Visualizing Science: 
A Crash Course in Digital Graphics

Coffee Hour | ARO Education Committee
21st June 2023
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‘Here is the data I collected’

‘Here is my addition to our field’

*Illustration by David Somerville based on the original by Hugh McLeod*
What makes a good figure? (*according to reddit)

r/dataisbeautiful

Global biodiversity has declined by nearly 70% since 1970

How to read the biodiversity stripes

- **Highest level of biodiversity**
- **Lower levels move through yellow to grey**
- **Darker greys represent greater declines**

<table>
<thead>
<tr>
<th>Region</th>
<th>Decline Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>69% decline 1970-2018</td>
</tr>
<tr>
<td>European and Central Asia</td>
<td>18% decline</td>
</tr>
<tr>
<td>North America</td>
<td>20% decline</td>
</tr>
<tr>
<td>Asia-Pacific</td>
<td>55% decline</td>
</tr>
<tr>
<td>Africa</td>
<td>66% decline</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>94% decline</td>
</tr>
</tbody>
</table>

Sources: biodiversitystripes.info; Living Planet Index database, 2022
© F7

r/dataisugly

**Which is the strongest Olympic team of all time?**

Share of Olympic medals won, top three teams at each games, %

- **Greece**
- **United States**
- **Japan**
- **Soviet Union**
- **China**

Sources: Gracenote; International Olympic Committee; Sports reference: “The Complete Book of the Olympics”, Wallechinsky & Loucky

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Ten Simple Rules for Better Figures

• Rougier, Droettboom & Bourne, 2014 (PLOS Computational Biology)
  1. Know your audience
  2. Identify your message
  3. Adapt the figure to support medium
  4. Captions are not optional
  5. Do not trust the defaults
  6. Use color effectively
  7. Do not mislead the reader
  8. Avoid ‘chartjunk’
  9. Message trumps beauty
 10. Get the right tool

https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1003833
Paid* vs Free Software

*extortionate @ $54.99/mo for individual plans

Photoshop
Raster/bitmap graphics
(pixels i.e. raw image files)

Illustrator
Vector graphics
(paths i.e. graphs & schematics)

Adobe Creative Cloud

INKSCAPE

gimp

Photopea

BROWSER BASED
**Raster vs Vector Graphics**

**Raster (aka bitmap) graphics** are NOT scalable (i.e. quality dependent on resolution)

**Vector graphics** are scalable (i.e. not dependent on resolution)
Raster vs Vector

Common file types:
- .jpg
- .gif
- .png
- .tiff
- .raw
- .psd

Common file types:
- .pdf
- .eps
- .ai
- .svg
- .emf

Bezier curves to create paths

https://pavilion.dinfos.edu/Article/Article/2223089/vector-vs-raster-images-choosing-the-right-format/
File type considerations

• **Compression** – am I willing to trade quality of resolution for file size?
  - Lostless compression (larger files): .tiff, .png, .psd, .ai, .pdf, .svg, .emf, .eps
  - Lossy compression (smaller files, lower resolution): .jpeg, .gif

• **Readability** – what programs can access the file?
  - Typically proprietary: .psd, .ai, .mat, .nd2
  - Many programs: .png, .jpeg, .tiff, .bmp, .pdf, .svg, .emf, .eps

• **Editability** – do I need to retain editable features?
  - Compressed or uncompressed with layers intact (large files): .psd, .ai, .pdf, .tiff
  - Compressed and ‘flattened’ (small files): .jpeg, .tiff, .png
Working with layers

Elemental Masks

Collaboration b/w
Paul Douard, France
Victor Vergara, Colombia

Concepts to cover:

- Program Workspace
- Window Panes & Toolbars
- Ruler/dimensions
- Layers
- Tools
  - Selection vs Direct Selection
  - Text Boxes vs Area Text Boxes
  - Pencil vs Pen vs Brushes
  - Stroke vs Fill
  - Select > Same
  - Arrows and Arrowheads
- File types
- Importing and exporting (print vs web)
Demonstrations
Useful references and resources

• GOOGLE!!!
• ‘Raj Lab basic Adobe Illustrator (CC) guide’ - Jiang, 2019 (RajLaboratory blog) - https://docs.google.com/document/d/1TXmbltzBPcApCCuj9HLOlQgWPqKyIrFRWRudrN-5vBE/edit#
• ‘Image integrity and standards’ - Nature Portfolio - https://www.nature.com/nature-portfolio/editorial-policies/image-integrity
• Coblis – Color Blindness Simulator - https://www.color-blindness.com/coblis-color-blindness-simulator/
Thanks for joining!

https://xkcd.com/2713/