Chapter 17

Graphical concepts

General image types
- Vector vs pixel
- Deciding when to use vector art, pixel art or both

Image resolution and dimensions

Image colors
- Color models and space
- Converting between color models
- Color profiles
- Color choices

Layers

*Why you should avoid powerpoint?*
General Image Types

- **Vector-based image:**
  
  Made of editable lines, curves, and shape which are defined by a few key properties.

- **Pixel-based image = bitmap = raster art:**

  Made of uniform grid or colored dots, named the pixels.

  Photos are typical pixel-based images.
**General Image Types**

- **Vector-based image:**
  
  In *vector art* the line is defined by *2 points*.

  **Storing info:**
  - X and Y of each point
  - color of line, width

- **Pixel-based image = bitmap = raster art:**
  
  In *pixel art* the line consists of *many points* of a particular color.

  **Storing info:**
  - color of each point of the grid
  - size of the image 10x10 or 100x100?
  - this values increase with size
**General Image Types**

- **Vector-based image:**
  
  In vector art the file format can be:
  - pdf: portable document format (Adobe)
  - eps: encapsulated post-crit format (Adobe)
  - svg: scalable vector graphics (XML)
  - AI: Adobe Illustrator

- **Pixel-based image = bitmap = raster art:**
  
  In pixel art the file format can be:
  - JPEG: Joint Photographic Expert Group (compressed)
  - PNG: Portable Network Graphic (screen capture)
  - TIFF: Tag Image File Format
  - BMP: Bitmap (Microsoft, IBM)
  - PSD: Adobe Photoshop
In **pixel art** images are made up by a grid of colored pixels.

**Pixel dimension:** the number of pixels along the full X and Y axes of the image, for example 800 x 600 pixels.

**Physical size:** the size that the image appears on a printed page, such as 89 mm x 66 mm.

**Resolution:** the size of each pixel, expressed as the number of pixels per unit of physical dimension, usually called dots per inch (DPI) or pixel per inch (PPI).
Image resolution & dimensions

Same physical size
Less pixels

Lower resolution
Image resolution & dimensions

Bigger physical size
same pixels

Lower resolution
Deciding between vector & pixels

**Vector-based image:**
- You can zoom and enlarge drawing without pixelization (open AI and PS)
- Text is searchable
- Everything is easily editable (annotations, arrows, color)
- You can convert vector to pixel art, (difficult in the other way)

**Graphical elements should be created with vector art**

**Pixel-based image = bitmap = raster art:**
- The pixellization rendering depends on resolution
- Requires thousands times more memory
- Pixel text is not searchable
- Pixel text can not be easily copied and pasted
- But contained complex info sometimes hard to represent line-by-line (photo, gels)
- For plots with thousands of data points, vector objects become cumbersome.
Combining vector & pixels

- Graphical elements and annotations should be kept with vector art (editable, scalable).
- Most vector file format (such as PDF) allow importation of photos, which will be embedded in file.
Using layers ...

Vector-based image (on Illustrator):
Using layers ...

- **Pixel-based image (on Photoshop):**
**Postscript files & rasterization**

Rasterization

- Postscript file (EPS)
- Conversion to pixel image
- Imposed final size
- (Print to file or Acrobat distiller)

Vector art format
Ex: Adobe Illustrator

10 x 15cm or Poster?
Additive synthesis
Based on addition of light
RGB

- in RGB: increasing value correspond to brighter pixels thus lighter color (White in center)

Subtractive synthesis
Based on absorption of pigments
CMYK

- in CMYK: increasing values represent more ink, thus darker (black in the center)
Color models & color space

Additive synthesis
- Based on addition of light
- RGB
  - screen / projectors

Subtractive synthesis
- Based on absorption of pigments
- CMYK
  - Press - printers

Light

Ink

Press - printers
Color models & color space
Practical computing for biologists - Chap 17

Color models & color space
Color models & color space
Color models & color space
Color models & color space
RGB describes a larger portion of color space than does CMYK.

That is the reason why it’s hard to convert RGB to CMYK.
- RGB describes a larger portion of color space than does CMYK
- Information about the oceanographic features in white boxes are lost in CMYK.
At least 7% of males have some degree of color blindness, which affects the ability to tell red and green apart. For this reason, you should avoid using red, and replace it by magenta.
At least 7% of males have some degree of color blindness, which affects the ability to tell red and green apart. For this reason, you should avoid using red, and replace it by magenta.
At least 7% of males have some degree of color blindness, which affects the ability to tell red and green apart. For this reason, you should avoid using red, and replace it by magenta.
Converting RGB to CMYK to publish

- Select color mode (RGB)
- Attribute a profile (Adobe RGB 1998)
- Use the command convert to profile (RGB -> CMYK)
Converting RGB to CMYK to publish

Graphic features in white boxes are lost in CMYK.
Converting RGB to CMYK to publish
Converting RGB to CMYK to publish

Graphic features in white boxes are lost in CMYK.
Converting RGB to CMYK to publish
Converting RGB to CMYK to publish
Converting RGB to CMYK to publish

- Information about the oceanographic features in white boxes are lost in CMYK.
Converting RGB to CMYK to publish

- Converting RGB to CMYK in Photoshop
- Information about the oceanographic features in white boxes are lost in CMYK.
The decision making process

**Summary:**

- Use **pixel art** images for photographic image.
- Prefer **vector art** for most everything else.
- Use layers to organize your graph & photos.
- Use RGB color for Web, photos and Presentation.
- Convert to CMYK at the very last, for printing.