Publication Quality Graphics

Biochemistry Boot Camp 2021
Session #6
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Why Quality Graphics?

- Clarity of Presentation
  – Sharp-looking Posters, Presentations, Papers
  – Make your message easier to understand

- Requirement of Many Journals: Print Standards

- Enable Close Inspection in Digital Format
  – Blurry, pixelated graphics are not professional
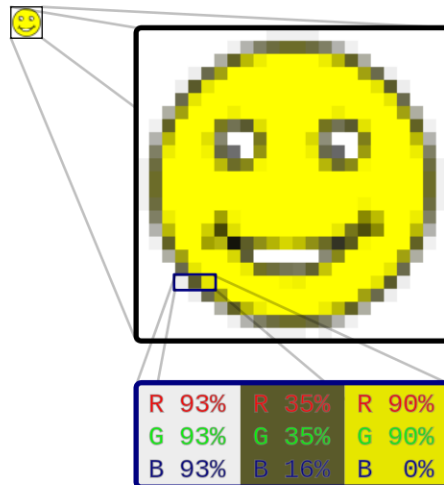
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Graphics with Bully
(try zooming in)

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How to Store Graphics

- *Raster* (or bitmap) graphics

- Pixels stored in pre-determined x, y order

- Can be grainy when zoomed

- Color must be stored with each pixel

- **Good for:** photos, artwork, graphs, diagrams
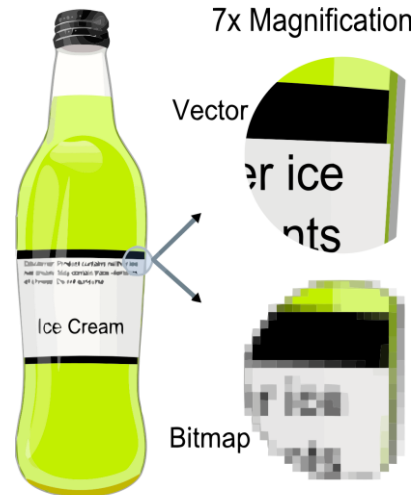
- **Software:** Photoshop, Gimp

http://en.Wikipedia.org/wiki/Raster_graphics

R 93%	R 35%	R 90%
G 93%	G 35%	G 90%
B 93%	B 16%	B 0%

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How to Store Graphics

- *Vector* graphics

- Shapes, text drawing effects are stored mathematically

- Arbitrary zoom without graininess

- Color is stored with each shape/line

- **Good for:** graphs, diagrams, but *not* photographs

- **Software:** Illustrator, Inkscape

http://en.Wikipedia.org/wiki/Vector_graphics

7x Magnification

Vector

Bitmap

Ice Cream

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Raster vs. Vector File Formats

Raster Formats
- GIF
- BMP
- PNG – Portable network graphics
- JPEG – Joint photographic experts group
- TIF – Tagged image file

Vector Formats*
- PDF
- SVG – Scalable vector graphics
- WMF – Windows Metafile
- PS – Postscript
- EPS – Encapsulated Postscript
- DOCX, PPTX – Office tools

* Most vector formats can also store rasterized graphics as a subset of artwork.

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Image Compression
(only applies to raster graphics)

- **Lossy:** Image is made smaller by "losing" data; approximations are made to maintain image
  — Generally can adjust quality (see above)
- **Lossless:** No image data is lost; quality is the same
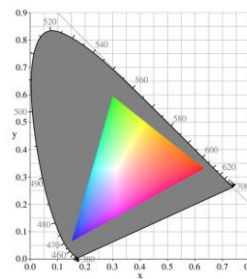 — File sizes will be bigger than lossy
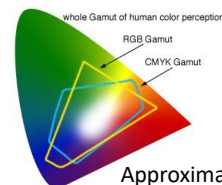
http://en.Wikipedia.org/wiki/Lossy_compression

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Color: RGB and CMYK

- **Computer monitors:** additive color (red, green, blue)

- **Printed material:** subtractive color (inks; cyan, magenta, yellow, black)

- Different technologies are limited to different colors!

Actual representation of RGB color gamut (all visible colors would be in the grey area)

whole Gamut of human color perception
RGB Gamut
CMYK Gamut

Approximation!

http://en.Wikipedia.org/wiki/Gamut, http://gotprint.net/g/showStaticPage.do?page=rgb-scmyk.html

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Best Practices For Publication

- Size (dimensions)
  - One column is 8 cm wide; two columns are 17 cm
  - Most journal pages are 28-30 cm tall
  - Poster figures can vary widely, but should be bigger

- Resolution
  - 300 dpi minimum, some publishers want 1,200 dpi for graphs and diagrams (overkill)

- Color Mode
  - RGB or CMYK (frequently doesn't matter, but used to be more important; check requirements)

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Best Practices For Publication
(continued)

- Fonts
  - 5 pt minimum, 8-11 pt for most labels
  - Panels (A, B, C) vs (a, b, c) → Check recently published papers

- Always read author guidelines carefully (format, dpi, color requirements)

- **Be Observant!**
  - Pay attention to what is acceptable in papers
  - Notice what works in posters/presentations

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Tips and Tricks

- Think carefully about layout and display: one column or two? How many panels?

- Layout figures in PowerPoint to get a rough estimate, then use other software to make a final version
  - PowerPoint is not a print publication tool!

- Learn your adviser's preferences and model them (read papers, talk to other students)

- <u>Pay attention to good design and effective communication!</u>

SECOND EDITION

The Visual Display of Quantitative Information

EDWARD R. TUFTE
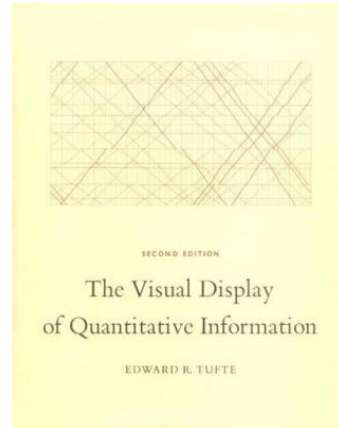
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The Software

- **Graphs:** Origin, Graphpad/Prism, Grace, Matlab, Gnuplot, Mathematica, Excel (?)

- **Touch-Up:**
  - Raster: Photoshop, GIMP
  - Vector: Illustrator, Inkscape

- Never (EVER) doctor an image or graph to make it look better
  - If there is <u>*any*</u> doubt about image manipulation, ask your adviser
  - An interesting afternoon: https://retractionwatch.com/

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Doing it With Excel: The Target
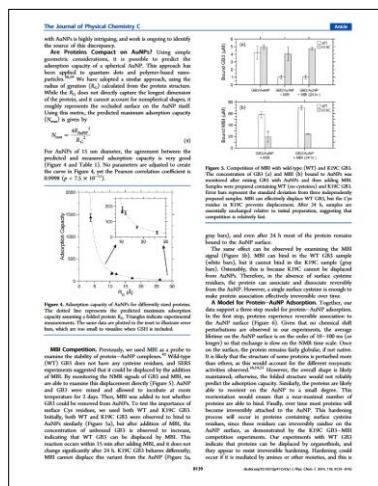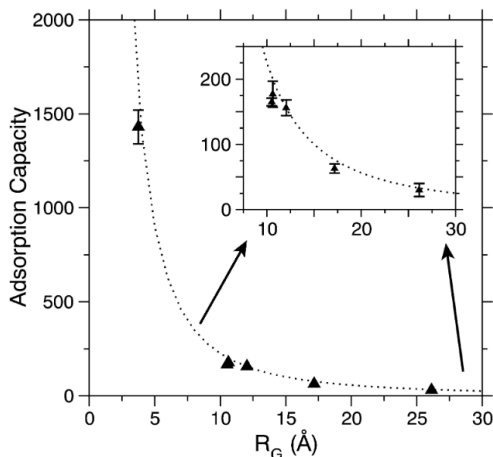
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Problems With Excel
(these must be overcome)

- Bad font choice
- No labels
- Layout
- Grey text (seriously, why?)
- Extra "chart junk" like gridlines
- Etc., etc., etc…

- **Let's try it!**

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Excel Tips

- Save templates (right click on graph) to make changing dumb defaults easier

- Use Excel's own grid to help with alignment (hold down alt while dragging a graph)
  - Take a look at Page Layout → Align for more
  - Panel labels (A, B, C) can go in cells behind graphs

- Use the Print Area to control what is saved to a PDF
  - Photoshop and GIMP can read PDFs and convert to high-resolution TIF/PNG file
  - Illustrator/Inkscape can read PDFs as vector images

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Summary

- Clear, professional images make it easier to communicate your science.
  - Make it easy for your audience to think you're smart!

- As a scientist, you will need to learn not only about science, but about publishing and graphics, too.

- PowerPoint and Excel can be useful tools in the publication repertoire, but some know-how is needed.

- Best skill is observation: What works? What doesn't?

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