Why does good design matter?

• Good design makes a great first impression

• Good design makes for effective communication

• Good design keeps the reader engaged

Art Palvanov (http://www.palvanov.com/)
Elements of design

- Contrast
- Alignment
- Colour
- Symmetry
- Space
- Proximity
- Repetition
- Size
Proximity – Find logical and visually appealing ways to structure panels

- Which figures logically group together?
- Are there sub-groups which should be connected?
- Is there a logical flow to the ordering?
- Is the layout balanced?
Alignment: Some arrangements are more visually appealing than others
We like symmetrical ordered layouts

**FIGURE 28.1.** Theory is used in two ways in evolutionary biology. (A) The evolution of a population can be traced forward in time, giving predictions about the effects of the various evolutionary processes. (B) We can focus on a sample of individuals and trace its ancestry backward in time. This allows us to make inferences about the past processes that shaped the sampled genes. Genes are shown by dots, with color indicating allelic state (red or black). There is a single mutation (black→red) in the ancestry of the five sampled genes.

_Nutritional Immunology and Molecular Medicine Laboratory (2012)_
_Modeling H. pylori using ENISI and Cell Designer_
We like regular radial arrangements

Chromatin modifiers (30.5%)  
MLL fusions, MLL PTD, 
NUP98-NSD1, ASXL1, EZ112, 
KDM6A, other modifiers  

Myeloid transcription factors (22%)  
RUNX1, CEBPA, other myeloid transcription factors  

Tumor suppressors (16.5%)  
TP53, WT1, PHF6  

Cohesin complex (13%)  

Transcription factor fusions (18%)  
PML-RARA, 
MYH11-CBFB, RUNX1-RUNX1T1, 
PICALM-MLLT10  

Spliceosome (13.5%)  

NPM1 (27%)  

DNA methylation (46%)  
TET1, TET2, IDH1, 
IDH2, DNMT3B, DNMT1, 
DNMT3A  

Activated signaling (59%)  
FLT3, KIT, KRAS, NRAS, PTPs, 
Ser/Thr kinases, other Tyr kinases  

A panoramic view of acute myeloid leukemia  
Sai-Juan Chen, Yang Shen & Zhu Chen  
Nature Genetics 45, 586–587 (2013)
Without symmetry we should consider visual weight


Different characteristics give an object visual weight

- Size
- Colour
- Shape
- Isolation
Use visual weight for emphasis or symmetry
Alignment: We are sensitive to aligned edges, even when they are separated.
Use a grid to help align disparate parts of a figure
Leave space between elements of figures
Whitespace has two main functions

- Implied grouping of elements
- Emphasis
Colour can be an essential or optional part of any figure
Colour can have multiple uses

• Colour can be used to:
  – Highlight specific data
  – Group categories of data
  – Encode quantitative values

• The more selective you are with colour, the greater its effect

• Try to make figures work in black and white
Sparing use of colour is most effective

• We want to show that samples 4 and 6 are low

• Which is most effective at conveying your message?
Don’t invent your own colour schemes
Use an appropriate colour scheme

- **Sequential**
  - Run between two values
  - Typically two main colours

- **Divergent**
  - Diverging from a central value to a min and a max
  - Typically three colours

- **Categorical**
  - Colours have no intrinsic ordering
If possible try to consider colour blind users

• Affects 1:12 men and 1:200 women worldwide

• “If a submitted manuscript happens to go to three male reviewers of Northern European descent, the chance that at least one will be colour blind is 22 percent.”
You can see how well your figure works for colour blind people

• Gradients are easy to change

• Categorical colours are very limited

• Basic interpretability in black and white is ideal

http://www.color-blindness.com/coblis-color-blindness-simulator/
When overlaying information, make sure you have sufficient contrast.

- **Poor contrast**
- **Good contrast**
- **Poor contrast**
- **Good contrast**
- **Vibrating colour**
- **Busy background**
Add overlays to increase contrast

Poor contrast

Good contrast
Keep text and fonts simple

- All fonts for figures should use sans serif fonts
  
  sans-serif  serif

- All text in figures should be black or white

  - [Wild type]
  - [Knockout]
Make sure appropriate labels are added

- Each axis is labelled
- Quantitative axes have units
- Colour scheme is explained
- Point shapes are explained
Make sure all text is legible at the final printed size.

6 point font is the smallest you can comfortably read (just over 2mm height on paper)
When resizing be aware of what can and cannot have its aspect ratio changed

- Things that always need to maintain their aspect ratios:
  - Images
  - Text
  - Circular objects
  - Axes with comparable units
When resizing be aware of what can and cannot have its aspect ratio changed
Simpler figures are easier to interpret.
Simpler figures are easier to interpret
Consistency across figures makes interpretation easier

- Same colour/marker for same group
- Size of comparable figures should be the same
- Positions of axis titles and labels
- Font styles and sizes
- Order: If presented ‘Sample A’ and then ‘Sample B’, maintain this throughout
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