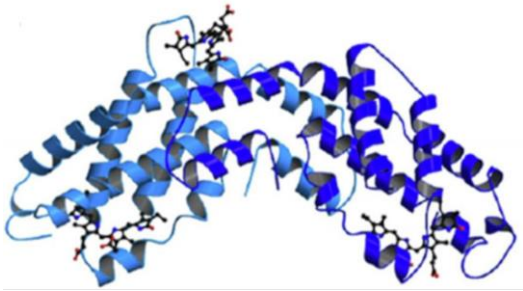
From the seed of an idea to fruitful research

Writing Successful Research Proposals

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What to write?

Start with an idea that excites you

- What is the key idea?
- Why is it important?
- What needs to be done in the research? (develop a method? Employ a known method to explore a new question?)
- How difficult are these goals?
- Do you have reason to think you can achieve them?
- If you achieve your goals what will it allow?



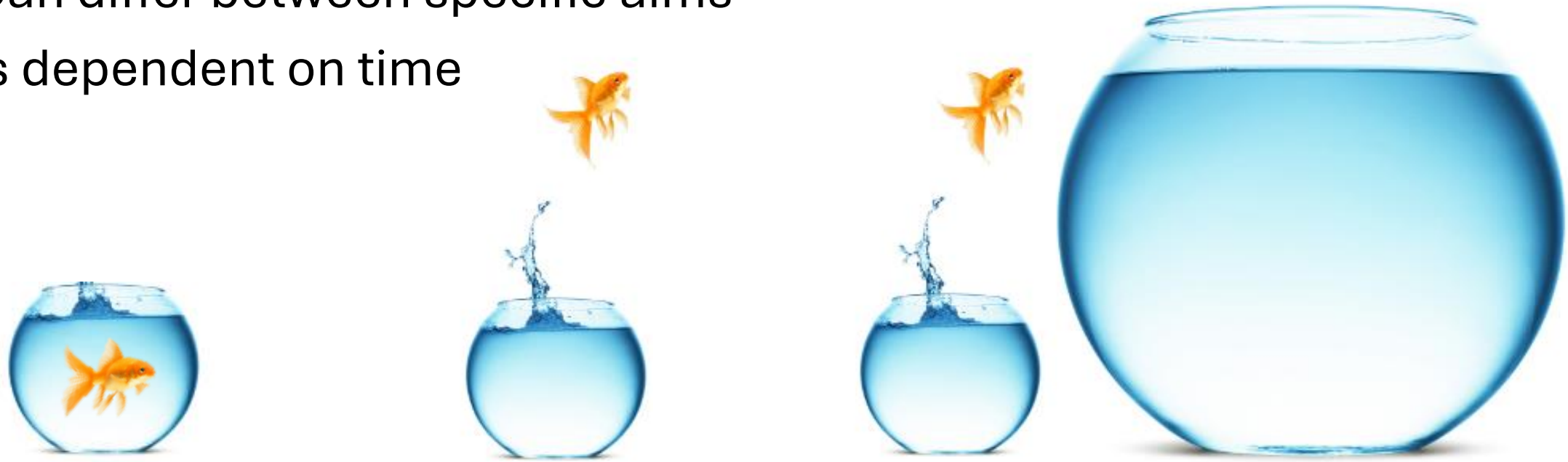


Main sections in most grant applications

- Background and challenge
- Hypothesis, Challenges, Overarching Goal and Specific aims
- Detailed Description of Proposed Research
- Preliminary Results
- Pitfalls and Expected Results
- Timescale and Feasibility
- Available Resources

Level of ambition

- Should reflect the level of ambition expected by the funding agency
- A higher risk should be accompanied by a higher gain
- Can be stated and should be explained
- Can differ between specific aims
- Is dependent on time



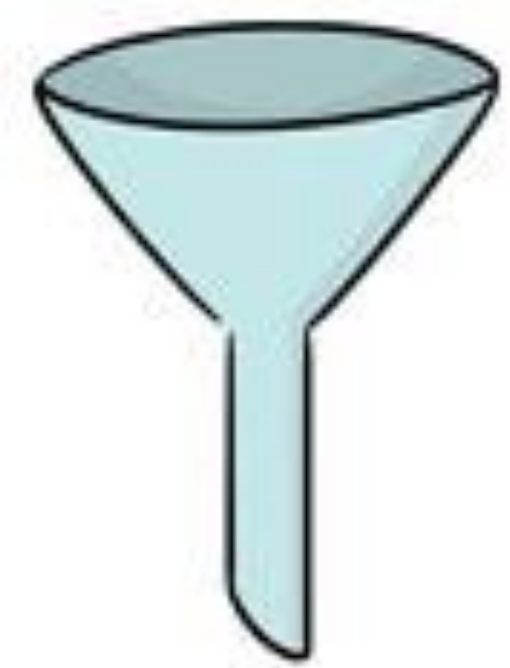
Low Risk

High Risk

High Risk – High Gain

How to write?

- Write clearly
- Write a single coherent document
- Write to your audience (audiences!)
- Present a well formatted document (what you see is what you get)



How to write?

A clear background is a good start

- Focus the reader
  - overarching idea in the first sentence?
  - overview figure?

- Provide only the details necessary to appreciate the proposal
- Concentrate on the state of the art today and not on the history of the problem
- Build towards stating the key challenge or gap in the state of the art

The heart of the proposal is the overarching goal and specific aims

- The overarching goal should directly reflect the main challenge / gap
- Break the goal into specific aims and explain how they connect and together address the goal (parallel vs sequential aims) and how ambitious they are
- Specific aims should be detailed not in a way that allows repeating the experiments (like a method) but in a way that details all the conceptual steps
- Human resources should directly relate to the aims (e.g. one student per aim / the most experienced team member on the most difficult aim)

Preliminary Results and Feasibility

- Convince the reviewer you can achieve your goals
  - Preliminary results
  - Detailed analysis of existing data
  - Demonstration of new methodology

- Convince the reviewer you have considered the challenges and can deal with them (potential pitfalls/risk mitigation) without too much detail

- Either dedicated section or integrated into aims (consider space)

Your experience and collaboration

(In individual grant applications)

- You need to demonstrate you have the skills and experience to lead the research
- Collaborations are usually appreciated but should be limited to specific aims
- The project outcomes should be improved by successful collaboration but not be dependent on it
- Need to be explained and justified



Funnel each section – from the big picture to the details

Aim 5 – Structural Characterization of Protein Misfolding

Studying protein misfolding is difficult since misfolded protein form disordered aggregates preventing structural analysis.

Restate challenge/ novelty/importance

The key idea here is to freeze proteins in a misfolded state before aggregation occurs.

High level description of the concept behind this specific aim

We will solve cryoEM structures of protein folding intermediates stalled during ribosomal translation.

The details

5.1 protein choice and controls

5.2 stall sequence – what/where/how

5.3 purification process

5.4 data processing

Write one document for many readers

Panel of experts



External Review



- Broad backgrounds
- Limited time
- Dealing with many proposals
- Fulfil agenda

- Experts in your field
- Understands state of the art, methodology, terminology
- Will look at specific details

Help yourself by helping the panel

- Use easy to follow and clear sentences
- Don’t use field specific acronyms or jargon
- Use consistent terminology that has been defined
- Use consistent and easy to follow numbering along with keywords

	Year 1	Year 2	Year 3	Year 4	Year 5
Structure Analysis					
Machine learning					
Protein Design					

Help yourself by helping the panel

- Reiterate keys points
- Use different methods to highlight key points, making them easy to identify

- Use dedicated boxes to focus the take home messages

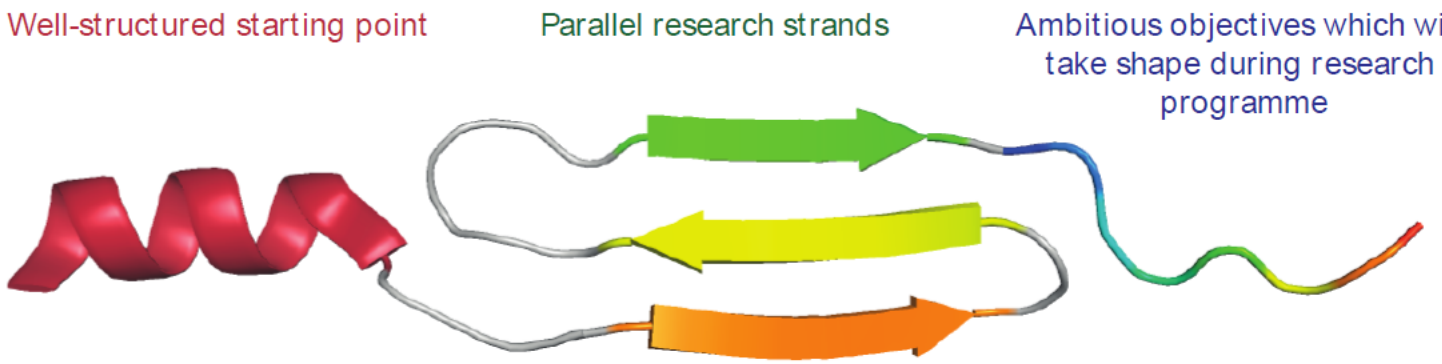
- Follow the instructions
- State the obvious
- Directly address criteria using keywords flags (all of the criteria)

Be creative and memorable

- Use clever titles and acronyms
- Use analogies

  “Protein are like IKEA furniture – designed to come together even in the absence of (genetic) instructions”

- Analogies in figures



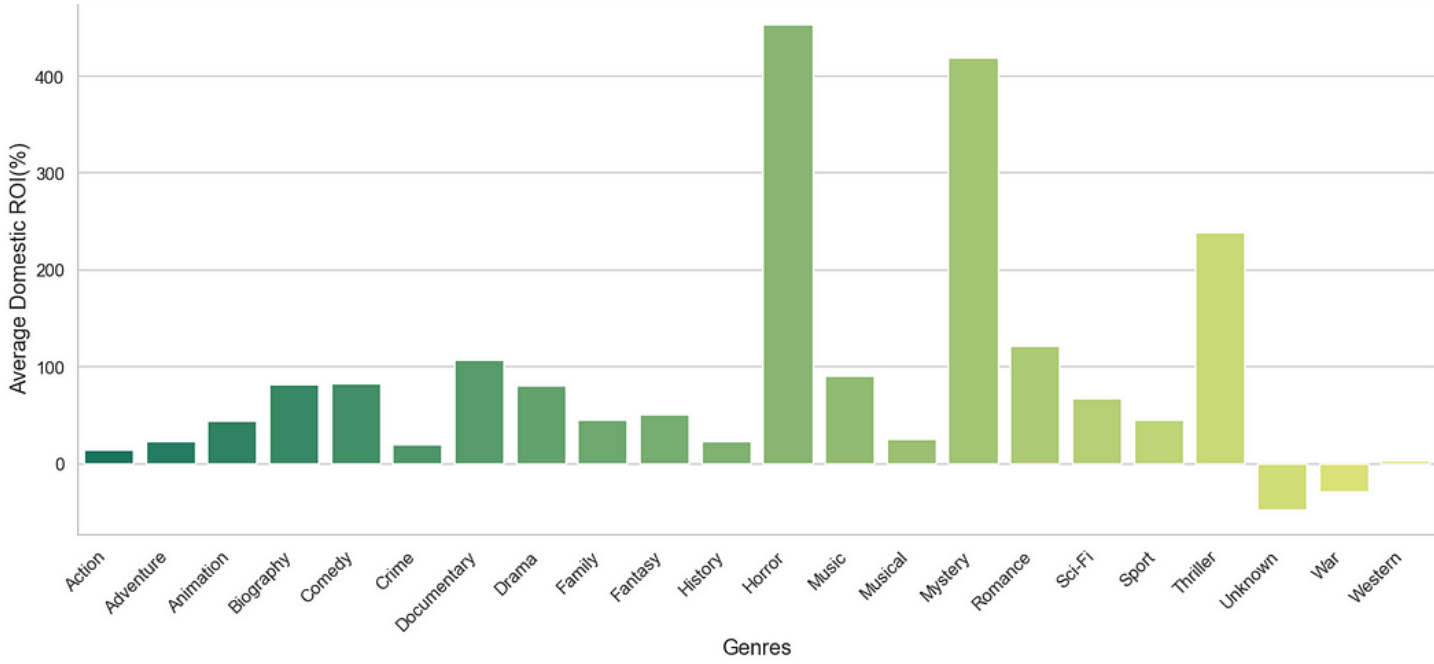
Year 1	Year 2-4	Year 5

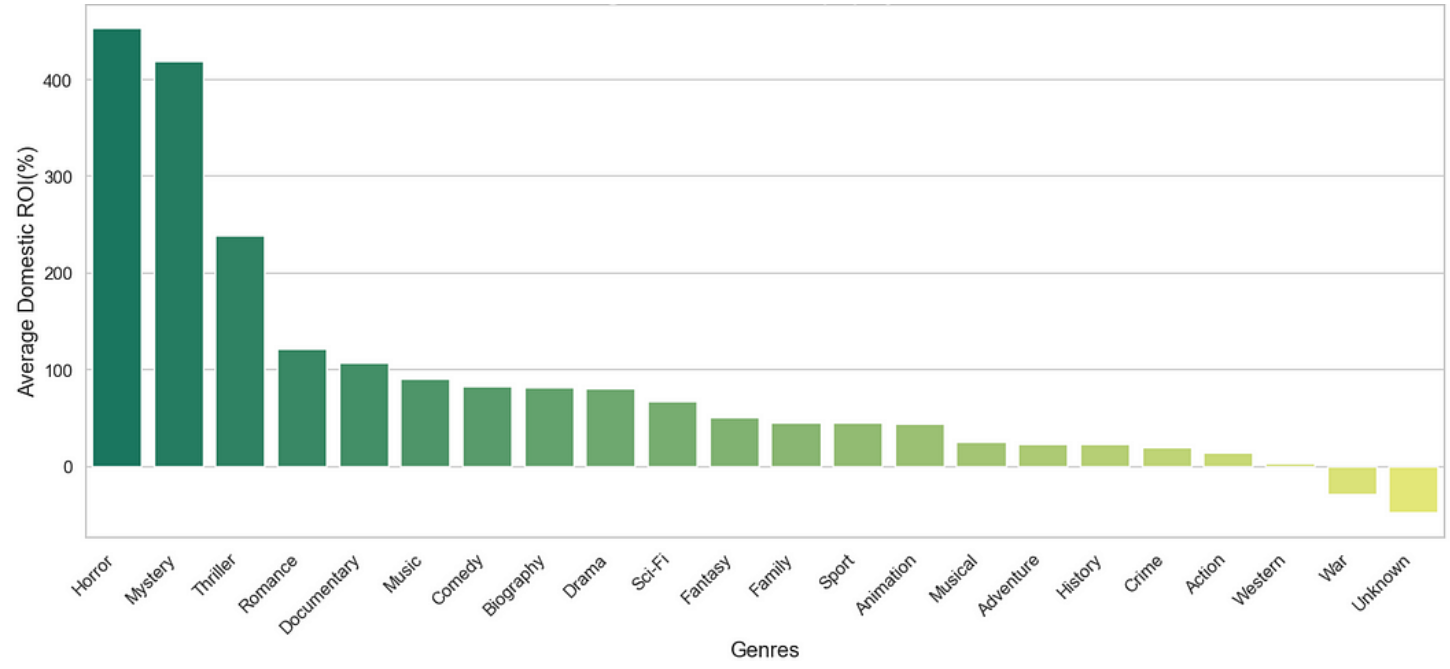
- Everything in moderation

A figure is worth 1000 words

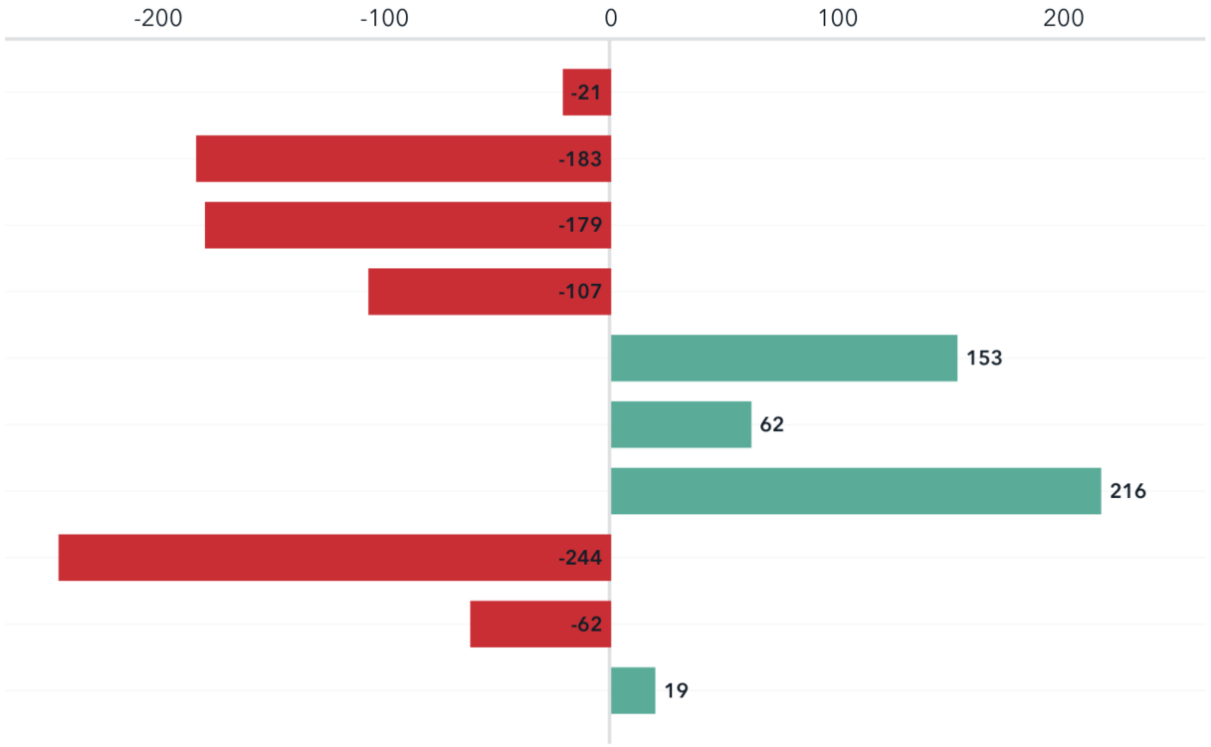
- High resolution and only showing relevant details
- Make figures and legends self contained
- Consider a graphical abstract on the first pages
- Use a scheme to show how the aims interact and come together to achieve the overall goal (and how preliminary results of collaborations fit in)

- Make sure the point of the figure is clear

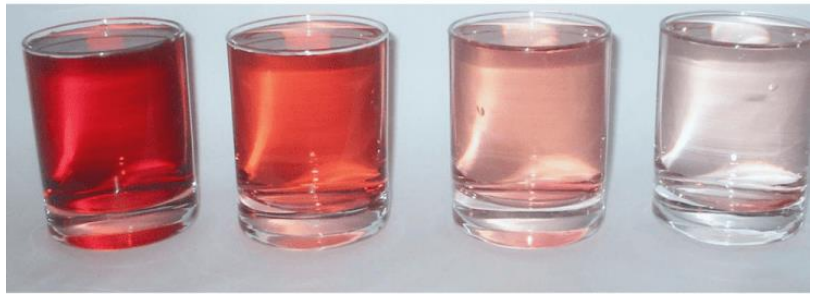

Average Domestic ROI(%)
400
300
200
100
0
Action
Adventure
Animation
Biography
Comedy
Crime
Documentary
Drama
Family
Fantasy
History
Horror
Music
Musical
Mystery
Romance
Sci-Fi
Sport
Thriller
Unknown
War
Western
Genres

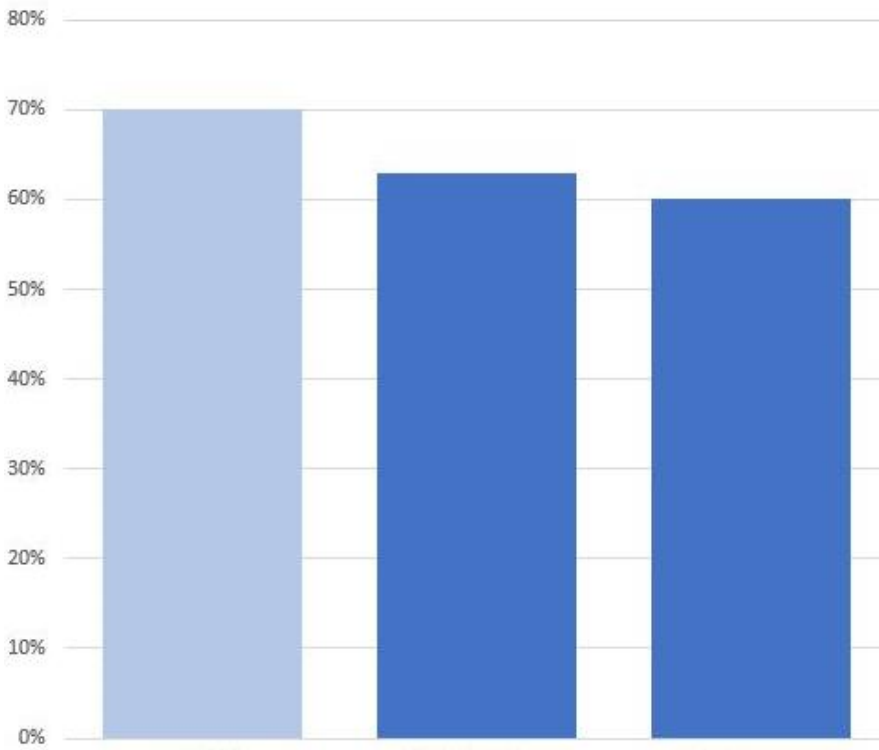

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Unknown
Genres

Colour conventions

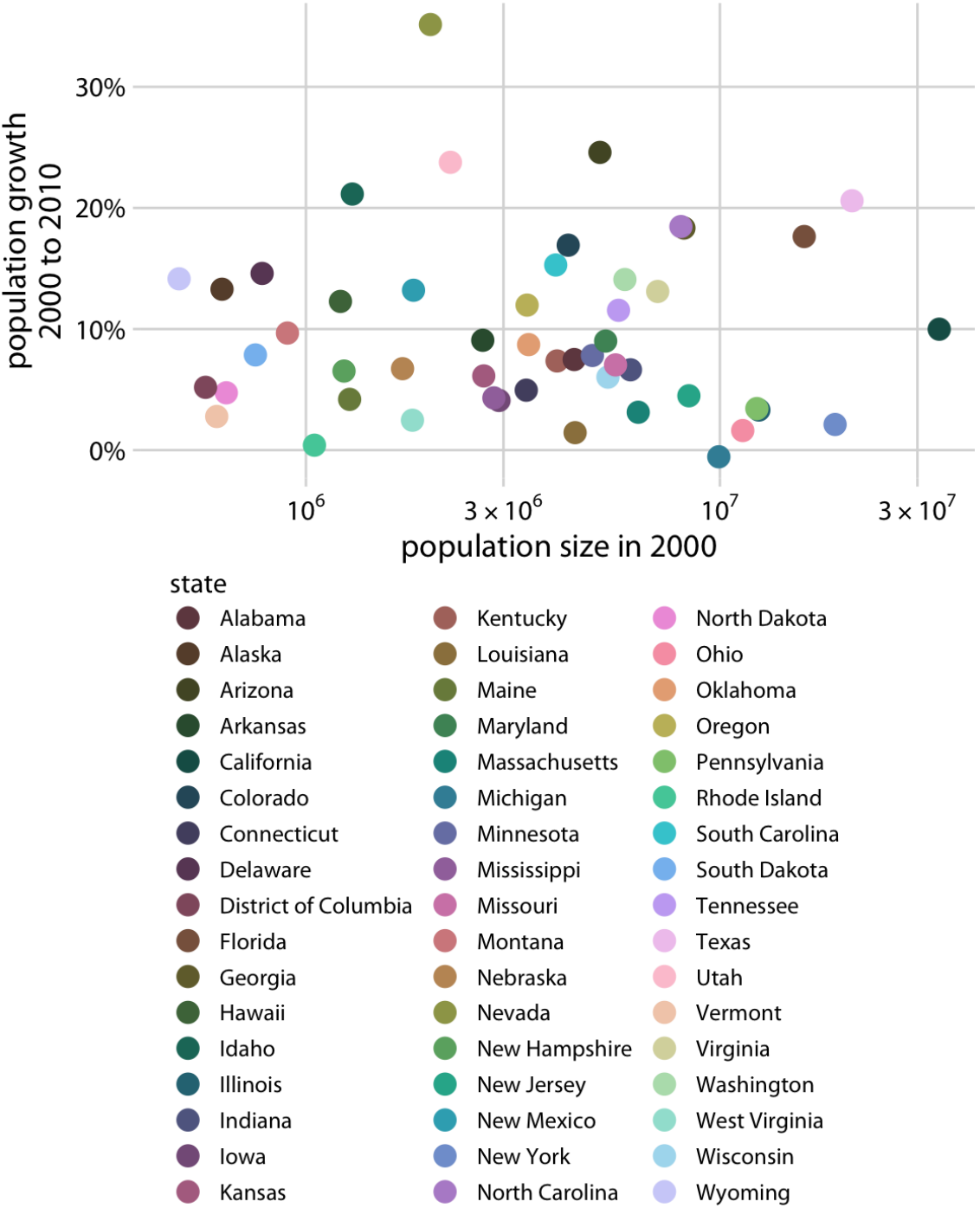


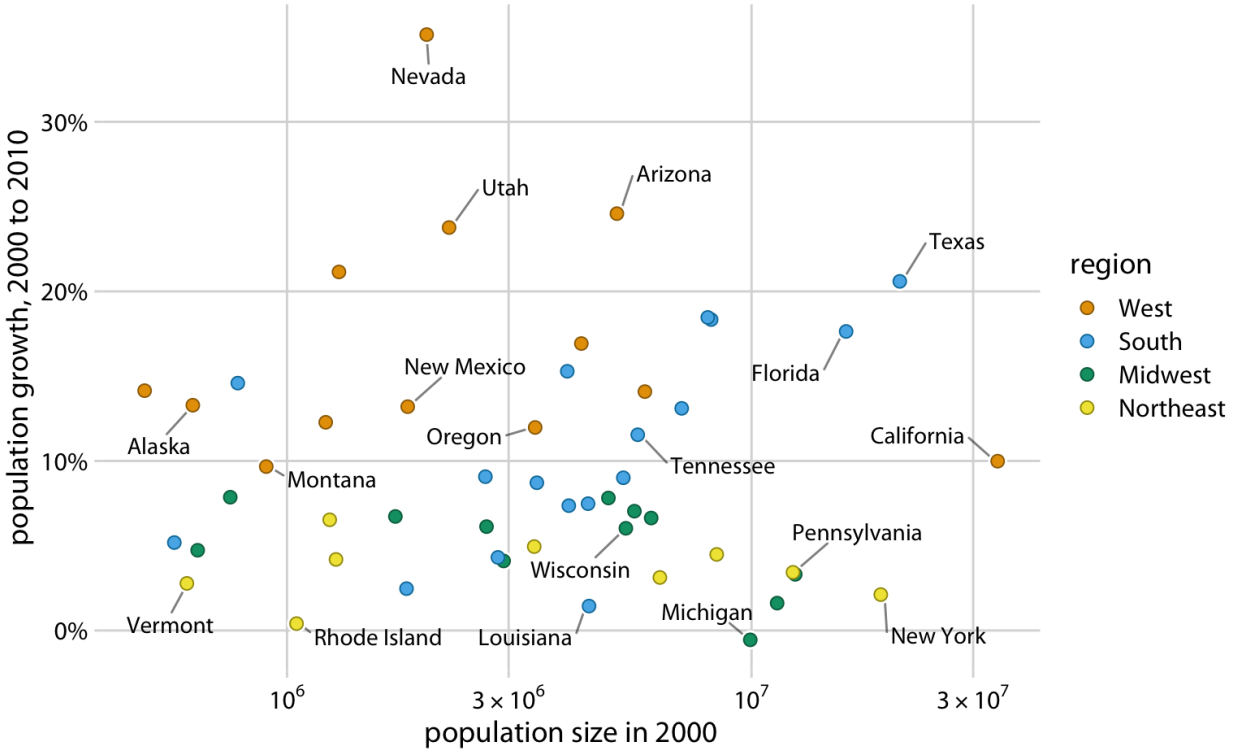
Obeys convention – positive is green and negative is red





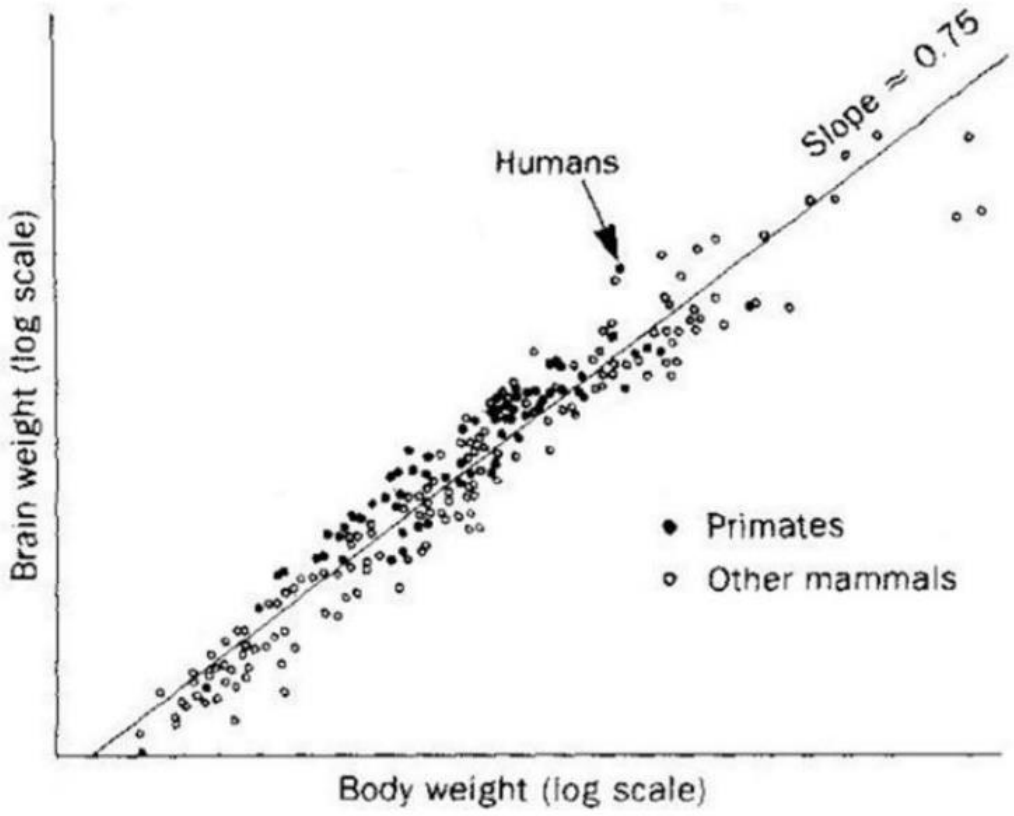
Does not obey convention – here more is lighter but life experience generally teaches that more is darker (concentration effect)

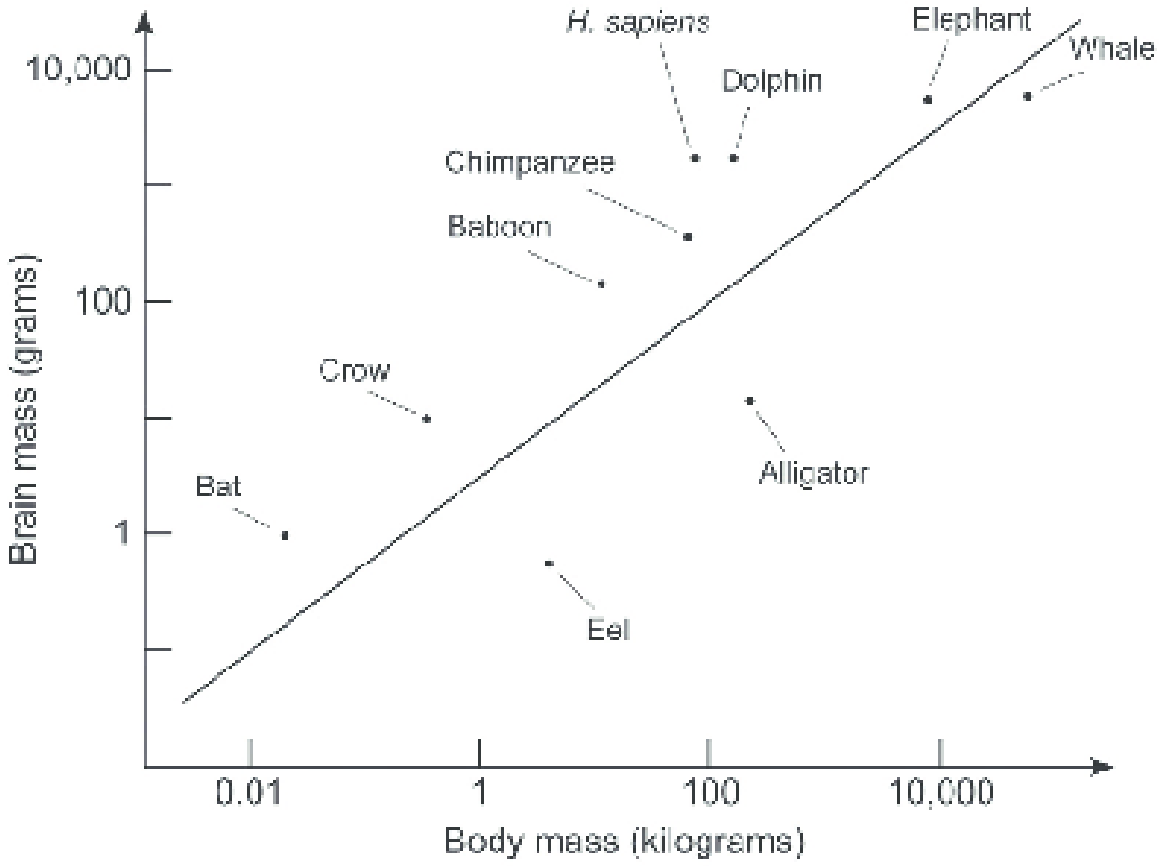




- Take up half the space
- More visual
- Data labels on graph (selective)
- Clustering (easier to take in and reveals new trends)

Brain mass vs body mass





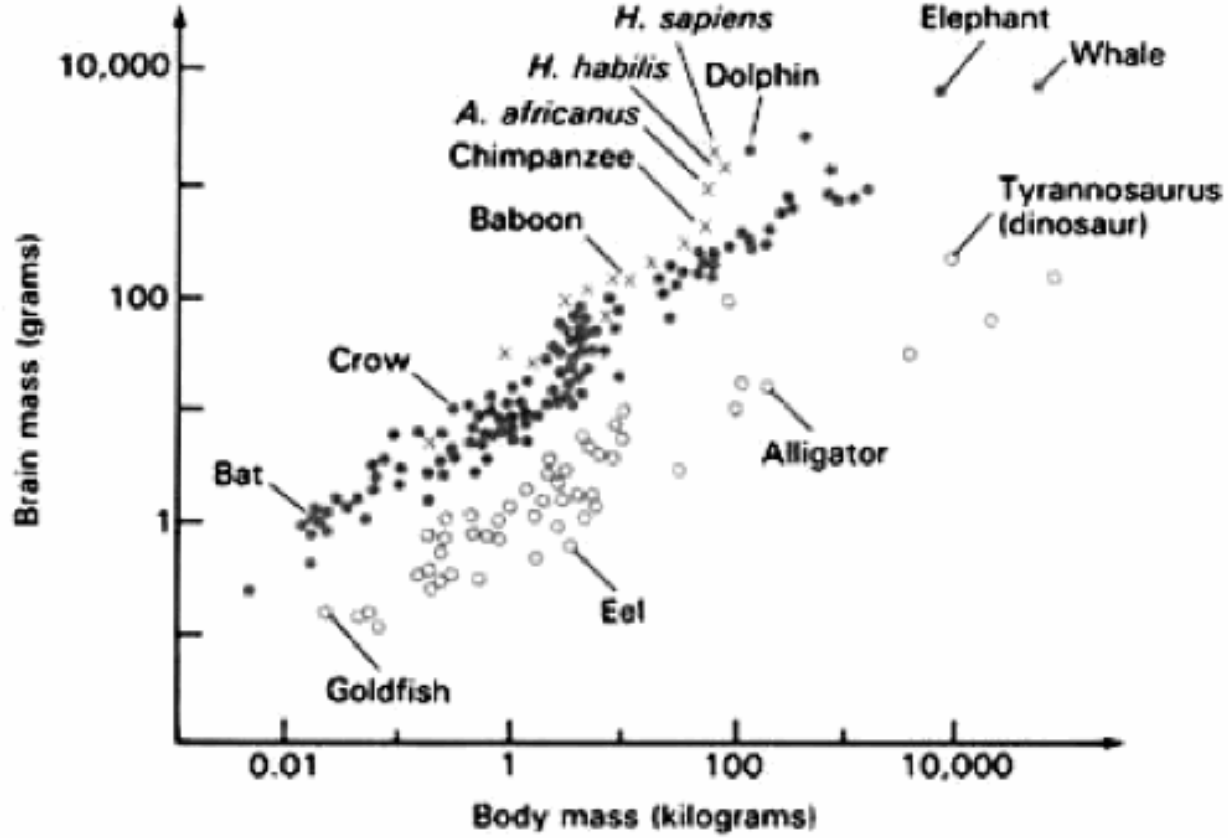
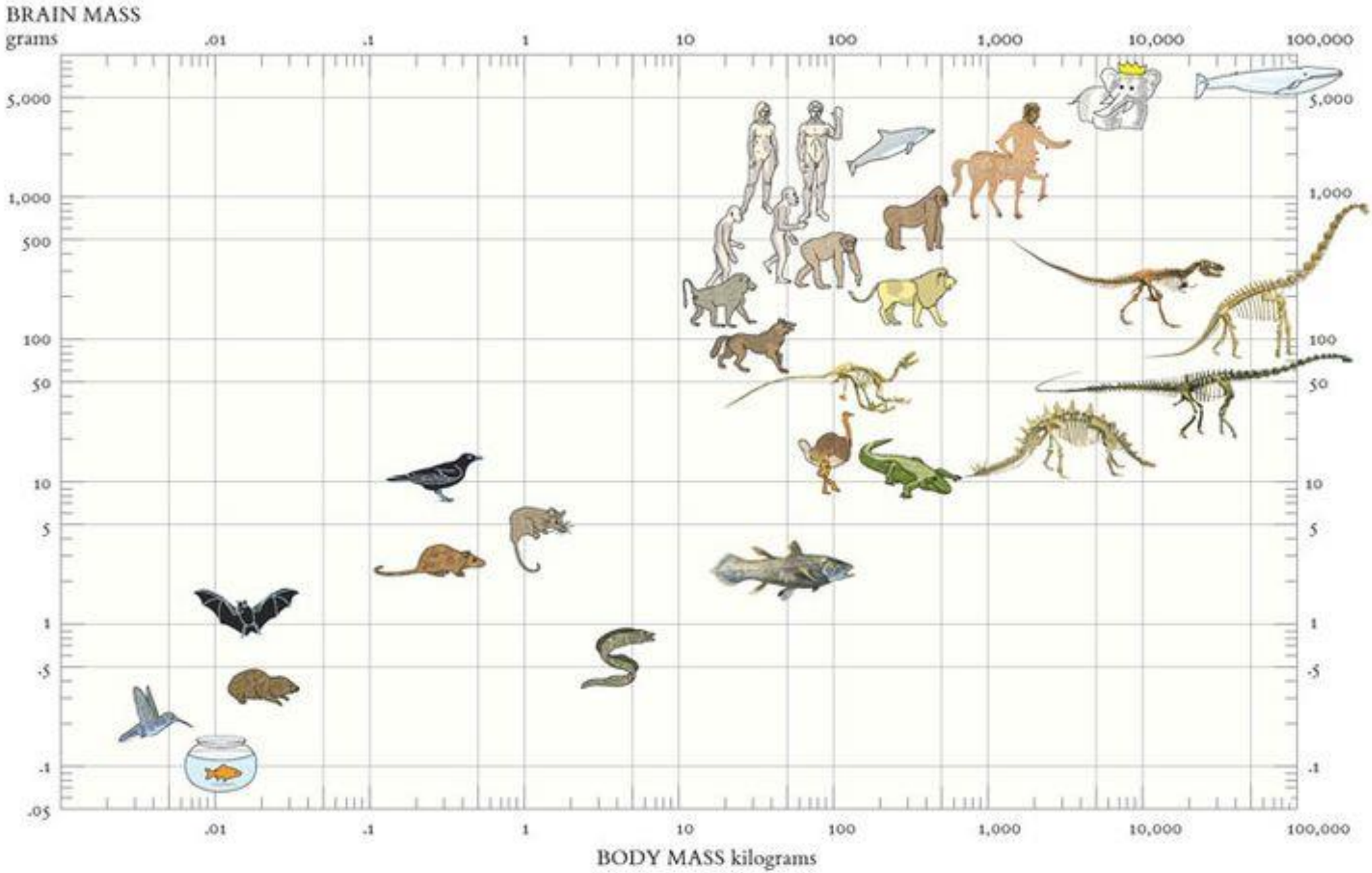
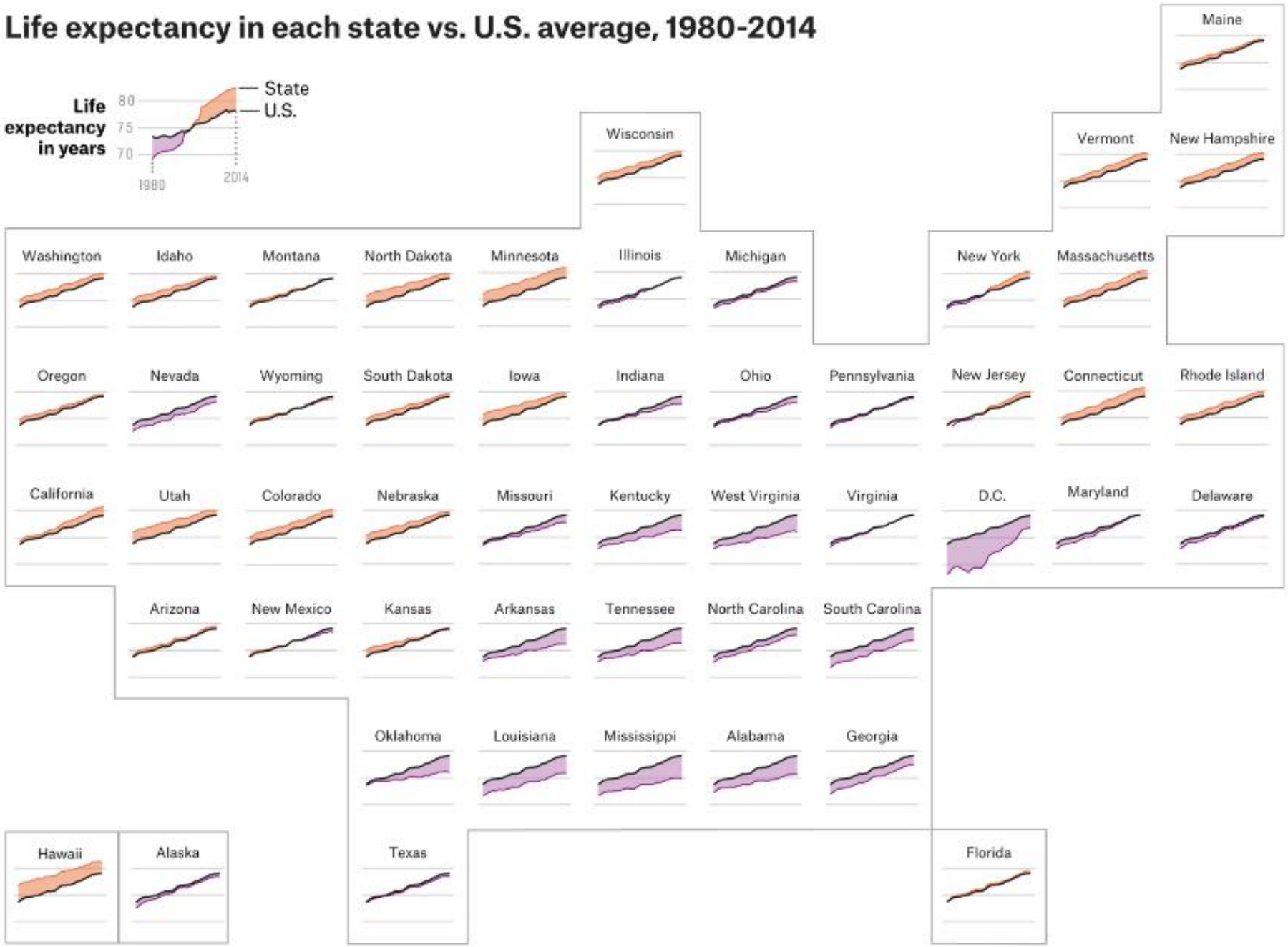
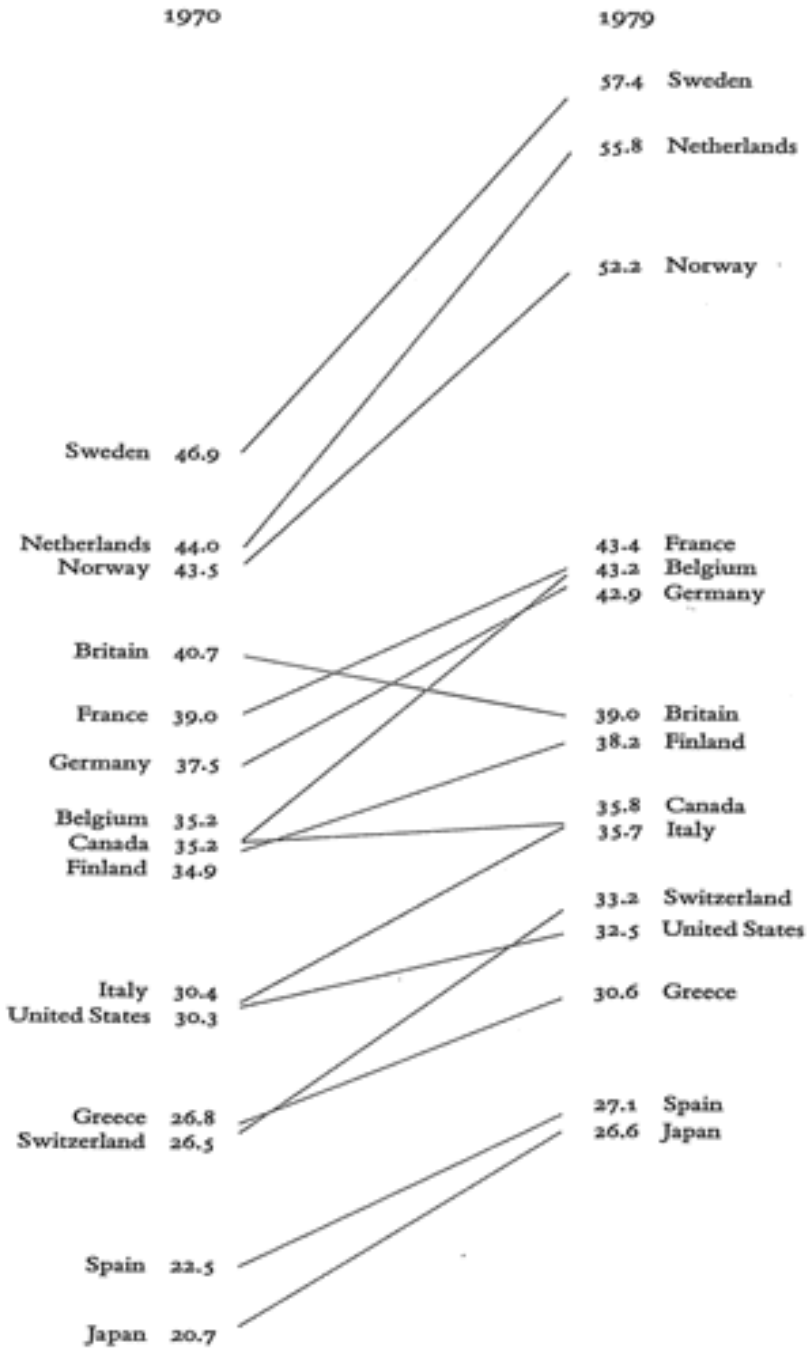


FIGURE 7.13 — A plot of brain mass versus body mass for a variety of animals. The open circles represent reptiles (including some fish and dinosaurs), the filled circles represent mammals (including many birds), and the x's represent primates (including humans and their immediate ancestors). (Carl Sagan)


BRAIN MASS
grams
.01
.1
1
10
100
1,000
10,000
100,000
5,000
1,000
500
100
50
10
5
1
.5
.1
.05
BODY MASS kilograms

Life expectancy in each state vs. U.S. average, 1980-2014




1970
1979
Sweden 46.9
Netherlands 44.0
Norway 43.5
Britain 40.7
France 39.0
Germany 37.5
Belgium 35.2
Canada 35.2
Finland 34.9
Italy 30.4
United States 30.3
Greece 26.8
Switzerland 26.5
Spain 22.5
Japan 20.7
57.4 Sweden
55.8 Netherlands
52.2 Norway
43.4 France
43.2 Belgium
42.9 Germany
39.0 Britain
38.2 Finland
35.8 Canada
35.7 Italy
33.2 Switzerland
32.5 United States
30.6 Greece
27.1 Spain
26.6 Japan

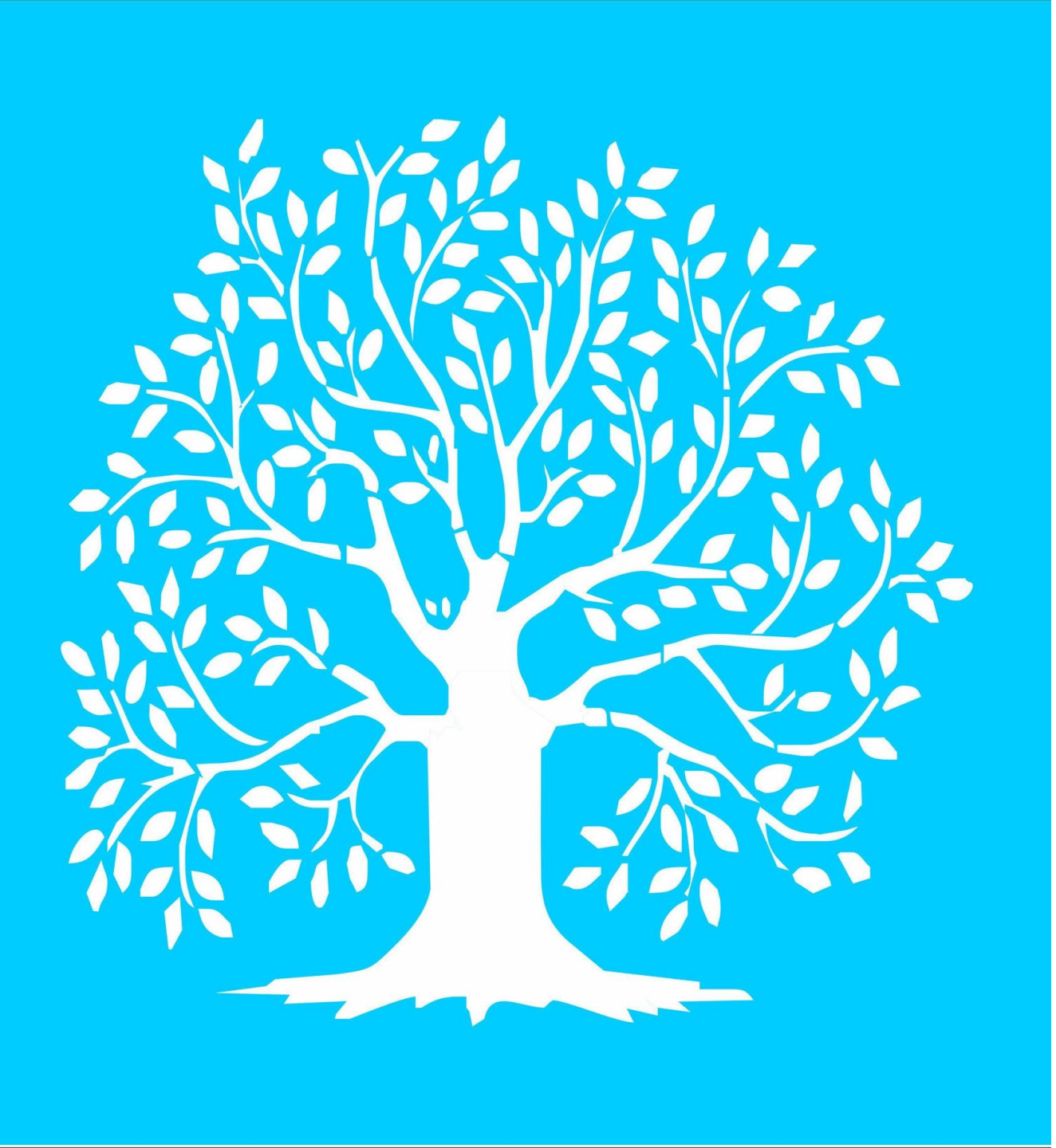

1970
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55.8 Netherlands
52.2 Norway
43.4 France
43.2 Belgium
42.9 Germany
39.0 Britain
38.2 Finland
35.8 Canada
35.7 Italy
33.2 Switzerland
32.5 United States
30.6 Greece
27.1 Spain
26.6 Japan

Reasons for not being funded

"No specific hypothesis about expected outcome"
"No clear objectives"
"No work plan or timetable"
"Integration of team members not detailed"
"Too few details – hard to assess method"
"No specific information on which (human disease)"
"No consideration of HOW database will be selected"
"Ideas not organized and project structure not clear"
"No methodology, timetable, framework"
"Unclear link between objectives"
"Challenges clear but approach vague"
"No work plan"
"Little mention of how analysis will be done and measures of efficiency and limitations"
"Third objective could have been more ambitious and include specific plans"
"Promises "new…." but no details on how

In most cases if the panel/reviewer didn't understand an aspect of the proposed work it is because you didn't do a good enough job in clearly explaining that point

- Get feedback from peers (closer to the field and more distant)
- Write – wait – rewrite
- Don't wait until the last moment



Devote time to both what and how

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