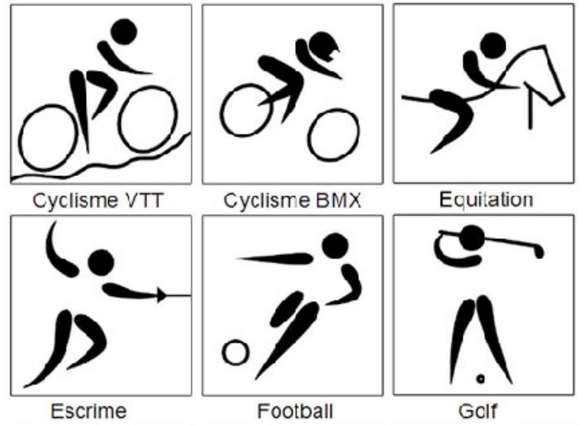
Graphics

Graphics

- A good graph
  - Provides the greatest number of ideas / information
  - Clarity : can be understood immediately
  - Relevant : answers one specific question
  - With the least amount of ink
  - In the smallest amount of space
  - And is aesthetic



International olympic committee

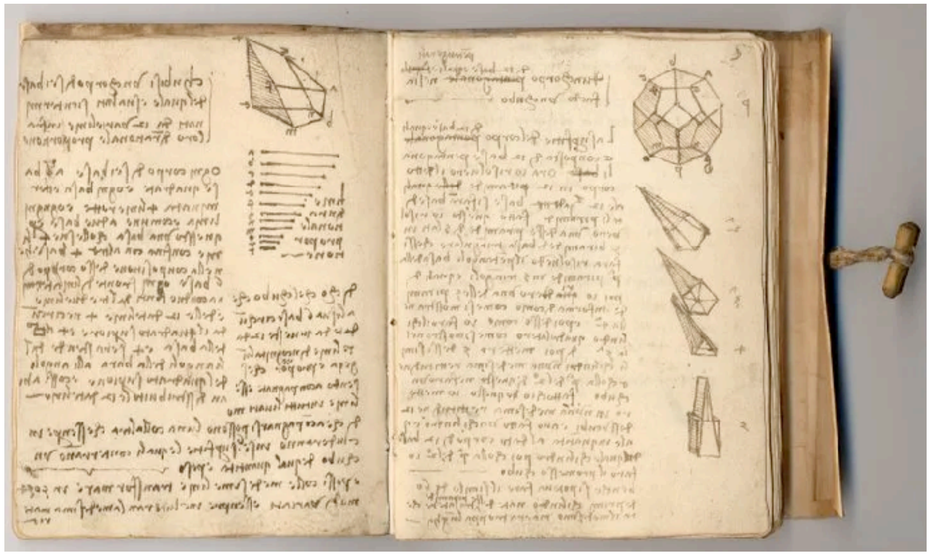
Graphics

“Show me your graph and I shall tell you how well you understand the problem”

Graphics

- A good graph **complements** you message
  + reinforces it
  + introduces a touch of creativity
  + is properly integrated in it

Leonardo da Vinci



- BEWARE : part of your audience will mainly focus on graphs

Graphics

Figure captions

- Should
  - Describe what is shown, e.g.
    “displacement versus age for a sample of xxx”
  - Provide all important experimental details
  - Identify multiple curves or traces

- Should NOT
  - discuss or interpret the results
  - be vague, e.g. “plot of the data”

What is wrong here ?

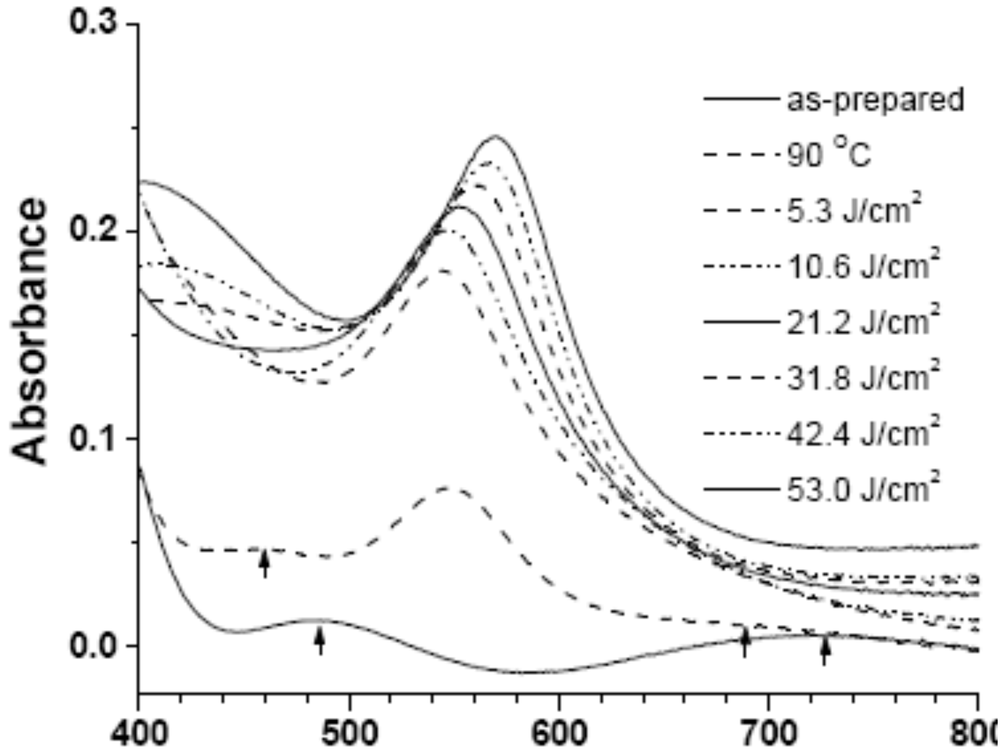
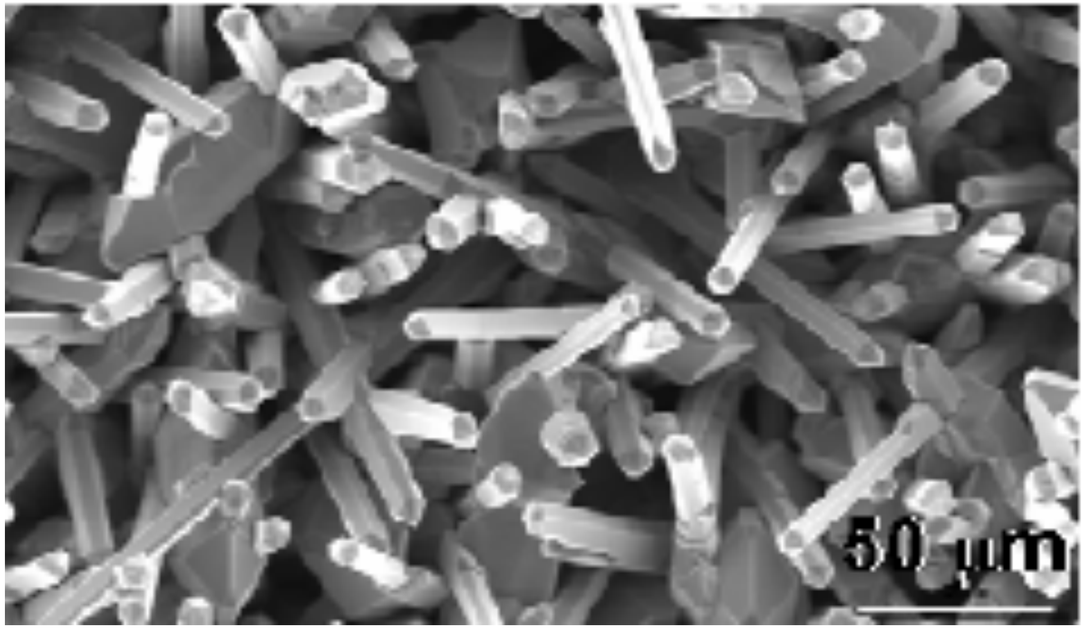


Figure 3 Optical absorption spectral evolutions of in-situ generated
inside the hybrid (SiO_2-TiO_2–PEO) film matrix with respect to the th
treatment energies.

What is wrong here ?



What is wrong here ?

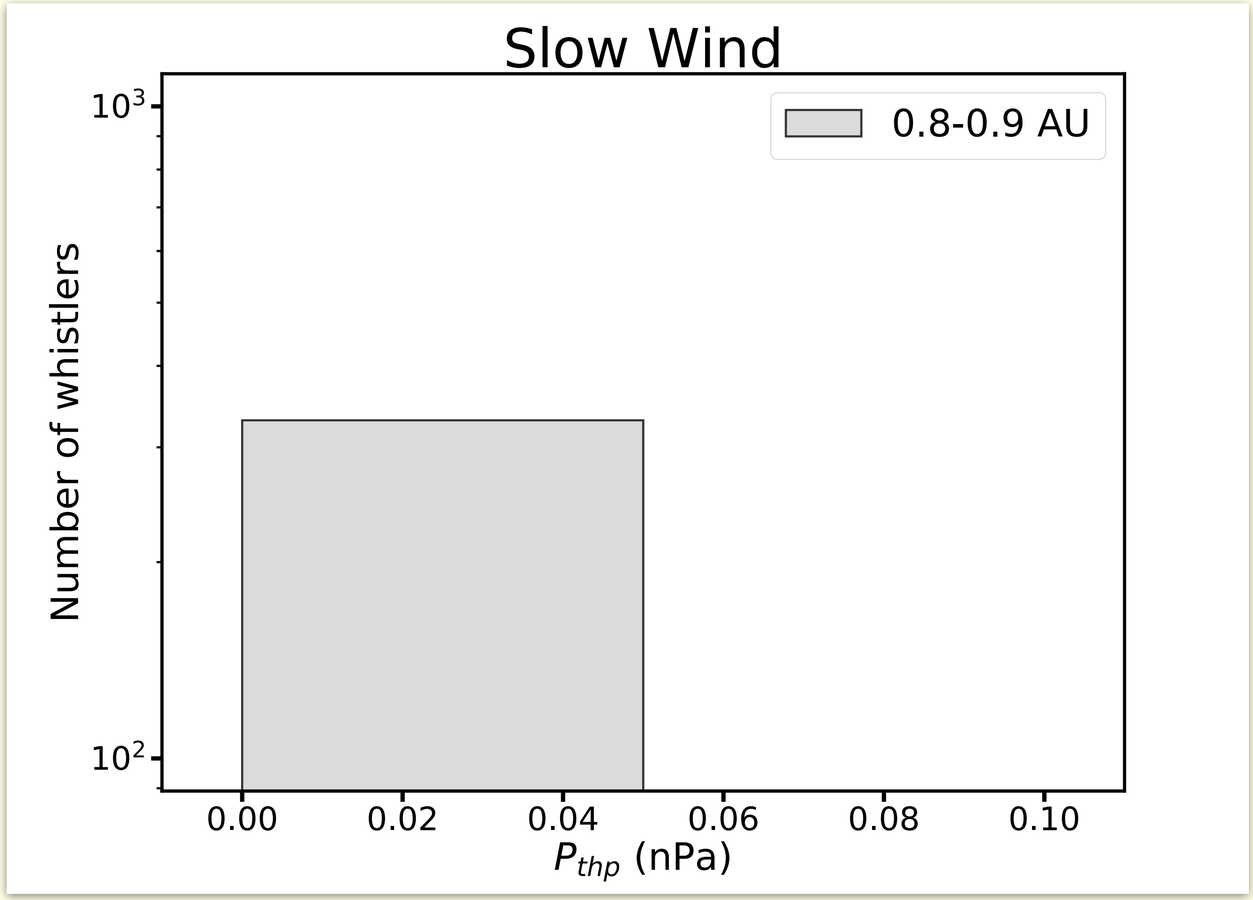


FIGURE 5.17: Proton thermal pressure of whistler waves observed between 0.8 to 0.9 AU (a) fast wind and (b) slow wind.

What is wrong here ?

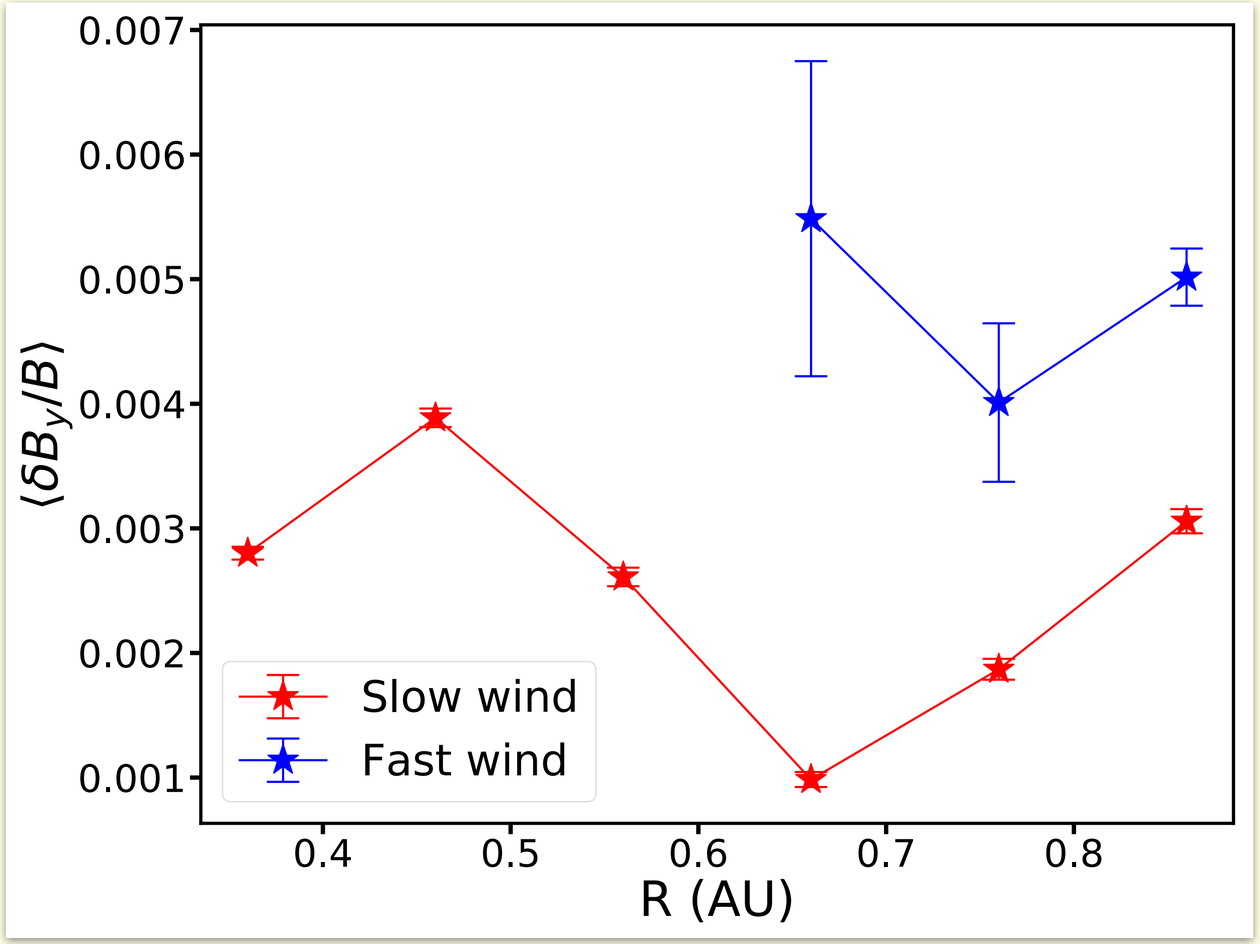
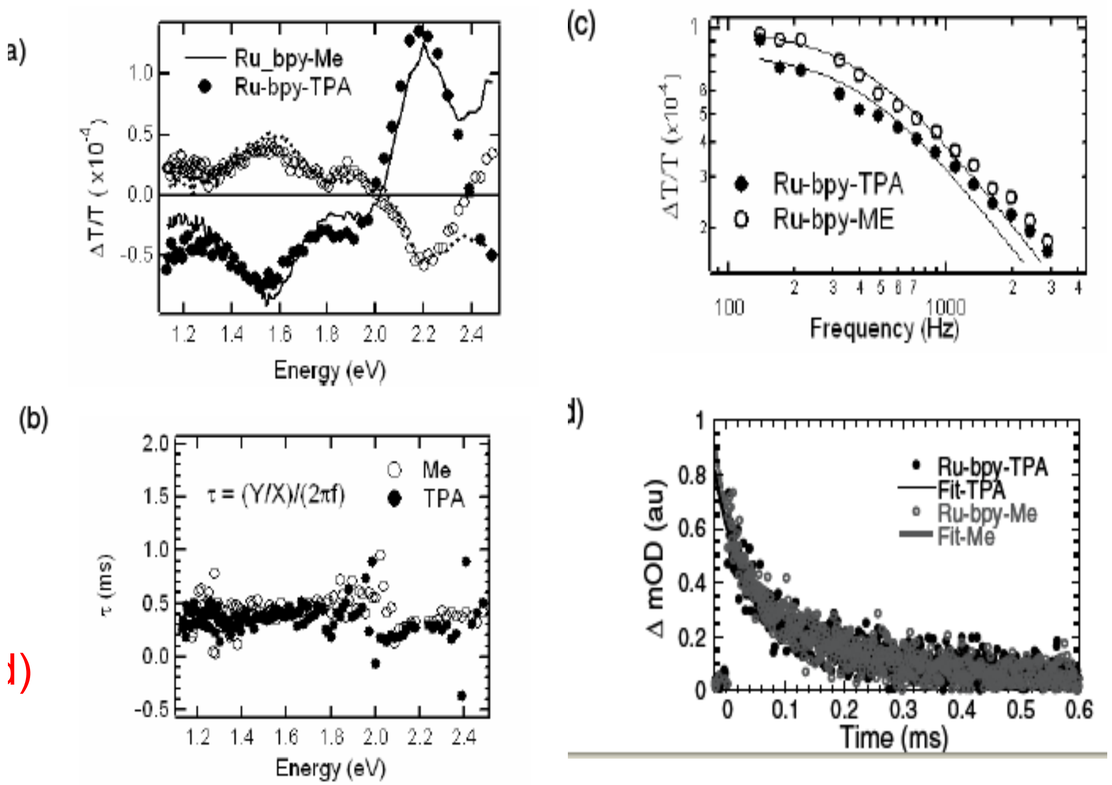


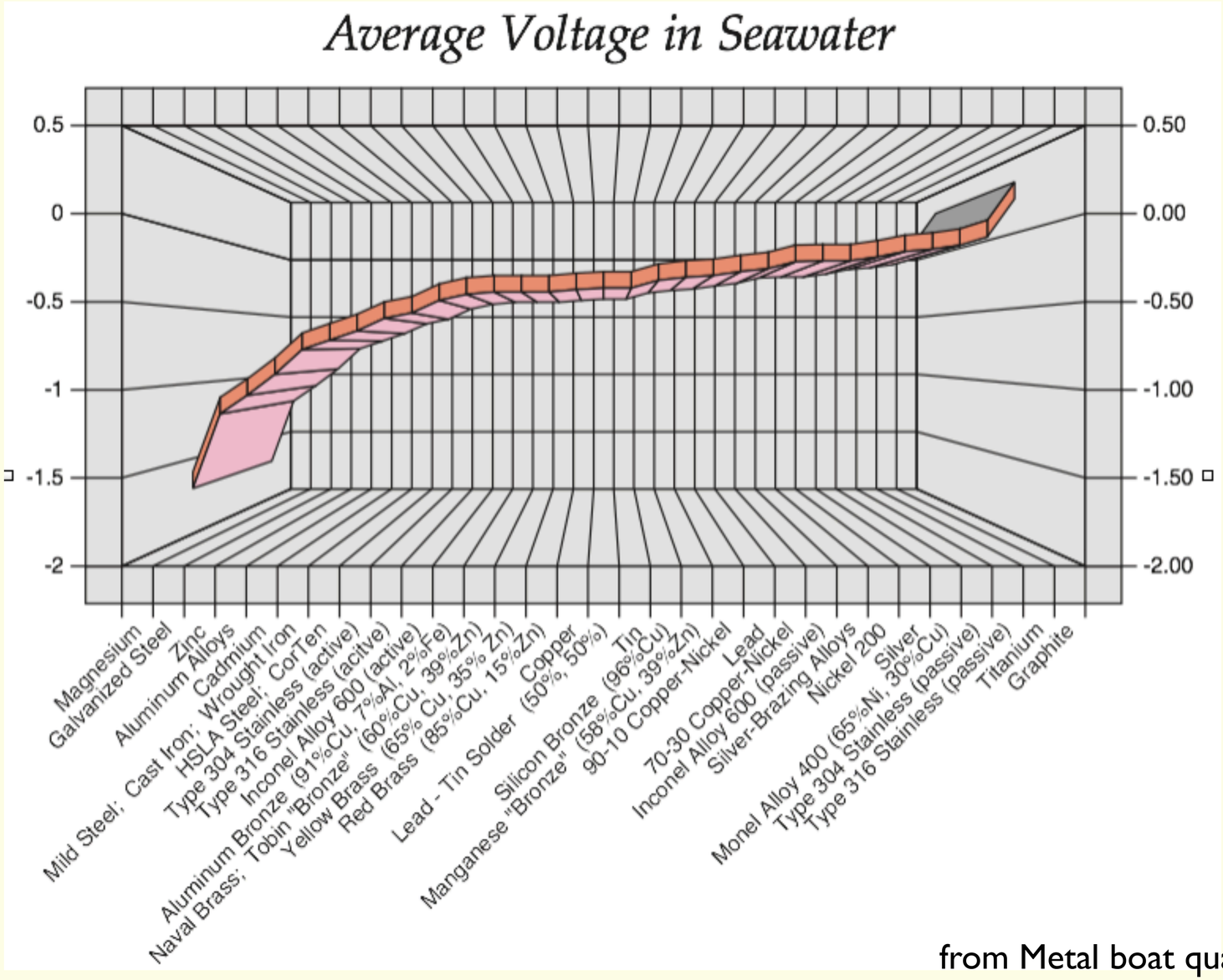
FIGURE 5.20: Normalized amplitude of whistler waves in the slow and fast solar wind, error bars show the standard error ($\frac{\sigma}{\sqrt{n}}$)

What is wrong here ?



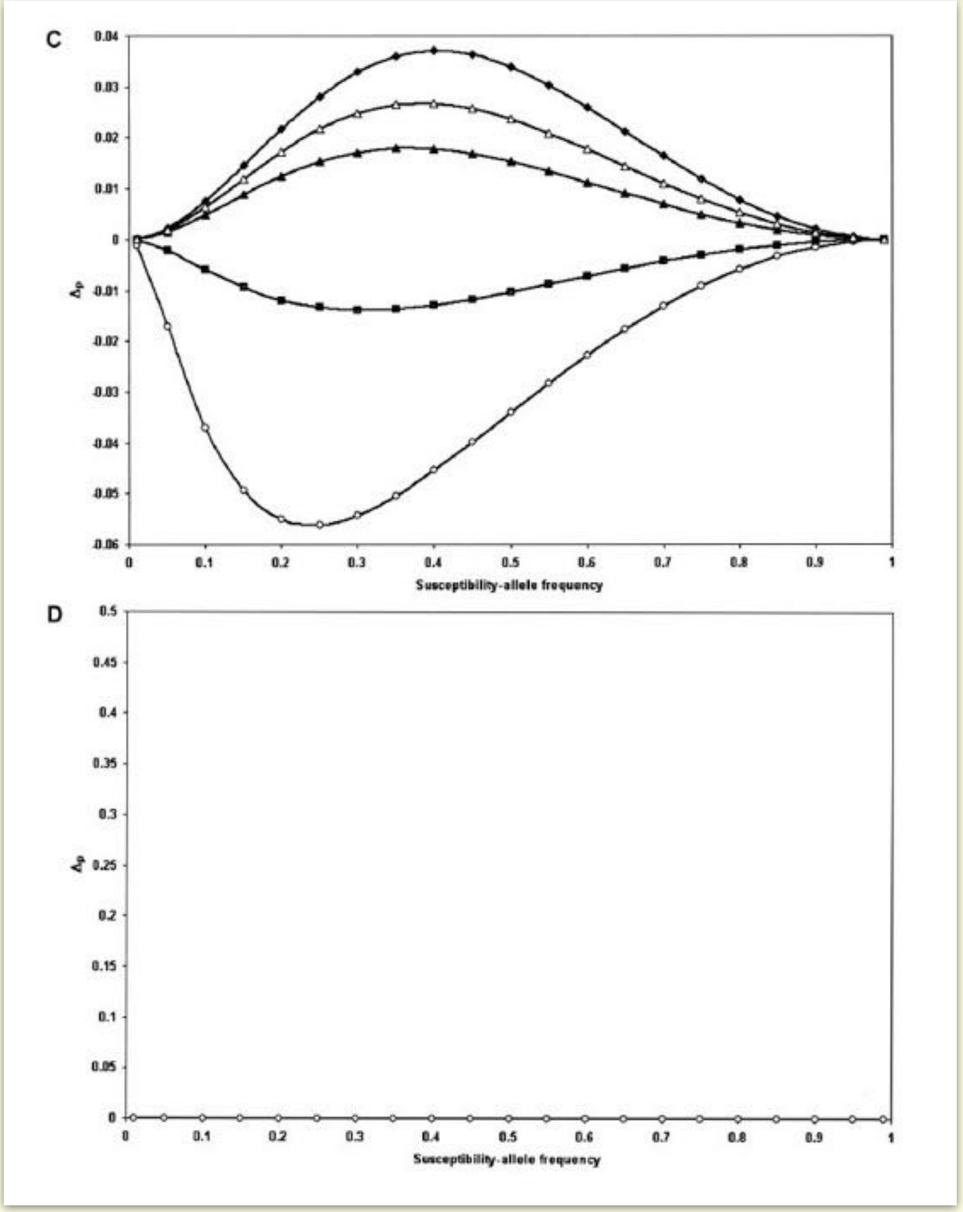
- Figure 2, a) Photo induced absorption (PIA) spectra for 1.4 µm thick mesoporous TiO2 films sensitized with Ru-bpy-TPA (circles) and Ru-bpy-Me (lines), pumped at 488 nm with an intensity of 128 mWcm-2 and a frequency of 200 Hz. The open circles and the dashed line correspond to the out-of-phase signals for the Ru-bpy-TPA and Ru-bpy-Me respectively. b) The frequency dependence of the PIA signal (dr = (dx2+dy2) at 800 nm (1.55 eV) under the same pump beam conditions as above. c) Transient absorption spectroscopy (TAS) of two similar samples to above, Ru-bpy-TPA (dark solid circles, solid line) and Ru-bpy-TPA (gray open circles, dashed line)of the transient absorption signal at 650 nm (~1.9 eV absorption of the oxidized dye species). The pump was at 600nm with a pulse width of ~ 5 ns with 35 µJ/pulse and a repetition rate of 30 Hz.

What is wrong here ?



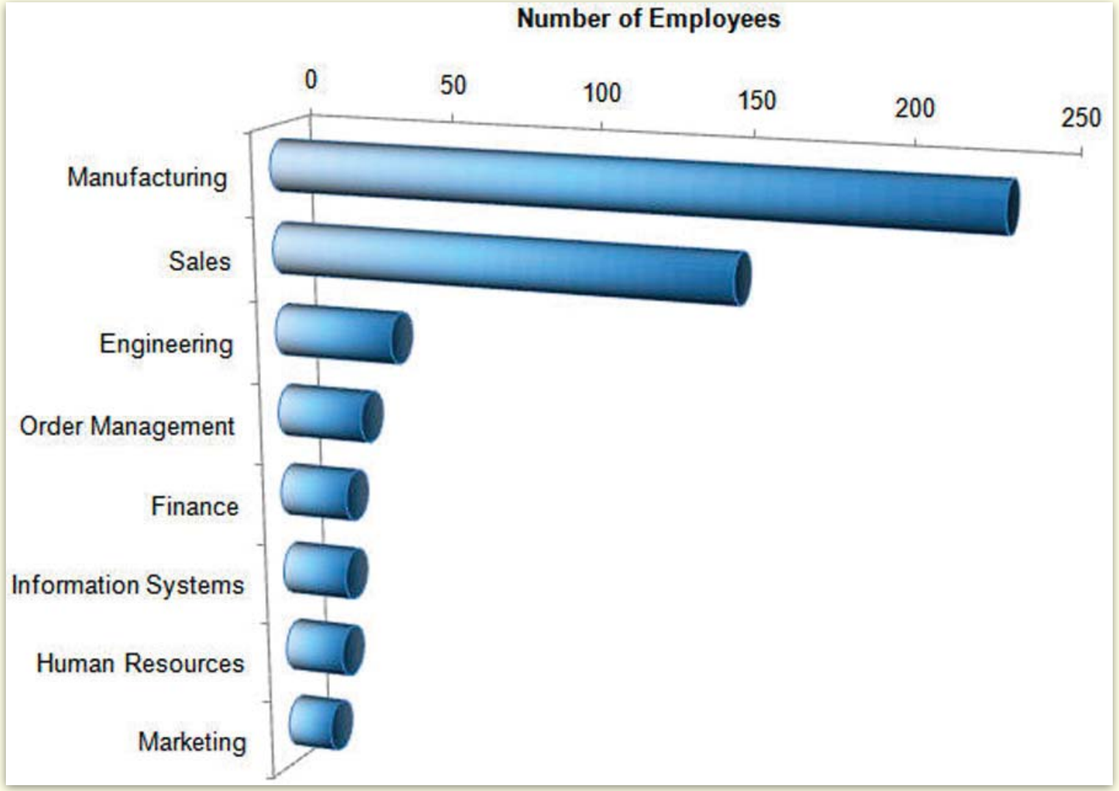
from Metal boat quarterly (1997)

What is wrong here ?



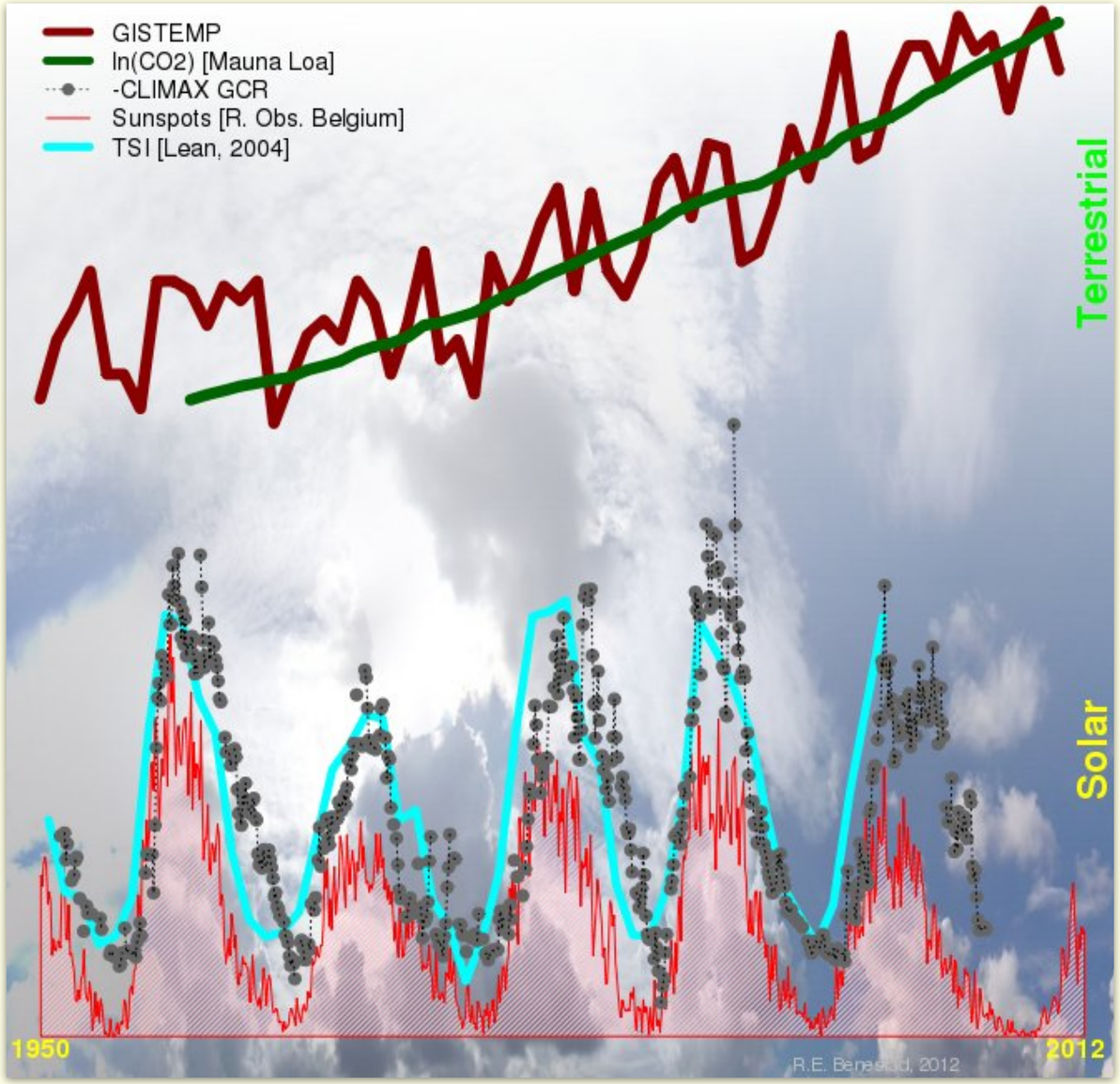
Wittke-Thompson et al. (2005)
Rational inferences about departures from Hardy-Weinberg equilibrium

What is wrong here ?



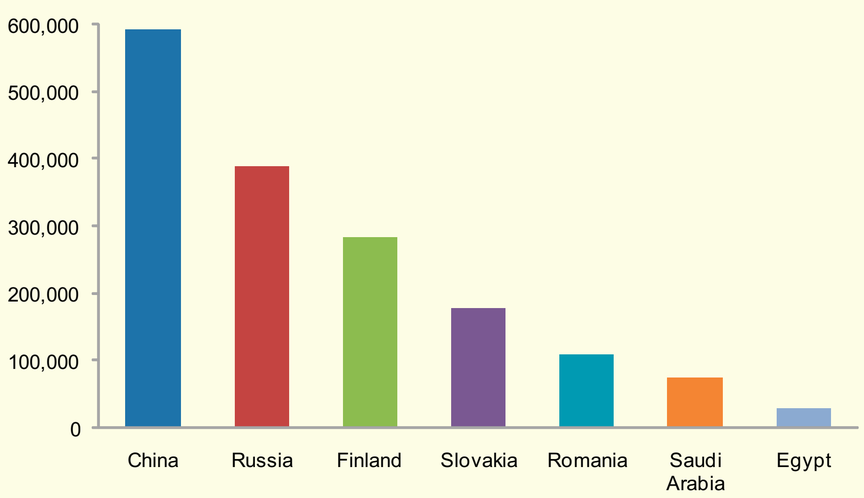
Stephen Few (2008)

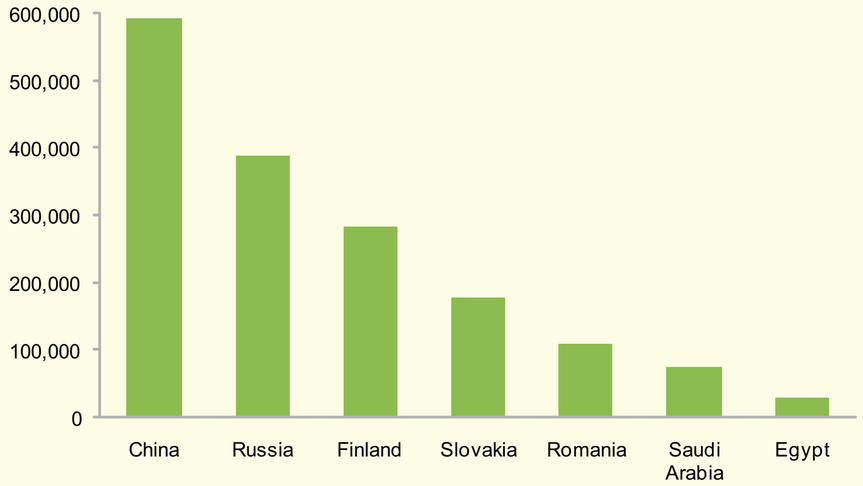
What is wrong here ?



R. Benestad (2015)

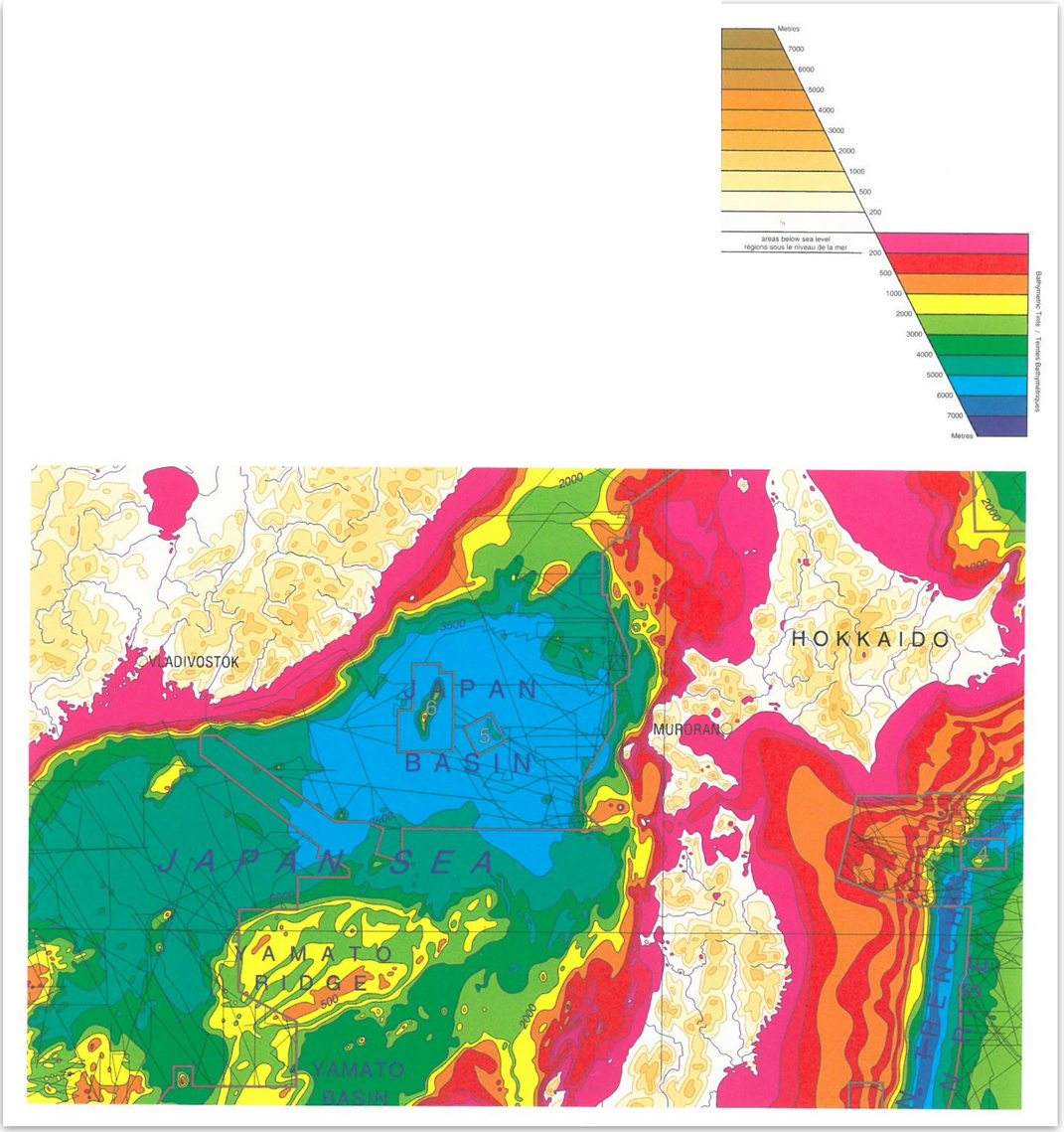
Which one is better ?





Use colours only when they add useful information

Colour palette

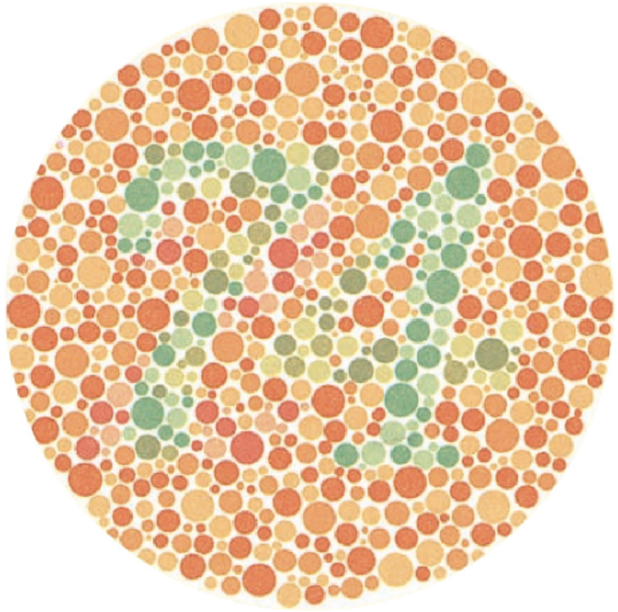


General bathymetric chart of the Oceans (GEBCO)

Coulours have a deep impact on what you want to reveal

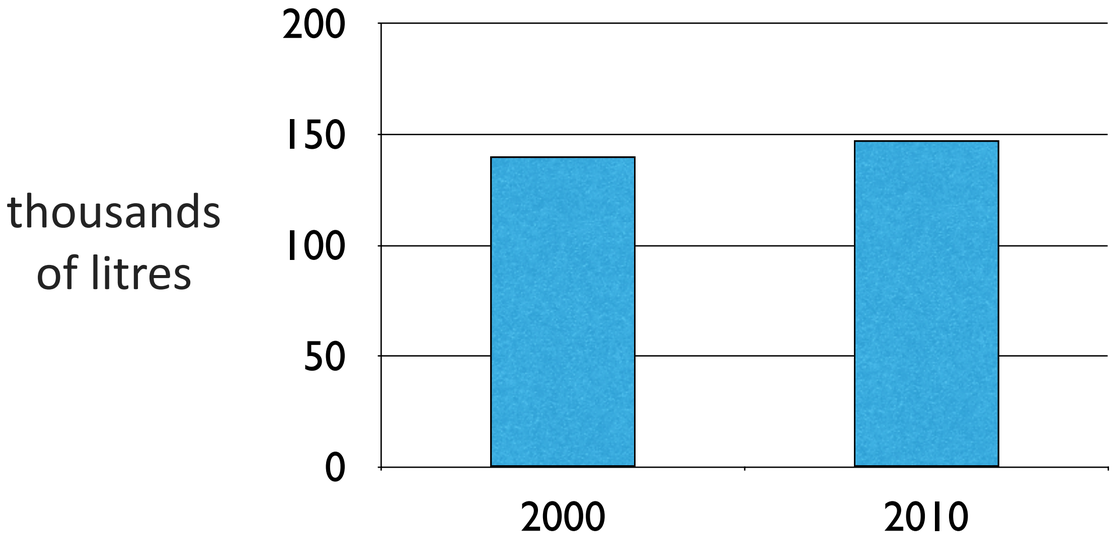
Some combinations must be avoided

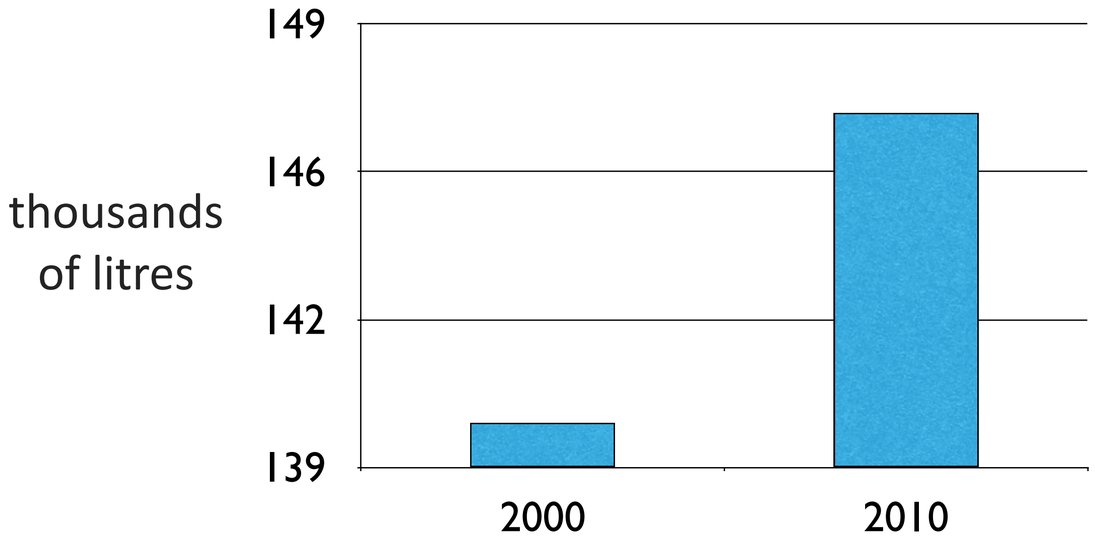
- Red and Green
  - about 10% of men suffer from daltonism
- Colours that will appear similar in black and white



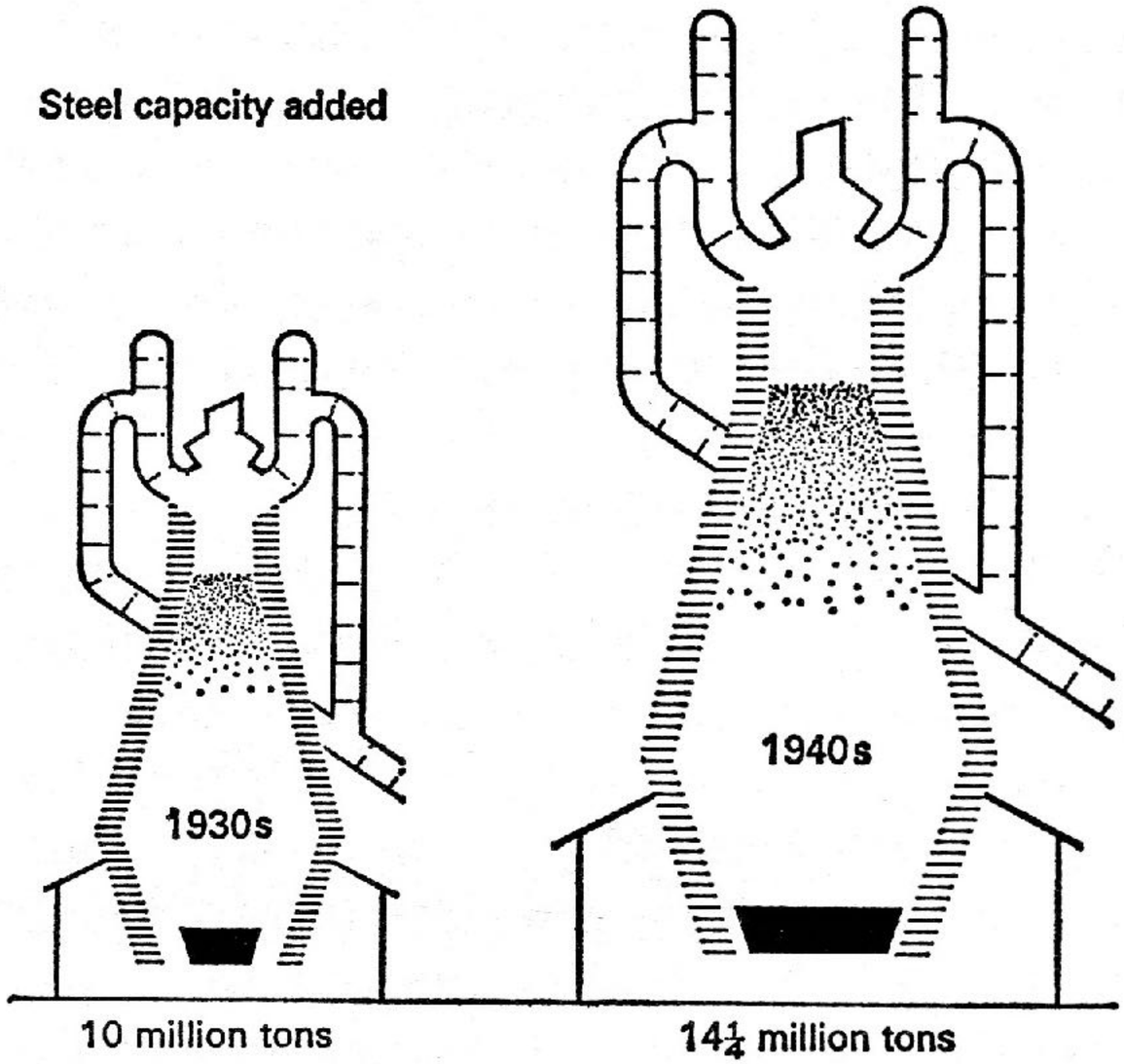
Isahara plates: what number is shown ?

Treacherous graphs



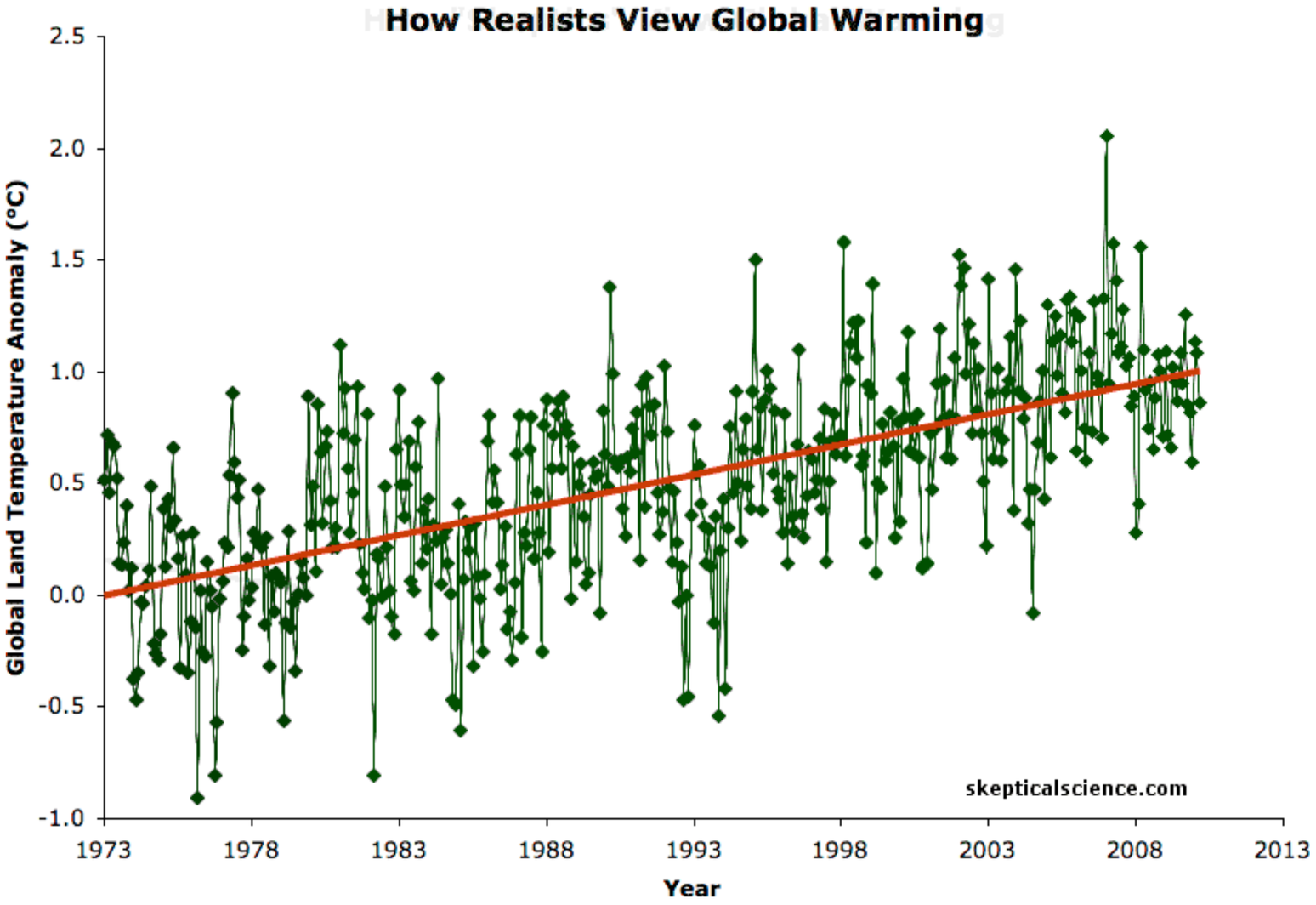


Treacherous graphs



How to lie with statistics (1989)

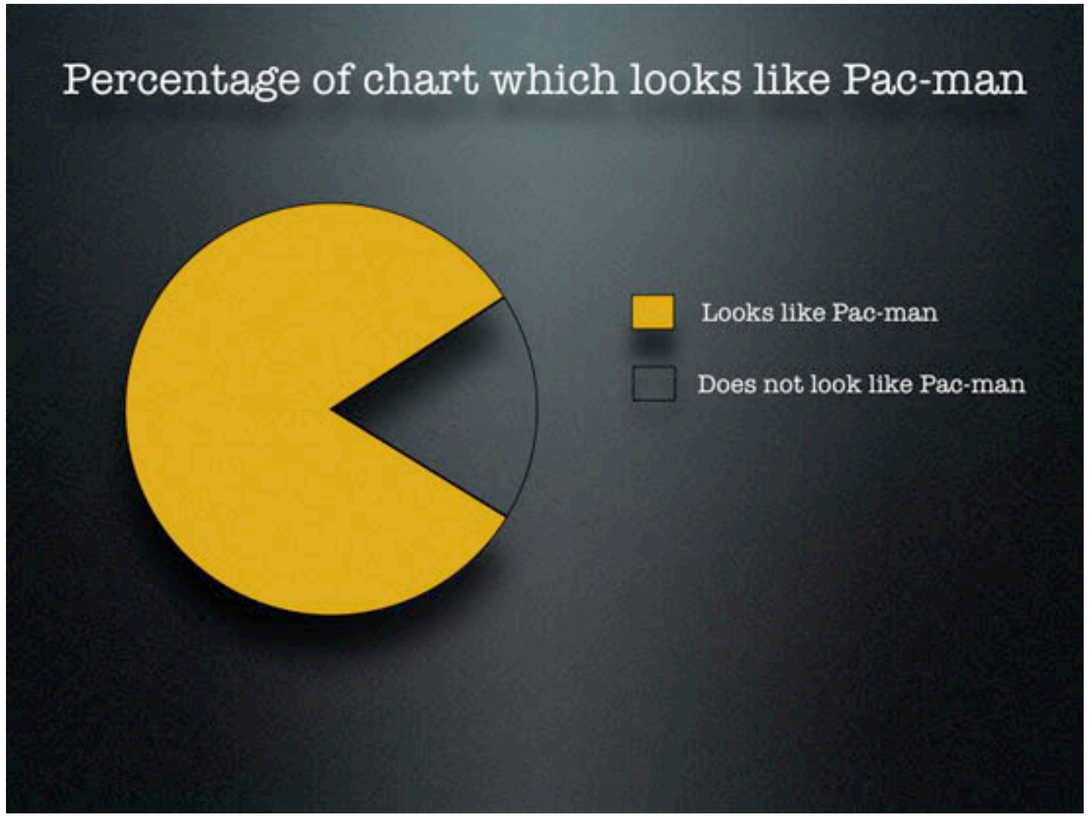
Treacherous graphs



Global land temperature
Skepticalscience (2012)

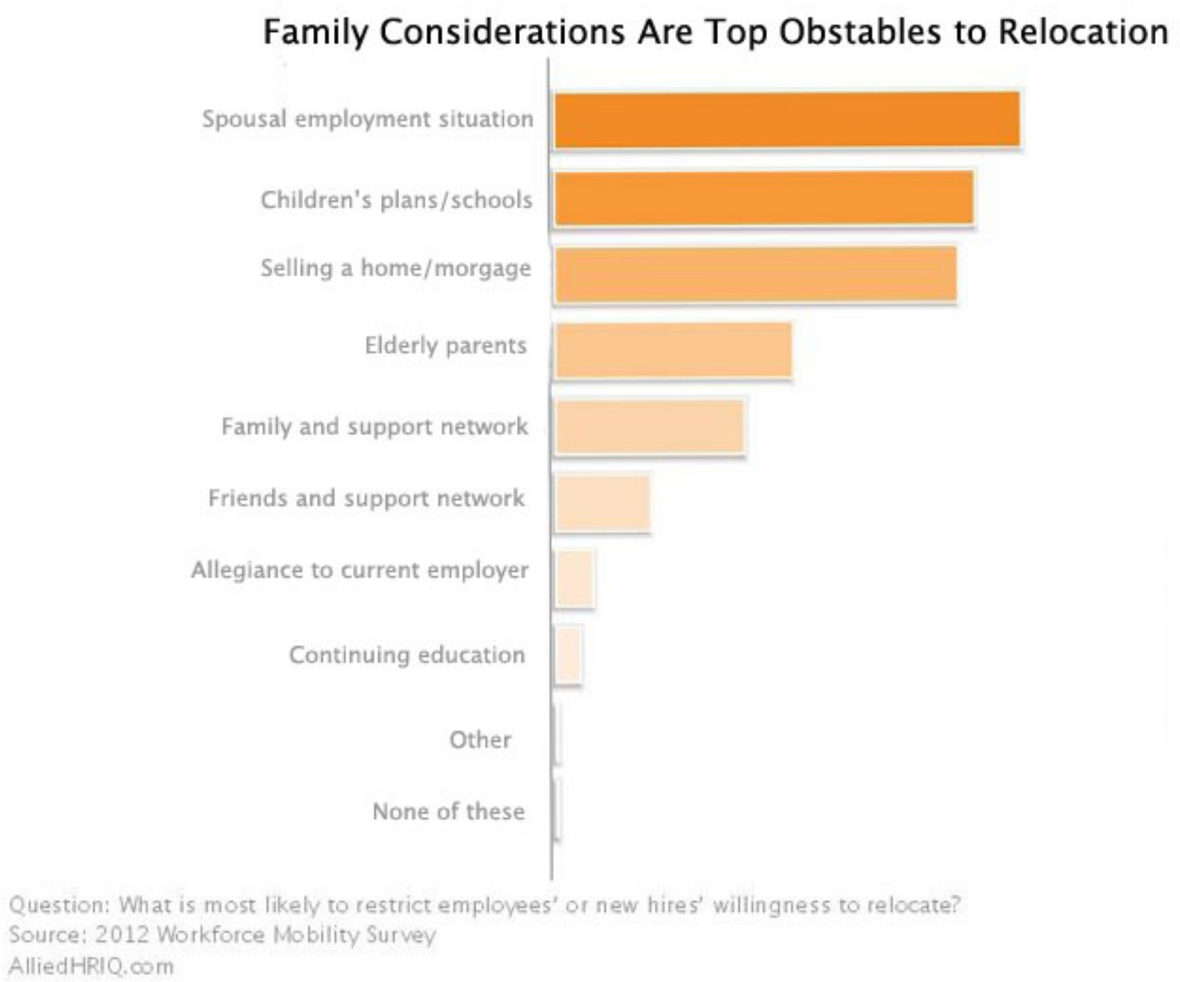
Some better examples

Examples



A. Gelman (2002)

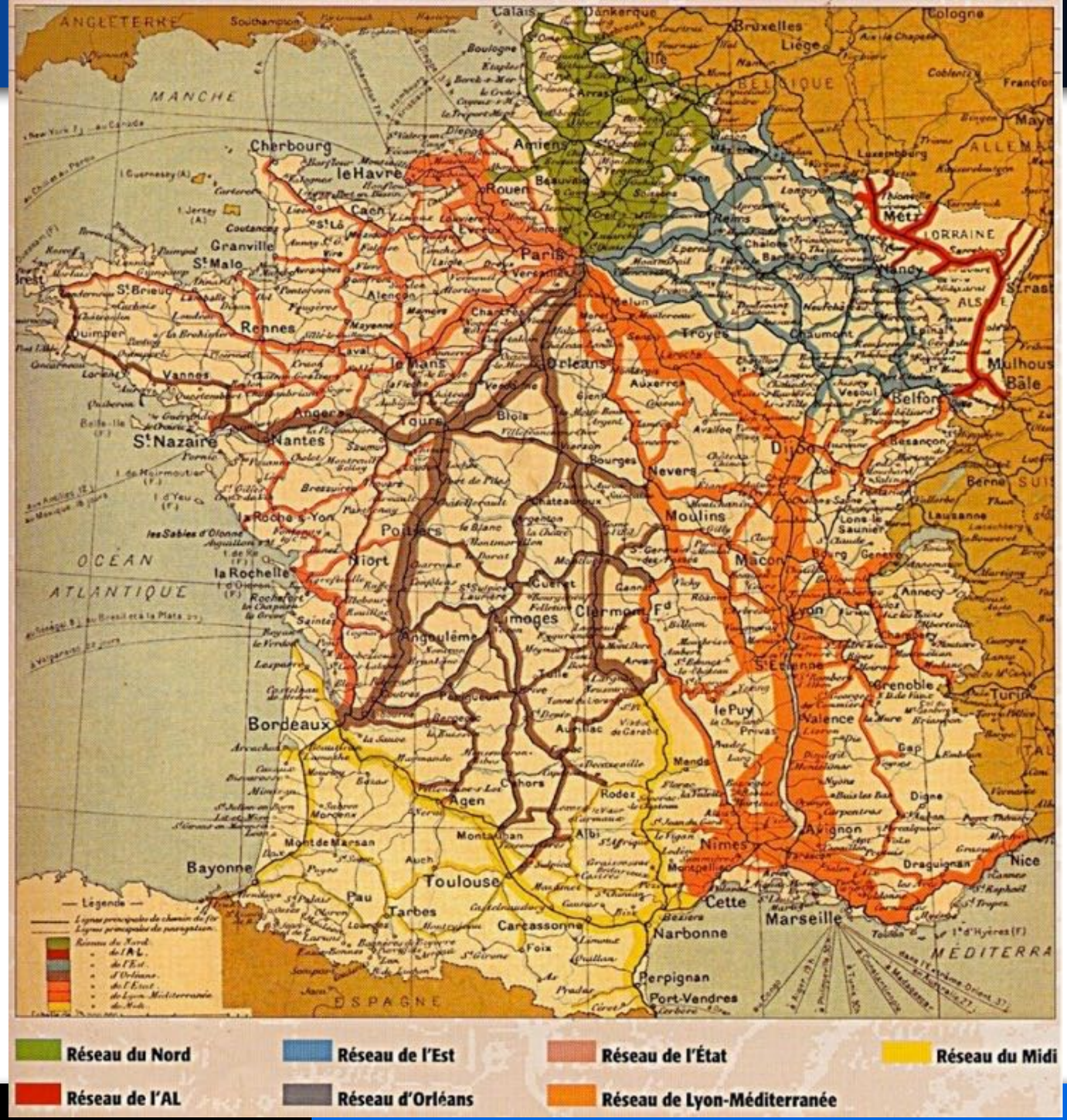
Examples



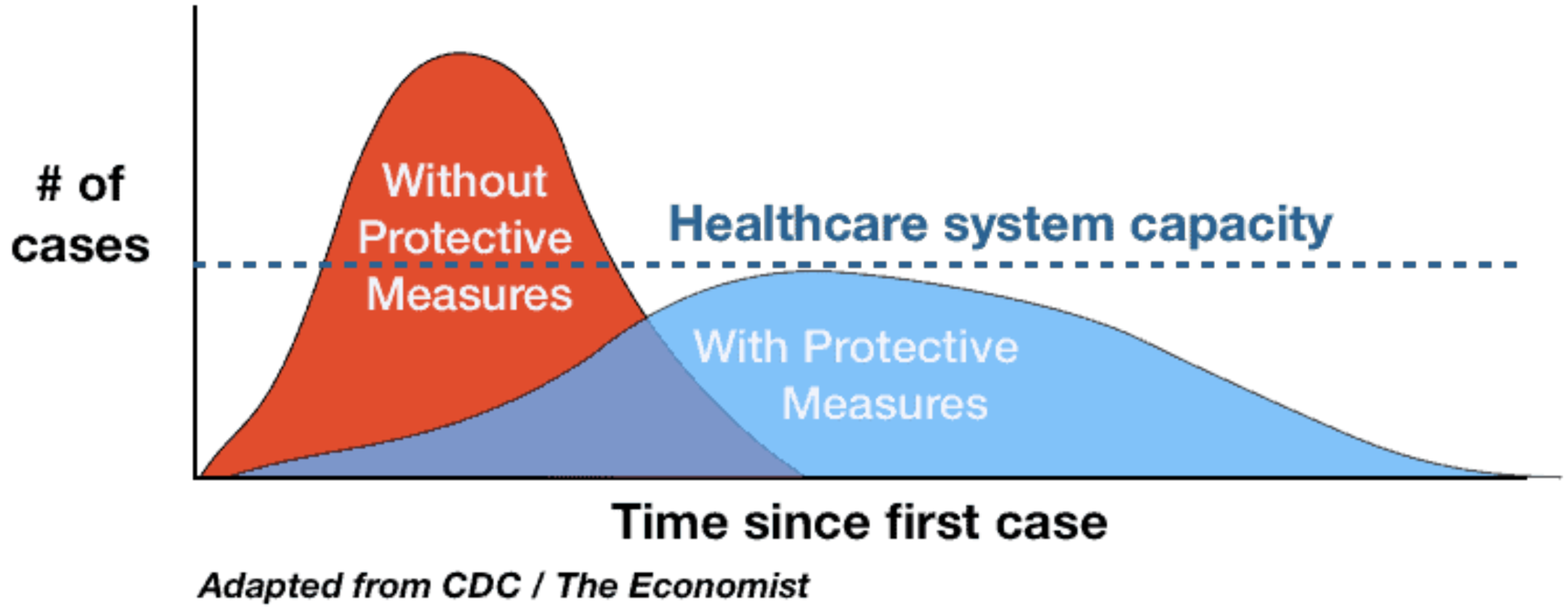
http://compensationinsider.com/a-good-graph-is-worth-a-thousand-words/

Examples

Map of the French Railway network (1934)



Examples



The COVID-19 “Flatten the curve” plot

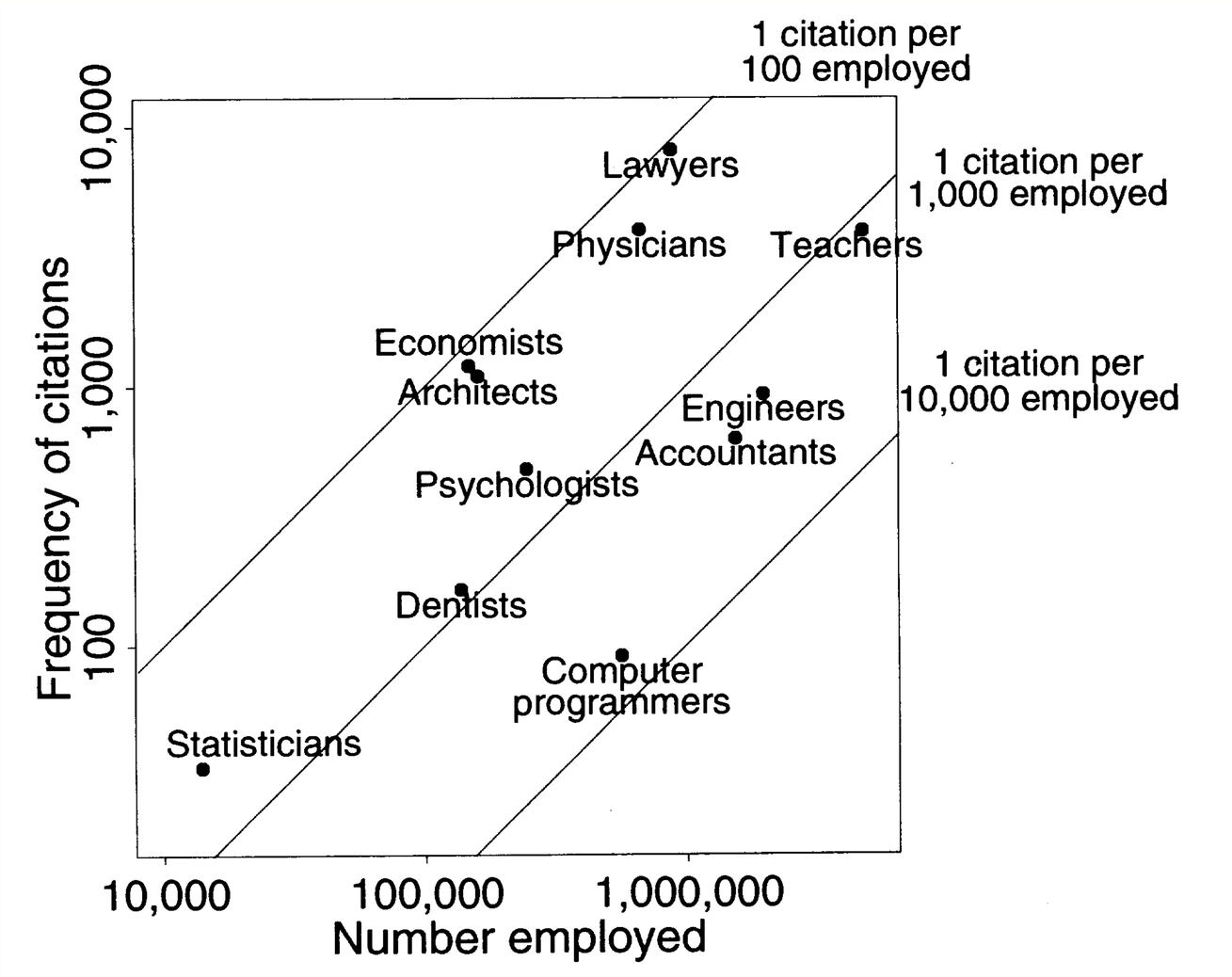
How to turn this into a good graph ?

- Counts of citations of various professions in the New York Times

Profession	*Frequency of recent citations*	*1996 total employed (1,000)*	*Relative frequency*
Lawyers	8101	880	9.2
Economists	1201	148	8.1
Architects	1097	160	6.9
Physicians	3989	667	6.0
Statisticians	34	14	2.4
Psychologists	479	245	2.0
Dentists	165	137	1.2
Teachers (not university)	3938	4724	0.8
Engineers	934	1960	0.5
Accountants	628	1538	0.4
Computer programmers	91	561	0.2
Total	20,657	11,034	1.9

A. Gelman et al. 2002

How to turn this into a good graph ?



A. Gelman et al. 2002

Graphics

For examples of beautiful or inspiring graphics, see

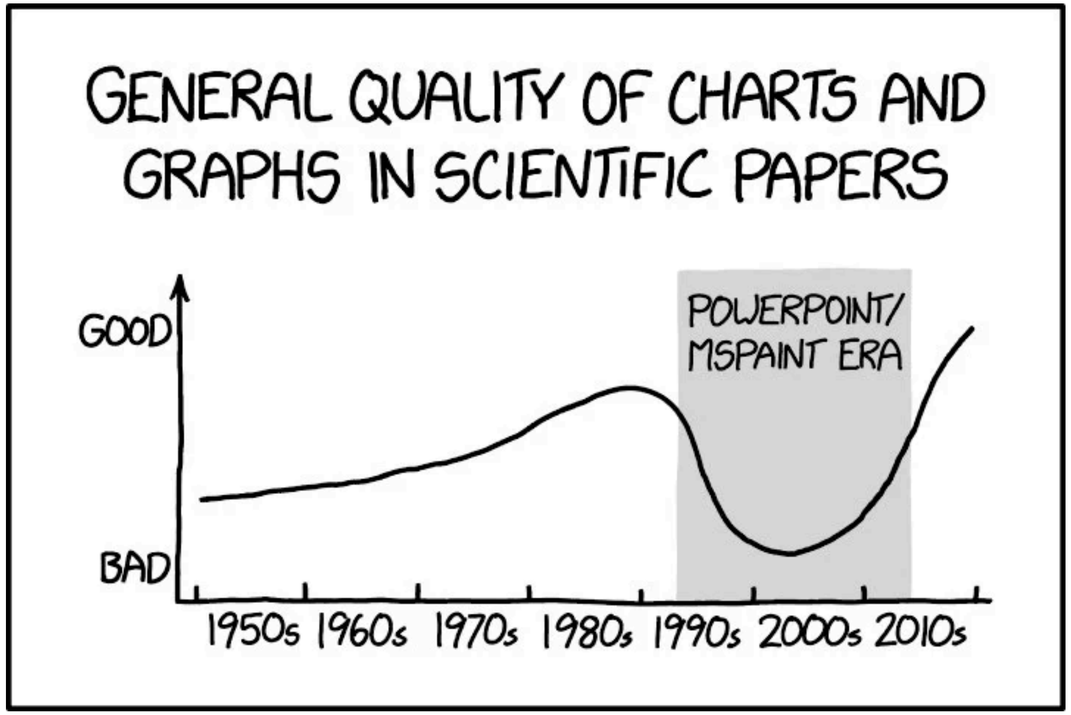
- https://informationisbeautiful.net
- http://www.storytellingwithdata.com
- https://www.edwardtufte.com/tufte/
- https://store.xkcd.com/collections/posters
- https://stats.stackexchange.com/questions/423/what-is-your-favorite-data-analysis-cartoon

One last thing…

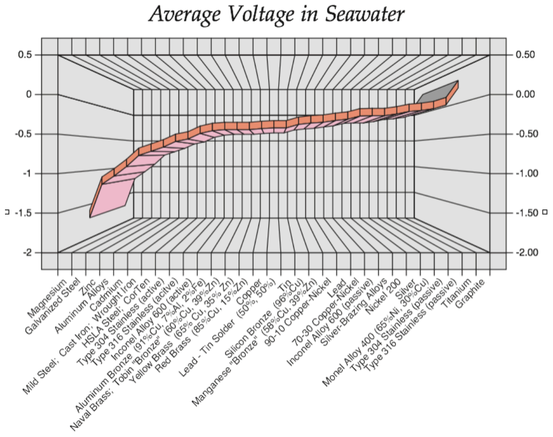
- Fill free space **intelligently**
- Fonts can be 10 to 20% smaller than in main text. **But not less!**
  Most plot have fonts that are too small
- Label axes
- The legend is here only to **explain** what is on the figure,
  Do NOT use the legend to comment on it..

One last thing…

- Using smart graph tools is no guarantee that your graph will be smarter



xkcd



Where should I publish ?

Different types of article : choose the proper one

- **Journal paper**: presents final original results, careful description of technique etc., refereed
- **“Letter to the Editor” or Rapid communication**: short research paper that requires rapid publication (sometimes esteemed higher than regular papers) refereed
- **Special issue** : in general, following a conference. More focused, but with hard deadlines.
- **Review paper**: summarises, evaluates and synthesises results already published elsewhere. Generally on invitation only. No description of personal achievements.
- **Proceedings paper**: Often preliminary results. Short, sometimes speculative and often not as important as a journal paper
- **PhD thesis:** Combination of above, but much more challenging !

Where to publish ?

Criteria to take into account

- What is the audience of the Journal ?
- In what countries will the journal be mostly read ?
- Impact Factor (IF)
- Overall quality of the journal
- Publication charges
- Quality of the editorial procedure: how many referees ?
- How long does it take to publish the article ?
- Quality of the proofreading ?

Impact factor

- Impact factor
  = average of citations per publication of the last 2-3 years
  = proxy for the relative importance of a journal within its field

$$IF_y = \frac{\text{citations}_{y-1} + \text{citations}_{y-2}}{\text{publications}_{y-1} + \text{publications}_{y-2}}$$

- Usually provided by Scopus or by Web of Science
- See: https://www.scijournal.org

Impact factor : examples (2018)

- Acta Geophysica : 0.9
- Annual Review Biochemistry : 19.9
- Applied Physics Letters : 3.4
- Astronomy & Astrophysics : 5.2
- Astrophysical Journal : 5.5
- Atmospheric Research : 3.8
- Combustion and Flame : 3.7
- Fuzzy Sets and Systems : 2.7
- Geophysical Research Letters : 4.3
- Int Journal Modern Sciences and Technology : 0.7 (*predatory*)
- Int Journal Science and Nature : 0.9 (*predatory*)
- International Journal of Engineering Science : 4.4
- Journal of Geophysical Research : 3.31
- Journal of Hazardous materials : 6.6
- Living Reviews in Solar Physics : 12.5
- Nature : 40.1
- Nature Physics : 22.8
- Nature Geoscience : 13.9
- New England Journal Medicine : 72.4
- Physical Review Letters : 8.4
- Physical Review E : 2.3
- Plasma Processes and Polymers : 2.8
- Plasma Sources Science and Tech : 3.3
- Proc Nat'l Academy Sciences : 9.6
- Science : 37.2
- Scientific Reports : 3.9
- MDPI Sensors : 3.8 (*predatory*)

Impact factor : caution !

- Impact factor
  - cannot be used to compare across disciplines
  - is highly skewed by scoops and controversial articles
  - is moderately correlated with the quality of the results

- High impact factor $\not\Rightarrow$ / $\not\Leftarrow$ High quality journal

One last thing...

Non-refereed journals
or low-IF journals
usually are not considered for
promotions or for job applications.

When/what to publish ?

Important questions to ask yourself before writing

- What is your topic of discussion?
- Why is it important?
- How is it related to previous work in the field?
- What is new or different about your contribution?

Careful planning (before writing) will help you save a lot of time.

When to publish ?

My study is fully completed

- *Advantage* : results have had time to mature
- *Advantage* : less risk that someone else will steal my results
- *Disadvantage* : work may never get published, long article = extra work

I am still working on my study

- *Advantage* : ideas are still fresh + writing may give new ideas
- *Disadvantage* : contributes to publication inflation, results may turn out to be wrong by lack of hindsight

When to publish ?

The best publications generally are those which clearly express

one single,
simple,
novel idea
in an **elegant**
and **pertinent** way.

When to publish ?

Too many messages will kill your message