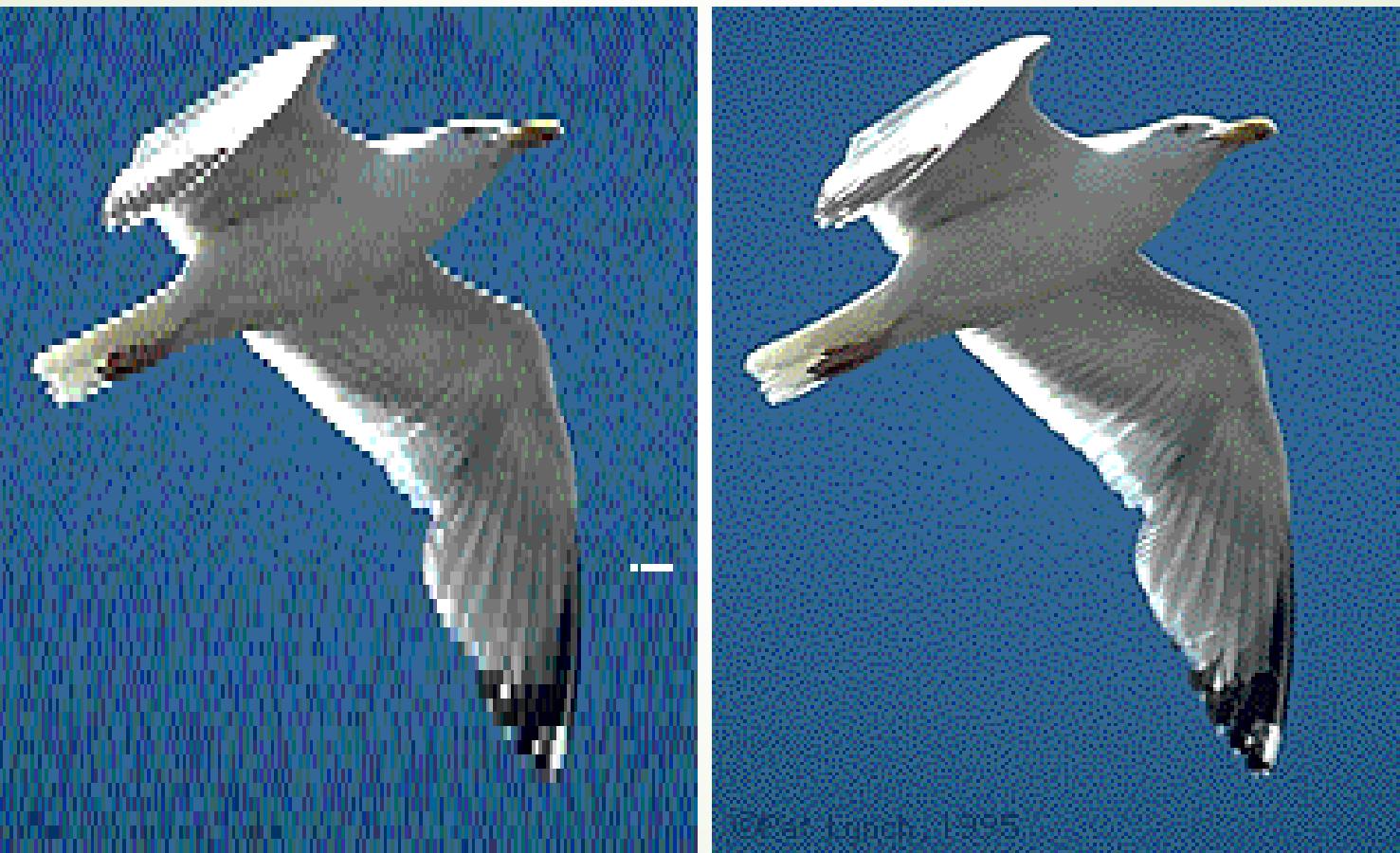
GIF Format

- ▶ The internal compression algorithm used by GIF is called the LZW (Lempel-Zev-Welch), which is patented by Unisys Corporation.
 - ▶ It is a “lossless” compression.
 - ▶ No image information is lost during compression process.
 - ▶ Take advantages of repetition in data streams.
- ▶ Question: When should we use GIF?
 - ▶ Logos, line art, icons, cartoon-like illustrations.
 - ▶ Majority is flat colors.
 - ▶ GIF is the best choice.

Interlacing

- ▶ Normal GIF displays one row of pixels at a time, from top to bottom.
 - ▶ Wait a long time for a slow connection.
- ▶ GIF87a and GIF89a support interlacing.
 - ▶ Display in 4 passes
 - ▶ 1 pass: appearance of blurry mosaic (12.5%)
 - ▶ 2 pass: fill more data to the image (25%)
 - ▶ 3 pass: more data (50%)
 - ▶ 4 pass: fill up the whole image (100%)
- ▶ Gives the viewer information about the image quickly

Interlaced Image



Interlacing Images



Transparency GIF

- ▶ The image can be shapes other than rectangles.
- ▶ One position of the color palette is designated as “Transparent”.
- ▶ All pixels of the image that have this particular color index will be painted as transparent when viewing.

Transparency GIF



Not a transparent GIF



a transparent GIF

JPEG

Joint Photographic Experts Group

- Preferred format for **scanned photographic images** for use over the internet or Web. Not meant for printing.
- Not good for images with a lot of solid color, vector drawings, type, or line art or images with “Web-safe” colors.
- JPEG compression is **lossy!** Save and archive the original before converting to JPEG.

JPEG Format

- ▶ JPEG – Joint Photographic Experts Group
- ▶ The JPEG format uses "**lossy**" compression to get more graphics into a smaller file than would otherwise be possible.
- ▶ There are a number of things that may not be apparent in using JPEG files, however, and which might make your use of them less than optimum.
- ▶ An image written to the JPEG format will be degraded.
- ▶ The amount of degradation, the "**quality factor**," can usually be set in a graphics software.
 - ▶ If the value is set to 100, almost no degradation will occur when an image is written to a JPEG file. Of course, the compression of the resulting file will not be significant.
 - ▶ If it is set to a value close to zero, the resulting image will be a very small file but unrecognizable.
 - ▶ The default value of 75 is usually a good compromise.

JPEG Format

- ▶ The image degradation caused by the JPEG format is cumulative. As such, if you write an image to a JPEG file, and then read it from the JPEG file and write it back to the JPEG format, it will have suffered two passes of image degradation.
- ▶ It works very, very badly on text, line art or other types of mechanical graphics, which it will degrade quite noticeably. These sorts of graphics should be stored in another format, such as GIF, BMP or PNG.
- ▶ Unlike GIF, JPEG does not support transparency or multiple images. It cannot be used for animation.
- ▶ When to use JPEG?
 - ▶ Ideal for photographic, paintings
 - ▶ Leave flat graphics to GIF

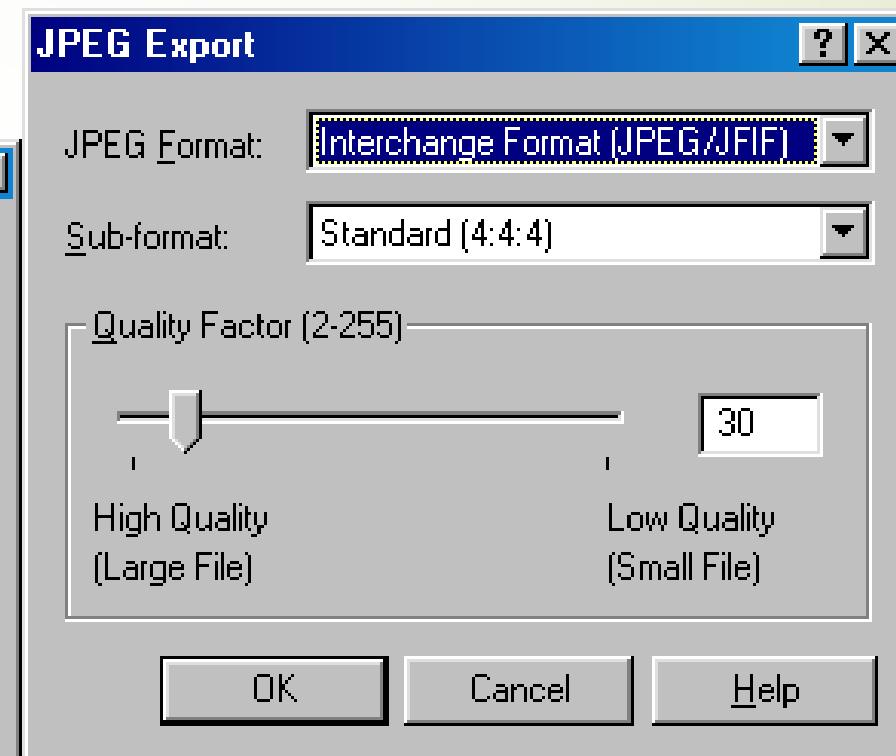
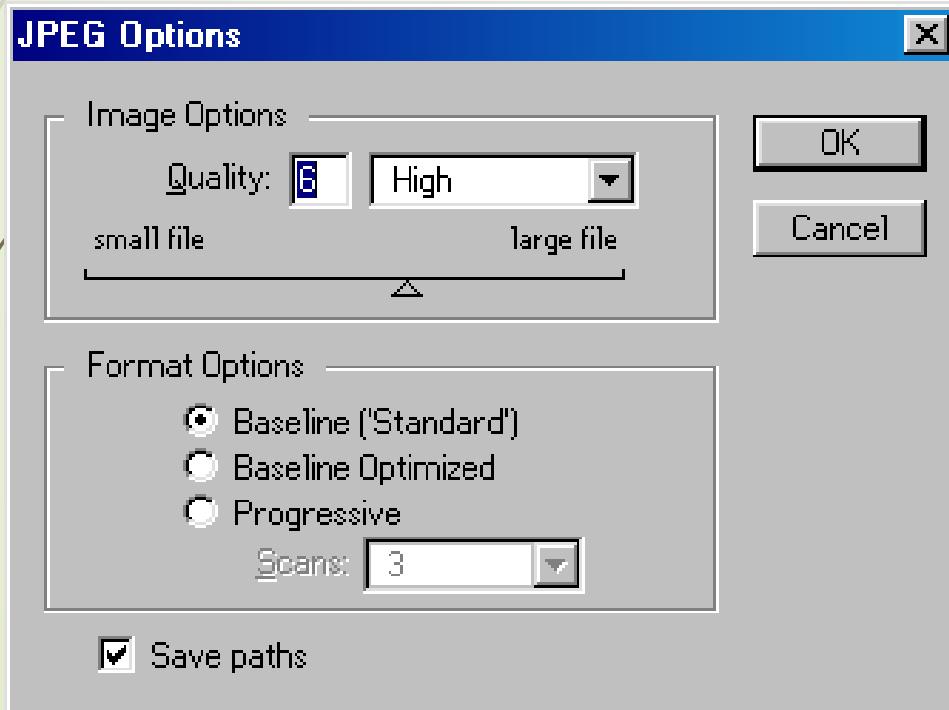
Progressive JPEG

- ▶ There are two types of JPEG files extant as of this writing, called "sequential" and "progressive".
 - ▶ A **sequential JPEG** file stores its image as a simple bitmap.
 - ▶ A **progressive JPEG** files stores its image such that it can appear initially out of focus when it begins to download to a web page, and resolve itself as more of the image is received by your web browser.
 - ▶ Advantage: Provide indication of the whole image to the viewer before the entired image is loaded.
 - ▶ Disadvantage: Require more computational power to display.

Progressive JPEG



Photoshop and Corel PhotoPaint Quality Setting

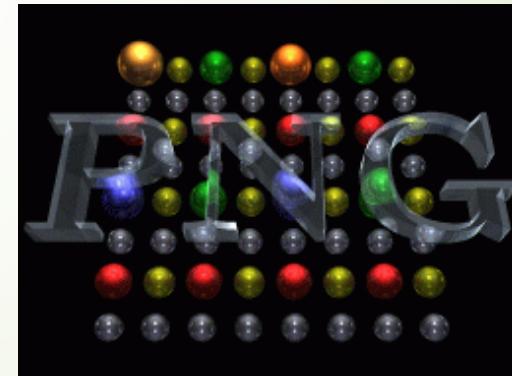


GIF versus JPEG

| | GIF | JPEG |
|-----------------------------|-------------------------------------|---|
| Best application | Line Art, Image with few color text | Photographs, Image with many colors |
| How to reduce display time? | Interlace | Interlace (Progressive) |
| Display speed | Fast | Slower, more computation |
| Benefits | Transparency, Animation | Greatest compress for photographs, more color |
| Max. color | 256 | 16.7 million |

PNG Format

- ▶ Portable Network Graphic (PNG) which is pronounced as “Ping”.
- ▶ Alternative to GIF, a lossless compression scheme is used.
- ▶ Support three image type: true color, grayscale, palette-based (8-bit).
 - ▶ JPEG supports the first 2.
 - ▶ GIF supports the 3rd one.



PNG Format

► Advantages

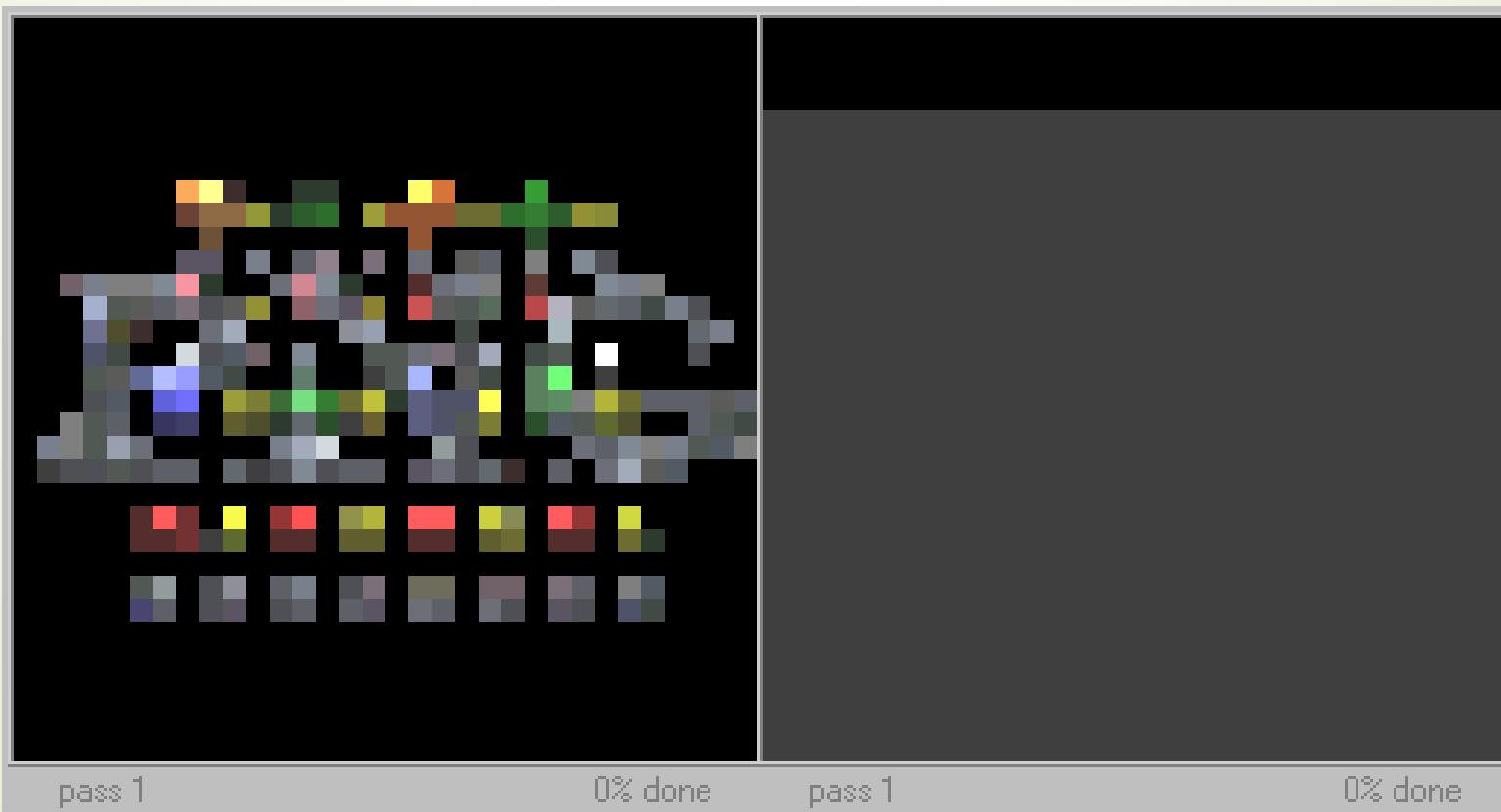
- ▶ Better Compression
 - ▶ Deflate is an improved version of the Lempel-Ziv compression algorithm.
- ▶ Improve Interlacing
 - ▶ Display image quicker than Interlaced GIF.
- ▶ True Color and Transparency
 - ▶ Support 16-bit (Grey scale) or 48-bit (True Color)
 - ▶ 16-bit for alpha channel (Transparency).
- ▶ Gamma storage
 - ▶ Store the gamma setting of the platform of the creator.

► Disadvantages

- ▶ Not support by old browsers (Netscape 2,3,4 and IE 2,3,4)

PNG Format

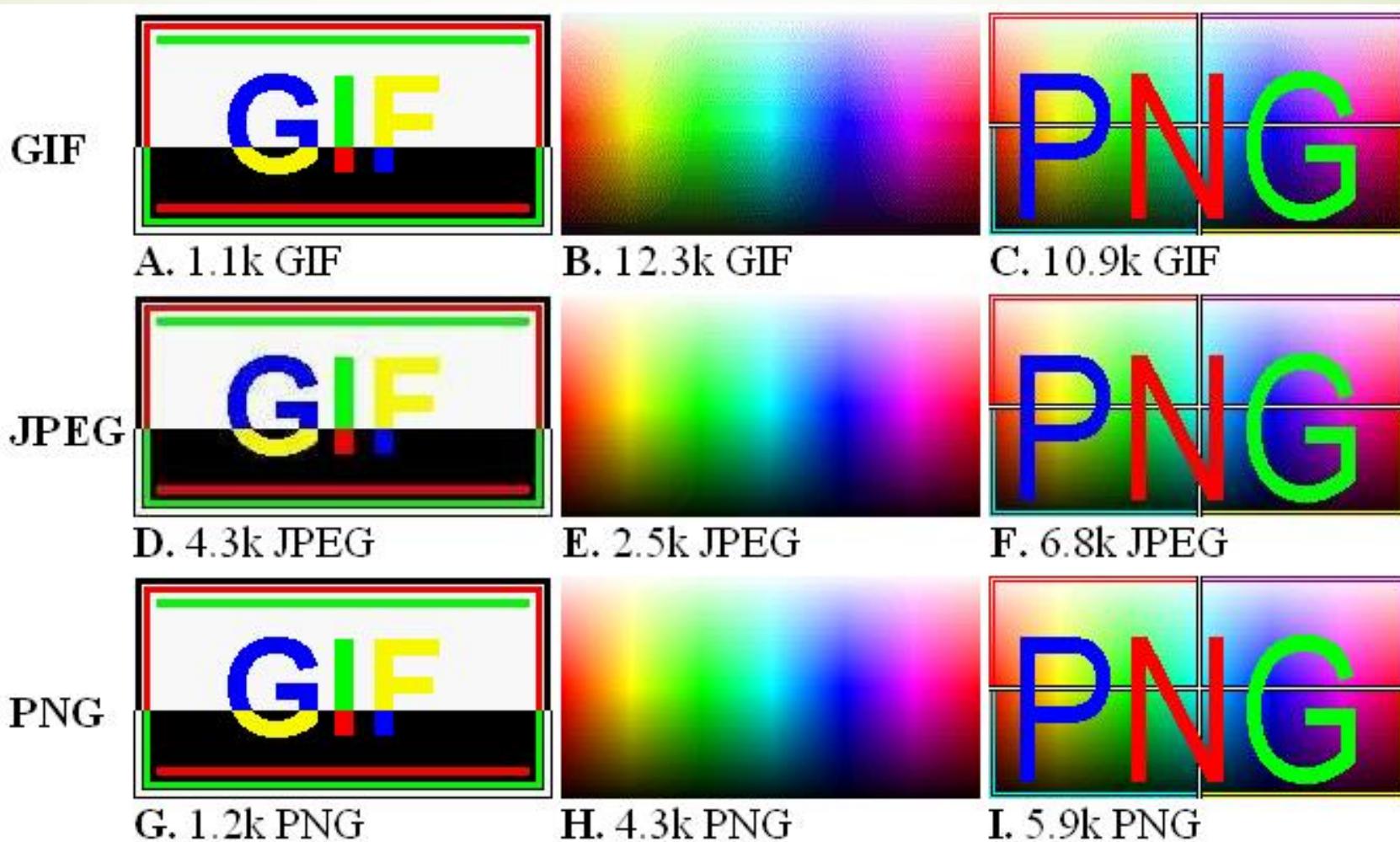
- ▶ PNG's 2D interlacing (left) compared with GIF's 1D interlacing (right)



Format Comparison

| Format | Compression Ratio |
|-----------|-----------------------------|
| GIF | 4:1 – 10:1 |
| JPEG (HQ) | 10:1 – 20:1 (no loss image) |
| JPEG (LQ) | 60:1 – 100:1 (previews) |
| PNG | 10-30% smaller than GIF |

Format Comparison



Other Formats

- ▶ **JPEG 2000** – New JPEG specification, lossy to lossless compression, wavelet transform, superior compression.
- ▶ **ART** – built-in color reduction, dither, gamma correction.
- ▶ **Wavelet** – transform an image as a frequency representation, like waves.
- ▶ **Bravo** – multi-platform 2D engine of Adobe's graphic format.
- ▶ **FlashPix** – developed by Kodak, HP, ...

Anti-aliasing

- ▶ Use anti-aliasing technique to create professional-looking graphics for the Web
- ▶ Slightly blur on the image edges to make the transitions between color smoother.
- ▶ Aliased edges are stair-stepped.



Aliased
Text



Anti-Aliased
Text

Optimizing Web Graphics – Tips for small files

- ▶ Minimize the dimension and maximum crop.
- ▶ Reduce the number of color used.
- ▶ Choose the color from the non-dithering palette.
- ▶ Use aliased fonts, anti-aliasing increase size.
- ▶ Use flat color, avoid gradation color.
- ▶ Reduce to 72dpi in the final step.
- ▶ Use multiple small images, other than a large image.

Web Graphics Tips

- ▶ **Edit an existing GIF image**
 - ▶ Open GIF in the editing tool
 - ▶ Change it to RGB mode
 - ▶ Edit the image
 - ▶ Change it back to indexed image
 - ▶ Save and export to GIF format
- ▶ **Resizing tips**
 - ▶ Convert to RGB before resizing
 - ▶ Don't enlarge the image
 - ▶ Incrementally resize the image smaller.

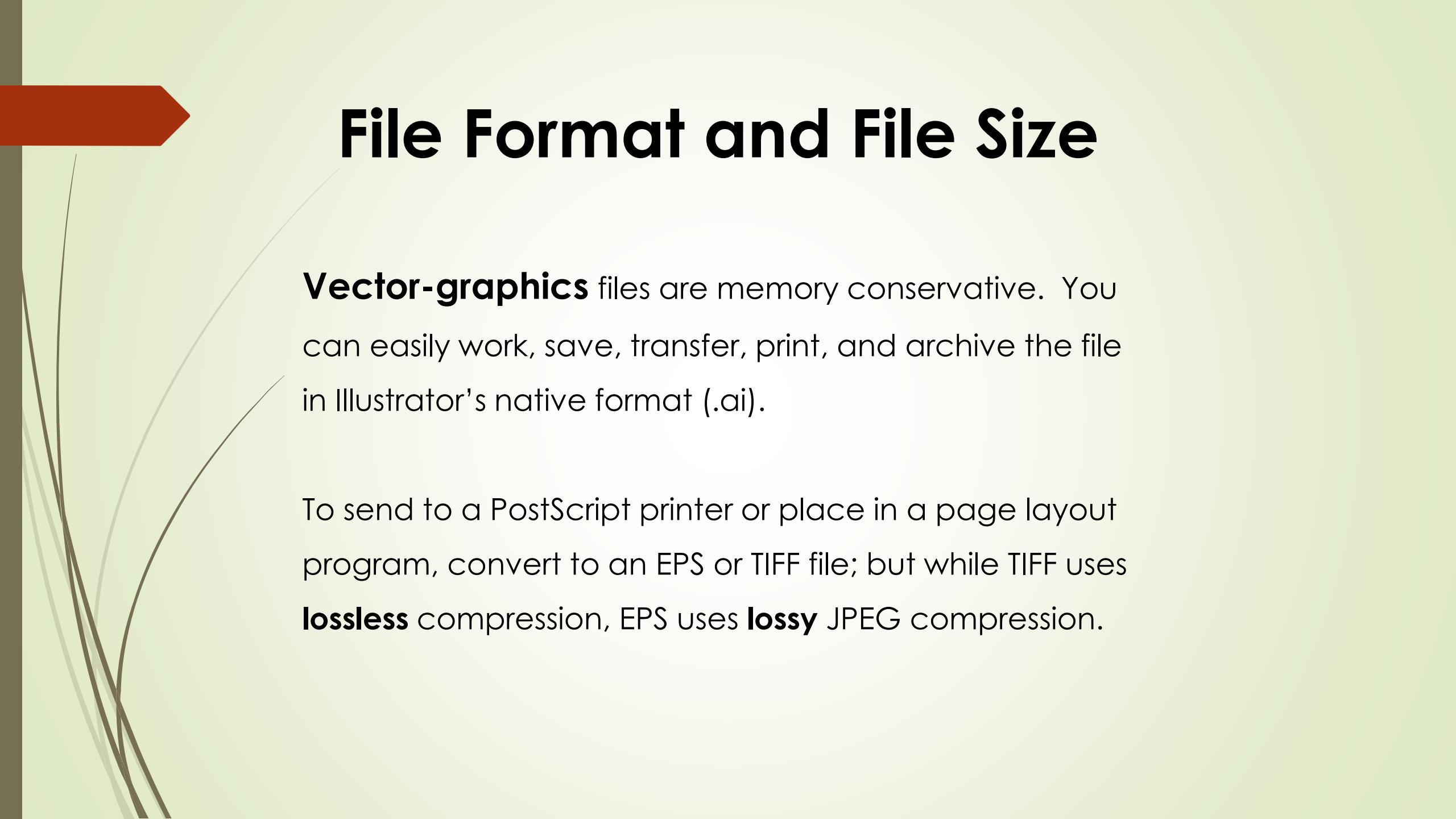
Graphical Tools

- ▶ Fireworks – by [macromedia](#)
- ▶ Photoshop / Imageready – by [adobe](#)
- ▶ PhotoImpact – by [Ulead](#)
- ▶ Paint Shop Pro – by [Jasc](#)
- ▶ ProJPEG / PhotoGIF – by [BoxTop](#)

PDF

Portable Document Format

- Developed to transfer and read documents without having to print them—the “paperless office.”
- Cross platform format that can be read with the free download **Adobe Acrobat Reader**.
- Can represent both vector and bitmap graphics.
- Can also contain electronic document search and navigation features as well as hypertext links.
- Can be created from almost any application, but the user cannot edit or modify the file except with Adobe Acrobat (or other software).
- Document formatting, fonts, colors, etc. are maintained and appear identical across platforms.
- Excellent in the “prepress” process — can be sent to the printer, but can also be placed in other documents.



File Format and File Size

Vector-graphics files are memory conservative. You can easily work, save, transfer, print, and archive the file in Illustrator's native format (.ai).

To send to a PostScript printer or place in a page layout program, convert to an EPS or TIFF file; but while TIFF uses **lossless** compression, EPS uses **lossy** JPEG compression.



Bit-mapped images use a **LOT** of memory and, hence, a lot of disk space.

The larger the file, the slower it is to edit, save, print, or send over the internet.

Work with smaller images and archive the image when not in use or use
compression.

But... be careful with **lossy** compression

Work in Photoshop's native file format (.psd) until you have to do something with the image.



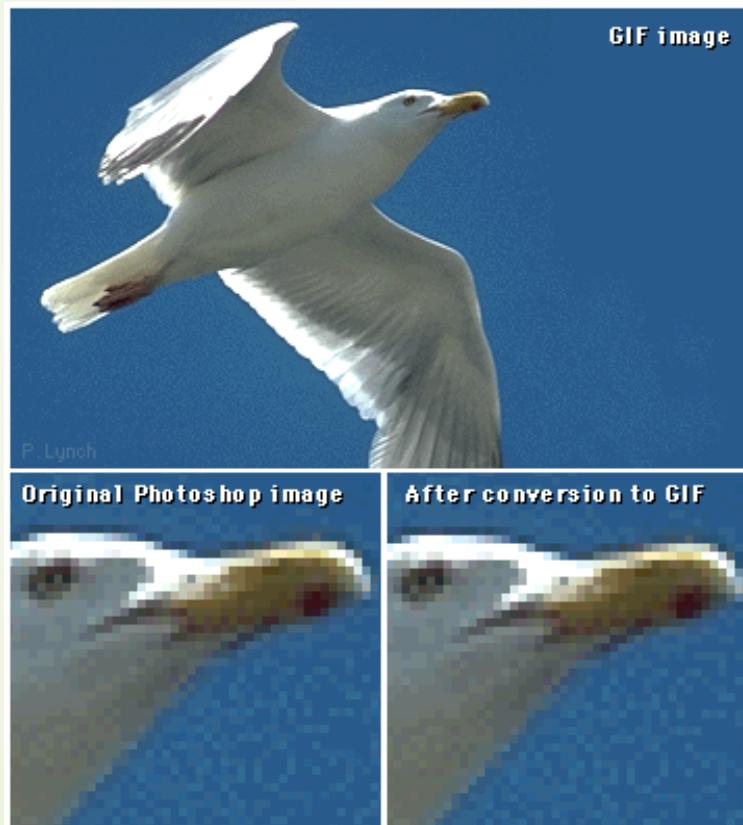
Compression: to lose or not to lose?

Lossless Compression
vs.
Lossy Compression

Compression

- ▶ Compression refers to how an image is saved in order to reduce the file size.
- ▶ The greater the compression, the lower the quality
- ▶ Two types:
 - ▶ Lossless
 - ▶ Reduces the file size without losing any pixel data
 - ▶ Quality is not compromised
 - ▶ GIF, PCX format
 - ▶ Lossy
 - ▶ Alters and/or eliminates some data
 - ▶ The more the image is reduced, the more the quality is degraded

Lossless Compression



Before Compression

After Compression

Notice that there is no difference, no data has been lost.

Lossless Compression

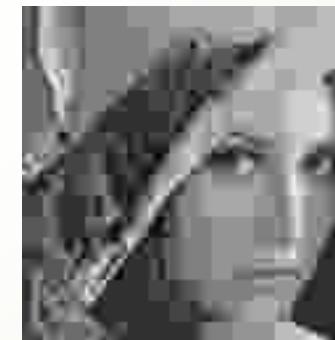
- ▶ This type is called “**non-lossy**“ or “**lossless**“ compression formats.
 - ▶ Whatever gets stored in them will be identical to what emerges from a lossless file when it's unpacked.
 - ▶ Most graphic formats use lossless compression - the GIF and PCX formats are among them.

Lossy Compression

- ▶ Notice that each time the image is saved, the quality is degraded.
- ▶ In the third image, the image is very pixelated.



Original



Final compression

Lossy Compression

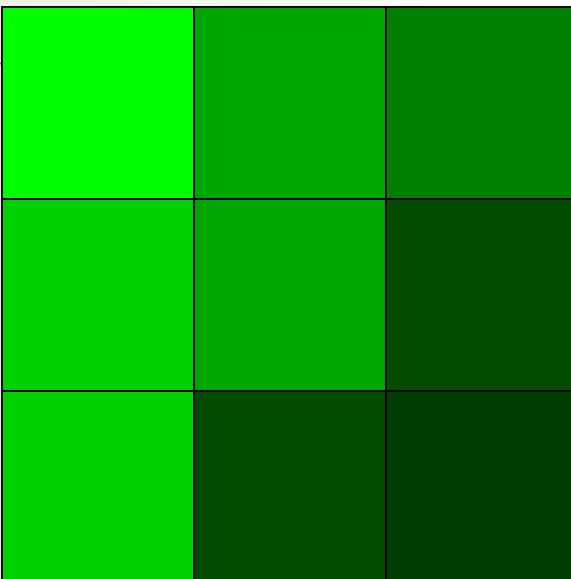
- ▶ The third type of bitmapped graphic file formats is called "lossy" compression.
 - ▶ Photorealistic images don't compress well because they have lots of details
 - ▶ the details are what prevent areas from being all the same color, and as such from responding well to compression.
 - ▶ In some cases the details represent very subtle color variations
 - ▶ perhaps too subtle to be discernable by your eye, or at least, too subtle to make much of a difference to your perception of the graphic in question.

Lossy Compression

- ▶ Lossy compression seeks to improve upon the compression of the graphics it deals with by throwing away some of the details in your source images to create more areas which are all the same colour.
- ▶ Having done so, lossy compression can typically improve upon the file compression offered by the non-lossy formats.
- ▶ Examples of lossy image file format are JPEG, PIC, and ART.
- ▶ Lossy compression allows you to specify the amount of detail to be discarded when a graphic is compressed. This level of image degradation is called the “quality factor“.

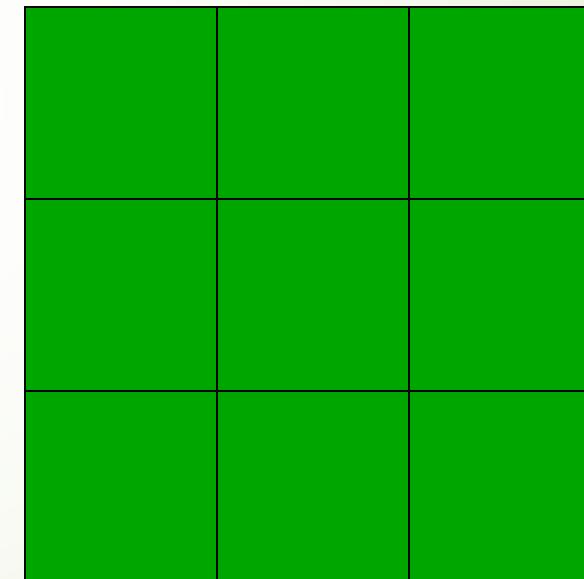
“Lossy” compression types:

- **JPEG**
- Genuine Fractals
- Mr. SID



Original

9:1
“averaging”



Compressed

Quality Comparison



BMP
65854



GIF
15628



JPG
100%
21162



JPG
75%
6745



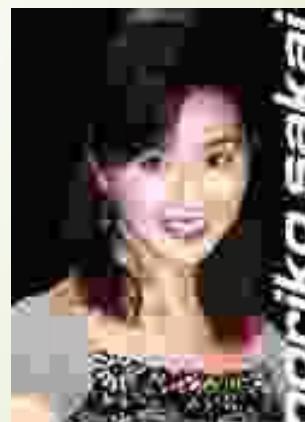
JPG
50%
4766



JPG
25%
3407

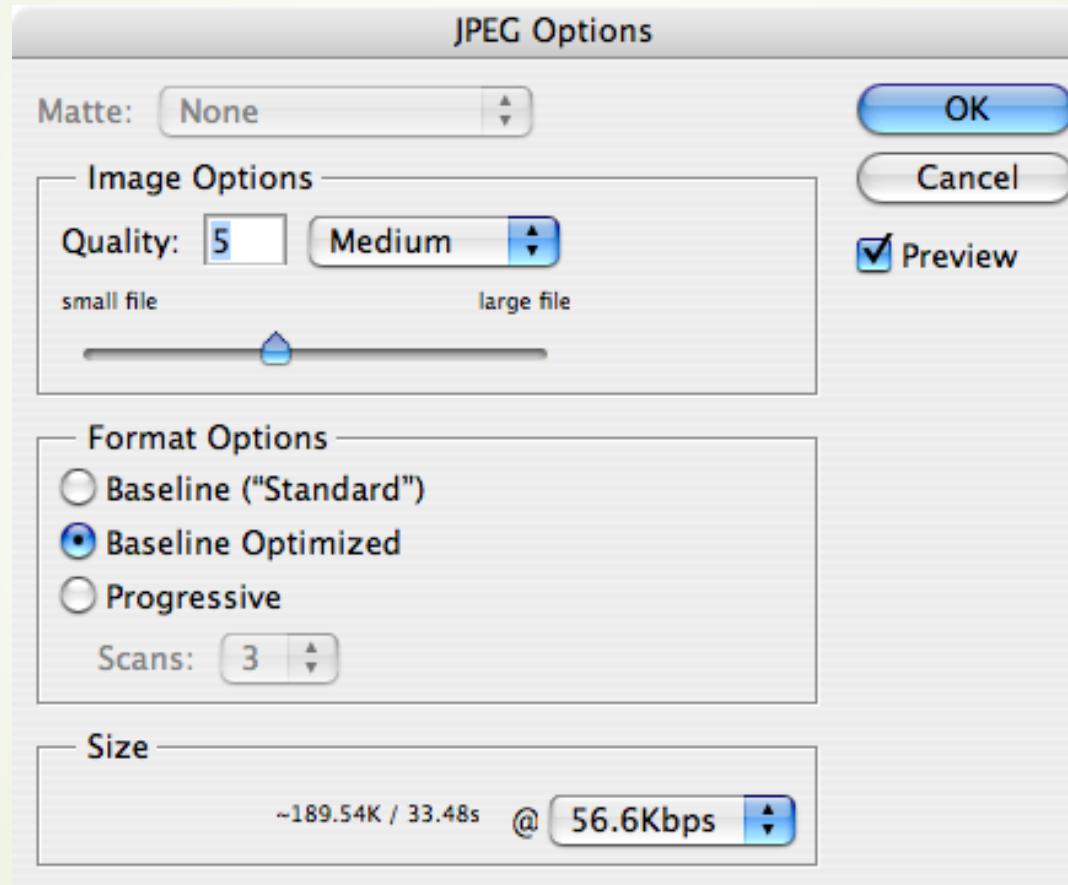


JPG
10%
2251



JPG
5%
1173

In Photoshop, when you **Save as...** a JPEG file, you can choose the level of compression and, therefore, the size and quality of the file.





JPEG cautions:

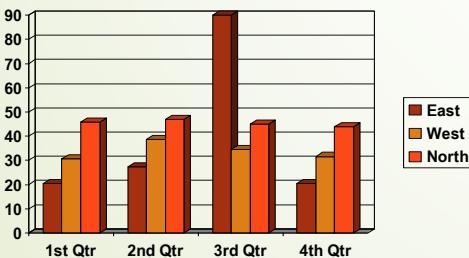
- Images with hard edges, high contrasts, angular areas, and text suffer from JPEG compression.
- Scanned “natural” photographs do not lose much, especially at High or Maximum quality.
- Only save **finished** images as JPEGs, every time you open and save again, even if you **don't** edit, you lose quality.
- Always **keep the original** non-JPEG version (the native .psd format).

So why use JPEG?

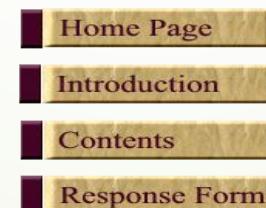
- It is the **best** format for photographic images on the Web.
- Its compression ability is very great.

Graphics

- ▶ **Graphics** - anything on the page that is not actual text, from simple line drawings to fully active images found on the World Wide Web.
- ▶ There are many different graphic file formats.
- ▶ The format you choose depends on several factors.



Chart



Buttons



Photograph

Analog versus bitmap images

- ▶ The visual world is analog, which is to say that real-world images is a continuous spectrum of colors. An analog image embodies an infinite number of details.
- ▶ Infinity is uncomfortably large to a computer. A computer-stored image is split into little bits of light.
- ▶ **A bitmap is a matrix of colored dots.**
- ▶ This should help illustrate the nature of a bitmap. The left side of the picture appears to be an analog image. The right side illustrates how the image is really constructed.

Analog versus bitmap images



Bitmaps, Pixels & Colors

- ▶ The colored dots that make up a bitmap are properly called "pixels".
- ▶ Web pages are measured in Pixels but not in inches, picas.
- ▶ In addition to providing your eyes with infinitely small details, the analog world presents it with images having the potential for an infinite number of possible colors.
- ▶ Color is represented on a computer by using varying amounts of red, green and blue light. These are the primary colors of what's called "additive" color - by adding percentages of red, green and blue, any color can be created.
- ▶ In the simplest sort of bitmapped image, each pixel is represented by three numbers to store the amounts of red, green and blue light that define the color of the pixel in question.

True Color Bitmap

- ▶ The smallest useful object for storing numbers on a computer is a byte.
- ▶ In this sort of bitmap, each pixel requires one byte for each color index for a total of three bytes per pixel.
- ▶ As a byte represents eight bits, each pixel requires 24 bits to store all its color information.
- ▶ This defines the maximum number of discrete colors this sort of bitmap can represent as 2^{24} , or 16,777,216.
- ▶ Such graphics are referred to as “**True Color**” images, or just as “24-bit” graphics.

Size consideration in a true-colored bitmap image

- ▶ The lowest resolution for a monitor displaying a Windows desktop is 640 by 480 pixels.
- ▶ In a bitmap of this resolution, then, there would be three bytes per pixel, for a total of $640 \times 480 \times 3$ bytes, or about 900 kilobytes.
- ▶ Bitmapped graphics are huge entities, and they become huger still as they get better looking.

8-bit and 24-bit photos

► Can you see the difference?



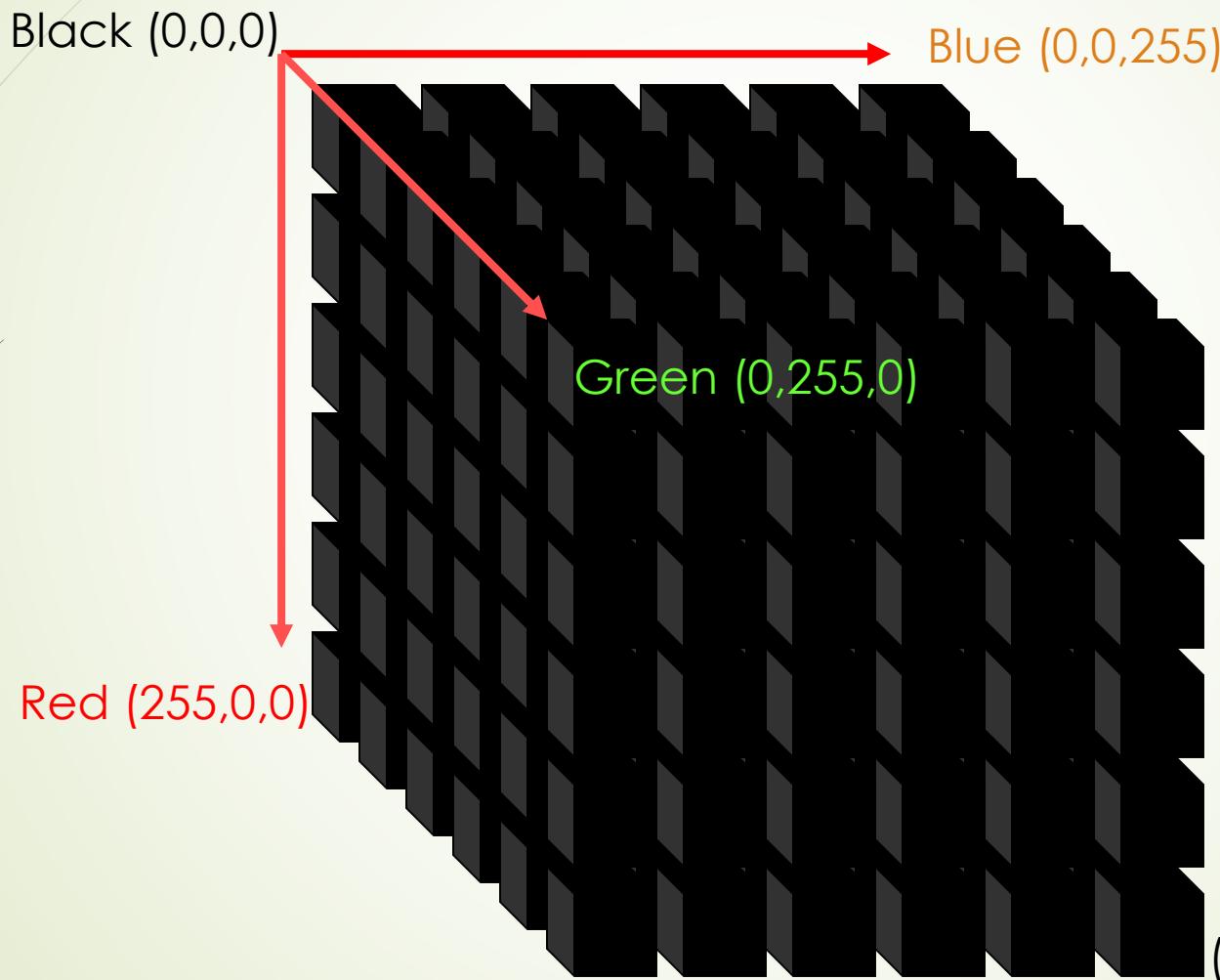
Color Palettes

- ▶ Photorealistic images look best if they're stored in a format which allows them to be reproduced with as many of the 16,777,216 colours in a computer. However, the resulting file size may be prohibitively large, especially when non-lossy formats are used.
- ▶ For practical purposes, the next step down from a file which can store images having a maximum of 16,777,216 colours, is one which can store images having a maximum of 256 colours.
- ▶ Such files are referred to as using "**palette-colour**". The colours in a palette-colour file are derived from a potential palette of 16,777,216 colours, but no more than 256 of them can be used in any one image.

The Web Palette

- ▶ Color in Browser – 24-bit color displays on an 8-bit monitor display.
- ▶ Need a common palette (Web Palette) for browser, guarantees the image will look the same on different platforms.
- ▶ If the browser is in 24-bit display, the palette does not affect the images.
- ▶ Web Palette consists of 216 colors
- ▶ Also called: Web-safe Palette, Non-dithering Palette, 6x6x6 cube.

Which Color Palette?



Why
00,33,66,
99,CC,FF?

Which one is
(99,FF,CC),
(153,255,204)
?

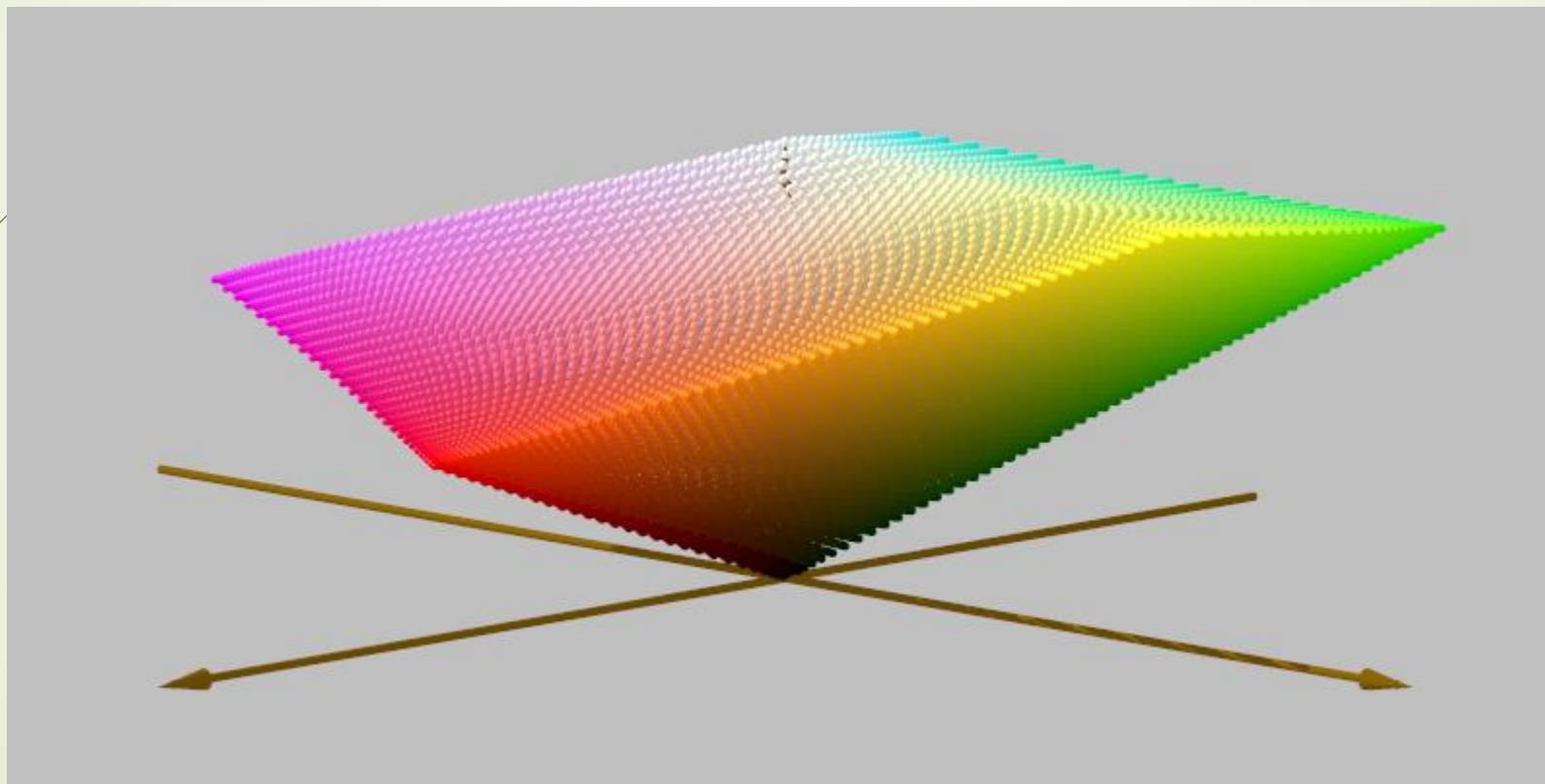
White
(FF,FF,FF)
(255,255,255)

6x6x6 Color Palette

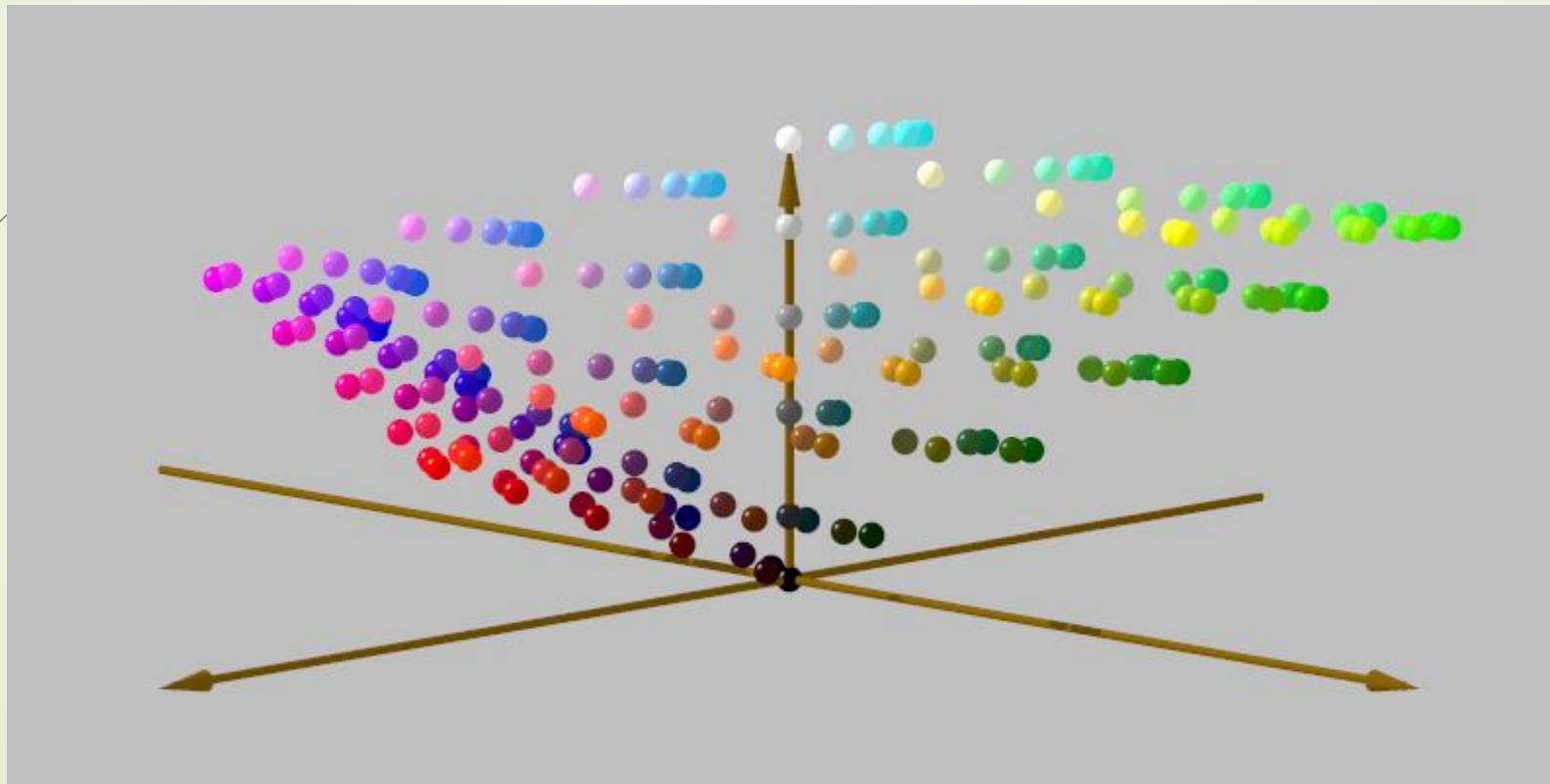
The diagram illustrates a 6x6x6 color palette grid, where each row and column is labeled with a two-digit hex code (00, 33, 66, 99, cc, ff) in red and green. A green circle highlights the top-right corner cell, which corresponds to the HTML color name FFFFFF. A red arrow points from this highlighted cell to the Microsoft Internet Explorer browser window, which displays a table of HTML color names and their corresponding RGB values.

| HTML Color Names | | 255, 255, 255 FFFFFF | 255,255,204 FFCCFF | 255,255,153 FFFF99 | 255,255,102 FFFF66 | 255,255,51 FFFF33 | 255,255,0 FFFF00 |
|----------------------|--------------|-------------------------|-----------------------|-----------------------|-----------------------|----------------------|---------------------|
| <u>List o' Links</u> | <u>Books</u> | 255,204,255 FFCCFF | 255,204,204 FFCCCC | 255,204,153 FFCC99 | 255,204,102 FFCC66 | 255,204,51 FFCC33 | 255,204,0 FFCC00 |
| | | 255,153,255 FF99FF | 255,153,204 FF99CC | 255,153,153 FF9999 | 255,153,102 FF9966 | 255,153,51 FF9933 | 255,153,0 FF9900 |
| | | 255,102,255 FF66FF | 255,102,204 FF66CC | 255,102,153 FF6699 | 255,102,102 FF6666 | 255,102,51 FF6633 | 255,102,0 FF6600 |
| | | 255,51,255 FF33FF | 255,51,204 FF33CC | 255,51,153 FF3399 | 255,51,102 FF3366 | 255,51,51 FF3333 | 255,51,0 FF3300 |
| | | 255,0,255 FF00FF | 255,0,204 FF00CC | 255,0,153 FF0099 | 255,0,102 FF0066 | 255,0,51 FF0033 | 255,0,0 FF0000 |
| | | 204,255,255 CCFFFF | 204,255,204 CCFFCC | 204,255,153 CCFF99 | 204,255,102 CCFF66 | 204,255,51 CCFF33 | 204,255,0 CCFF00 |
| | | 204,204,255 CCCCFF | 204,204,204 CCCCCC | 204,204,153 CCCC99 | 204,204,102 CCCC66 | 204,204,51 CCCC33 | 204,204,0 CCCC00 |
| | | 204,153,255 CC99FF | 204,153,204 CC99CC | 204,153,153 CC9999 | 204,153,102 CC9966 | 204,153,51 CC9933 | 204,153,0 CC9900 |
| | | 204,102,255 CC66FF | 204,102,204 CC66CC | 204,102,153 CC6699 | 204,102,102 CC6666 | 204,102,51 CC6633 | 204,102,0 CC6600 |
| | | 204,51,255 CC33FF | 204,51,204 CC33CC | 204,51,153 CC3399 | 204,51,102 CC3366 | 204,51,51 CC3333 | 204,51,0 CC3300 |
| | | 204,0,255 CC00FF | 204,0,204 CC00CC | 204,0,153 CC0099 | 204,0,102 CC0066 | 204,0,51 CC0033 | 204,0,0 CC0000 |
| | | 153,255,255 99FFFF | 153,255,204 99FFCC | 153,255,153 99FF99 | 153,255,102 99FF66 | 153,255,51 99FF33 | 153,255,0 99FF00 |

True Color (RGB) “Palette”



Standard Web Palette



Define RGB Values

► Decimal

- Ranging from 0 to 255.
- 51-51-255 means red value is 51, green value is 51, blue value is 255.

► Hexadecimal

- Base-16 number system
- Only six characters to describe RGB color.
- 51-51-255 is 3333FF.

► Percentage

- 51-51-51 is 20%-20%-100%
- 00,33,66,99,CC,FF – 0%,20%,40%,60%,80%,100%
- Some old Macintosh programs use it.

Gamma

- ▶ Refers to the overall brightness of the display of a computer monitor.
- ▶ The relationship of voltage and the light intensity.
- ▶ Default gamma setting varies from platform to platform
 - ▶ Macintosh – 1.8 Gamma
 - ▶ PC – 2.2 Gamma
 - ▶ UNIX – 2.4 Gamma
- ▶ The higher the gamma value, the darker the display.
- ▶ Image created on PC looks wash out on Macintosh.

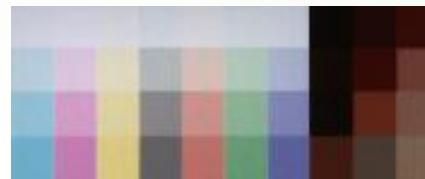
Gamma Control

Different Gamma Value



Gamma Value

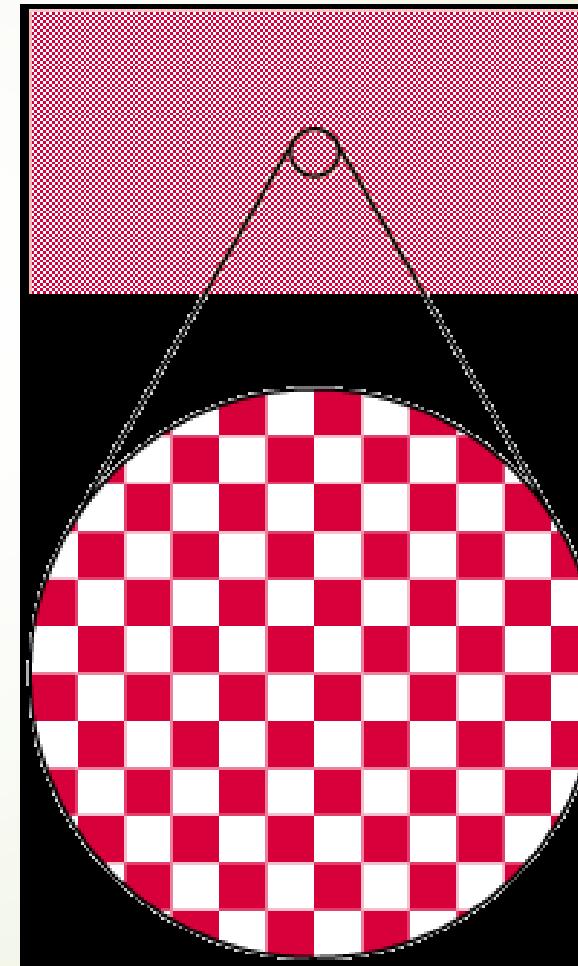
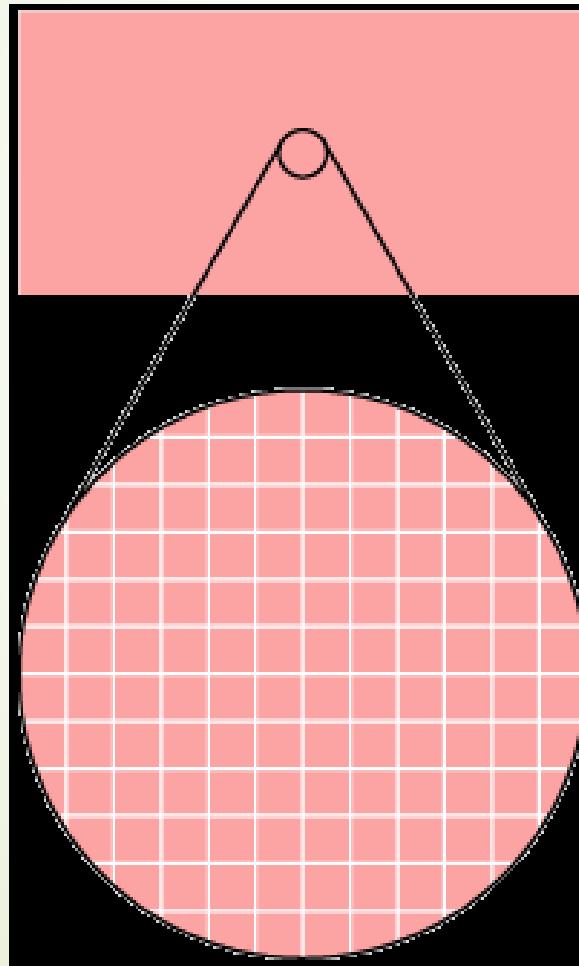
- ▶ Gamma: 2.4
- ▶ Gamma: 1.8
- ▶ Gamma: 1.0



Dithering

- ▶ 256 colours are not sufficient to represent a photorealistic image so it looks photorealistic.
- ▶ Browsers approximate a color by **dithering**.
- ▶ There is a way to cheat around this problem - photorealistic images can be dithered to 256 colours to create a convincing simulation of all their colours.
- ▶ Dithering involves using patterns of alternating colored dots to simulate more colors than are actually available.
- ▶ Dithering creates precisely the sort of images that compress very badly.

Dithering How to



Dithering Example

- ▶ No dithering and dithering
- ▶ Which one is better?



Vector Graphics

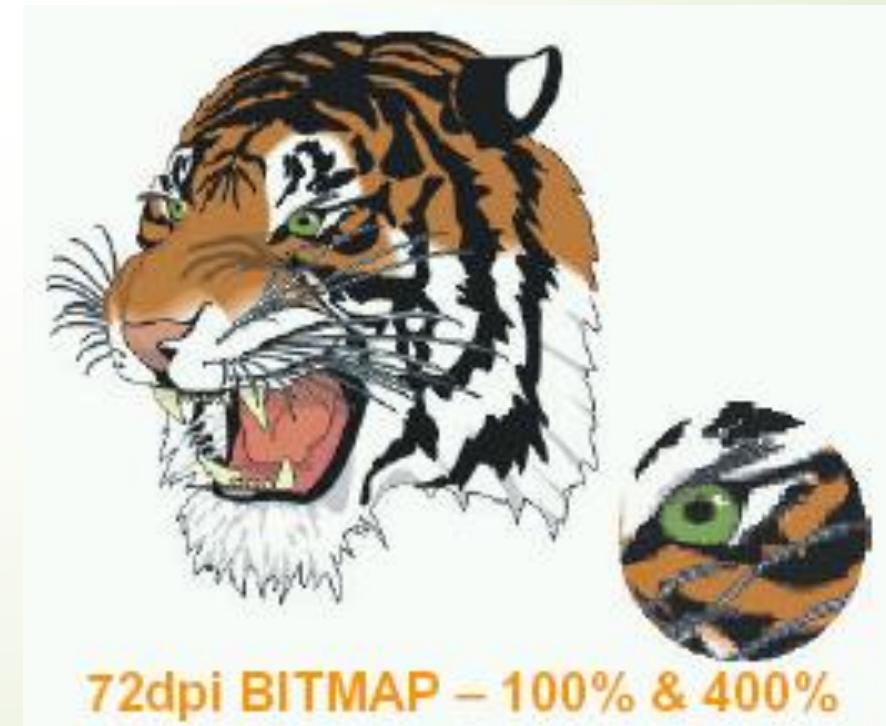
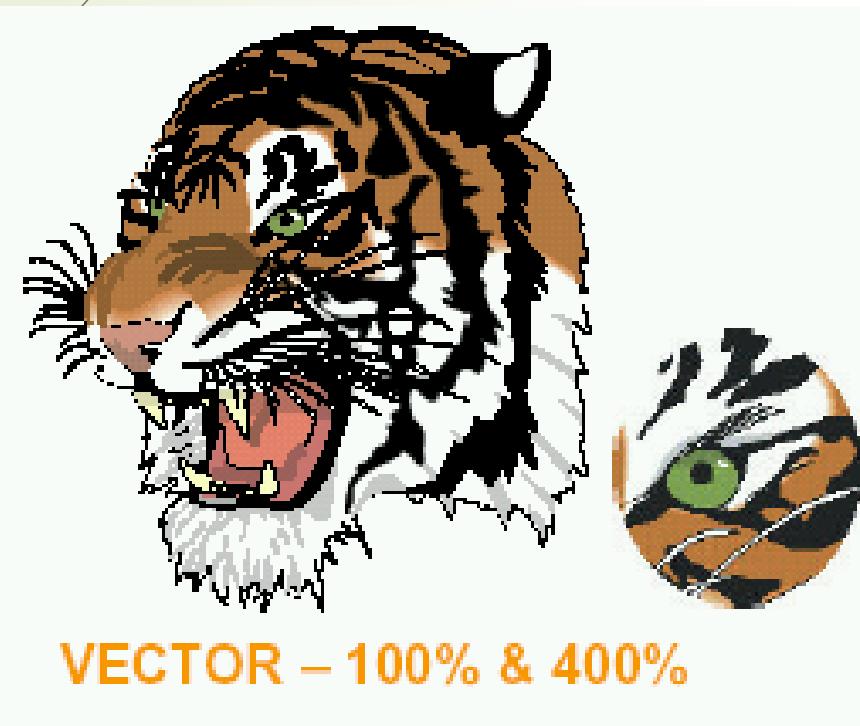
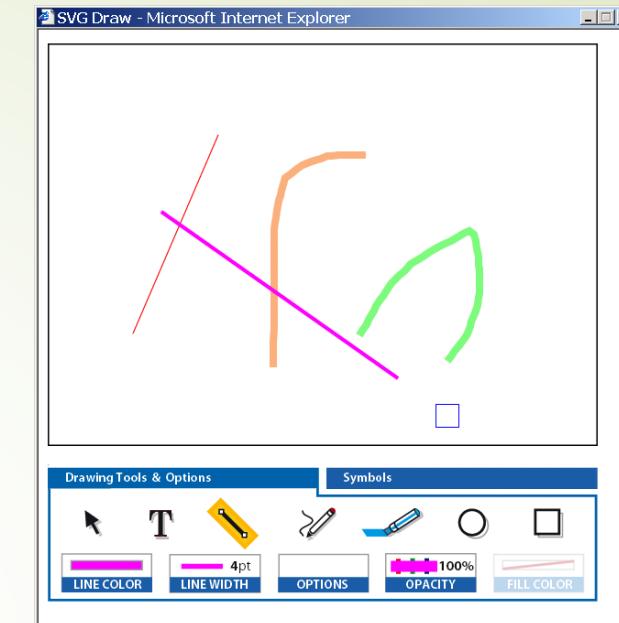
- ▶ In addition to bitmap graphics, there are **vector graphics**.
- ▶ Vector graphics define pictures as collections of lines, ellipses, triangles, polygons and other basic graphic "primitives."
- ▶ Vector graphics are limited to storing mechanical art
 - ▶ they cannot handle photo realistic subject.
- ▶ Vector graphic formats include
 - ▶ Encapsulated PostScript files, which use the extension EPS,
 - ▶ Corel Draw files, which use the extension CDR,
 - ▶ AutoCAD drawings, which use the extension DXF.

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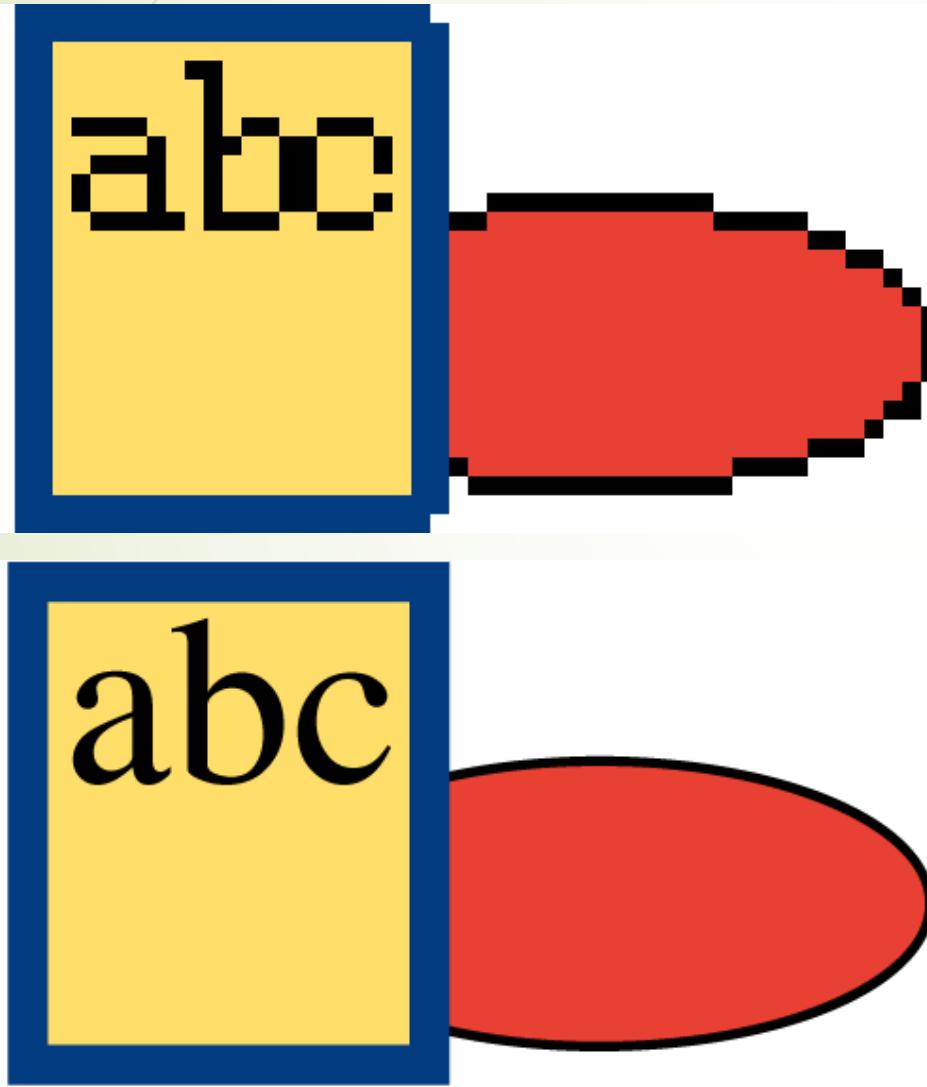


Vector Graphics

- ▶ Scaling vector graphics



Bitmap vs. Vector Graphics



- ▶ Vector graphics
 - ▶ Describe object relationships; can be scaled to any desired size without pixellation

Bitmap and Vector graphics file format

- ▶ **Vector-based** files are more suitable for illustrations that require precise measurements.
 - ▶ File names for vector-based images usually consist of extensions such as ***.EPS**, ***.AI**, ***CDR**, or ***.DWG**.
- ▶ **Bitmap-based** files are more suitable for photo-realistic images that require complex color variations.
 - ▶ File names for bitmap-based images usually consist of extensions such as ***.PSD**, ***.JPG**, ***GIF**, ***.TIF**, or ***.BMP**.



Factors that Affect Graphic Format

- ▶ Color depth
- ▶ Compression
- ▶ Portability
- ▶ Transparency

Color Depth

- ▶ The number of colors per pixel that can be contained in an image.
- ▶ Most graphics editing programs will allow you to set the color depth for your image.
- ▶ Different graphic formats contain different numbers of colors per pixel.
- ▶ Examples:

| | |
|--------------|--------------------------------|
| 1-bit Color | 2 Colors Per Pixel |
| 8-bit Color | 256 Colors Per Pixel |
| 16-bit Color | 65.5 Thousand Colors Per Pixel |
| 24-bit Color | 16.7 Million Colors Per Pixel |

Bit-Depth = Color-Depth

- ▶ Number of Colors = $2^{\text{Bit-depth}}$
- ▶ Bit-depth is the number of bits.
 - ▶ It is also called “Color resolution”.

| Bit depth | Color resolution | Calcuation |
|-----------|-------------------|---------------------------------|
| 1-bit | 2 colors | $2^1 = 2$ |
| 2-bit | 4 colors | $2^2 = 4$ |
| 3-bit | 8 colors | $2^3 = 8$ |
| 4-bit | 16 colors | $2^4 = 16$ |
| 8-bits | 256 colors | $2^8 = 256$ |
| 16-bits | 65,536 colors | $2^{16} = 65536$ |
| 24-bits | 16,777,215 colors | $2^{24} = 16.7 \text{ million}$ |



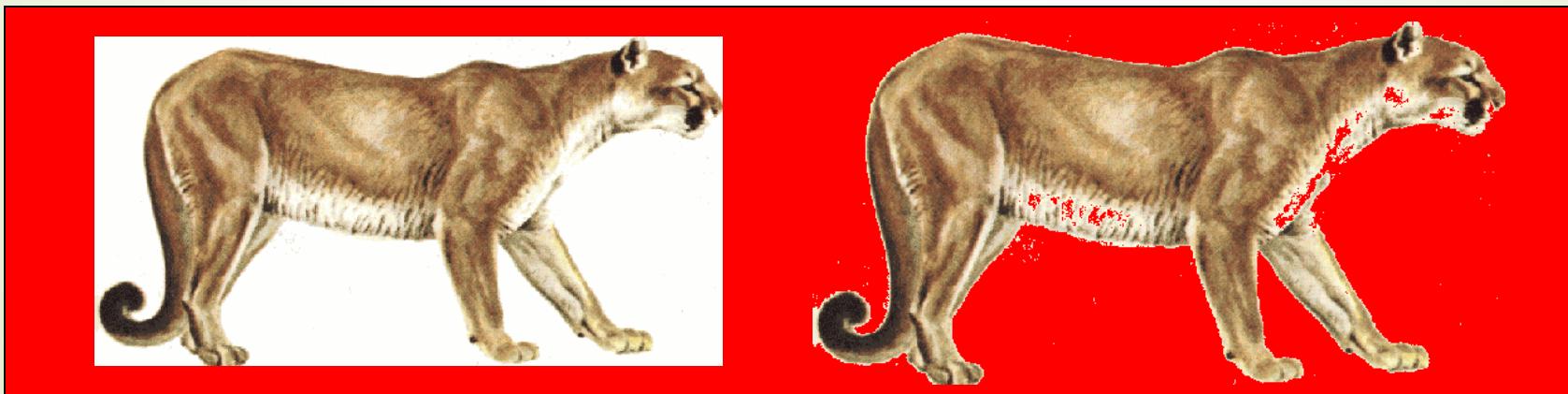
Portability

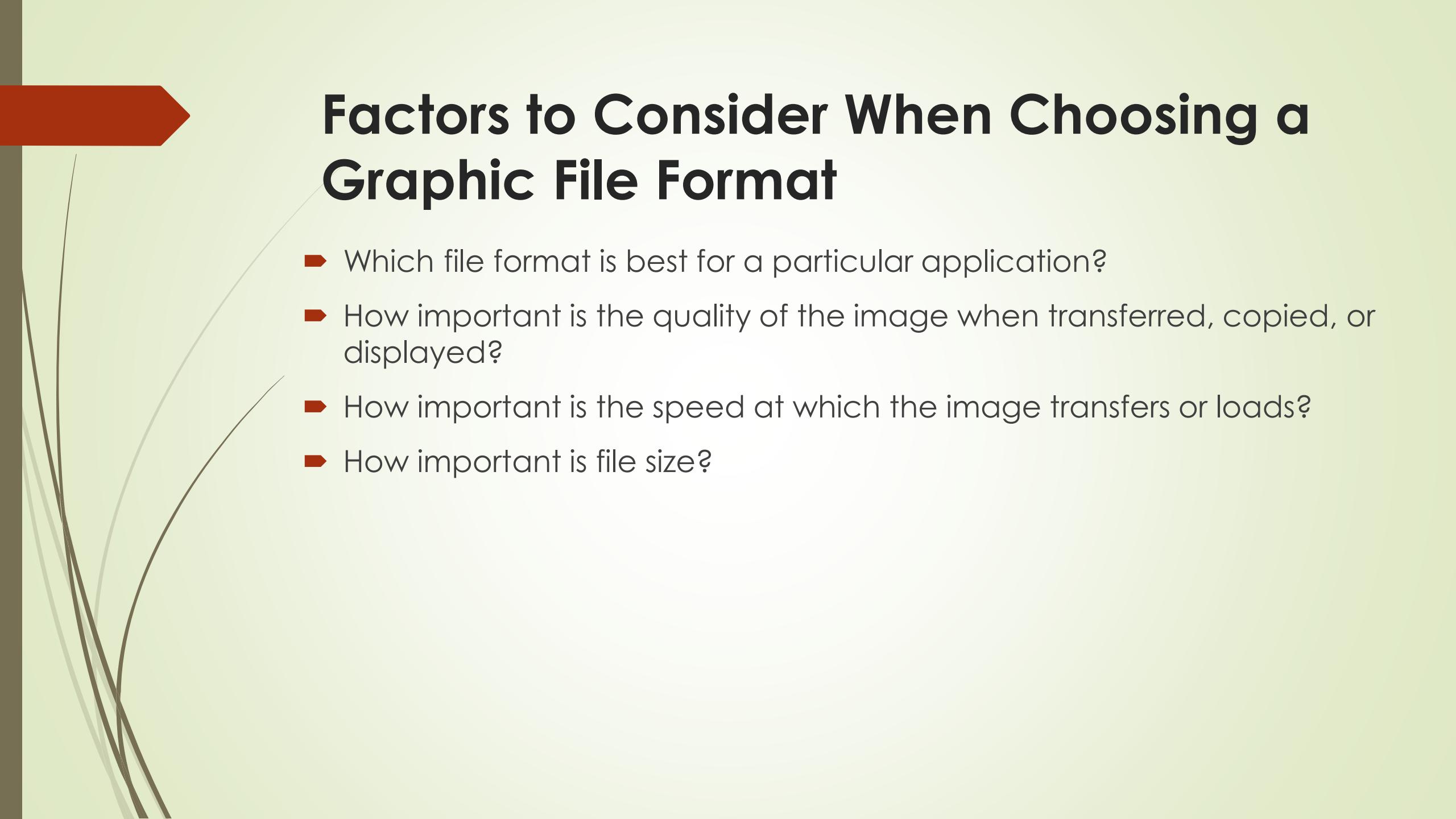


How easily you can open, modify, and view the files on computers using different operating systems, software and browsers.

Transparency

- ▶ Allows the background color of an image to be “eliminated” or made transparent so that the background behind the image can be seen.
- ▶ It makes part of the image invisible, or “see-through.”





Factors to Consider When Choosing a Graphic File Format

- Which file format is best for a particular application?
- How important is the quality of the image when transferred, copied, or displayed?
- How important is the speed at which the image transfers or loads?
- How important is file size?

Multi-modal vs. Multi-media

► Multi-modal systems

- use more than one sense (or mode) of interaction

e.g. visual and aural senses: a text processor may speak the words as well as echoing them to the screen

► Multi-media systems

- use a number of different media to communicate information

e.g. a computer-based teaching system:may use video, animation, text and still images: different media all using the visual mode of interaction; may also use sounds, both speech and non-speech: two more media, now using a different mode



Sound



Speech and Auditory Interfaces

- ▶ There's the dream
- ▶ Then there's reality
- ▶ Practical apps don't really require freeform discussions with a computer
 - ▶ Goals:
 - ▶ Low cognitive load
 - ▶ Low error rates
 - ▶ Smaller goals:
 - ▶ Speech Store and Forward (voice mail)
 - ▶ Speech Generation
 - ▶ Currently not too bad, low cost, available

Speech and Auditory Interfaces

- ▶ Bandwidth is much lower than visual displays
- ▶ Ephemeral nature of speech (tone, etc.)
- ▶ Difficulty in parsing/searching (Box 9.2)
- ▶ Types
 - ▶ Discrete-word recognition
 - ▶ Continuous speech
 - ▶ Voice information
 - ▶ Speech generation
 - ▶ Non-speech auditory
- ▶ If you want to do research here, lots of research in the audio, audio psychology, and DSP field you should understand

Discrete-Word Recognition

- ▶ Individual words spoken by a specific person
- ▶ Command and control
- ▶ 90-98% for 100-10000 word vocabularies
- ▶ Training
 - ▶ Speaker speaks the vocabulary
 - ▶ Speaker-independent
- ▶ Still requires
 - ▶ Low noise operating environment
 - ▶ Microphones
 - ▶ Vocabulary choice
 - ▶ Clear voice (language disabled are hampered, stressed)
 - ▶ Reduce most questions to very distinct answers (yes/no)

Discrete-Word Recognition

- ▶ Helps:
 - ▶ Disabled
 - ▶ Elderly
 - ▶ Cognitive challenged
 - ▶ User is visually distracted
 - ▶ Mobility or space restrictions
- ▶ Apps:
 - ▶ Telephone-based info
- ▶ **Study:** much slower for cursor movement than mouse or keyboard (Christian '00)
- ▶ **Study:** choosing actions (such as drawing actions) improved performance by 21% (Pausch '91) and word processing (Karl '93)
 - ▶ However acoustic memory requires high cognitive load (> than hand/eye)
- ▶ Toys are successful (dolls, robots). Accuracy isn't as important
- ▶ Feedback is difficult

Continuous Speech Recognition

- ▶ Dictation
- ▶ Error rates and error repair are still poor
- ▶ Higher cognitive load, could lower overall quality
- ▶ Why is it hard?
 - ▶ Recognize boundaries (normal speech blurs them)
 - ▶ Context sensitivity
 - ▶ “How to wreck a nice beach”
- ▶ Much training
- ▶ Specialized vocabularies (like medical or legal)
- ▶ Apps:
 - ▶ Dictate reports, notes, letters
 - ▶ Communication skills practice (virtual patient)
 - ▶ Automatic retrieval/transcription of audio content (like radio, CC)
 - ▶ Security/user ID

Voice Information Systems

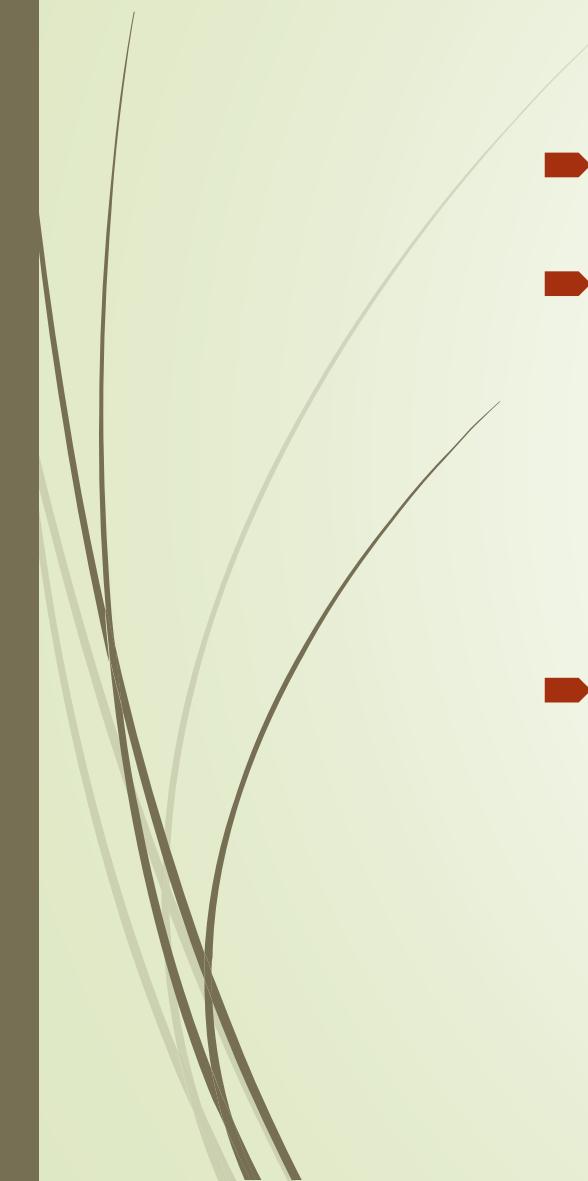
- ▶ Use human voice as a source of info
- ▶ Apps:
 - ▶ Tourist info
 - ▶ Museum audio tours
 - ▶ Voice menus (Interactive Voice Response IVR systems)
- ▶ Use speech recognition to also cut through menus
 - ▶ If menus are too long, users get frustrated
 - ▶ Cheaper than hiring 24 hr/day reps
- ▶ Voice mail systems
 - ▶ Interface isn't the best
- ▶ Get email in your car
 - ▶ Also helps with non-tech savvy like the elderly
- ▶ Potentially aides with
 - ▶ Learning (engage more senses)
 - ▶ Cognitive load (hypothesize each sense has a limited 'bandwidth')
 - ▶ Think ER, or fighter jets

Speech Generation

- ▶ Play back speech (games)
- ▶ Combine text (navigation systems)
- ▶ Careful evaluation!
 - ▶ Speech isn't always great
 - ▶ Door is ajar – now just a tone
 - ▶ Use flash
 - ▶ Supermarket scanners
 - ▶ Often times a simple tone is better
 - ▶ Why? Cognitive load
 - ▶ Thus cockpits and control rooms need speech
 - ▶ Competes w/ human-human communication

Speech Generation

- ▶ Ex: Text-to-Speech (TTS)
- ▶ Latest TTS uses multiple syllabi to make generated speech sound better
 - ▶ Robotic speech could be desirable to get attention
 - ▶ All depends on app
 - ▶ Thus don't assume one way is the best, you should user test
- ▶ **Apps:** TTS for blind, JAWS
- ▶ Web-based voice apps: VoiceXML and SALT (tagged web pages).
 - ▶ Good for disabled, and also for mobile devices
- ▶ Use if
 - ▶ Message is short
 - ▶ Requires dynamic responses
 - ▶ Events in time
- ▶ Good when visual displays aren't that useful. When?
 - ▶ Bad lighting, vibrations (say liftoff)



Non-speech Auditory Interface

- ▶ Audio tones that provide information
- ▶ Major Research Area
 - ▶ Sonification – converting information into audio
 - ▶ Audiolization
 - ▶ Auditory Interfaces
- ▶ Browsers produced a click when you clicked on a link
 - ▶ Increases confidence
 - ▶ Can do tasks without visual cognitive load
 - ▶ Helps figure out when things are wrong
 - ▶ Greatly helps visually impaired

Non-speech Auditory Interface

- ▶ Terms:
 - ▶ Auditory icons – familiar sounds (record real world sound and play it in your app)
 - ▶ Earcons – new learned sounds (door ajar)
- ▶ Role in video games is huge
 - ▶ Emotions, Tension, set mood
- ▶ To create 3D sound
 - ▶ Need to do more than stereo
 - ▶ Take into account Head-related transfer function (HRTF)
 - ▶ Ear and head shape
- ▶ New musical instruments
 - ▶ Theremin
- ▶ New ways to arrange music



Electronic Pioneer Soho Kingdomsub with Etherwave Theremins of Moogmusic



Speech



Human beings have a great and natural mastery of speech

- ▶ makes it difficult to appreciate the complexities
but
- ▶ it's an easy medium for communication

Speech Recognition Problems

- ▶ Different people speak differently:
 - ▶ accent, intonation, stress, idiom, volume, etc.
- ▶ The syntax of semantically similar sentences may vary.
- ▶ Background noises can interfere.
- ▶ People often “ummm.....” and “errr.....”
- ▶ Words not enough - semantics needed as well
 - ▶ requires intelligence to understand a sentence
 - ▶ context of the utterance often has to be known
 - ▶ also information about the subject and speaker

e.g. even if “Errr.... I, um, don't like this” is recognised, it is a fairly useless piece of information on its own

Speech Recognition: useful?



- ▶ Single user or limited vocabulary systems
 - e.g. computer dictation



- ▶ Open use, limited vocabulary systems can work satisfactorily

e.g. some voice activated telephone systems



- ▶ general user, wide vocabulary systems ...
... still a problem

- ▶ Great potential, however

- ▶ when users hands are already occupied
 - e.g. driving, manufacturing

- ▶ for users with physical disabilities

- ▶ lightweight mobile devices

Speech Synthesis

The generation of speech

Useful

- ▶ natural and familiar way of receiving information

Problems

- ▶ similar to recognition: prosody particularly

Additional problems

- ▶ intrusive - needs headphones, or creates noise in the workplace
- ▶ transient - harder to review and browse

Speech Synthesis: useful?

Successful in certain constrained applications
when the user:

- ▶ is particularly motivated to overcome problems
- ▶ has few alternatives

Examples:

- ▶ screen readers
 - ▶ read the textual display to the user utilised by visually impaired people
- ▶ warning signals
 - ▶ spoken information sometimes presented to pilots whose visual and haptic skills are already fully occupied

Non-Speech Sounds

boings, bangs, squeaks, clicks etc.

- ▶ commonly used for warnings and alarms
- ▶ Evidence to show they are useful
 - ▶ fewer typing mistakes with key clicks
 - ▶ video games harder without sound
- ▶ Language/culture independent, unlike speech

Non-Speech Sounds: useful?

- ▶ Dual mode displays:
 - ▶ information presented along two different sensory channels
 - ▶ redundant presentation of information
 - ▶ resolution of ambiguity in one mode through information in another
- ▶ Sound good for
 - ▶ transient information
 - ▶ background status information

e.g. Sound can be used as a redundant mode in the Apple Macintosh; almost any user action (file selection, window active, disk insert, search error, copy complete, etc.) can have a different sound associated with it.



Auditory Icons

- ▶ Use natural sounds to represent different types of object or action
- ▶ Natural sounds have associated semantics which can be mapped onto similar meanings in the interaction
 - e.g. throwing something away
 - ~ the sound of smashing glass
- ▶ Problem: not all things have associated meanings
- ▶ Additional information can also be presented:
 - ▶ muffled sounds if object is obscured or action is in the background
 - ▶ use of stereo allows positional information to be added



SonicFinder for the Macintosh

- ▶ items and actions on the desktop have associated sounds
- ▶ folders have a papery noise
- ▶ moving files – dragging sound
- ▶ copying – a problem ...
sound of a liquid being poured into a receptacle
rising pitch indicates the progress of the copy
- ▶ big files have louder sound than smaller ones



Web Design

[www.LTScotland.org.uk/sustainabledevelopment/**climatechange**](http://www.LTScotland.org.uk/sustainabledevelopment/climatechange)

Web Design Personnel

Web design involves a range of skills.

Everyone in the class can be involved in planning the website structure and in researching, locating and creating text, images and multimedia content.

However you will also need to utilise the special skills and aptitudes of class members and assign people to the following roles:

- ▶ **Production manager:** in charge of the whole production. They need to have organisation and social skills
- ▶ **Editor:** in charge of proofing, sub-editing, headlines, captions. They need to have good language skills.
- ▶ **Designer:** in charge of presentation design and image creation. They should have art and design skills.
- ▶ **Programmer:** in charge of processing multimedia elements and constructing page templates, cascading style sheets, final testing. They should have on-line computing skills.

It is advisable to have at least two people in these roles so that absence does not hold up the whole production process.



Stages in Web Design

- 
1. Information design
 2. Content design
 3. Interaction design
 4. Presentation design
 5. Technical design
 6. Marketing design
 7. Evaluation and maintenance



Stage 1. Information Design

- ▶ You should have established the following:
 - ▶ What communication problems the site is intended to solve
 - ▶ The target audiences
 - ▶ The objectives of the website
- ▶ This should allow you to construct a structure for your website in the form of a site map
- ▶ You should aim for a maximum of three clicks to find any item of information
- ▶ Use the site map to plan the home page in the form of a wireframe (storyboard)
- ▶ Use the homepage wireframe to structure the other pages in the website – this unifies the site and makes navigation easy for the user.



Questions to Ask Yourself

- ▶ What is the purpose of my website?
- ▶ Who is my main audience?
- ▶ My secondary audience?
- ▶ What information do I want to present?

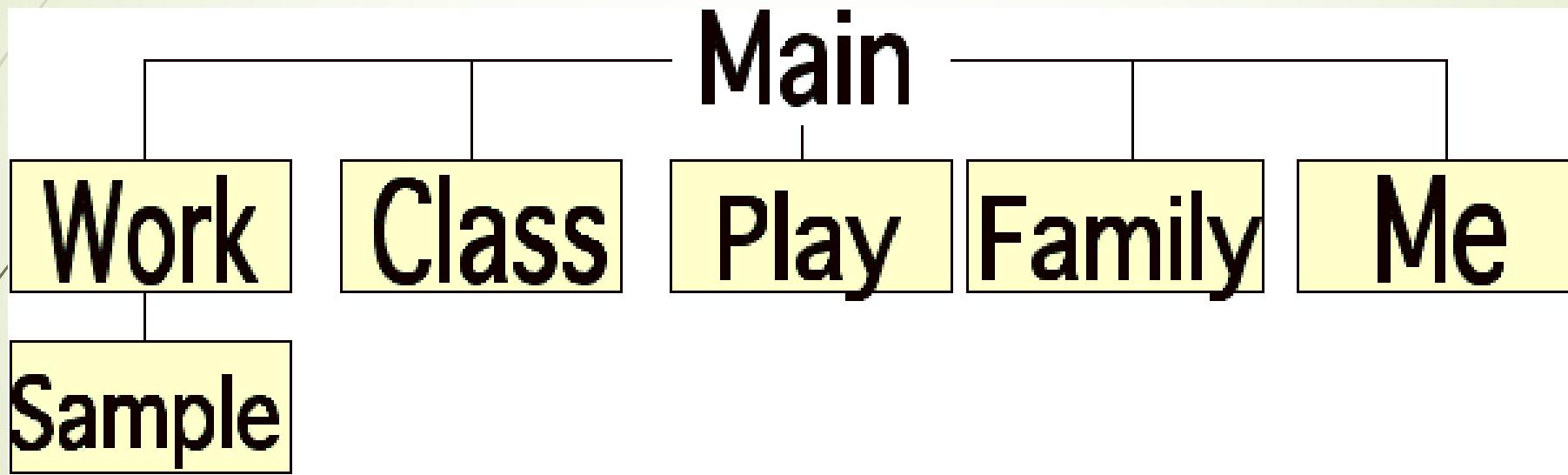


Designing Your Site

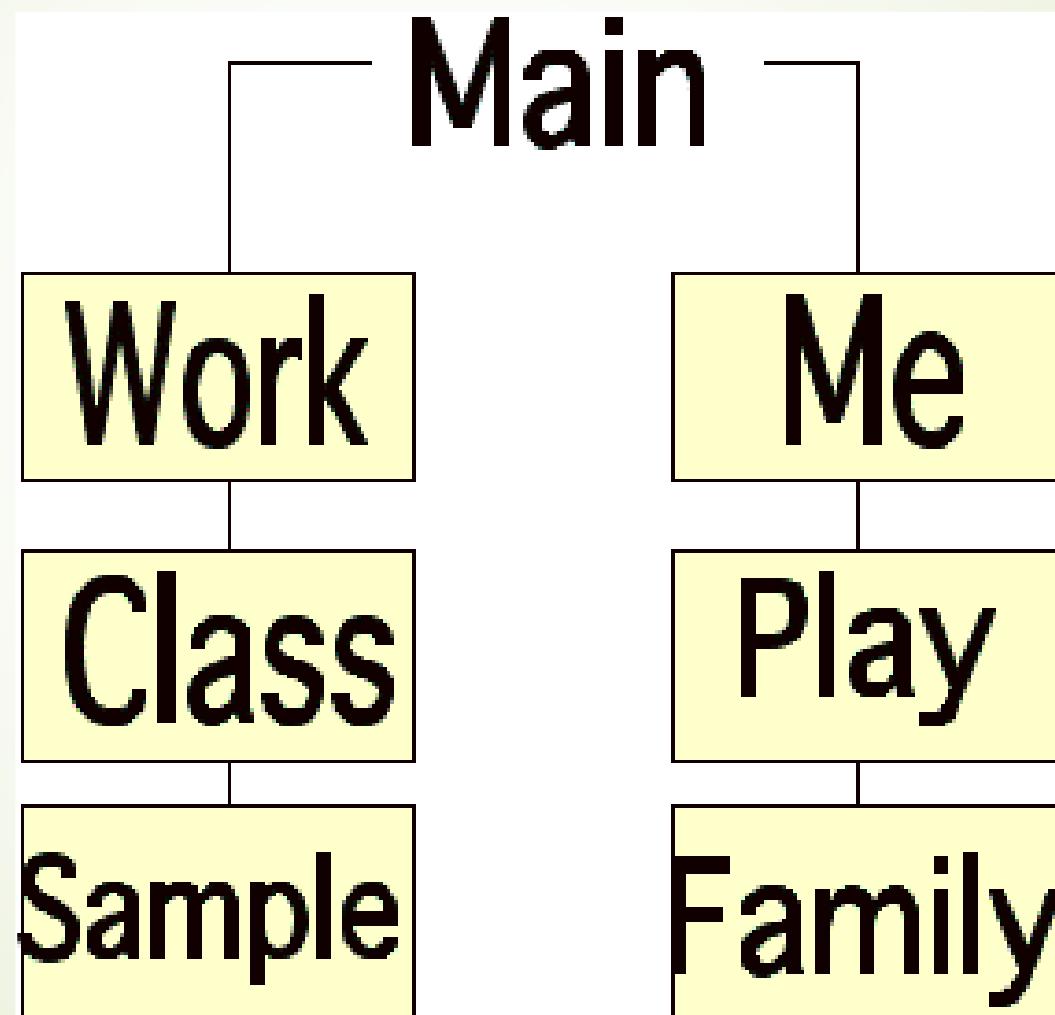
Plan your sites hierarchy

- ▶ How are your pages linked together?
- ▶ How many links exactly?
- ▶ Where does the user go next?

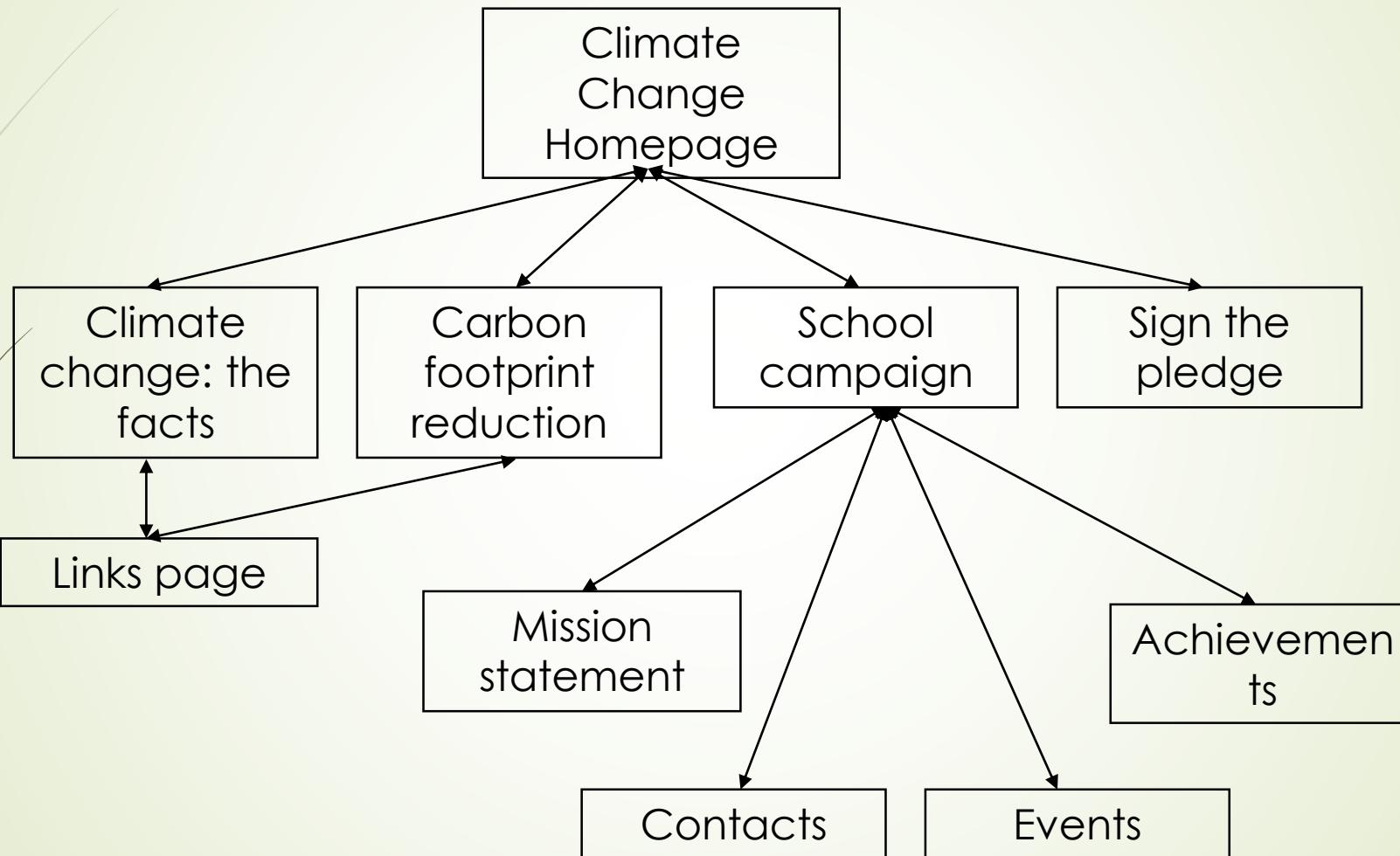
A Structure That is More Wide Than Deep



A Structure That is More Deep Than Wide



Climate Change Site Map





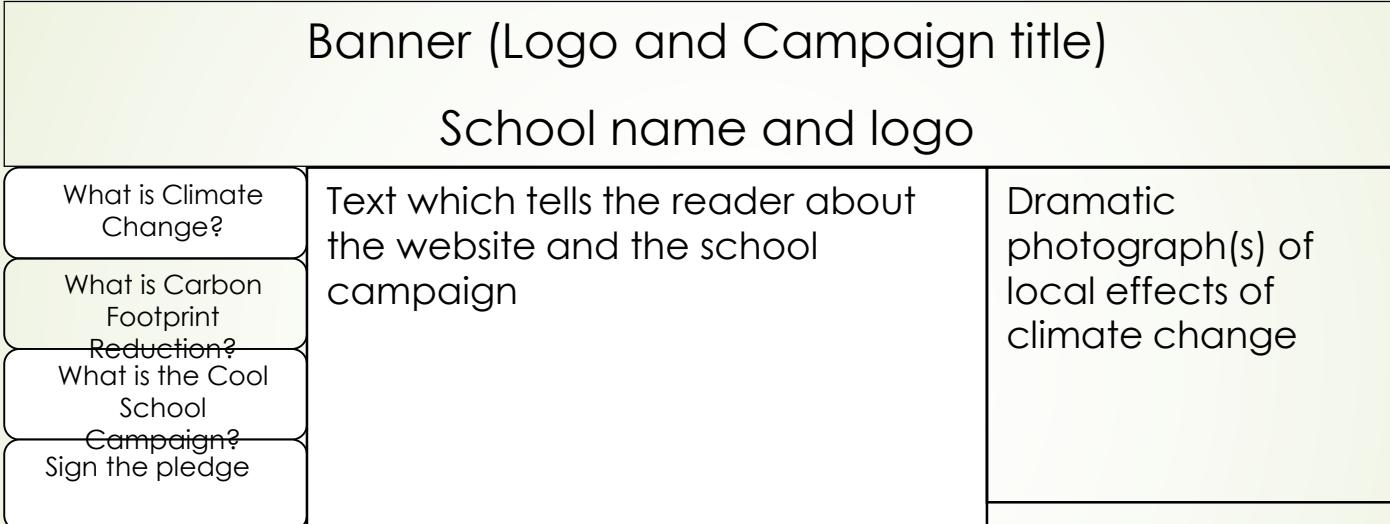
Designing Your Content

The “do’s” of good web design

- ▶ Name files consistently and logically
- ▶ Keep a consistent look and feel
- ▶ Use colors that are high in contrast
- ▶ Design for low bandwidth

Wireframe

Homepage



Stage 2.1 Content Design: Text

In creating text for web pages you should:

- ▶ Use short headlines of no more than one line
- ▶ Use short sentences of no more than 20 words
- ▶ Vary sentence length to avoid monotony
- ▶ Use short paragraphs of no more than 2 sentences
- ▶ Write concisely and simply
- ▶ Omit unnecessary words
- ▶ Avoid foreign words or technical jargon or slang or texting abbreviations
- ▶ Avoid clichés (e.g. ‘It rained cats and dogs.’)
- ▶ Be positive in your use of language
- ▶ Keep text concise so that vertical scrolling is either unnecessary or minimised
- ▶ Chunk longer material and separate with subheads
- ▶ Summarise lengthy text and hyperlink to a downloadable full version
- ▶ Proof to correct spelling, grammar and punctuation.

Stage 2.2 Content Design: Photographs

In selecting images you should ask questions such as:

- ▶ Is the image relevant to the body text?
- ▶ Does a photograph show people's emotions or actions?
- ▶ Does it show a critical moment?
- ▶ Does it have an interesting composition?
- ▶ Does it show an interesting contrast or repetition?
- ▶ Is the image attractive or dramatic?

When combining several images on the same page you should ask:

- ▶ Is there an idea or concept which links the images?

Stage 2.3 Content Design: Multimedia

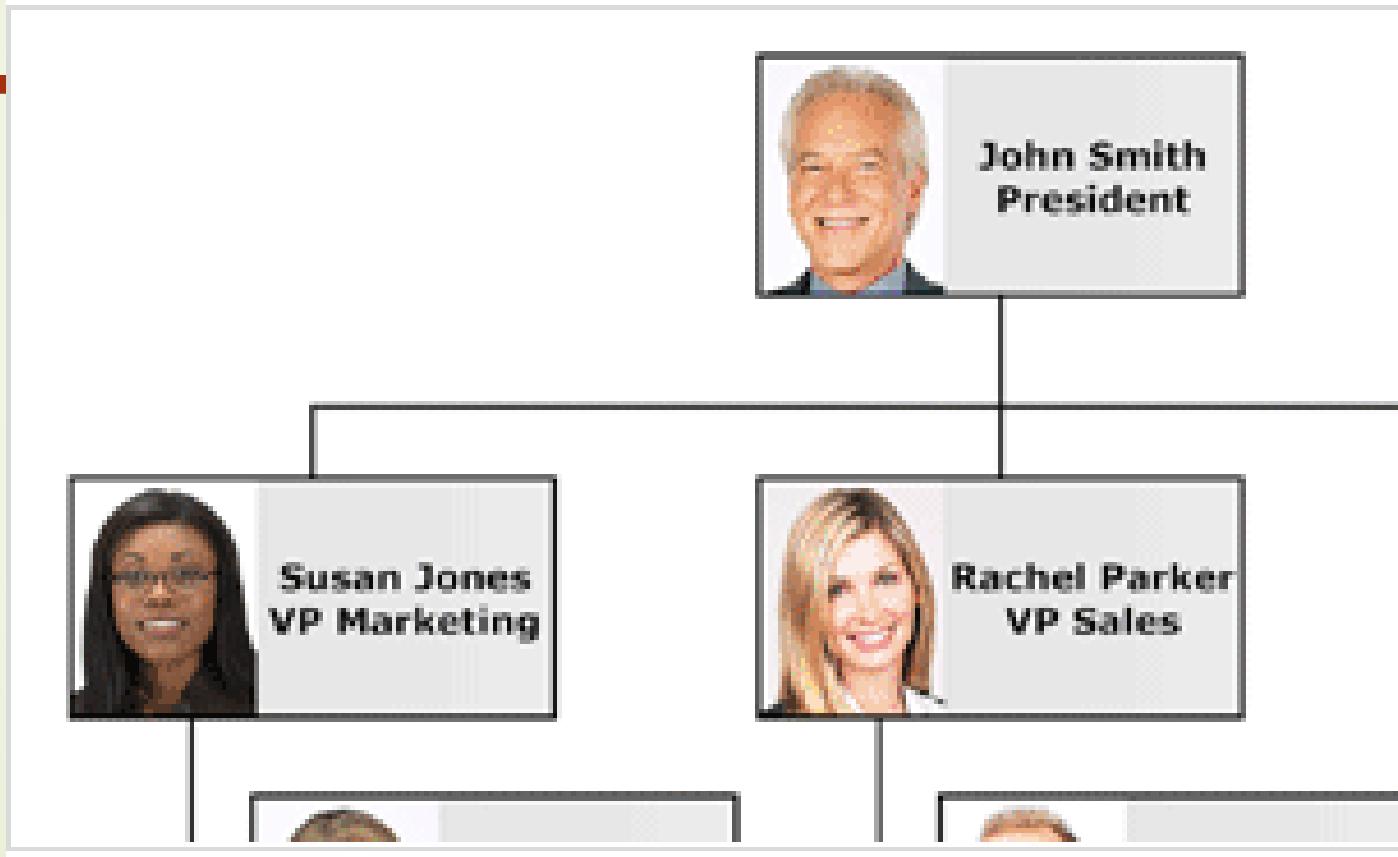
- ▶ Overuse of motion and sound can make a website an irritating and slow experience
- ▶ Sound, video or animation elements should only be added to the website if they add value
- ▶ For example, an animation explaining how greenhouse gases lead to global warming may explain the concept better than a still image or text.

Visual items

► Compare

Arbor Business Company, INC.
President: John Smith
VP Marketing: Susan Jones
Alice Johnson, Manager
Tim Moore, Manager
VP Sales: Rachel Parker
Michael Gross, Manager
Kim D'Ole, Manager
VP Production: Tom Allen
Kathy Roberts, Manager
Betsey FOster, Manager

Visual items



Stage 3. Interaction Design

- ▶ Your wireframe will set out how text, graphic, hyperlinks are to be arranged on the page
- ▶ You should aim for ease-of-use, for example:
 - ▶ consistent navigation across pages
 - ▶ legibility of text against backgrounds
 - ▶ understandable language
 - ▶ a link to the home page from any sub-page
 - ▶ minimal vertical scrolling
 - ▶ no horizontal scrolling

Stage 4.1 Presentation Design: Colour

- ▶ Unite the page and website by using a limited number of websafe colours (<http://en.wikipedia.org/wiki/Websafe>)
- ▶ Avoid background images which obscure or distract from the text
- ▶ Colours should carry appropriate connotations for the audience (greens and blues are common on environmental websites as these colours connote 'nature')
- ▶ Make sure text is easy to read against its background colour
- ▶ Multiple use of the same graphic elements unifies the website e.g. banner, logo, buttons.

Stage 4.2 Presentation Design: Typography

- ▶ Use standard serif or sans serif fonts (if the user does not have a font on their system it will render it in a different font of the same kind)
- ▶ Use a maximum of 2 different fonts on the page
- ▶ Sans serif is preferred to serif on computer screens as the serif strokes do not render well on screen
- ▶ Verdana is the most readable sans serif font on screen
- ▶ Georgia is the most readable serif font on screen
- ▶ Don't use all UPPER CASE
- ▶ Headlines should use Title Case rather than UPPER CASE
- ▶ Left justify text
- ▶ If you know how, establish a consistent text style through CSS (cascading style sheets).

Stage 4.3 Presentation Design: Layout

- When you design a web page you should consider four aspects of presentation:
 1. Contrast
 2. Repetition
 3. Alignment
 4. Proximity
- These are illustrated in the following webpages from environmental organisations.

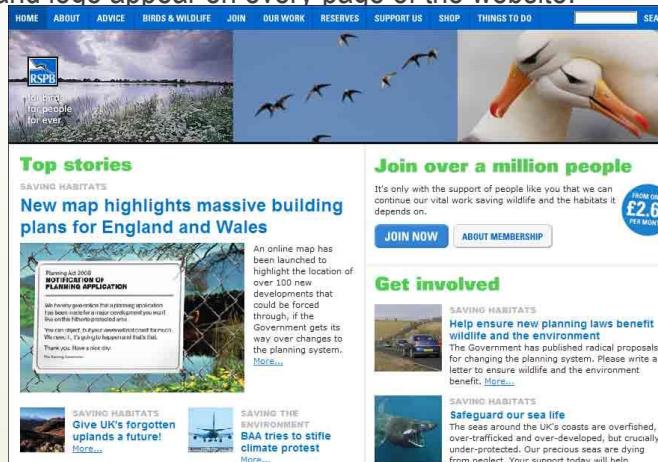
Stage 4.4 Presentation Design: Contrast

- ▶ Contrast means that elements that are different should look different.
- ▶ This is part of a page on the Stop Climate Change Scotland website (<http://www.stopclimatechaoscotland.org>) on 4 August 2007.
- ▶ Colour is used to differentiate parts of the page – the top part has an orange background; the menu bar is multicoloured and the main story is on a light blue background which rhymes with the blue grey smoke of the accompanying photograph
- ▶ Text: The headline (“the facts”) and subhead (“Global warming”) are emboldened to stand out from the body text.



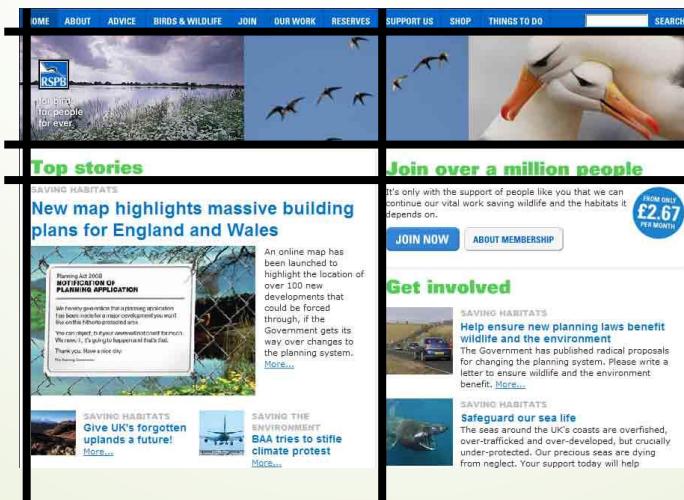
Stage 4.5 Presentation Design: Repetition

- ▶ Repetition means repeating elements so that each page - and the whole website - are unified.
- ▶ This is part of a page on the Royal Society for the Protection of Birds website (<http://www.rspb.org.uk>) on 4 August 2007.
- ▶ The colours blue, white and green are used in background, images, buttons and text. Blue and white predominate and this reflects the colours of the RSPB logo top left. Similar colour schemes are used throughout the website.
- ▶ Text: A sans serif typeface is used throughout.
- ▶ Navigation: The same menu bar and logo appear on every page of the website.



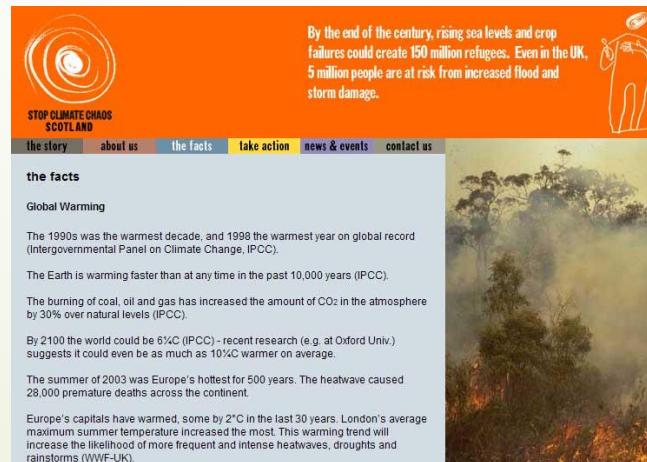
Stage 4.6 Presentation Design: Alignment

- Alignment means lining elements up with each other. This leads the eye along the content and makes it easy for the reader to identify the desired information. In general, centre alignment should be avoided. It is best to use no more than 3 vertical lines for alignment.
- This is part of a page on the Royal Society for the Protection of Birds website (<http://www.rspb.org.uk>) on 4 August 2007.
- Vertical alignment: two vertical lines are used to align the main content of the page.
- Horizontal alignment: three horizontal lines are used to align menu options, images and headlines.



Stage 4.7 Presentation Design: Proximity

- ▶ Proximity means that related elements should be close together on a web page.
- ▶ This is part of a page on the Stop Climate Change Scotland website (<http://www.stopclimatechaosscotland.org>) on 4 August 2007.
- ▶ The page uses a modular layout with three horizontal modules:
- ▶ Top: this contains logo, organisation name and text expressing their concern over climate change
- ▶ Menu bar: Horizontal menu bar providing links to other pages on the website.
- ▶ Bottom: Single column of text about global warming with dramatic photograph of burning forest





Stage 5.1 Technical Design

- ▶ Save images files as GIFs or JPEGs for quick loading
 - ▶ for JPEGs this is a trade-off between quality and file size
- ▶ Aim for pages that download within 10 seconds
- ▶ Stick to websafe colours
- ▶ Ensure windows are titled
- ▶ Make sure images, buttons and hyperlinks have informative alt tags

Stage 5.2 Technical Design: Testing

- ▶ Validate your web pages' HTML, links, CSS at
<http://www.w3.org/QA/Tools/> (free)
- ▶ Upload and test with different browsers & platforms
(PC/Mac)
- ▶ Register with search engines
- ▶ Use SEOs (search engine optimisation tools) to increase
the chances of your site appearing in a keyword search.



Stage 6. Marketing Design

- ▶ Create an easy-to-remember web address
 - ▶ Publicise the website address in press releases, posters, blog postings, articles...
- 



Stage 7. Evaluation & Maintenance

- ▶ Does the website meet its objectives?
- ▶ Is the information design satisfactory? e.g. is it easy to locate all necessary information? Are all text, images and multimedia relevant?
- ▶ Is the navigation design satisfactory? e.g. is the site easy to use and do all the hyperlinks work?
- ▶ Is the presentation satisfactory? e.g. does it make effective use of colour, typography, contrast, repetition, alignment, proximity?
- ▶ Is the technical design satisfactory? e.g. are pages fast to download?
- ▶ If there are any faults, maintain the website to correct them immediately
- ▶ Maintain the website regularly to keep it fresh and up-to-date.



Using Adobe Photoshop CS

Image Editing software



What is Photoshop?

- ▶ Image editing program
- ▶ Shows images as bitmaps
- ▶ Bitmap = arrangement of dots (pixels) on grid
 - ▶ Don't confuse bitmap with file type called .bmp - just a descriptive term
- ▶ Pixel = "Picture element" - smallest unit of an image
- ▶ Size of pixel depends on resolution
 - ▶ Typical web image: 72 dpi
 - ▶ Typical print image: 300 dpi or higher
- ▶ End result can be saved in variety of ways: .bmp, .jpeg, .gif, .tif

Other options

- ▶ Adobe Elements (basic, cheaper version of PShop) - \$79
- ▶ Corel Paintshop Pro - \$79 (similar to Elements)
- ▶ MS Photodraw/ PhotoEditor – often free
- ▶ Software that comes with digital camera

Types of image files 1

- ▶ .psd
 - ▶ Native Photoshop file, usually needs to be saved as other type
 - ▶ New images, layered images start as .psd
- ▶ .gif
 - ▶ Good for web, used for simple images, large eras of flat color
 - ▶ Often good for B & W
 - ▶ Supports transparency
 - ▶ Lossless
- ▶ .jpeg
 - ▶ Good for web, used for photos or complex coloration (e.g. – gradients)
 - ▶ Slightly longer to download (decompression time)
 - ▶ Lossy
 - ▶ Doesn't support transparency

Types of image files 2

- ▶ .png
 - ▶ Good for web, best of both worlds (lossless, supports complex photographs)
 - ▶ Not supported by older browsers (pre IE 4, NN 6)
 - ▶ Wait for all browsers to catch up before using
- ▶ .tif
 - ▶ Good for print media
 - ▶ Can be imported by most apps (QuarkX, Pagemaker, InDesign)
 - ▶ Large file sizes (but compressible)
 - ▶ Can support layers
- ▶ .bmp
 - ▶ Simple grid of pixels
 - ▶ Uncompressed, large file sizes
 - ▶ Can be imported by almost all apps

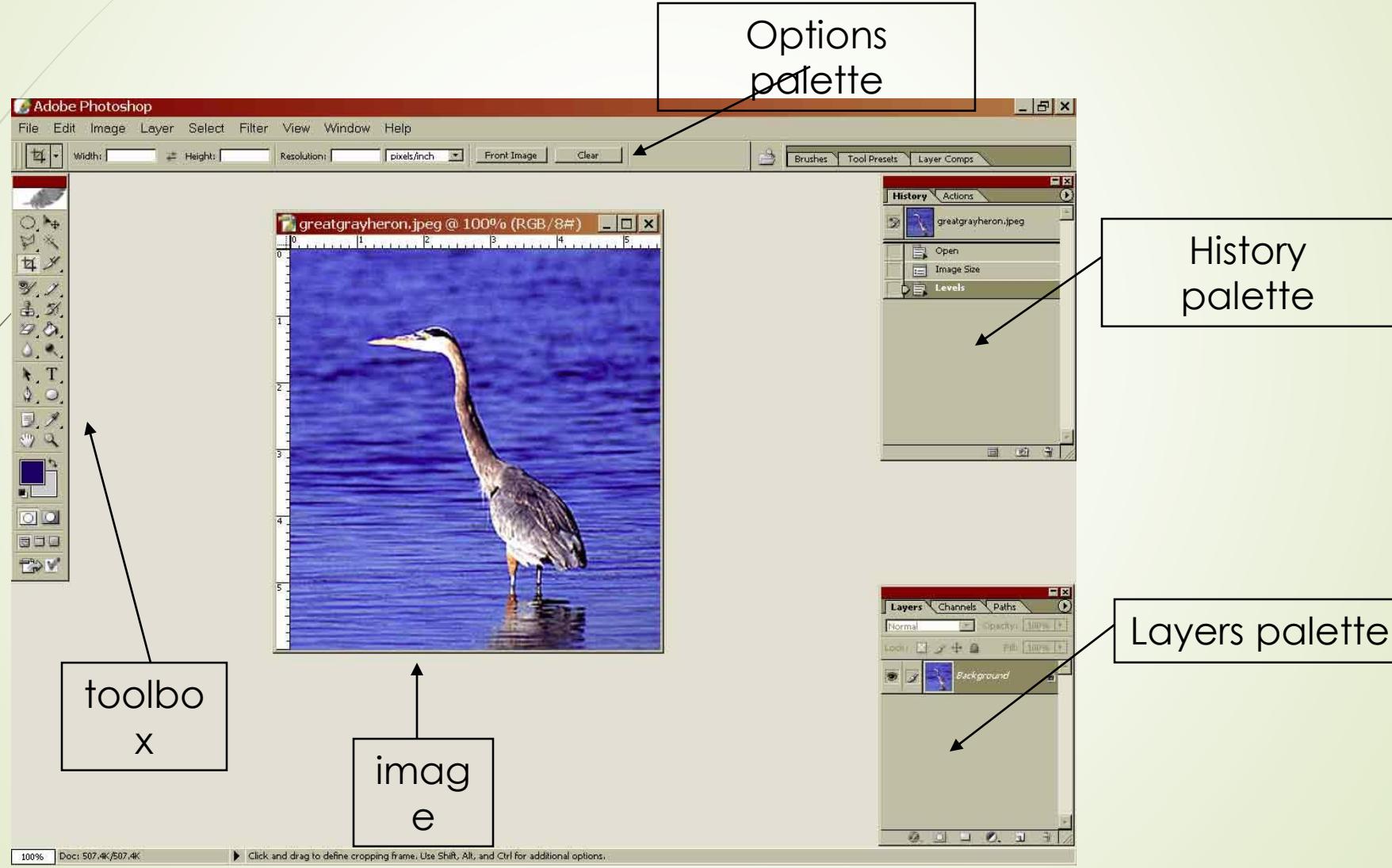
Color modes

► Image, Modes

- RGB is almost always best bet
 - Default choice
- CMYK for high end professional printers
- Grayscale for B&W
- Index greatly reduces file size
- IMPORTANT: If Photoshop is not allowing you to use a tool, change mode from index to RGB
- 8-bit is usually adequate
 - It's per channel, so you're actually talking about 24 bit image in RGB mode
 - 16-bit only for very high resolution pictures
 - Very large file size



The Photoshop workspace



The toolbox

- ▶ Commonly used tools arranged as icons
- ▶ Triangle in lower right means multiple tools are nested there



Paintbucket icon



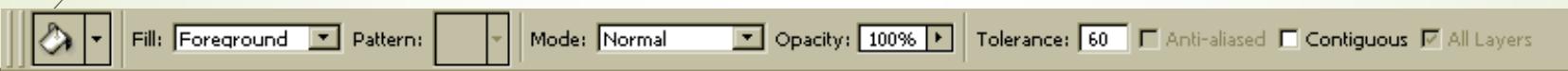
Expanded: Gradient and paintbucket tools

- ▶ Left-click the icon and hold down the button to see all tools nested there



The options palette

- ▶ Just below the Menu choices
- ▶ Changes depending on which tool you've chosen from the toolbox



Options palette for paintbucket tool

- ▶ Allows greater control of that tool by changing settings



The palettes

- ▶ 19 palettes available from the Windows menu
- ▶ Only need a few up all the time
 - ▶ Toolbox (already discussed)
 - ▶ Options (already discussed)
 - ▶ Layers
 - ▶ One of the main reasons Photoshop is so versatile
 - ▶ Layer images on top of other images – mix text, photos, shapes by superimposing them
 - ▶ History
 - ▶ Ctrl + Z only works for the last thing you did
 - ▶ History palette lets you go “back in time” step by step - particularly useful when you’re first learning Photoshop, so you can back out of a bad decision
- ▶ Pull up others (e.g. Character for text, Styles for special effects) as needed



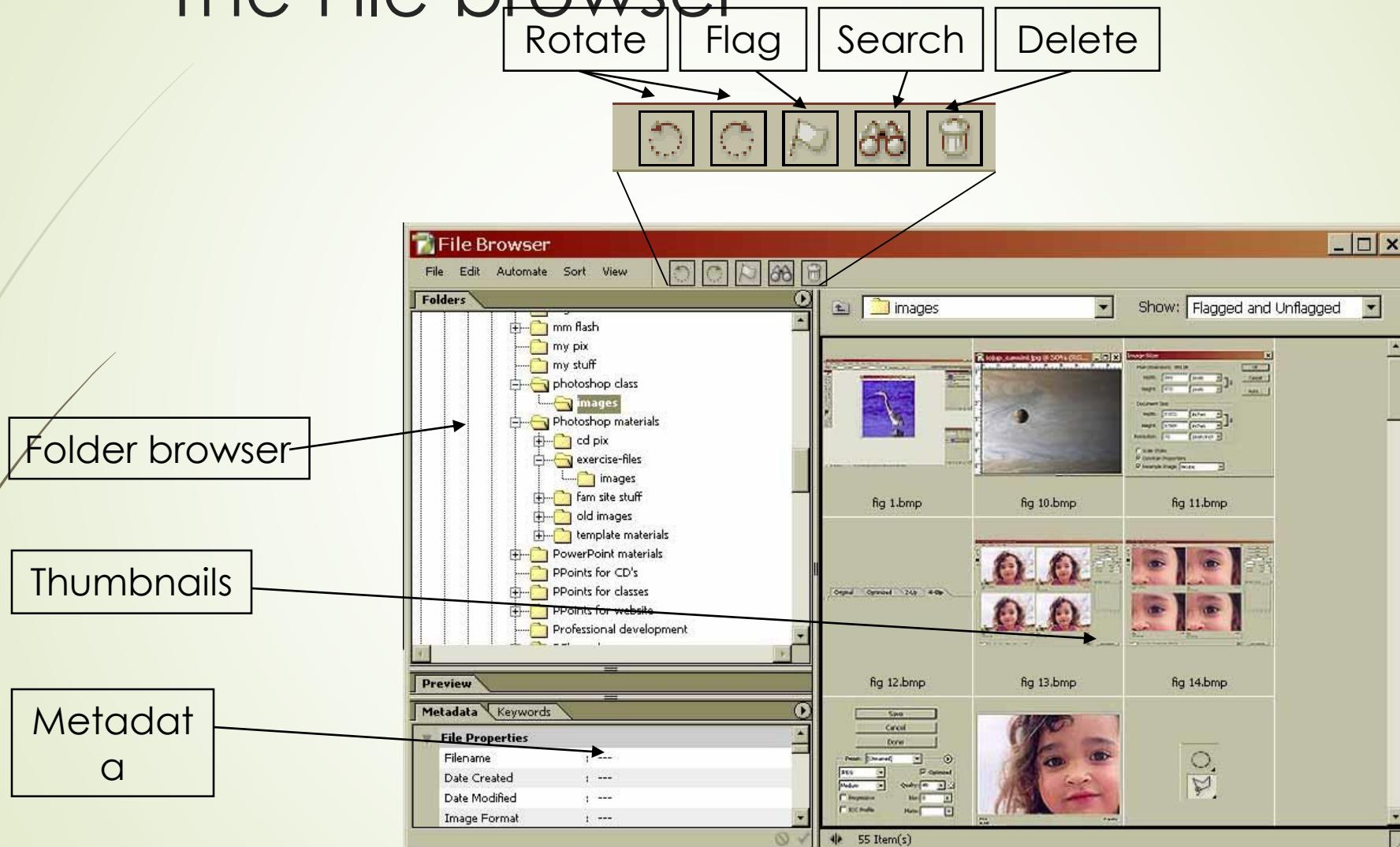
Basic photo manipulation

Opening, cropping, resizing, saving as .jpeg

Opening an image: the file browser

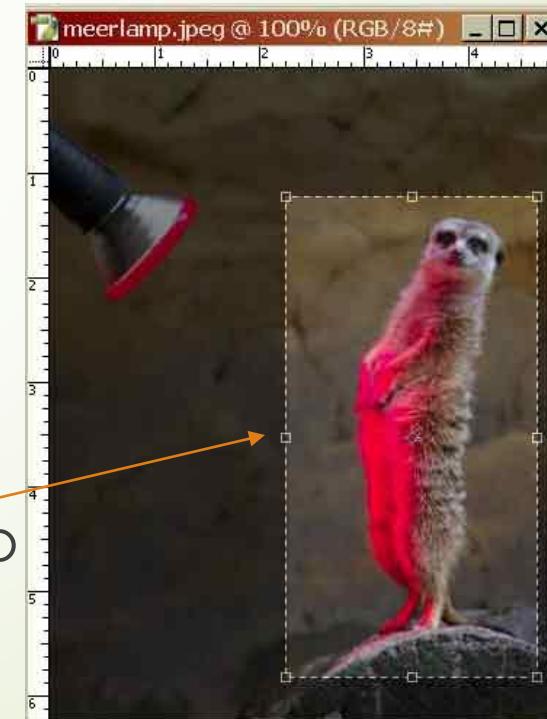
- ▶ If you know exact name of file...
 - ▶ File, Open
 - ▶ Web sites often have huge numbers of images
 - ▶ 1 images folder – gets bigger and bigger
- ▶ For large libraries of images, or non-descriptive file names...
 - ▶ Window, File browser
 - ▶ Gives thumbnail of every picture in folder
 - ▶ Allows fast ways to browse, sort, flag, rotate, delete, etc.

The File browser



Cropping an image 1

- ▶ Bring up image
 - ▶ File, Open (if you know the name of file)
 - ▶ Window, File Browser (to see thumbnails of all images in a folder)
- ▶ Choose cropping tool
- ▶ Left-click and drag to define crop area
 - ▶ Uncropped area will be shaded
 - ▶ Don't have to be perfect
 - ▶ Use sizing boxes to fine-tune crop area



Cropping an image 2

- ▶ When you're happy with crop, double-click inside it
 - ▶ Cursor will change to solid black triangle
- ▶ The cropped image will be displayed
- ▶ Rename the image (so you don't overwrite original image) and save it
 - ▶ AFTER you've saved it, when Photoshop asks if you want to save changes, say "no" (it's counter-intuitive, but you've already saved a version of your image)
 - ▶ We'll discuss save options in a few minutes



Resizing an image 1

- ▶ For web: smaller image = smaller file size = faster download time
 - ▶ Also lower file size by compressing when saving
- ▶ Web images are measured in pixels
 - ▶ Actual size depends on resolution
 - ▶ Design with 800 x 600 in mind
 - ▶ 640 x 480 (1%)*
 - ▶ 800 x 600 (29%)*
 - ▶ 1024 x 768 and higher (68%)*
 - ▶ Your specific audience might skew higher or lower

*these numbers are notoriously hard to track accurately

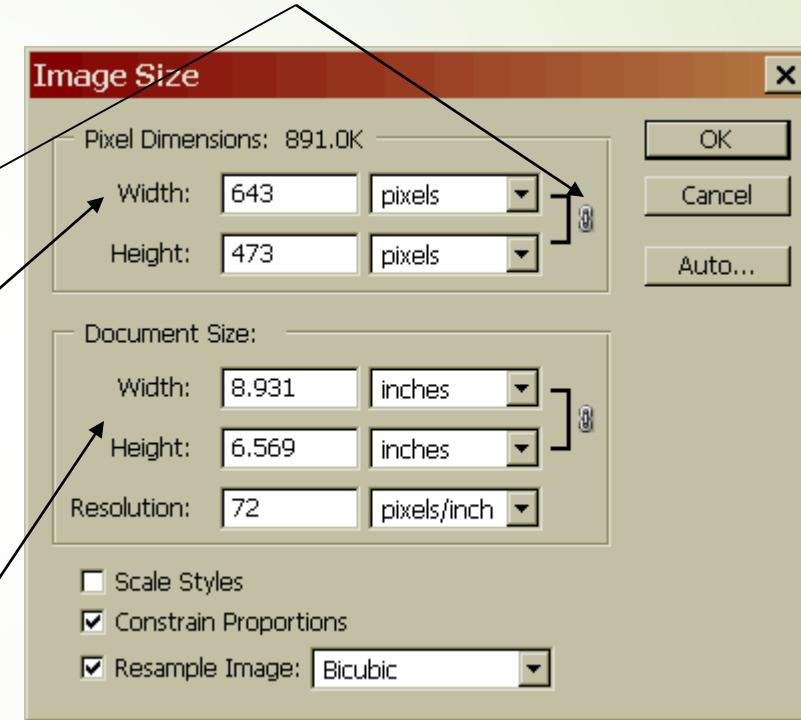
Resizing an image 2

- ▶ Images will not necessarily be shown actual size in Photoshop
 - ▶ Look at title bar to see percentage
 - ▶ Ctrl and + to zoom in
 - ▶ Ctrl and – to zoom out
 - ▶ Magnifying glass in toolbar does this too (more cumbersome, but good for zooming in on the specific area you click)
 - ▶ View menu, Actual Pixels will also take you to 100%



Resizing an image 3

- ▶ Image menu, Image Size
- ▶ Make sure “Constrain proportions” is checked to avoid stretching
 - ▶ Link icon appears
 - ▶ Change width (in pixels), height will automatically change
 - ▶ Use document size box for print (set in inches, not pixels)
 - ▶ Save as new file name, so as not to overwrite original image



Saving images 1

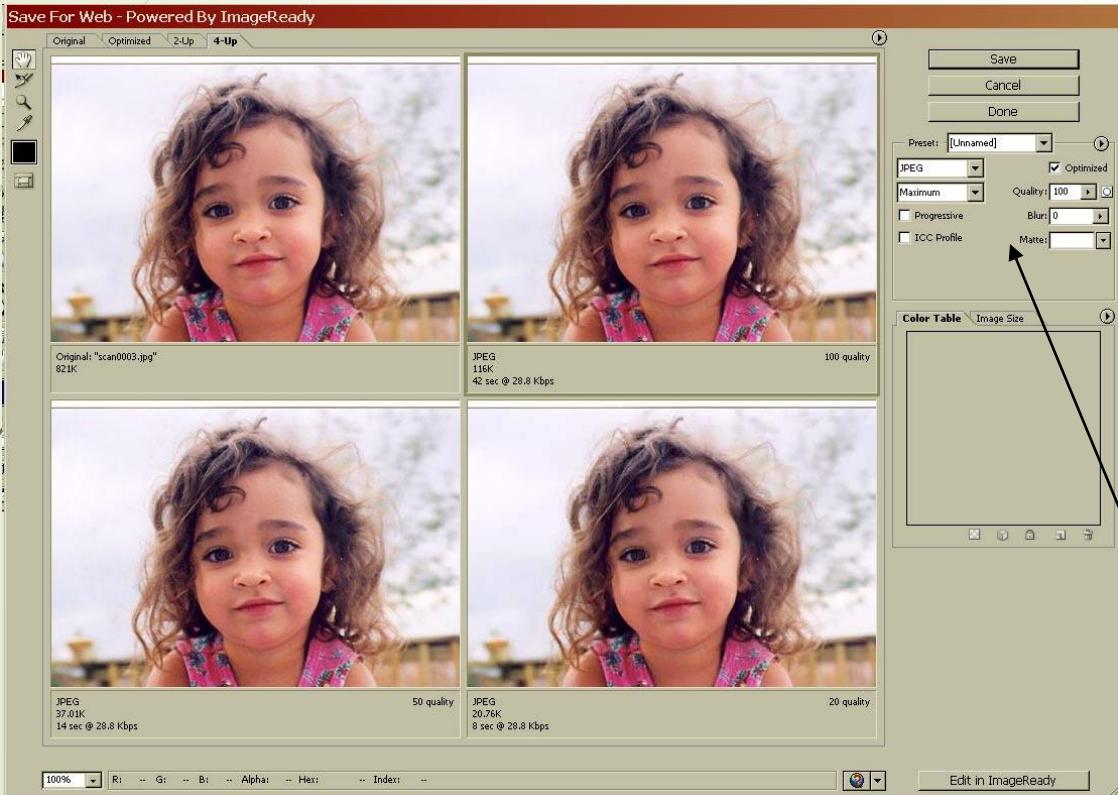
- ▶ General rule:
 - ▶ Photos, complex images save as .jpeg
 - ▶ Cartoonish images with large areas of flat color save as .gif
 - ▶ Many exceptions, so try both options and compare side by side (using 2-up or 4-up)
 - ▶ .png is not supported by all browsers, so try to avoid
 - ▶ Transparency supported by .gif, but not .jpeg
- ▶ Goal is to find a compromise between file size and image quality
 - ▶ Lower file size = lower image quality

Saving images 2

- ▶ After you've cropped, resized, adjusted
- ▶ File, Save for web
 - ▶ ImageReady is another option (icon at bottom of toolbox)
 - ▶ IR doesn't help that much with simple images (use for animation, links, rollovers – web specific tasks)
- ▶ Dialogue box appears
 - ▶ Choose 4 Up tab at top



Save for Web dialogue box 1



- ▶ 4 versions of picture
- ▶ Allows side-by-side comparison of different settings
- ▶ Use these controls to change settings

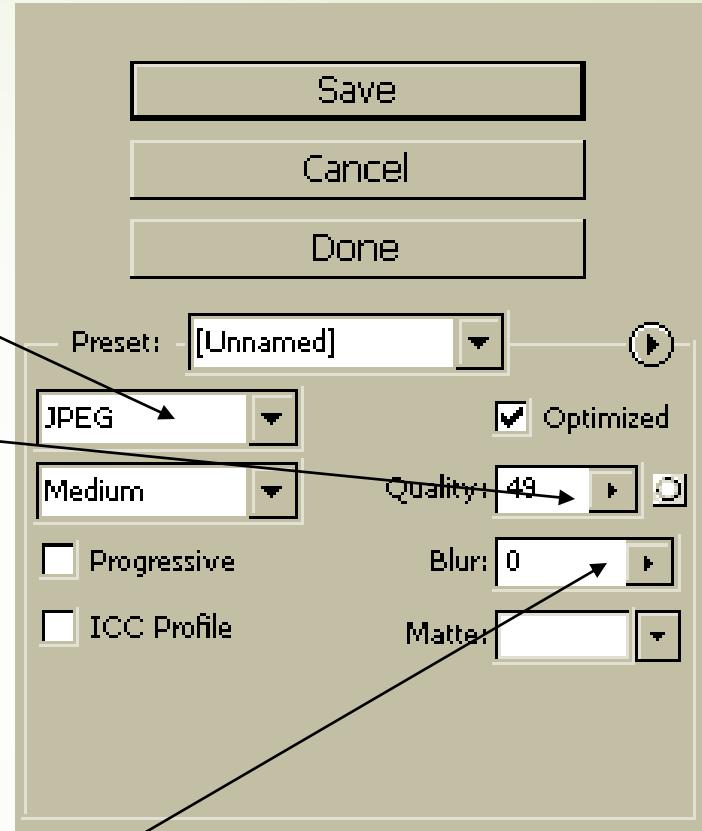
Save for Web dialogue box 2

- ▶ Ctrl and + or – will allow you to zoom in or out
- ▶ L-Click and drag allows you to drag image around
- ▶ Download time under all 4 versions:
CRUCIAL piece of info



Saving .jpegs

- ▶ Use this pulldown to switch between jpeg and gif
- ▶ Use this slider to adjust quality
 - ▶ Higher quality = larger file size
 - ▶ Often get by with 15-20 for web use
- ▶ Zoom in and drag around to look for “artifacts”
 - ▶ Little blemishes caused by compression process, often in areas of flat color
- ▶ Adding a little blur with this slider sometimes masks artifacts or poor image quality
 - ▶ Don’t overdo it!



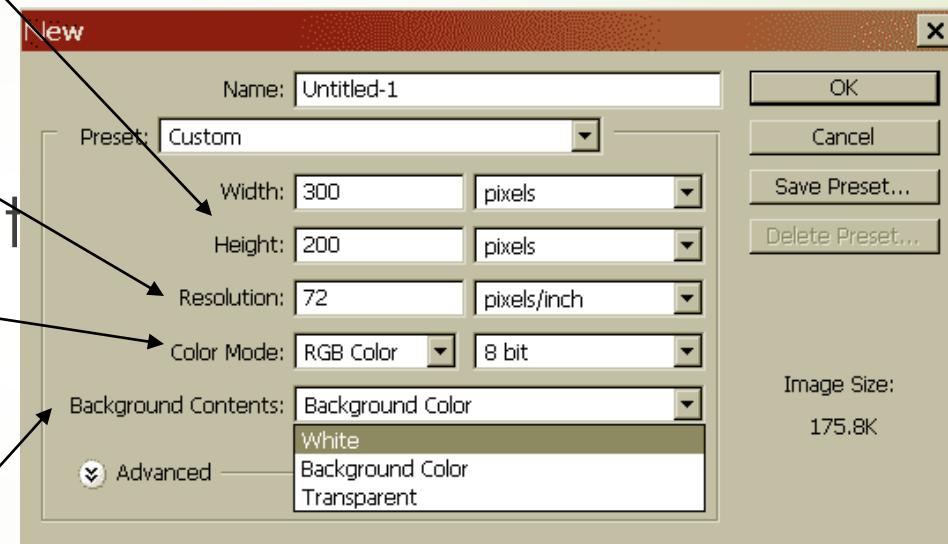


Creating new images

New image dialogue box, pencil and paintbrush tools, paintbucket and gradient tools, saving as .gifs, dither

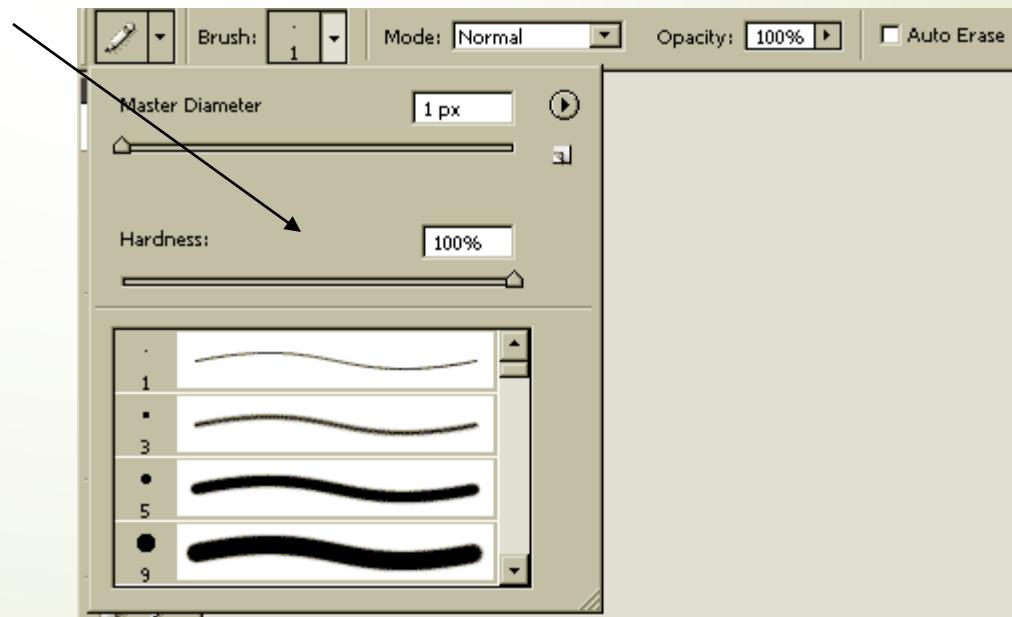
New image dialogue box

- ▶ Width, height in pixels, inches, cm, etc.
- ▶ Resolution: 72 ppi for web work, 300 or higher for print
- ▶ Color mode: RGB best default, grayscale for B&W, CMYK for high-end print work
- ▶ Background content: transparent for gifs only, background color needs to be set beforehand



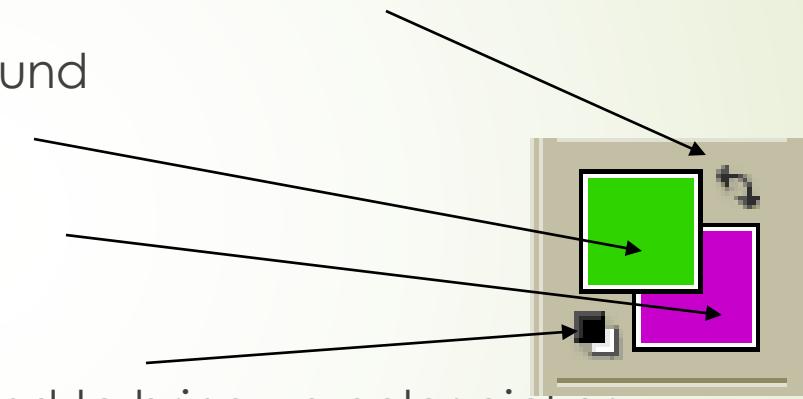
The pencil and paintbrush tools

- ▶ Left-click and hold down icon to choose
 - ▶ Pencil has hard edges
 - ▶ Brush has feathered edges
- ▶ Brush pulldown in options bar controls diameter, hardness
- ▶ Brush palette has presets for stars, leaves, grass, etc.



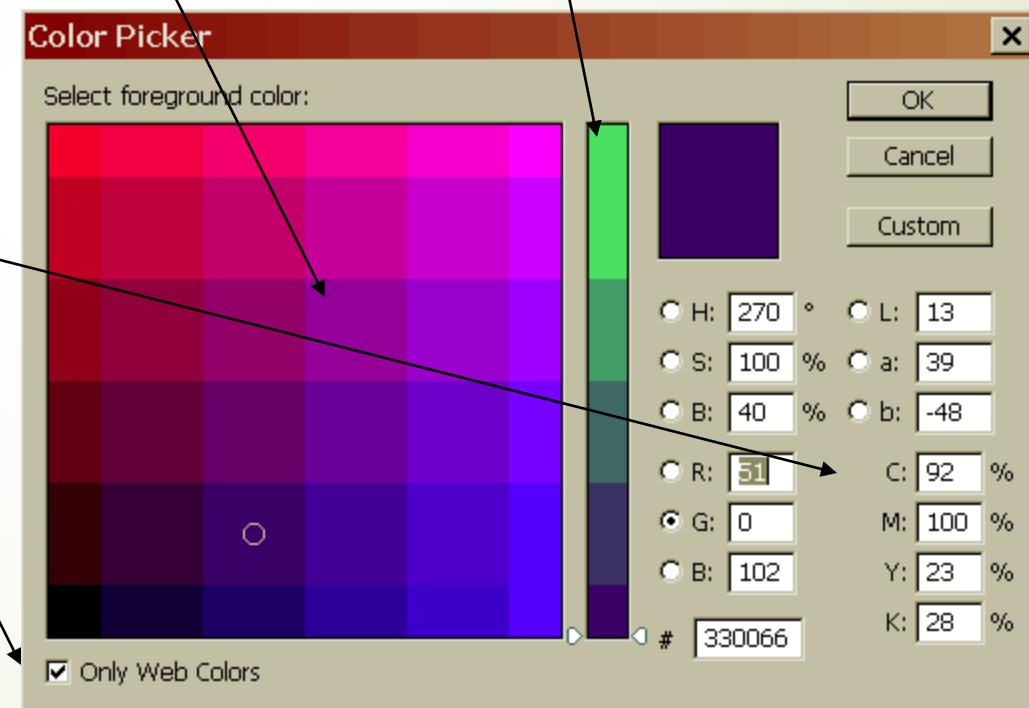
The color picker 1

- ▶ On toolbox
- ▶ Flips background and foreground
- ▶ Foreground color picker
- ▶ Background color picker
- ▶ Default (in this case B&W)
- ▶ Click background or foreground to bring up color picker



The color picker 2

- ▶ Color slider
- ▶ Color field
- ▶ Field/slider combo gives you access to all colors
- ▶ Numeric color values
- ▶ Web safe colors option (important!)
- ▶ You can sample colors with the CP eyedropper



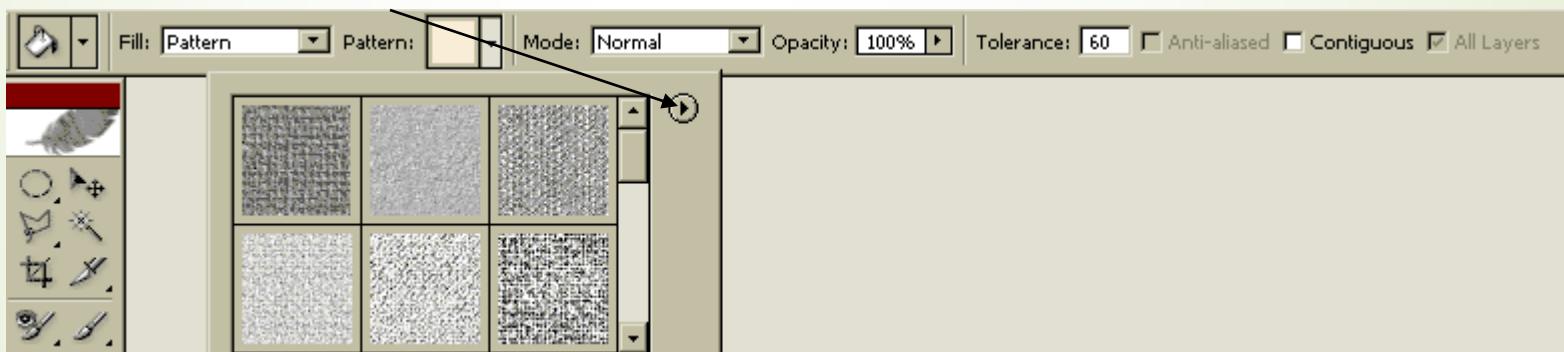


The paintbucket tool 1

- ▶ Left-click and hold down to choose between paintbucket and gradient
- ▶ Paintbucket is for solid fill backgrounds and patterns
 - ▶ Solid fill – choose color from options bar
 - ▶ Patterns – lots to chose from: cloth and paper textures, nature images (rocks, flowers), abstract patterns
- ▶ Select proper layer, choose paintbucket, click on area to fill
 - ▶ Can't paint a background – change to layer first
 - ▶ Tolerance and opacity on options bar

The paintbucket tool 2

- ▶ For patterned backgrounds
 - ▶ Change Fill box from Foreground to Pattern in options bar
 - ▶ Use Pattern box pulldown to see patterns to use
 - ▶ Use this button to bring up more pattern choices

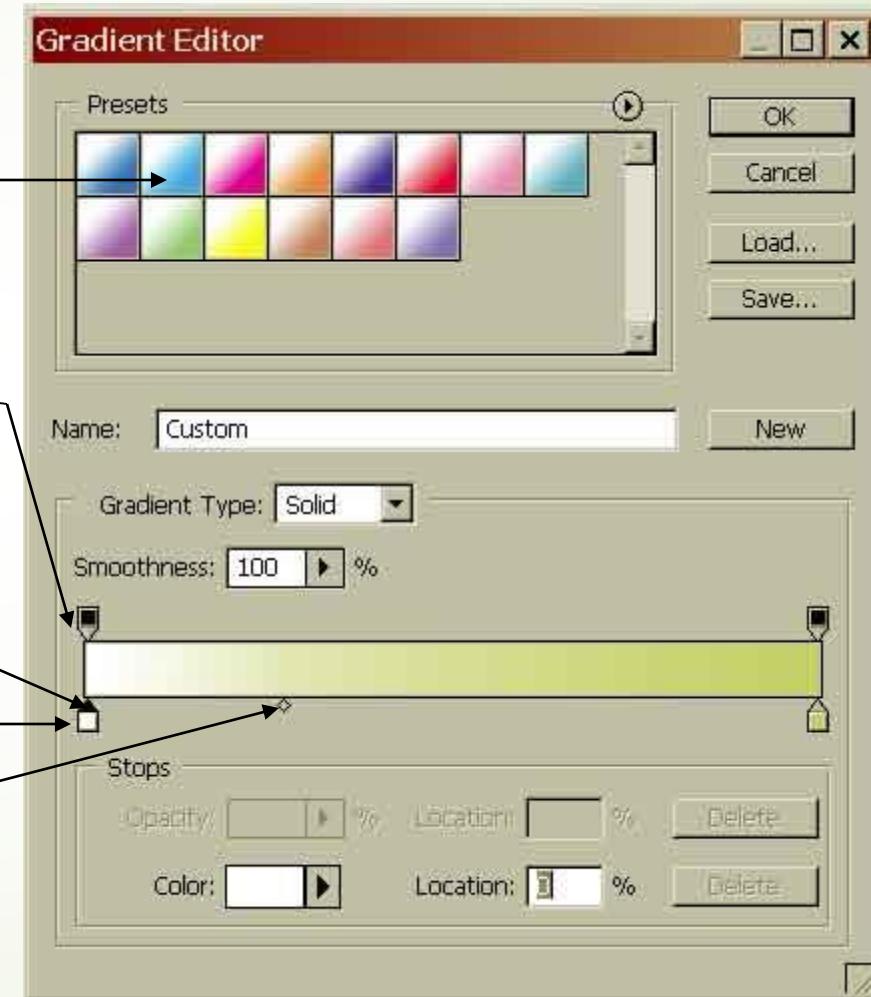


The gradient tool

- ▶ Gradient = gradual transition between two or more colors
- ▶ ~~Choose gradient tool, choose preset from options bar~~
 - ▶ “Draw” gradient with a left click and drag
 - ▶ Starting and stopping points and direction of dragged line will define gradient
 - ▶ Use History panel to back up, try again
 - ▶ Click on Gradient box in toolbar to create own gradient

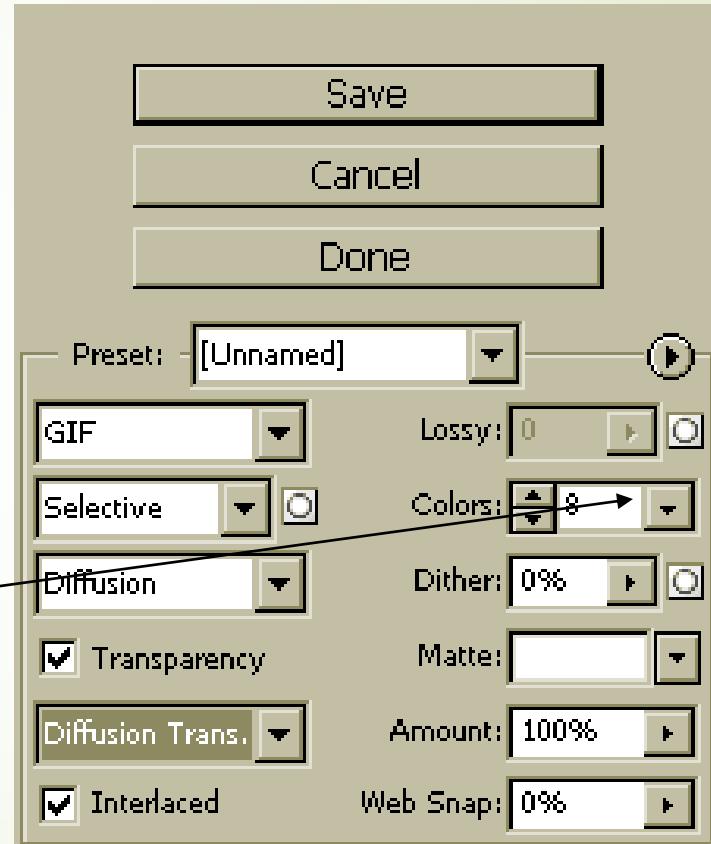
Custom gradients

- ▶ Preset gradients are here
- ▶ Click on these boxes to change opacity (for a fade to transparency)
- ▶ Click on these to change color of gradient
- ▶ Slide them to change when gradient ends
- ▶ This changes midpoint of transition



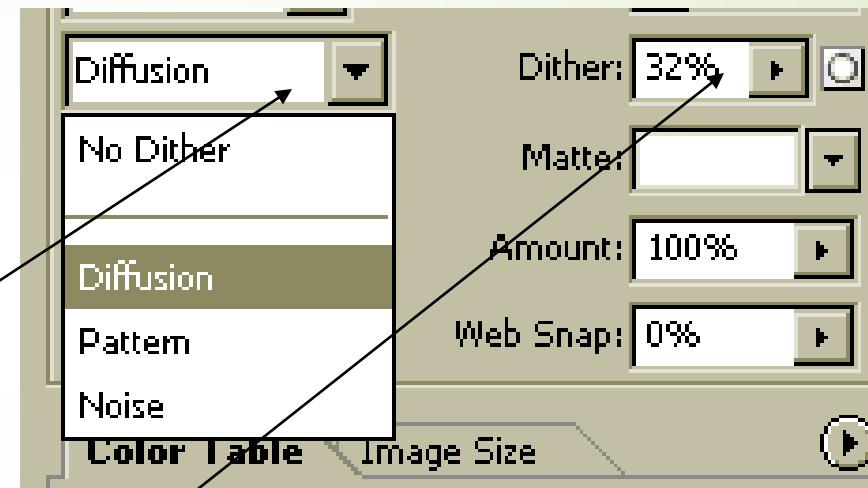
Saving .gifs 1

- ▶ File, Save for web, 4-Up tab (just like .jpeg)
- ▶ Can have between 2 and 256 colors
 - ▶ More colors = larger file size
- ▶ Control # of colors with this pulldown



Saving gifs: dither

- ▶ Dither diffuses color boundaries by mixing pixels together
- ▶ Good for preventing “banding” in gradients and shading
- ▶ Turn it on using this pulldown (diffusion is usually best bet)
- ▶ Set amount of dither, from 0 to 100
 - ▶ Don’t overdo it – can create graininess





Adjusting and retouching photos

Rotation, adjustments, The dodge-burn-sponge tools, the clone tool, the filters menu

Rotation

- ▶ Image menu, Rotate canvas
- ▶ 180° , 90° clockwise or counter
- ▶ Flip horizontal or vertical
- ▶ Arbitrary is for specific number of degrees (not really arbitrary at all!)
- ▶ Bring up grid (View menu, Show, Grid) for more accuracy



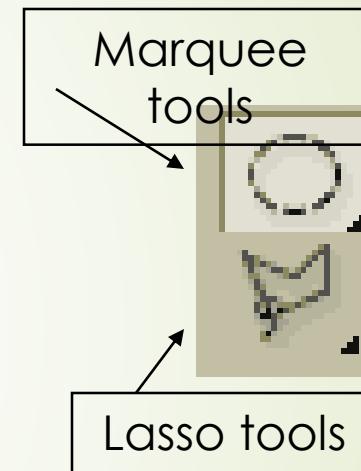
Adjustments 1

- ▶ Image menu, adjustments allows you to fine-tune image (or sections of image)
 - ▶ LOTS of options
- ▶ Adjust levels, color balance, brightness, contrast
 - ▶ Contrast and Color have both auto and manual options
 - ▶ Levels limits the range of pixels being used (auto-levels lets P-Shop do it)
 - ▶ Very useful tool
 - ▶ Auto option available as well



Adjustments 2

- ▶ To adjust just a section of photo, use the marquee or lasso tool to select section, then adjust (upper-left in toolbox)
 - ▶ Marquee for squares/rectangles and circles/ellipses
 - ▶ Lasso for irregular sections
 - ▶ Regular lasso for freehand (need good mouse skills)
 - ▶ Polygonal for point to point (I recommend this)
 - ▶ “Magnetic” lasso for P-Shop to decide (based on change in pixel value)
 - ▶ Tip: Little circle in lower right of cursor lets you know you’re done; quit before that and PShop will just keep drawing lasso



Dodge/burn/sponge tools



- ▶ Dodge – lightens an area
- ▶ Burn – darkens an area
- ▶ Sponge – saturates or desaturates color
 - ▶ Mode box in options bar determines saturate or desaturate
- ▶ For Dodge/Burn, keep exposure low (20-30), use multiple passes
- ▶ For Sponge, keep flow low, use multiple passes
- ▶ Use history palette to “back up” if you go too far

The clone tool 1

- ▶ Really fun!
- ▶ “Clones” pixels from one area of your image and places them in another
- ▶ VERY useful for repair and retouching
- ▶ Select Clone stamp tool from Toolbox
- ▶ Bring up image
- ▶
- ▶ Hold down Alt key – cursor turns to crosshair





The clone tool 2

- ▶ Move cursor to general area you want to clone from (make sure there's room on all sides)
- ▶ With Alt key still held down, left-click to select clone area
- ▶ Left-click and drag to paint cloned pixels onto new area
 - ▶ Cross marks where you are sampling from – will move as your cursor moves
 - ▶ Re-sample clone pixels as needed
 - ▶ Change brush size in options bar as needed
- ▶ Takes practice, but a very useful tool

Filters 1

- ▶ Almost as fun as the clone tool!
- ▶ Over 100 effects to choose from
- ▶ Some are subtle, some bizarre
- ▶ Filter gallery is best approach:
 - ▶ Allows you to quickly tour all filters
 - ▶ Shows preview on left as you adjust variables

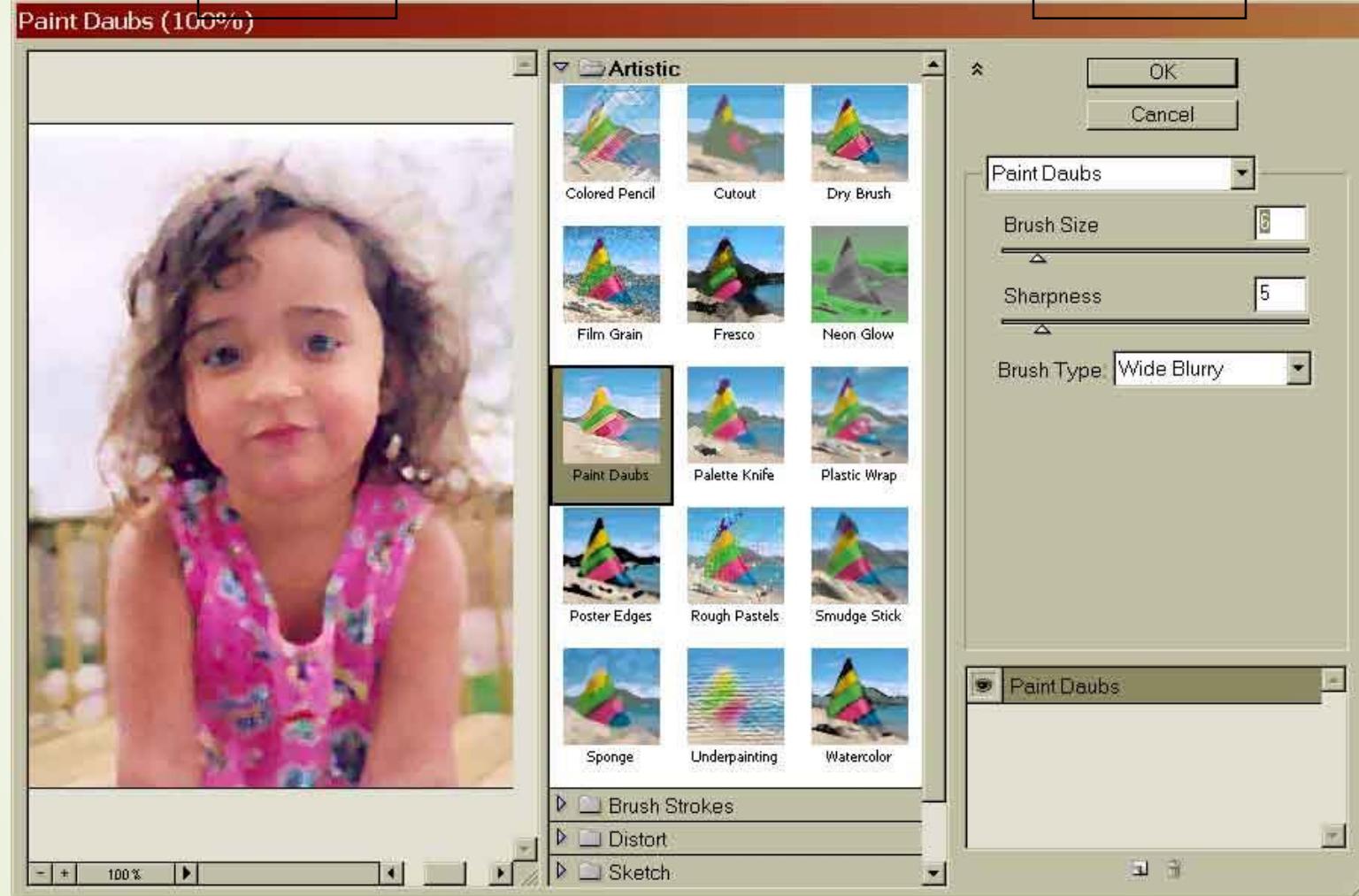
| | |
|-------------------|------------------|
| Last Filter | Ctrl+F |
| Extract... | Alt+Ctrl+X |
| Filter Gallery... | |
| Liquify... | Shift+Ctrl+X |
| Pattern Maker... | Alt+Shift+Ctrl+X |
| Artistic | ▶ |
| Blur | ▶ |
| Brush Strokes | ▶ |
| Distort | ▶ |
| Noise | ▶ |
| Pixelate | ▶ |
| Render | ▶ |
| Sharpen | ▶ |
| Sketch | ▶ |
| Stylize | ▶ |
| Texture | ▶ |
| Video | ▶ |
| Other | ▶ |
| Digimarc | ▶ |

Filters 2

previe
w

filters

variable
s

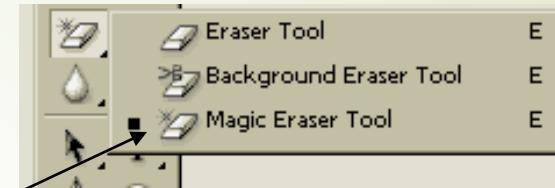


Transparency

Creating transparent backgrounds, saving transparent images, transparency dither

Creating transparent backgrounds 1

- ▶ Bring up image
 - ▶ Need a flat color background
- ▶ L-click and hold down eraser tool to get all options
 - ▶ Choose Magic Eraser tool
- ▶ Set tolerance to 5 in options bar (a starting point)
- ▶ Anti-alias should be checked (gets rid of “jaggies” on edges)
 - ▶ Uncheck contiguous to make insides of letters transparent



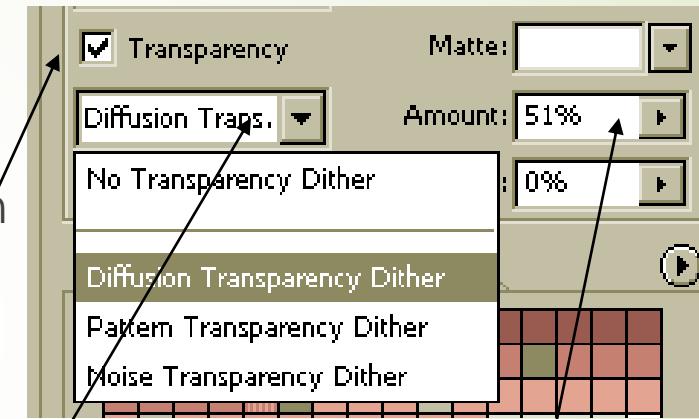
Creating transparent backgrounds 2

- ▶ Click on background
 - ▶ Background will disappear, checkerboard will appear
 - ▶ No checkerboard in actual image
 - ▶ If some background remains, Ctrl + Z, raise tolerance
 - ▶ If some logo is gone, Ctrl + Z, lower tolerance
- ▶ If you get Ø symbol, change image mode from index to RGB
 - ▶ Image menu, choose Mode, choose RGB



Saving .gifs: transparency dither

- Only .gifs support transparency
- Turn on transparency here
 - Background will be checkerboard
- Turn on transparency dither here (diffusion usually best)
 - % of transparency dither
 - Again, don't go crazy



Transparency dither example

- Without transparency dither
- With 51% diffusion transparency dither
(all other variables the same)

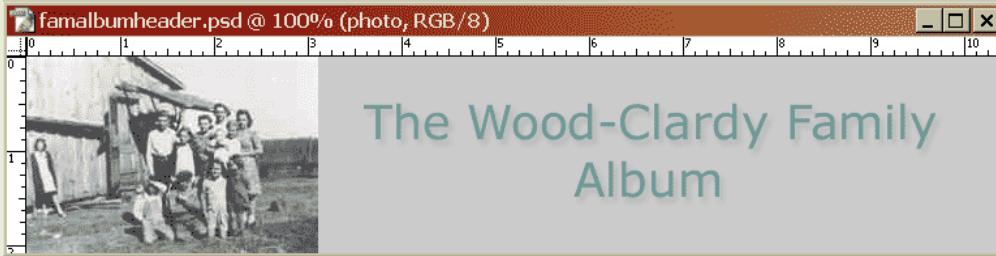




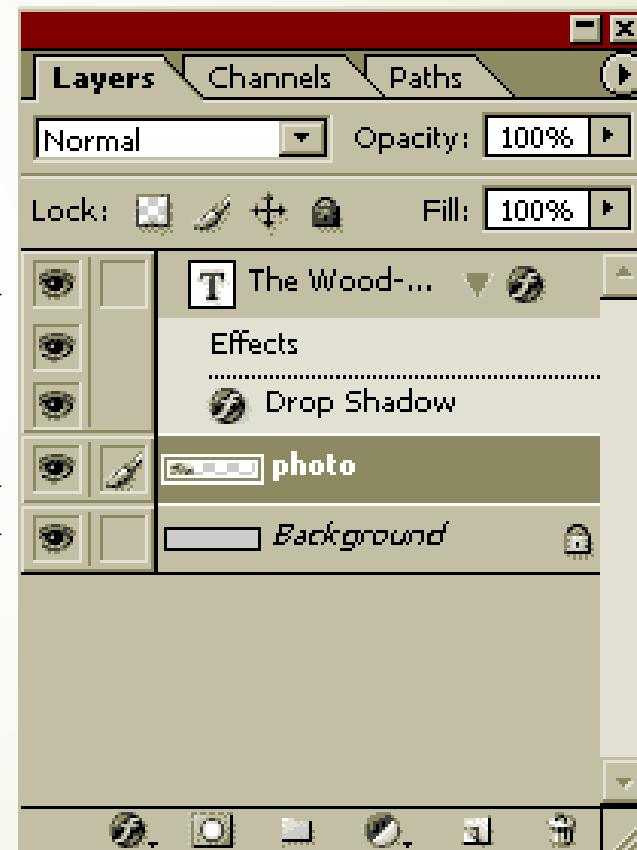
Layers

Layer basics, moving layers, naming layers, copying layers, compositing images, transforming layers, layer via copy/cut, adding text

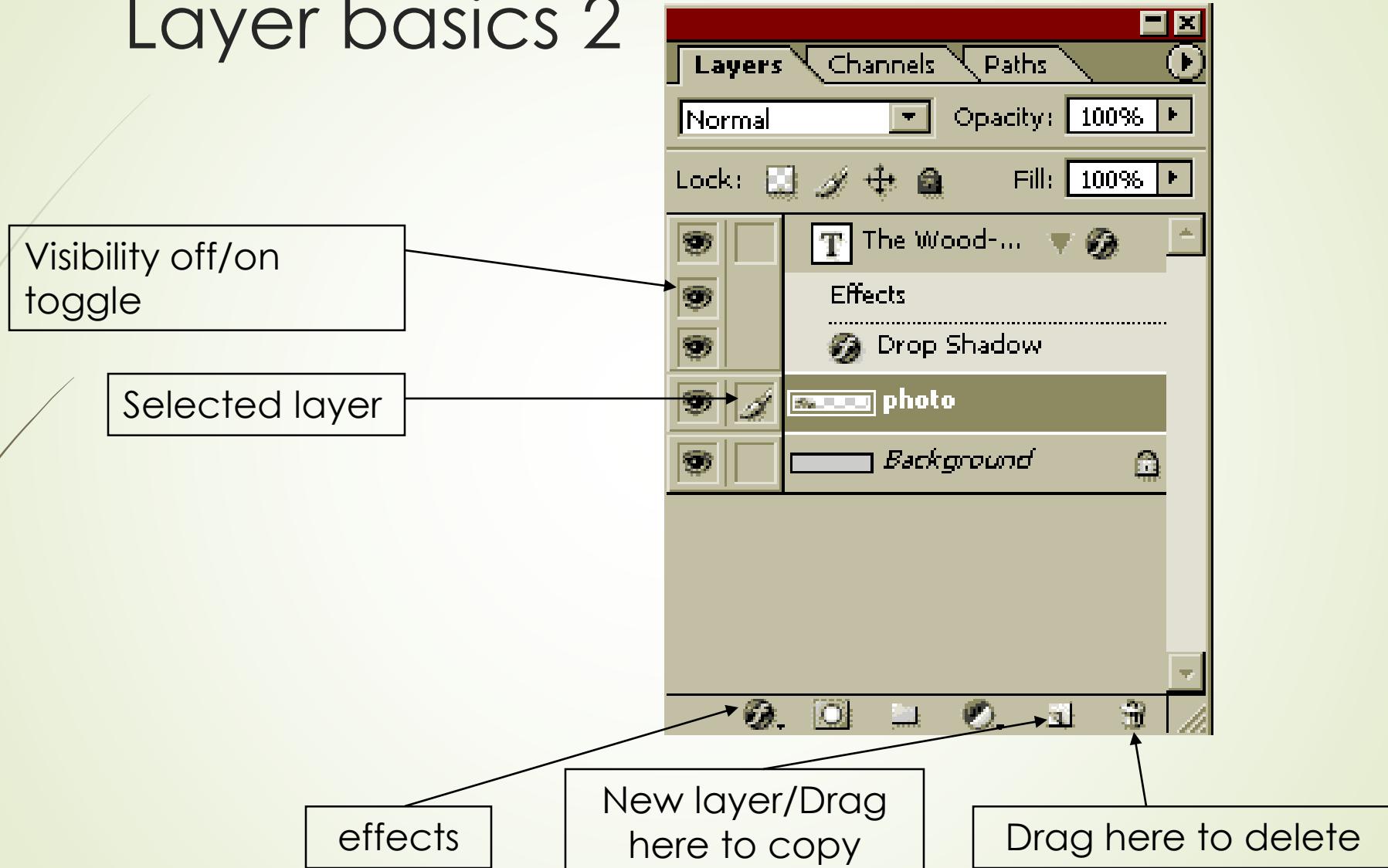
Layer basics 1



- ▶ Layers are like sheets of glass stacked on top of each other
- ▶ From top to bottom:
 - ▶ Text layer
 - ▶ Text effect/Drop shadow
 - ▶ Photo at left
 - ▶ Gray background
- ▶ L-click and drag layers to move them up or down



Layer basics 2



Layer basics 3

- ▶ Name your layers with a descriptive name
 - ▶ Right-click a layer and choose “layer properties”
 - ▶ You can left-click right inside the name to change it too
 - ▶ The “color” pulldown allows you to color code your layers
 - ▶ Good organization technique for complex images



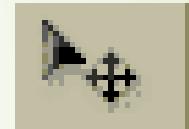
Compositing two images 1

- ▶ You can save a layer from one image directly into another image
 - ▶ Fast effective way to composite two images
 - ▶ Right-click on layer, select Duplicate Layer
 - ▶ Destination document must be open as well
 - ▶ Choose destination document from pull-down



Compositing two images 2

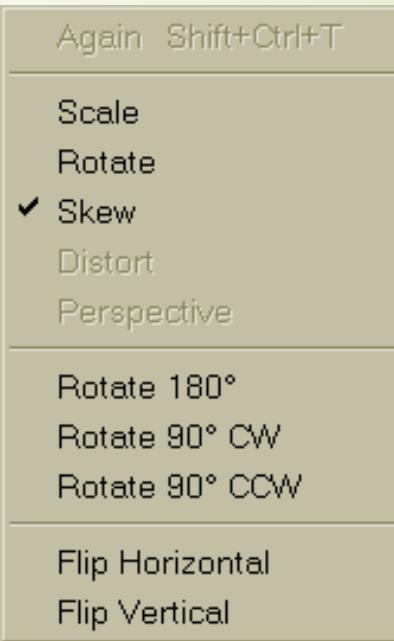
- ▶ You can drag layers from one image to another
- ▶ Both images must be open
 - ▶ Select Move tool from toolbox
 - ▶ L-click and drag
 - ▶ You'll see new layer in layer palette
 - ▶ Drag multiple times to create “clone” images
 - ▶ If it doesn't work, make sure both images are in RGB mode
 - ▶ Fine-tune position by using arrow keys to move it to correct spot



Transforming layers

- ▶ Use transform to manipulate a layer within an image
 - ▶ Select layer to transform
 - ▶ Edit menu, Transform
 - ▶ Resize, rotate, flip, etc.

- ▶ Use sizing boxes or Options bar
 - ▶ If resizing, use Scale command
 - ▶ Click chain link in options bar to keep width/height ratio

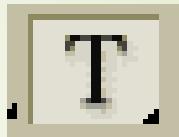




Layer via copy or cut

- ▶ You can select a section of a layer, then copy or cut the selection into new layer
 - ▶ Use Marquee or Lasso tool to make a selection
 - ▶ Right-click
 - ▶ Choose “Layer via copy” or “Layer via cut”

Adding text

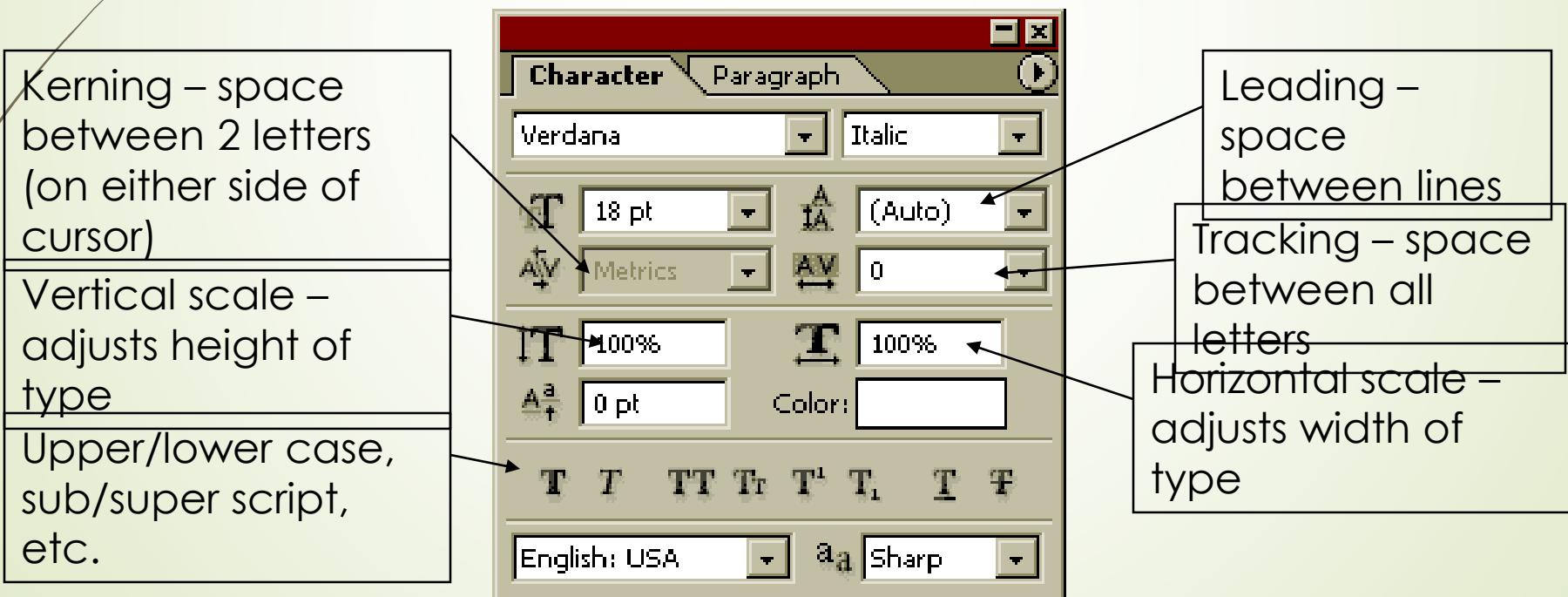


- ▶ Choose text tool
- ▶ Two ways to begin:
 - ▶ Click once on image for insertion point, begin typing, or...
 - ▶ L-click and drag to define text area, then start typing
- ▶ Use Options bar for basic manipulation
 - ▶ Text options can all be changed after the fact – highlight text, then change settings on Options bar



Character palette

- For more advanced manipulation
 - Window menu, Character
- Particularly useful for squeezing text or spreading it out



Other resources

- ▶ Websites:

- ▶ Photoshop training videos
 - ▶ <http://www.ext.colostate.edu/pshop/>
- ▶ ImageReady training videos
 - ▶ <http://www.ext.colostate.edu/iready/>

- ▶ Photoshop and ImageReady CDs

- ▶ Same material as website, larger screen size
- ▶ Email me and ask for them
 - ▶ jwood@coop.ext.colostate.edu



Basic Photoshop

► http://krukorawee.com/photoshopcs3/mix_unit1.html





Inspiration

► <https://www.youtube.com/watch?v=Ai6PEagQpAs>



Ready Templates

- ▶ <https://w3layouts.com/free-responsive-html5-css3-website-templates/>
- ▶ <http://www.free-css.com/template-categories/responsive>
- ▶ <http://designscrazed.org/free-responsive-html5-css3-templates/>
- ▶ <https://w3layouts.com/page/2/>
- ▶ <http://www.bittbox.com/all/20-free-responsive-and-mobile-website-templates>

Summary

- ▶ The Role of Graphic Design
- ▶ Principles of Graphic Design
- ▶ Animation/Rollovers
- ▶ Typography
- ▶ Color
- ▶ Icon Design
- ▶ File Format
- ▶ Sound
- ▶ Web Design
- ▶ Photoshop & Tools

Sources

- ▶ Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, S. & Carey, T. (1994) Human-Computer Interaction: Concepts And Design, Addison Wesley, ISBN 0-201-62769-8
- ▶ <http://www.id-book.com/>
- ▶ Lecture note CSC1720 – Introduction to Internet by C.C. Cheung 2003.
- ▶ D. Blatner and B. Fraser, 2004, Real World Adobe Photoshop CS, Peachpit Press.

Individual work III

- ▶ Design example of Interface or Home page of a new application or website
 - ▶ Write down:
 - ▶ Who is the target user group of this application or website (Use **Persona** from Lecture 4)
 - ▶ Discuss the design issues in detail
 - ▶ May base your discussion on (but not limit to)
 - ▶ Color
 - ▶ Graphics
 - ▶ Perception
 - ▶ Memory
 - ▶ Attention
 - ▶ (See lecture 1-3)

Tutorial in using Photoshop for creating basic web template:
<http://www.youtube.com/watch?v=dgmnWUZao-Y>