

## Today's Lab

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In this lab you will be introduced to the three main ways of creating graphic in R – using 'base' graphics, the 'ggplot' package and 'grid' graphics. There are six scripts which have the instructions, directions and questions as comments. You will not complete them all! The goals are:

- to orientate you with the structure of the different methods (a broad, but shallow overview),
- encourage you to defy the defaults and show you how to make visuals your own,
- introduce some design and computational thinking,
- and give you a spring board to become an independent learner.

Remember (as I should have said in the lecture) not all the visuals we will produce make sense! Some examples just show you alternatives, or signposts things you may consider later on. Except for the jpeg, all the data is contained in the scripts. Do not linger too long on looking at the data. That is what the visualisations are for. Please use the scripts in this order...

1. anscombe.R
2. anscombelayouts.R
3. truncated.R
4. piecharts.R
5. anscombeGGplot.R
6. ukko.R (also using ukko5.jpg, download this and save it)

Don't feel like you have to learn every command, every argument and every method. We all look up information frequently, if not all the time. The key is to know enough that you can articulate your question. Most questions are already answered on the internet.

## Useful Visualisation Resources

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Below are some resources that I really like. There is no single resource I could suggest. Getting 'better' at visualisation requires some background knowledge, skills, a new perspective, and most of all it requires a lot of practice. The best way to improve is to keep trying stuff and failing better each time. You'll often hear about 'rules' but most design rules are contingencies. Though I do like the rules that 1) everything in the design should have a reason, and 2) get it right in black and white.

**Software (you can do amazing things in most software, but the greatest control and flexibility come with programming skills)... Every software has its good and bad bits.**

- R <https://www.r-project.org/>
- Processing <https://processing.org/>
- D3 <https://d3js.org/>
- Lyra (if you fancy something different!) <http://idl.cs.washington.edu/projects/lyra/>
- I love PowerPoint 😊

**This podcast is very interesting (most of the time) and covers a wide diversity of perspectives and topics. Lots of great resources available on the page for each episode.**

- <http://datastori.es/>

**These 'points of view' articles are really useful (and short)... there is about 40 in total (free to access)**

- <http://blogs.nature.com/methagora/2013/07/data-visualization-points-of-view.html>

**People to look out for (cool work and interesting thoughts)**

- <http://truth-and-beauty.net/>
- <http://tulpinteractive.com/>
- <http://www.stefanieposavec.co.uk/>
- <http://benfry.com/projects/>

#### A couple of blogs ...

- <https://eagereyes.org/>
- <http://www.perceptualedge.com/> (some revealing and entertaining controversies emanate from here!)

#### There is no single textbook that covers everything, but I'd recommend (in this order)

- Tufte, ER. The Visual Display of Quantitative Information. Graphics Press, USA, 2001
- Meirelles, I. Design for Information - An Introduction to the Histories, Theories, and Best Practices Behind Effective Information Visualizations. Rockport, 2014.
- Munzner, T. Visualization Analysis and Design. CRC Press, 2014. (also probably available via the library)
- Ware, C. Information visualisation – perception for design. Morgan Kaufman, 2012. (probably in the library as an ebook, chapter 1 and chapter 5 are worth a read)

#### A neat graphic design book:

- Design elements – a graphic style guide <https://www.amazon.co.uk/Design-Elements-Graphic-Style-Manual/dp/1592532616>

#### A great article that encourages you to take visualisation with a pinch of salt

- Hall, P. (2008) "Critical Visualization." In Design and the Elastic Mind, edited by Paola. Antonelli. 122-131. New York: Museum of Modern Art.

#### General articles on visualisation:

- McInerney, G J. et al. (2014) Information visualization in science and policy - engaging users & communicating bias. Trends in Ecology & Evolution. 29. 148-157. (I would update this now but there is some good stuff in there :)
- Spiegelhalter, D. et al. (2011) Visualizing uncertainty about the future. Science 333, 1393–1400
- Wainer, H. (1994). How to display data badly. American Statistician. 38, 137-147.
- Viégas, F. & Wattenberg, M. (2015). Design and Redesign in Data Visualization. Malofiej 22. [https://medium.com/@hint\\_fm/design-and-redesign-4ab77206cf9#.ubwv83fvv](https://medium.com/@hint_fm/design-and-redesign-4ab77206cf9#.ubwv83fvv)

#### An interesting discussion via an articles and 2 replies, on storytelling and narrative

- Krzywinski, M. and Cairo, A. (2013) Points of view: storytelling. Nat. Methods 10, 687
- Katz, Y. (2013) Against storytelling of scientific results. Nat. Methods 10, 1045
- Krzywinski, M. and Cairo, A. (2013) Reply to: 'Against storytelling of scientific results'. Nat. Methods 10, 1046

#### A couple of useful PLoS articles –

- <http://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1003833>
- <http://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1002128>

#### Some useful papers from the Vis community... there are hundreds more so this really is just a start!

- Heer, J., Bostock M. & Ogievetsky, V. (2010). A tour through the visualisation zoo. Communications of the ACM, 53(6), 59-67.
- Graphical Perception: Theory, Experimentation, and Application - <https://www.cs.ubc.ca/~tmm/courses/cpsc533c-04-spr/readings/cleveland.pdf>