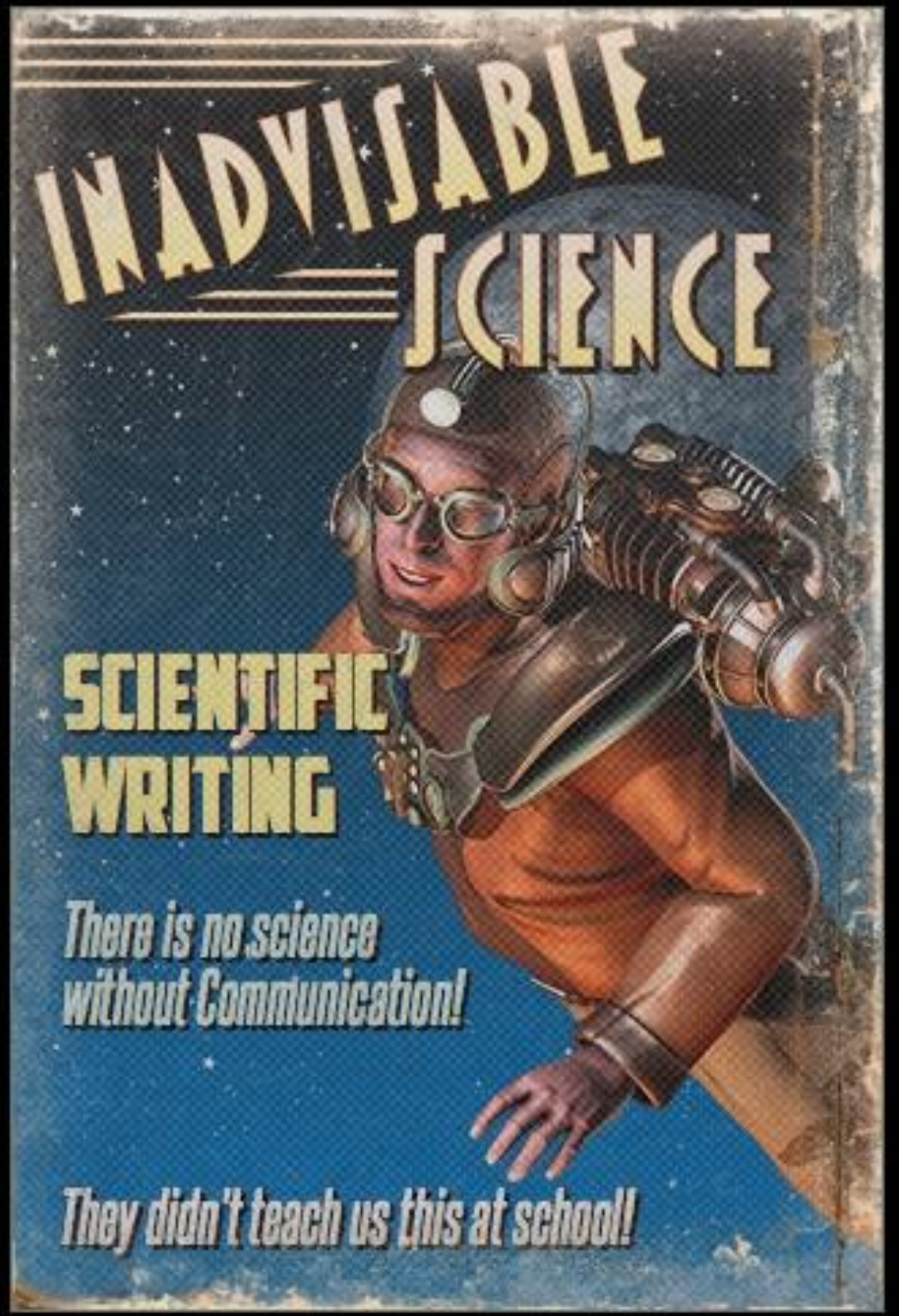
Writing Papers

Henri Boffin
ESO



"Most of us write to facilitate rapid and easy understanding of complex topics, not to earn a Nobel in literature, a Pulitzer on feature writing, or an award for arty non-fiction."

—Y. Douglas

Quiz

What is the main reason to structure a scientific paper like a story?

A. Because scientists secretly want to win the Pulitzer Prize

B. Because journals refuse to publish papers unless the reviewer *laughs, cries,* and *grows as a person*

C. It allows the author to include personal anecdotes and opinions

D. It is the most efficient way to communicate information and engage the reader's attention

What is the main reason to structure a scientific paper like a story?

A. Because scientists secretly want to win the Pulitzer Prize

B. Because journals refuse to publish papers unless the reviewer *laughs, cries,* and *grows as a person*

C. It allows the author to include personal anecdotes and opinions

D. It is the most efficient way to communicate information and engage the reader's attention

When writing sentences, what advice is given for choosing 'characters' and 'actions'?

A. Make tangible, concrete nouns the subjects and their actions the verbs

B. The researcher (‘I’ or ‘we”) should always be the subject of every sentence

C. Let your characters be mysterious and your actions vague—it keeps reviewers guessing and spiritually engaged

D. Assign every action to an inanimate object, so your paper reads like a surrealist novel.

When writing sentences, what advice is given for choosing 'characters' and 'actions'?

A. Make tangible, concrete nouns the subjects and their actions the verbs

B. The researcher (‘I’ or ‘we”) should always be the subject of every sentence

C. Let your characters be mysterious and your actions vague—it keeps reviewers guessing and spiritually engaged

D. Assign every action to an inanimate object, so your paper reads like a surrealist novel.

Which statement accurately reflects the guidance on using the passive voice in scientific writing?

A. Using the passive voice is a way to make sentences longer and meet word counts requirements

B. The active voice should be preferred, but passive voice is acceptable in certain contexts

C. The passive voice should always be used to maintain an objective and impersonal tone

D. Avoid the active voice at all costs—readers must never know *who* did anything.

Which statement accurately reflects the guidance on using the passive voice in scientific writing?

A. Using the passive voice is a way to make sentences longer and meet word counts requirements

B. The active voice should be preferred, but passive voice is acceptable in certain contexts

C. The passive voice should always be used to maintain an objective and impersonal tone

D. Avoid the active voice at all costs—readers must never know *who* did anything.

To improve clarity, what relationship between a sentence's subject and verb is recommended?

A. Keep the subject and verb as far apart as possible to build suspense

B. Put the verb first, then spend the rest of the sentence deciding what the subject should have been

C. Insert at least three unrelated clauses between the subject and verb to test whether readers are truly committed

D. Keep the subject and verb as close together as possible

To improve clarity, what relationship between a sentence's subject and verb is recommended?

A. Keep the subject and verb as far apart as possible to build suspense

B. Put the verb first, then spend the rest of the sentence deciding what the subject should have been

C. Insert at least three unrelated clauses between the subject and verb to test whether readers are truly committed

D. Keep the subject and verb as close together as possible

The advice to 'use short words instead of long ones' is based on what historical aspect of the English language?

A. All scientific terms were originally short, but have been lengthened over time to sound more impressive

B. Medieval scribes were charged by the letter, so long words bankrupted entire monasteries

C. Longer, more complex words often come from Latin and French, while shorter, plainer words tend to be of Anglo-Saxon origin

D. Shorter words are a modern invention to simplify the language for non-native speakers.

The advice to 'use short words instead of long ones' is based on what historical aspect of the English language?

A. All scientific terms were originally short, but have been lengthened over time to sound more impressive

B. Medieval scribes were charged by the letter, so long words bankrupted entire monasteries

C. Longer, more complex words often come from Latin and French, while shorter, plainer words tend to be of Anglo-Saxon origin

D. Shorter words are a modern invention to simplify the language for non-native speakers.

“If the reader is to grasp what the writer means, the writer must understand what the reader needs.”

—George Gopen & Judith Swan

Structure

Readers do not simply read; they interpret

Readers interpret the **substance** based on clues they receive from its **structure**

Substance vs. Structure

Which is clearer?

1

t (time)=15′, T (temperature)=32 °; t=0′, T=25 °; t=6′, T=29°; t=3′, T=27 °; t=12′, T=32°; t=9′, T=31°

2

Time (min)	Temperature (°C)
0	25
3	27
6	29
9	31
12	32
15	32

Substance vs. Structure

If the two sides of this table are reversed, it becomes much harder to read

Information is interpreted more easily and more uniformly if it is placed where readers expect to find it

Temperature (°C)	Time (min)
25	0
27	3
29	6
31	9
32	12
32	15

Substance vs. Structure

Research articles are divided into recognizable sections

Readers are confused when your sections are mixed up, e.g., when too much experimental detail is found in the Results section, or when the discussion and results are intermingled

The same is true at the **sentence** and **paragraph** level

Structure

Sentences have definite beginnings and ends, and readers expect to find specific information in each

We do not write sentences in isolation. We write them in sequences, and these must form sensible paragraphs

Structuring paragraphs - Issue

Issue: each paragraph should open by telling the reader what the paragraph is about (in 1, 2 or 3 sentences)

The issue should end by introducing the characters and actions that will be featured in the rest of the paragraph

Galaxy clusters are the largest virialized objects in the Universe.

We now expect a paragraph about galaxy clusters

Structuring paragraphs

What makes a paragraph a paragraph?

4 elements:

1. Unity (the whole paragraph is about one concept)
2. Order (information is presented logically)
3. Coherence (all the concepts go well together)
4. Completeness (is it wrapped up?)

Reader expect some order in your paragraphs

Chronological order (Methods section)

General to specific (Introduction)

Specific to general (Discussion/Conclusion)

Least important to most important (to persuade)

Problem to solution

Compare and contrast

Structuring paragraphs - Development

After presenting the issue at the beginning of a paragraph, the writer expands on it in the development

One good way to write the development is to lay out well defined steps that lead to some conclusion

Some sentences of the development will begin with a transition word

Transition words

Chronological order
first, second, third, initially, then, finally, in conclusion, thus, to conclude, to summarise, another, after, before, earlier, later, meanwhile, ...

General to specific
for example, for instance, namely, specifically, accordingly, therefore, thus, ...

Least important to most important
clearly, most importantly, the most serious, the foremost, ...

Problem to solution
but, however, in spite of, nevertheless, nonetheless, instead, still, yet,...

Compare and contrast
similarly, also, just as, likewise, in contrast, on the contrary, however, on the one hand, ...

Transition words

They are like road signs

They help readers to navigate a written piece by making smooth connections between sentences and paragraphs

Used skilfully, they can make reading almost effortless

Without transition words

Castles in the middle ages were cold, dirty and infested with bats and rats. Castles were miserable to live in. The early castles were simple and square and small. Castles were for protection and defence. The later ones were large and elegant. These castles were homes of lords and kings.

With transition words

Castles in the middle ages were cold, dirty and infested with bats and rats, making them utterly miserable to live in. They were also uncomfortable because they were simple, square and small. But, medieval castles were never designed to be comfortable homes, their purpose instead being protection and defence. In contrast, later castles were large and elegant, and therefore suitable homes for lords and kings.

Transition words

They are like road signs; they help readers to navigate a written piece by making smooth connections between sentences and paragraphs

Used skilfully, they can make reading almost effortless

But too much can bury your ideas!

Structuring paragraphs - Conclusion

Readers look for a sentence at the end of a paragraph that serves as a kind of comprehension check – did they understand what the writer was getting at?

This conclusion is preceded by words such as “Thus” if the conclusion is a summary, which is most common.

Another possibility is to have the conclusion as a question or making a speculation. This would then start with “Perhaps”.

A paragraph

The tails of an open cluster can be compared to the roads leading away from a small village. Just as the village is a centre of community life, the open cluster is a centre of gravitational attraction for its member stars. And just as the roads branching out from the village allow for the spreading of houses into the surrounding countryside, the tidal tails of the cluster allow its stars to spread out into the Milky Way. Yet, as with any village that loses its inhabitants to the wider world, the dissolution of the cluster through its tails brings a sense of loss and nostalgia for what once was. The stars, once bound together in the tight-knit community of the cluster, now wander alone in the vast expanse of space. It is a bittersweet fate, one that speaks to the transience of all things and the impermanence of our place in the universe.

Boffin 2023

A paragraph

6 sentences

ISSUE

Development

Conclusion

The tails of an open cluster can be compared to the roads leading away from a small village. Just as the village is a centre of community life, the open cluster is a centre of gravitational attraction for its member stars. And just as the roads branching out from the village allow for the spreading of houses into the surrounding countryside, the tidal tails of the cluster allow its stars to spread out into the Milky Way. Yet, as with any village that loses its inhabitants to the wider world, the dissolution of the cluster through its tails brings a sense of loss and nostalgia for what once was. The stars, once bound together in the tight-knit community of the cluster, now wander alone in the vast expanse of space. It is a bittersweet fate, one that speaks to the transience of all things and the impermanence of our place in the universe.

Boffin 2023

Very Important
Letter to the Editor

When Tails Tell Tales

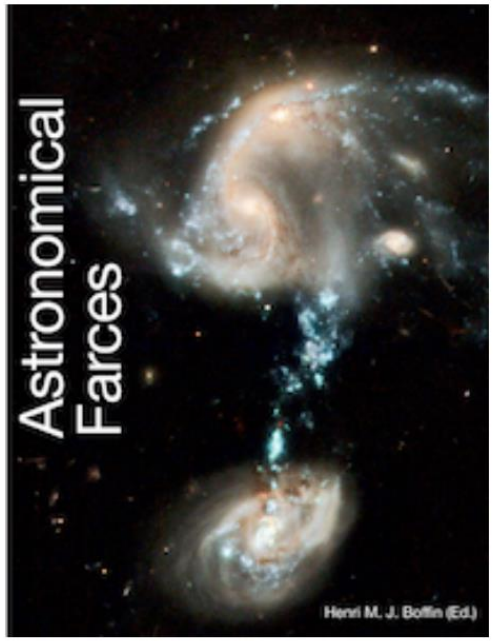
Henri M.J. Boffin[1,★]

Boffin 2023

https://eso.org/~hboffin/Attic.html

Astronomical Farces

Please read here a compendium of amusing stories, poems, jokes or astounding images, all related to astronomy, with the hope to lighten your day.



The Astronomical Enquirer

I decided to start a new astronomical journal that would publish only high profile articles that would be fun to read (well, hopefully!).

- On the Use of Astronomy: Predicting the Doom of Humankind, H.M.J. Boffin et al., 1 April 2014
- Do we grasp the physics of binary stars?, H.M.J. Boffin et al., 1 April 2020
- The secret of the elixir of youth of blue straggler stars, H.M.J. Boffin et al., 1 April 2021
- Follow the Index: a new proposal, H.M.J. Boffin et al., 1 April 2022
- When Tails Tell Tales, H.M.J. Boffin, 1 April 2023

Is this a paragraph?

However, these numerical simulations have been computed independently for star and planet so far, while acquired spectra are the result of the natural coupling at each phase along the planet orbit. A next step forward is needed: coupling stellar and planetary 3D models dynamics during the transit.

Is this a paragraph? **NO**

However, these numerical simulations have been computed independently for star and planet so far, while acquired spectra are the result of the natural coupling at each phase along the planet orbit. A next step forward is needed: coupling stellar and planetary 3D models dynamics during the transit.

- "However" implies that the first sentence is linked to a previous concept, which was not fully explored.
- These two sentences do not provide enough information to be a paragraph

A paragraph is not simply delimited when the writer thinks they should add some white space!

Paragraphs should be short

"Maximum length of a paragraph in a well-written research paper is about 15 sentences.

Most paragraphs should be shorter.

My average for a paper in preparation: 6.25 sentences per paragraph. Maximum 11, minimum 3."

— A. Hatzes

Structuring **sentences**: Remember the table

Since (in English) we read from left to right, we prefer the context on the left, where it can more effectively familiarize the reader

We prefer the new, important information on the right, since its job is to intrigue the reader

Information is interpreted more easily and more uniformly if it is placed where most readers expect to find it.

Structuring sentences

In general (there are always exceptions):

- Start the sentence with its topic
- End with what you want to stress

Sentences that violate these principles feel choppy, disjointed and/or incoherent

The Topic Position

The information that begins a sentence establishes a perspective for viewing the sentence as a unit

Bees disperse pollen — Tells us something about bees

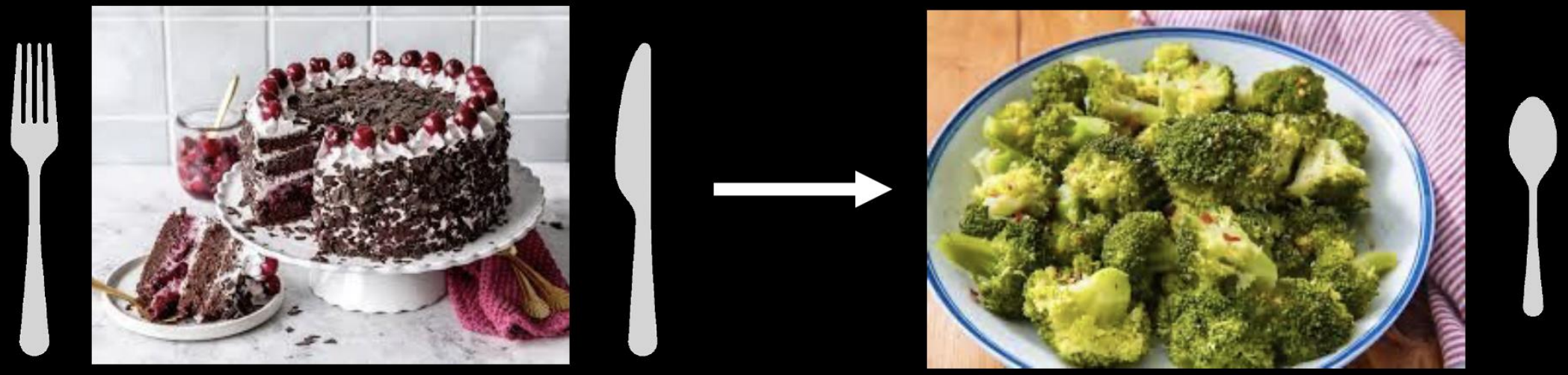
Pollen is dispersed by bees — Tells us something about pollen

The stress position

Readers naturally emphasize the material that arrives at the end of a sentence, i.e., the “stress position”

The stress position

It’s like saving the best till last. We do not work our way from the chocolate cake to the broccoli



The stress position

When the writer puts the emphatic material elsewhere one of two bad things can happen:

1) The reader guesses what to emphasise
2) The reader assumes whatever is in the stress position is worth emphasising

Achieving Flow – old before new

Put ‘old’ information in the beginning of your sentence, and ‘new’ information at the end.

Begin sentences with information familiar to your reader.

Which sounds better?:

1. Ann conducted a research study in the social sciences. In Dubai, she interviewed twenty people.

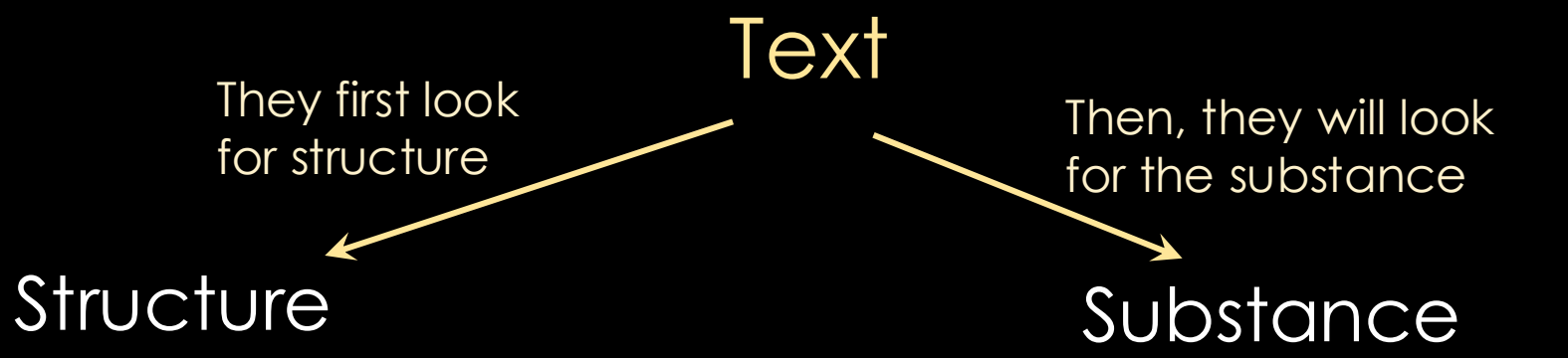
2. Ann conducted a research study in the social sciences. As part of her study, she interviewed twenty people in Dubai.

Why we **feel** stupid reading text

Most of our difficulty is owing to the author's lack of comprehension of our structural needs as readers, NOT any deficiency in our reading skills

The misplacement of old and new information is a big issue!

The reader interpret the text



Is this a sentence, a paragraph?

Where is the subject and where is the verb?

What is the message?

A reader has only a fixed amount of energy

Judy Swan

Bad writing is where the reader has to spend too much energy to understand the structure

It is already the case at document level

description of the observations should be in the method section

It is the same at the level of paragraphs and sentences

Judy Swan

Emphasis

1. Main – independent – clause
2. Save the best for last (of a sentence, of a paragraph, …)
3. Length – the longer the text, the more important is must be
4. Repetition – don't hesitate to repeat; main result of a paper will be in the abstract, in the result, in the discussion, in the title, and at the end of the introduction
5. Semantics – use of words; e.g., the most important is…

Readers take the cue for emphasis for 80% from the structure and only 20% from the substance

Structure also affects substance

a) Although Fred is a nice guy, he beats his dog.
b) Although Fred beats his dog, he is a nice guy.
c) Fred is a nice guy, but he beats his dog.
d) Fred beats his dog, but he is a nice guy.

Those four sentences say the same but they don't convey the same impression — the structure defines the substance

What is at the end is most important and will convey the message… but the first impression will lead the judgment

Gopen & Swan 90

If your writing is not clear enough, the reader may not interpret the sentence as you wanted!

This can also be used to hide things or be ambivalent.

Something we shouldn't do in science!

e) Fred is a good husband, a caring father, a good colleague and an altogether nice guy, even though he beats his dog.

By increasing the length, we put more emphasis on the good things

f) Even though he beats his dog, Fred is a good husband, a caring father, a fine colleague and an altogether nice guy.

We have 4 plus and one minus, and the minus is at the beginning, so is considered the least important. By the time we have finished the sentence, we forgot that Fred beats his dog and remember only the good things. → structure defines the substance

Although Fred is a nice guy, …

Although Fred is a nice guy, he commits genocide!

Words do matter!

However, often, words cannot undo a *problem of structure*

The problem

We usually start by writing the main clause, the positive thing, and then we put the caveat

This is likely the wrong way, as what the reader will retain is the last part

There is no neutral sentence!

This is why we revise!

Structure affects substance - lists

In a single sentence, you often tell your readers more than one piece of new information.

Two or more pieces of information are easier to read and remember if their structures are **parallel**, that is, the items are written using similar kinds of words within similar grammatical arrangements.

Structure affects substance - lists

These similarities include an early sensitive period, an innate filtering mechanism that isolates conspecific vocalisations, a babbling developmental phase, and the importance of social variables in vocal learning.

Structure affects substance - lists

These similarities include an early sensitive period, an innate filtering mechanism that isolates conspecific vocalisations, a babbling developmental phase, and the importance of social variables in vocal learning.

Not parallel!

Structure affects substance - lists

The items of the sentence are:

1. an early sensitive **period**
2. an innate filtering **mechanism** that isolates conspecific vocalisations
3. a babbling developmental **phase**
4. the importance of social variables in vocal learning

Make lists parallel

make the list parallel by keeping same structure and picking one word instead of 3 (period, mechanism, and phase):

These similarities include an early sensitive phase, a filtering phase, a babbling phase, and a social phase.

Make lists parallel

Not Parallel: If you want to be a good doctor, you must study hard, critically think about the medical literature, and you should be a good listener.

Parallel: If you want to be a good doctor you must study hard, listen well, and think critically about the medical literature. (imperative, imperative, imperative)

Parallel: If you want to be a good doctor, you must be a good student, a good listener, and a critical thinker about the medical literature. (noun, noun, noun)

Simplify and make lists parallel

It is interesting to note that the new organism is green in color, round in shape, 5x10 mm in size, and active with respect to motility.

The new organism is green, round, 5x10 mm long, and mobile.

Avoid making your sentences too long

Too long sentence

This results in texts which are extremely difficult to read as well as revealing to the world that their authors are clueless about paragraph structure.

This results in texts which are extremely difficult to read. In addition, they also reveal to the world that their authors are clueless about paragraph structure.

Rule of thumb

Read your sentence out loud.

If you run out of breath it is too long!

Vary the length of your sentences

The best writing consists of sentences of **various lengths**. A string of long sentences (30 words or more) is difficult to get through; a string of short sentences (10 words or less) is choppy, and a string of medium-length sentences (15-25 words) is monotonous.

If you vary the length of the sentences by combining some and shortening others, you are more likely to hold your readers' attention.

Make sentences smaller than about 20-25 words.

Recap

Structure of the sentence is important - it will influence how you interpret what you read

Put old information at beginning of sentences

Put new information at end of sentences

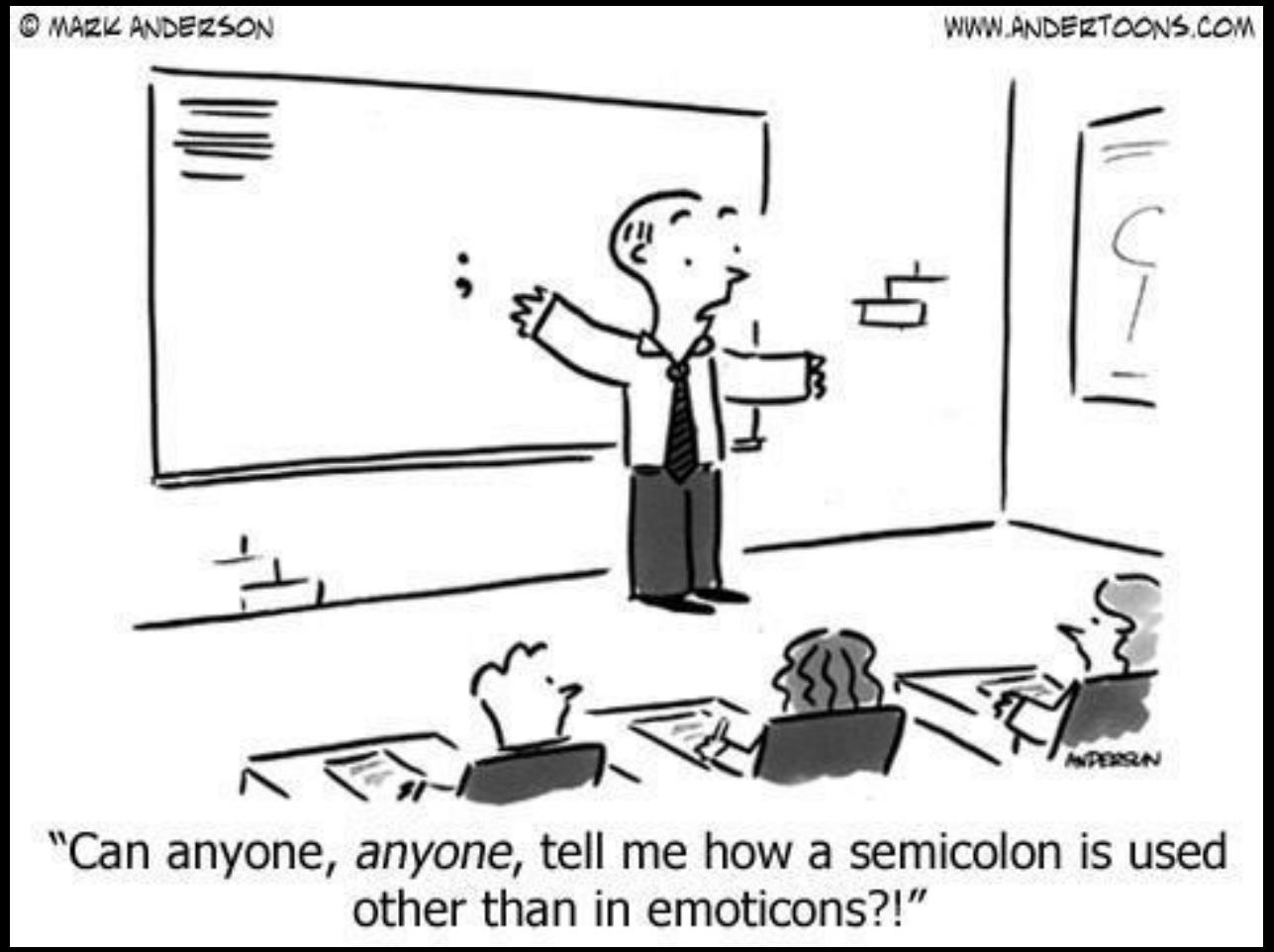
Make lists parallel

Vary the length of your sentences

"*Writing is a process of experimentation. You need to try things out, engaging in trial and error, tinkering around.*"

—S. Montgomery

Use punctuation correctly…



Which of these sentences contain(s) a mistake?

1. She was dressed in a cotton dress, that fitted close around a heavy bust.
2. If there's anything you can remember then we can act on it.
3. It was a meal, Tom the cook, had prepared for them.
4. She can't have the dessert, it contains nuts.
5. He came out with a long tedious monologue.

Punctuation

Punctuation serves as a pause within a sentence

→ often necessary in order to emphasize certain phrases or words

→ to help readers understand better what the writer is trying to convey.

Punctuation

Punctuation marks are also used to divide text into words and phrases when necessary in order to better clarify the meaning of those words or phrases.

On the contrary, using punctuation incorrectly can convey an entirely different meaning of a sentence from the one that was originally intended.

Compound Hyphens

Why and when compound hyphens matter

‘A man-eating crocodile…’

is not the same as

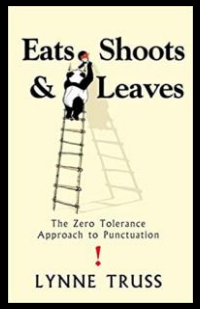
‘A man eating crocodile…’

The Panda's story

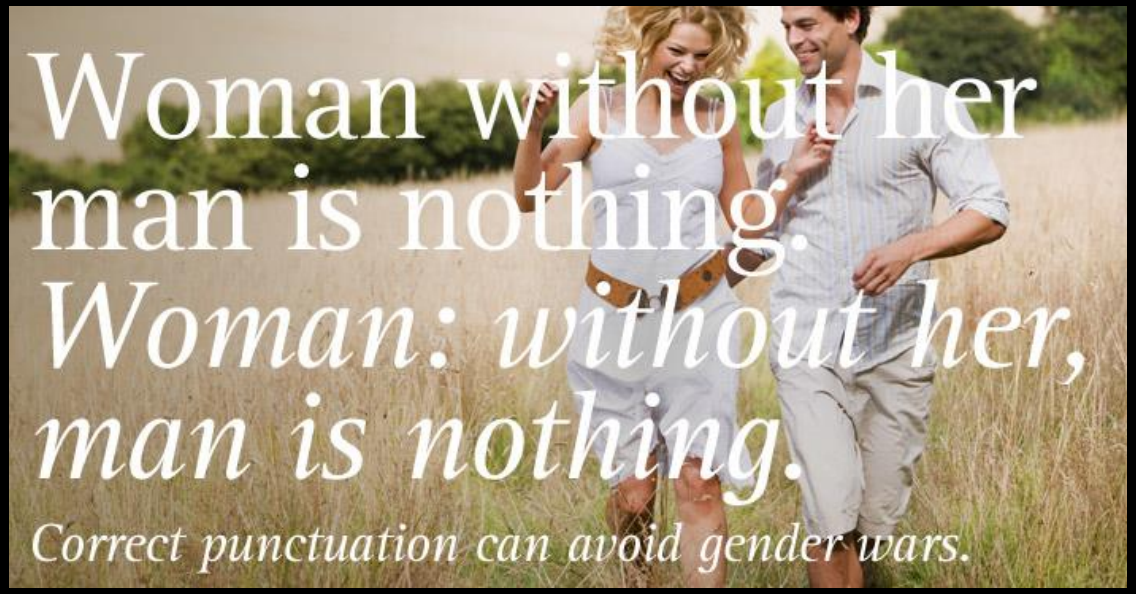
The Panda eats, shoots, and leaves

The Panda eats shoots and leaves

The difference two commas can make



Use punctuations correctly



Commas

Use a comma before every (even the last) *and* or *or* in a series of three or more items.

RIGHT: *the cats, the dogs, and the fish*

WRONG: *the cats, the dogs and the fish*

Commas

I invited my parents, the Queen and Harry Potter.


I invited my parents, the Queen, and Harry Potter.



Semicolons ; At first , they may seem frightening ;

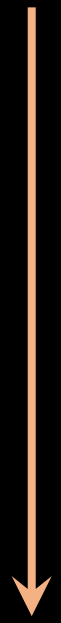
then , they become enlightening ; finally , you'll find yourself

falling for these delightful punctuation marks .

Punctuation

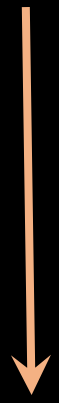
Increasing power to separate:

Comma ,
Colon :
Dash –
Parentheses ()
Semicolon ;
Period .



Punctuation

Increasing formality:



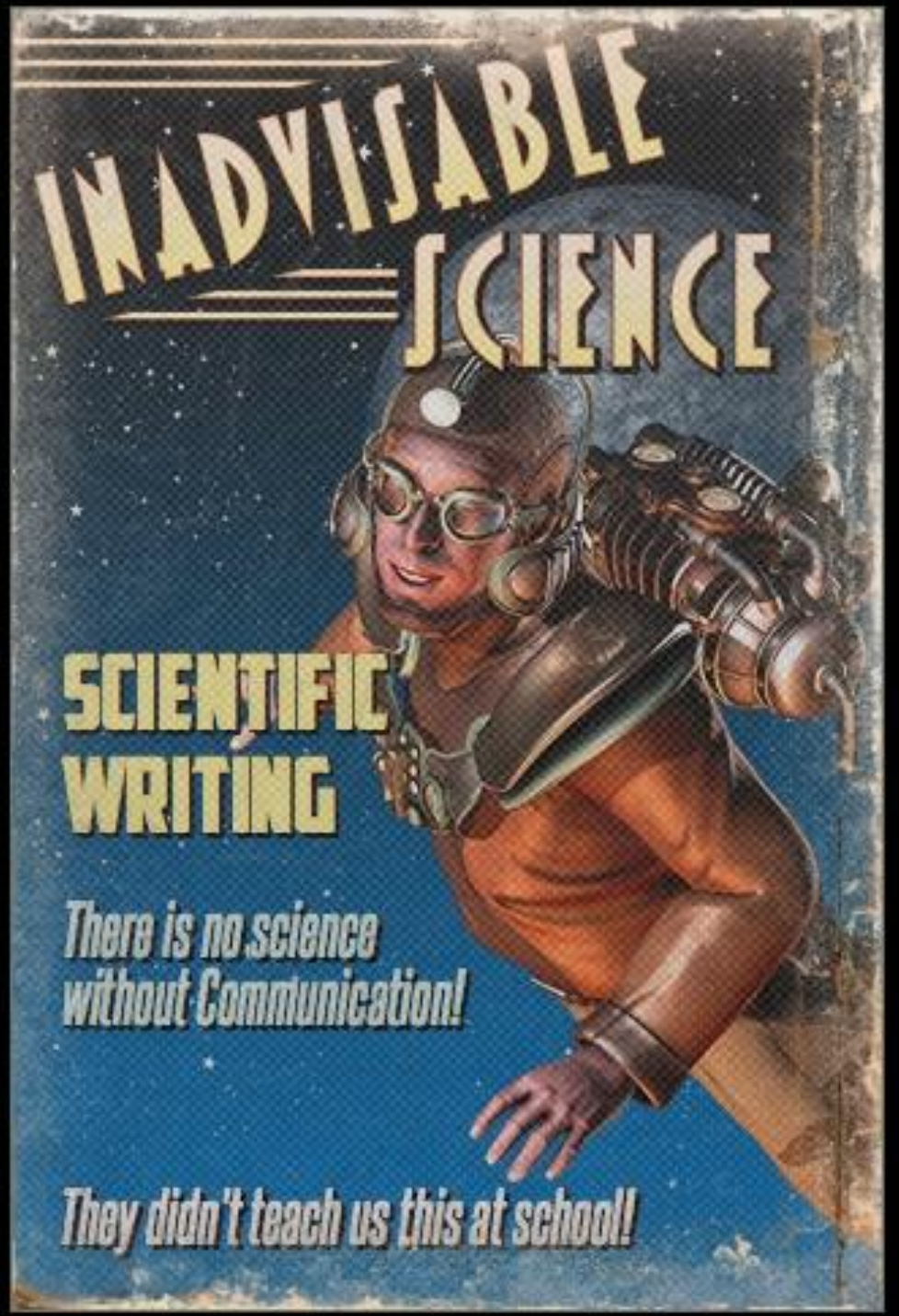
Dash
Parentheses
The Others (Comma, Colon, Semicolon, Period)

“Please, could you expel, or, at least, restrain,
the comma-maniac on your editorial staff?”

“Please, could you expel—or, at least, restrain—the comma-maniac on your editorial staff?”

Writing Papers

Henri Boffin
ESO



Quiz

You should avoid to use ‘very' because it…

A. Makes the writing sound too subjective and emotional

B. Is considered grammatically incorrect in formal writing

C. Lengthens sentences unnecessarily, violating the rule of conciseness

D. Can often be replaced by a more precise and stronger word.

You should avoid to use ‘very' because it…

A. Makes the writing sound too subjective and emotional

B. Is considered grammatically incorrect in formal writing

C. Lengthens sentences unnecessarily, violating the rule of conciseness

D. Can often be replaced by a more precise and stronger word.

Why are job applications that rely on AI-generated content disadvantaged?

A. They are typically too verbose and exceed word count limits

B. They lack the necessary depth and originality

C. The often contain factual errors and plagiarised content

D. They violate the institute’s academic honest policy

Why are job applications that rely on AI-generated content disadvantaged?

A. They are typically too verbose and exceed word count limits

B. They lack the necessary depth and originality

C. The often contain factual errors and plagiarised content

D. They violate the institute's academic honest policy

The 'old before new' principle in sentence structure suggests that writers should...

A. Start sentences with new, exciting information to grab the reader's attention

B. Place familiar information at the beginning of a sentence to provide context

C. Alternate between old and new information from sentence to sentence

D. Avoid using old information and focus only on presenting new findings.

The 'old before new' principle in sentence structure suggests that writers should...

A. Start sentences with new, exciting information to grab the reader's attention

B. Place familiar information at the beginning of a sentence to provide context

C. Alternate between old and new information from sentence to sentence

D. Avoid using old information and focus only on presenting new findings.

What is the primary function of transition words like 'however', 'therefore', and 'similarly' in a paragraph?

A. They separate the ‘issue’ part of a paragraph from the ‘development’ part

B. To increase the paragraph’s word count to meet a minimum length

C. To introduce complex vocabulary and make the writing sound more academic

D. To act as “road signs” that guide the reader through the logical flow of ideas.

What is the primary function of transition words like 'however', 'therefore', and 'similarly' in a paragraph?

A. They separate the ‘issue’ part of a paragraph from the ‘development’ part

B. To increase the paragraph’s word count to meet a minimum length

C. To introduce complex vocabulary and make the writing sound more academic

D. To act as “road signs” that guide the reader through the logical flow of ideas.

For maximum impact, where should the most important, new information in a sentence be placed?

A. At the very end of the sentence

B. In the middle of the sentence, surrounded by context

C. In a dependent clause at the beginning

D. As the main subject at the beginning of the sentence.

For maximum impact, where should the most important, new information in a sentence be placed?

A. At the very end of the sentence

B. In the middle of the sentence, surrounded by context

C. In a dependent clause at the beginning

D. As the main subject at the beginning of the sentence.

Which of the following lists demonstrates correct parallel structure?

A. A good doctor must study hard, listen well, and think critically

B. The new organism is green in colour, round in shape and has high motility

C. The similarities include an early sensitive period, a filtering mechanism, and the importance of social variables

D. Her tasks were to analyse the data, writing the report, and the presentation of the findings.

Which of the following lists demonstrates correct parallel structure?

A. A good doctor must study hard, listen well, and think critically

B. The new organism is green in colour, round in shape and has high motility

C. The similarities include an early sensitive period, a filtering mechanism, and the importance of social variables

D. Her tasks were to analyse the data, writing the report, and the presentation of the findings.

Why should adverbs such as "really," "basically," and “generally," be removed from a text?

A. They are technical jargon that cannot be understood by a general audience.

B. They are often superfluous, meaning they seldom add anything useful and can frequently be removed without weakening the sentence.

C. They are exclusively used in the passive voice, which is explicitly prohibited in all scientific papers.

D. They force the reader to focus on the structure of the sentence rather than the substance of the argument.

Why should adverbs such as "really," "basically," and “generally," be removed from a text?

A. They are technical jargon that cannot be understood by a general audience.

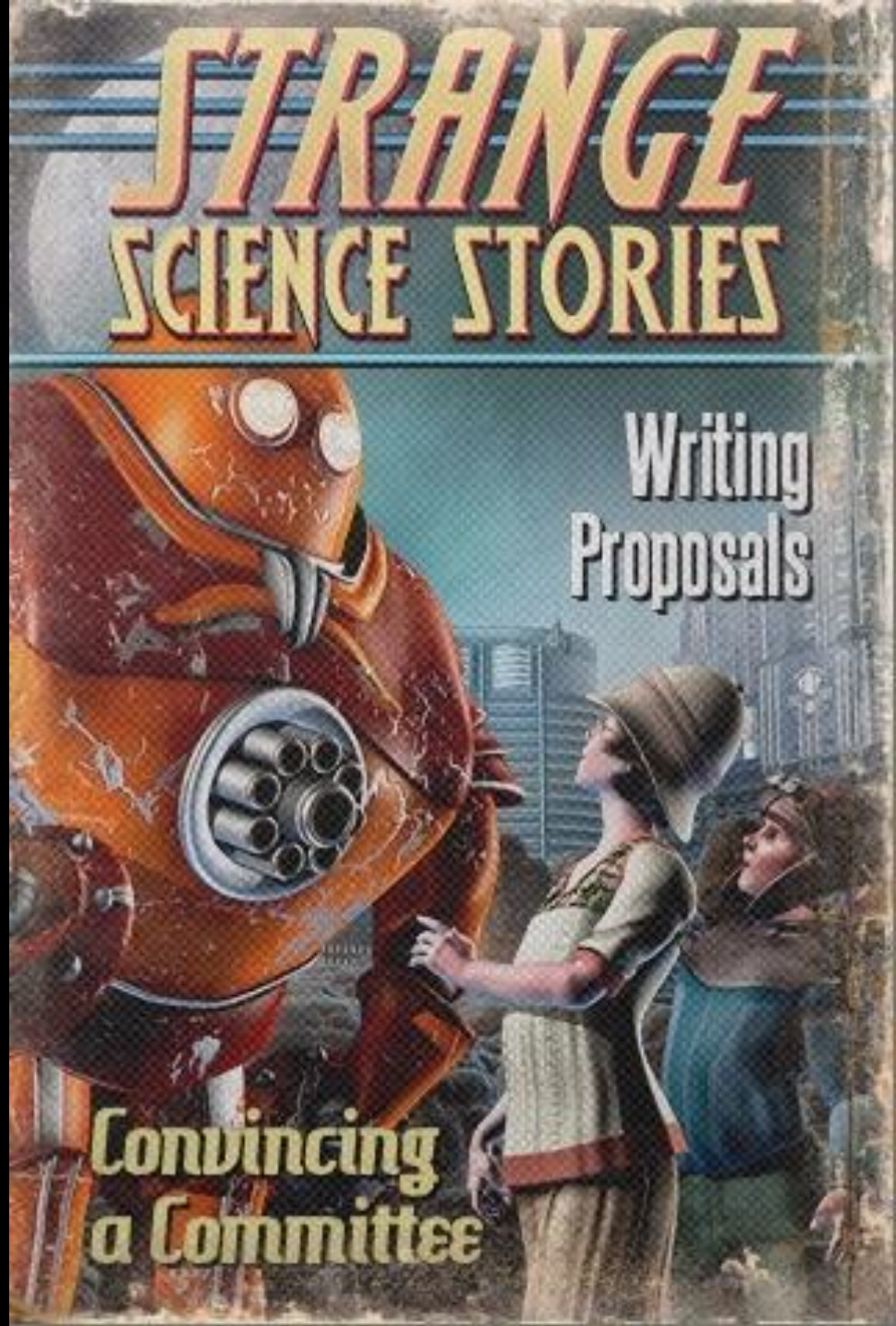
B. They are often superfluous, meaning they seldom add anything useful and can frequently be removed without weakening the sentence.

C. They are exclusively used in the passive voice, which is explicitly prohibited in all scientific papers.

D. They force the reader to focus on the structure of the sentence rather than the substance of the argument.

Writing and communicating your science

Henri Boffin
ESO, Garching, Germany
hboffin@eso.org



Proposals

Observing time
Supercomputing time
Grant proposal
Job application

Proposals

Observing time
Supercomputing time
Grant proposal
Job application

Likely the most important documents you must write

Proposals

Observing time
Supercomputing time
Grant proposal
Job application

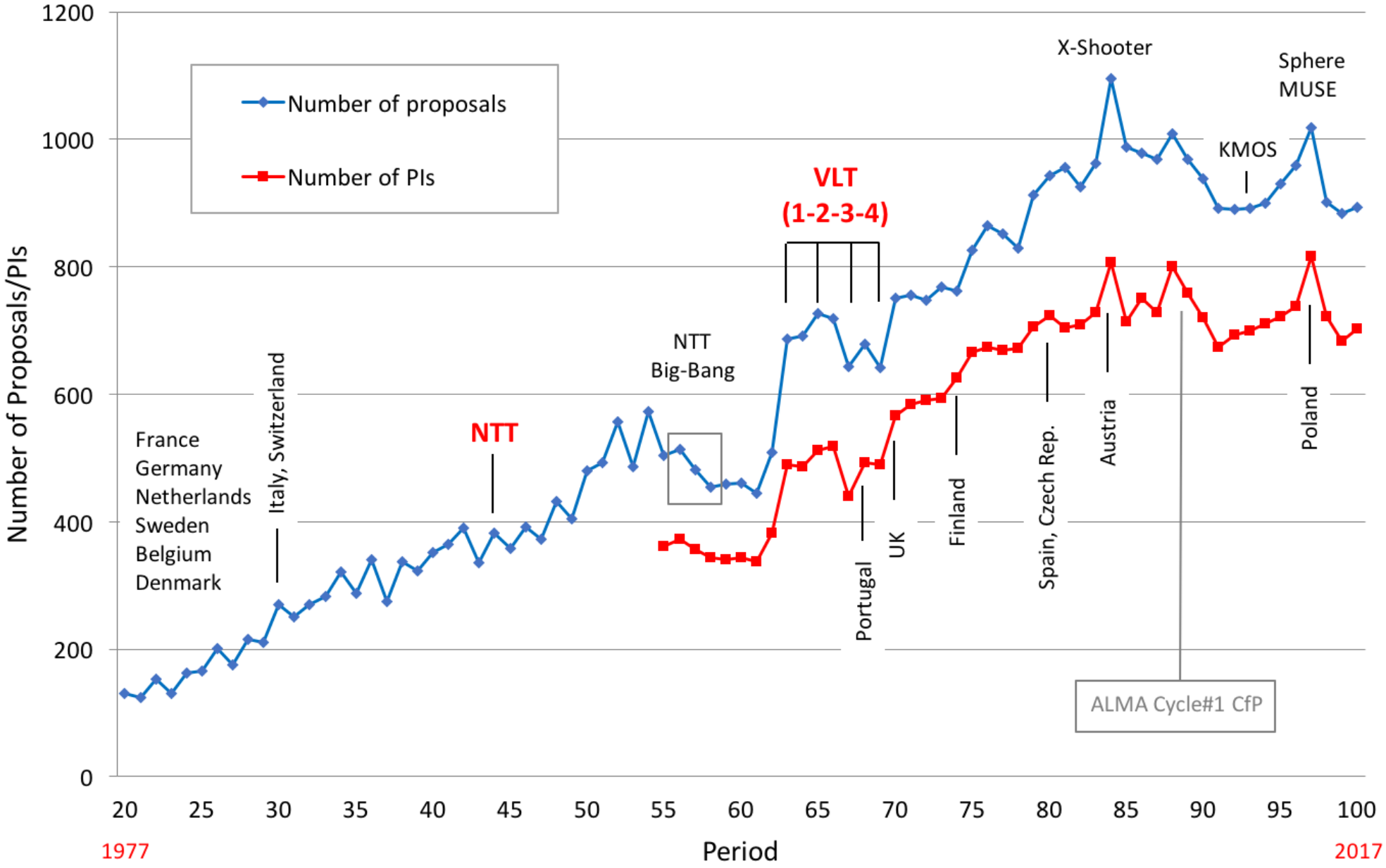
Likely the most important documents
you must write

There is just one hurdle…

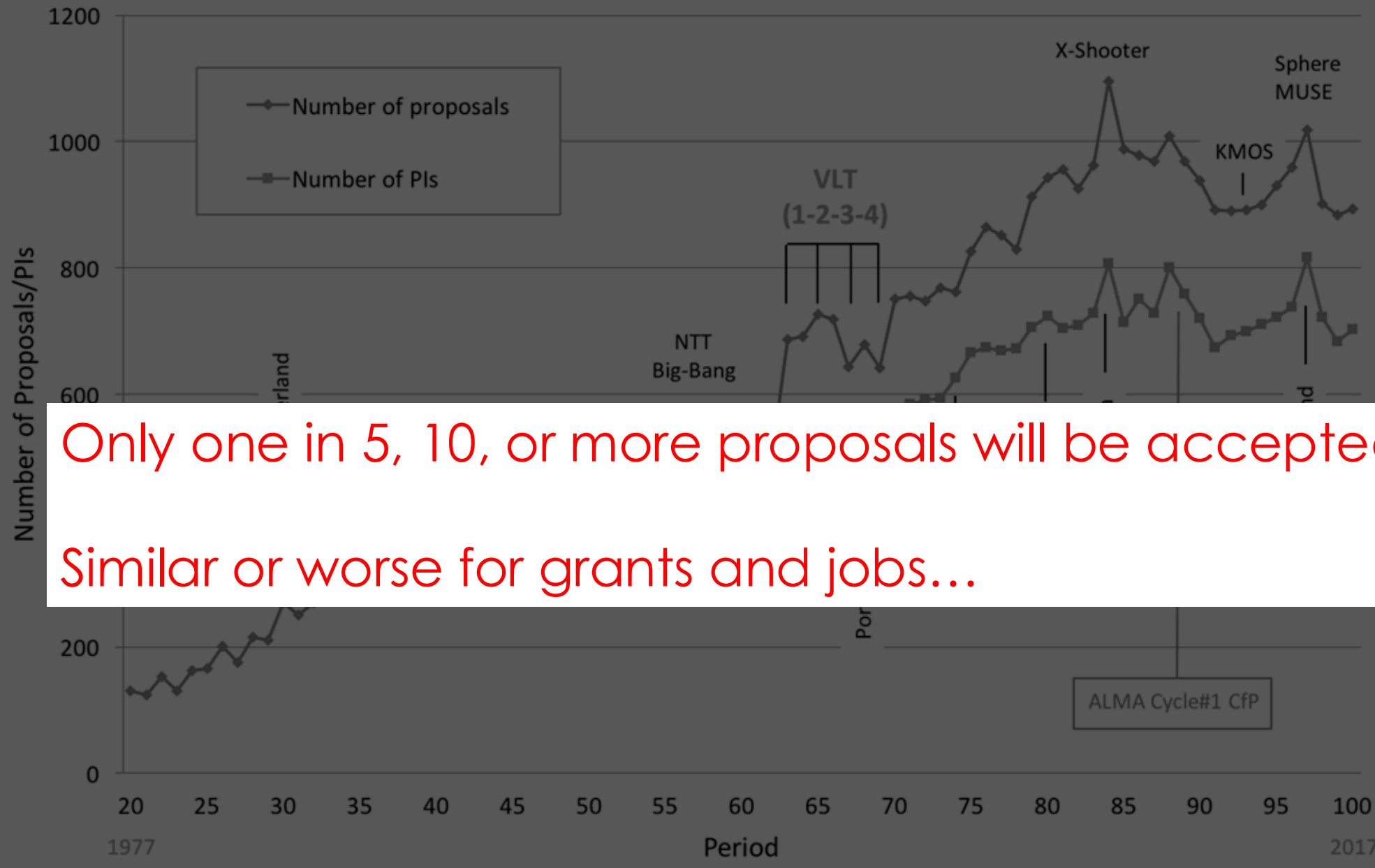
The hurdle

The Time Allocation Committee (TAC), the grant committee, the hiring committee, …

You are not alone to have an idea…



You are not alone to have an idea…



Only one in 5, 10, or more proposals will be accepted!

Similar or worse for grants and jobs…

A proposal

One night of the VLT costs ~60,000 EUR!

So, it makes sense that one has to justify using it!

Not unlike a business proposal…

A proposal is a sales tool,
not an information packet

The purpose of the proposal is to
make a persuasive case that leads to
telescope time, a job, money, …

https://www.inc.com/geoffrey-james/how-to-write-a-winning-proposal.html

A proposal

A proposal is a sales tool, not an information packet. The purpose of the proposal is to make a persuasive case that leads to telescope time, a job, money, …

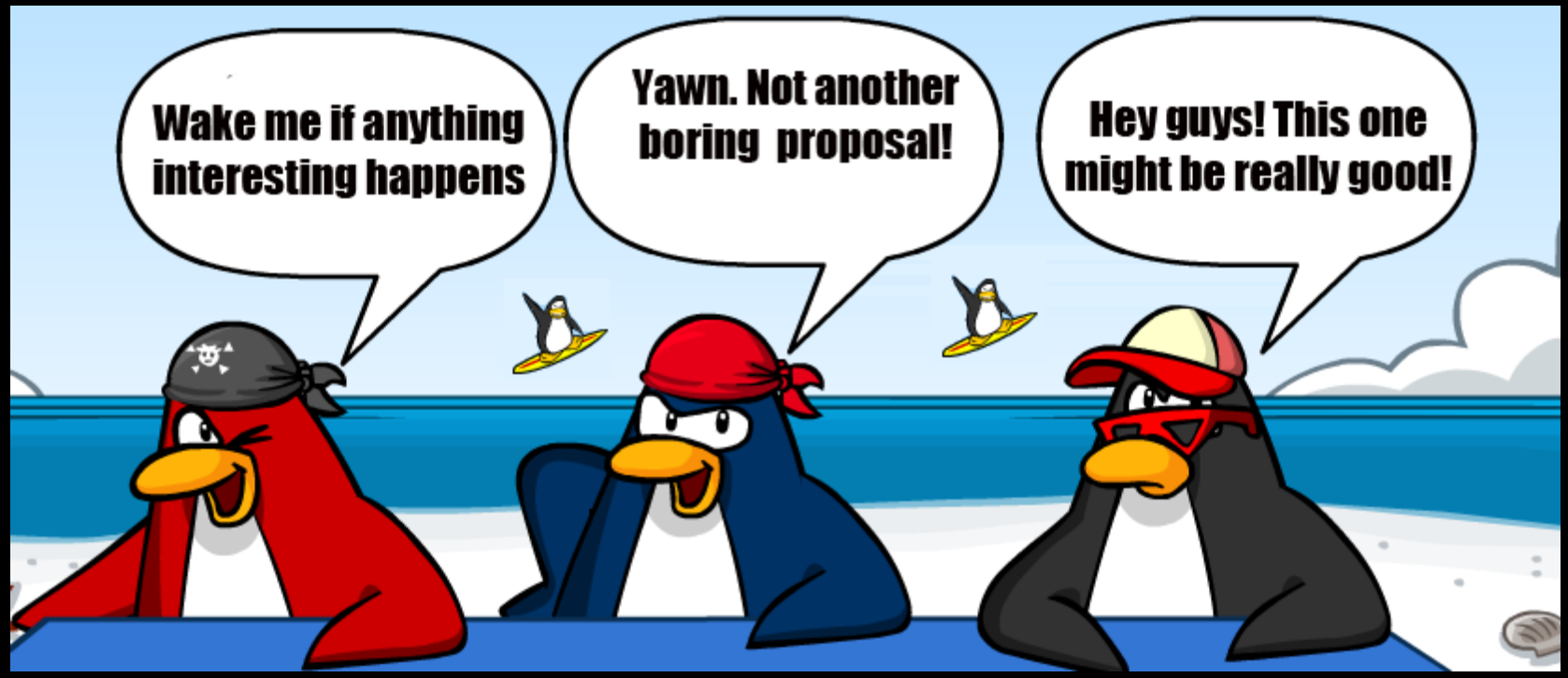
The same rules apply:

✓Is this proposal compliant?

✓Does this proposal make sense?

✓Does the solution provide value?

https://www.inc.com/geoffrey-james/how-to-write-a-winning-proposal.html



Many proposals to be read by committee members

A proposal must be **concise and clear**: get your point across quickly and efficiently!

The OPC

Composed of peers

- At ESO (or HST) there are sub-panels that consist of experts in a broad area
- In national TACs there is usually only one group

→ The reviewer is unlikely to be an expert on your topic

A proposal must be understandable
for a non-expert

Make your science understandable

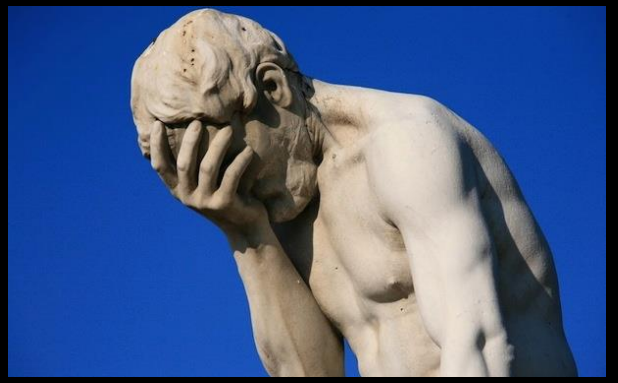
You are the expert

The panel members may not be

Be explicit, do not assume that the panel will work out what you meant

It is most likely that your proposal will be the 20th proposal to be read during that day!

If the reviewer does not immediately understand what you say you have lost



What makes a proposal successful? (I)

Exciting science

providing a clear progress in our understanding of some phenomenon

A neat idea

unusual method, new idea, new approach, unique observation or experiment

Clear language

presentation of an exciting story, which is interesting for many people

cover all questions somebody may have

is well written and not wordy

What makes a proposal successful? (II)

Exciting science

- providing a clear progress in our understanding of some phenomenon

A neat idea

- unusual method, new idea, new approach, unique observation or experiment

Clear language

- presentation of an exciting story, which is interesting for many people
- cover all questions somebody may have
- is well written and not wordy

A consistent story

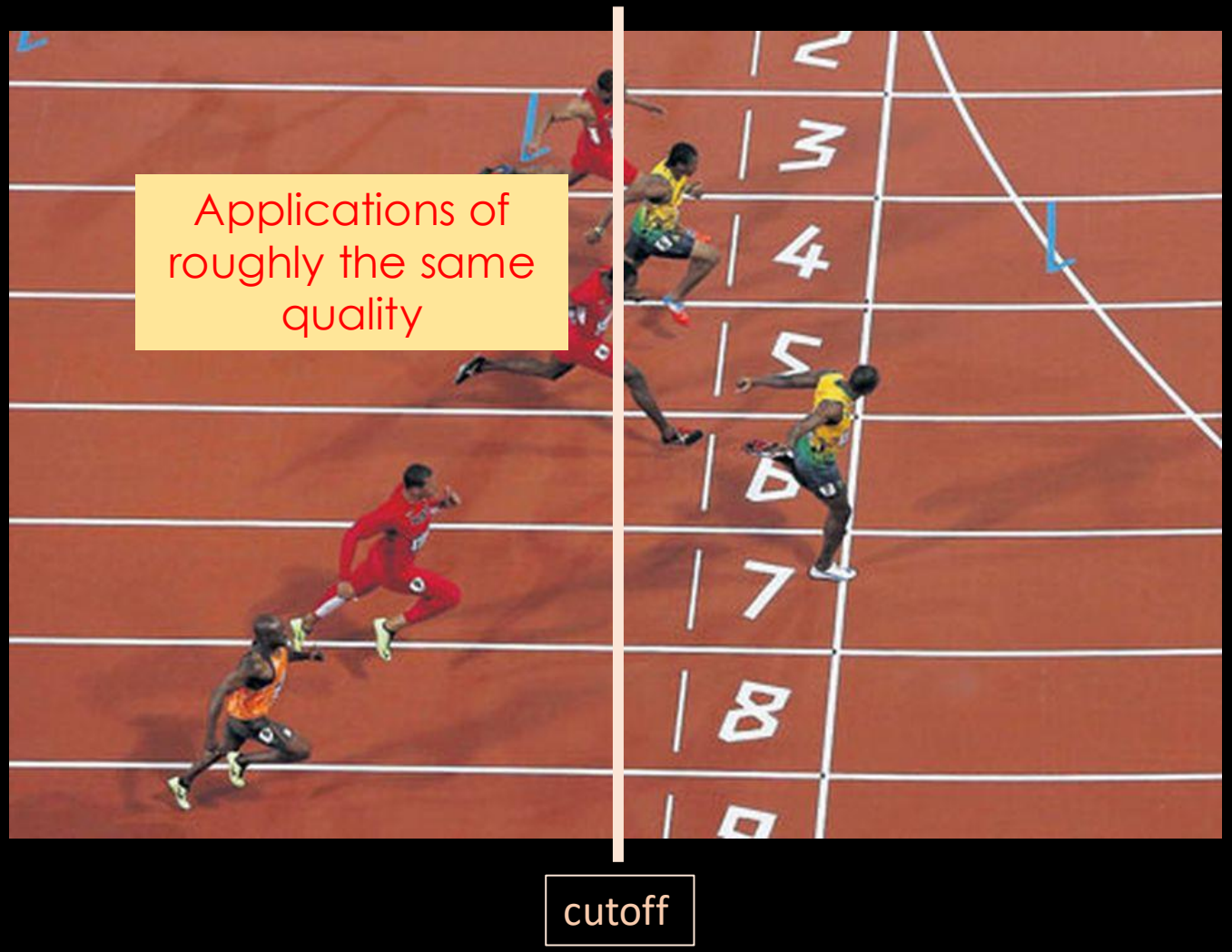
- the proposal is complete and provides all information
- quantitative arguments for the amount (of time, of money, …) requested

A proposal with a good idea but
poorly written will be rejected.

A proposal with an average idea
but well written
may get accepted.

A. Hatzes

Your proposal is part of a "Thundering Herd"



The boundary between success and failure can be a fraction of a point

Your job: do everything you can to position yourself above the cutoff

Adapted from A. Hatzes

Essential differences

A paper

Can have any number of pages

There are **no** hard deadlines for submitting

All data at hand. You can write the full story and then summarise it

A proposal

Limited number of pages!

HARD DEADLINES for submitting

No data. Need to make up the story

Often, anonymised

F. Patat

Get a catchy title

Likely done **at the end** and should be well thought

Describes content in an **honest**, but **attractive** way

Beware of using AI for it!

To the point – reviewer should understand what the proposal is about

Improving the title

Unveiling the 50 Myr-old two-Neptune system TOI-942 with JWST's transmission spectroscopy

Unveiling the 50 Myr-old two-Neptune system TOI-942 with JWST's transmission spectroscopy

A comparative study of disequilibrium chemistry in the atmospheres of very young Neptunes

The abstract

Unlike for a paper, write the abstract of your proposal first

This ensure you have a good idea

The abstract HAS to contain the punch line

Despite considerable modeling and observational efforts, the mechanisms leading to the explosion of a White Dwarf (WD) as a Type Ia supernova (SN Ia) are still uncertain. In particular, it is unclear whether the mass of the exploding WD is near the Chandrasekhar limit (1.4 solar masses) or significantly below. Here we propose to test a robust diagnostic of the progenitor WD mass, derived from state-of-the-art radiative transfer simulations, based on the detection of a strong [Ni II] line at 1.94 microns predicted in the late-time spectra of Chandrasekhar-mass models. This line is entirely absent from sub-Chandrasekhar-mass models. We will test this prediction using a sample of four SNe Ia discovered before maximum light during May-Oct 2017 by ongoing surveys, for which we will obtain a single high-S/N X-shooter spectrum when the SN is around 150 days past maximum. This unique data set will help unravel the true nature of Type Ia supernova progenitors.

The big picture

How?

What we would like to do and its connection to the big picture (central problem)

The expected goal and the outcome of the observations

Core of the proposal

Put your science into context, so that its relevance for the broader picture, its potential impact, and its timeliness can be appreciated by referees

Be specific about the expected outcome of the project:

What is the quantitative information about the target that should be obtained?	Which physical processes will this information constrain, and how?	Will the data be compared to theoretical models? Do these models already exist? If not, when and how will they be developed?

Writing a proposal

Create an outline of what you will discuss

Write a draft - just get something down on paper

Revise, revise, revise

Obtain peer feedback on the draft
(also from colleagues not in your field)

Revise

Every proposal reader constantly scans for clear answers to 3 questions:

What are we going to learn as the result of the proposed project that we do not yet know?

Why is it worth knowing?

How will we know that the conclusions are valid?

Make it clear that your proposal will really answer the question at hand

Find equilibrium between being ambitious and boastful

A good proposal

"Good proposals include some background on the subject you are studying, in particular why anyone not in your specific field should care.

Then you can explain what exactly you want to do, and why it will solve every problem left in astronomy and find a cure for the common cold.

Adding good figures and tables almost always makes a proposal stronger and easier to understand for the reviewers."

–Spitzer Space Telescope Science Center

https://slideplayer.com/slide/8168642/

Avoid empty sentences

Avoid generic and empty sentences, especially at the start of your proposal. For example:

The study of [...] is one of the key fields of modern astrophysics.

One can replace [...] by your preferred subject and it will be true. But it doesn't tell us anything. I didn't learn anything, and I have now the feeling I will lose my time.

Start with a sentence that will trigger interest

"First sentences
are doors to worlds."

—Ursula K. Le Guin

Look at some of the famous books first sentence

"Mother died today. Or maybe it was yesterday. I don't know."

— The Stranger by Albert Camus

"As Gregor Samsa awoke one morning from uneasy dreams he found himself transformed in his bed into a gigantic insect."

— Metamorphosis by Franz Kafka

"The story so far: in the beginning, the universe was created. This has made a lot of people very angry and been widely regarded as a bad move."

— The Restaurant at the End of the Universe by Douglas Adams

Project enthusiasm and optimism

Some examples of enthusiastic words used by Steve Jobs

Stunning

Revolutionary

Remarkable

Beautiful

Best

Great

Tour de Force

Awesome

Avoid negative expressions

Negative expressions leave a more lasting impression on our psyche than positive ones

Specifically, negative messages have something like 5 to 7 times as powerful an impact on our minds as positive messages

When a married couple has more than 5 positive interactions for every negative one, marriage experts say the relationship is healthy

Avoid negative expressions

On a review panel, any negative impression you give will stay and will be difficult to erase

Avoid negative comments at all costs!

Referees often think they are not doing their job unless they come up with some critical points.

Don't make their job easier!

The following sentences will kill a proposal:

"..I will likely face problems with the onset of dust formation. Therefore, I expect that the models will not be immediately applicable to all of the very latest M dwarfs."

" Some of the projects listed below may be overly ambitious."

"Some of my proposed projects may be tentative."

Adapted from A. Hatzes

Avoid negative comments at all costs!

Referees often think they are not doing their job unless they come up with some critical points.

Don't make their job easier!

Be honest, but cast things in a positive way:

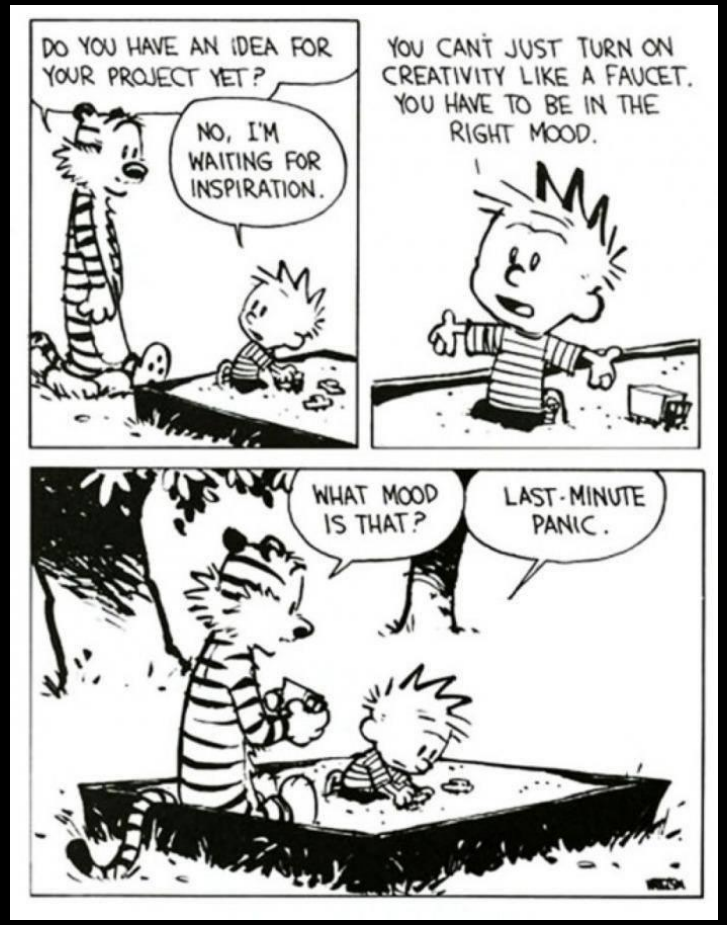
"I realise that the onset of dust formation may cause problems. In this case dust can be treated in the following way... Even without the treatment of dust progress will be made in understanding..."

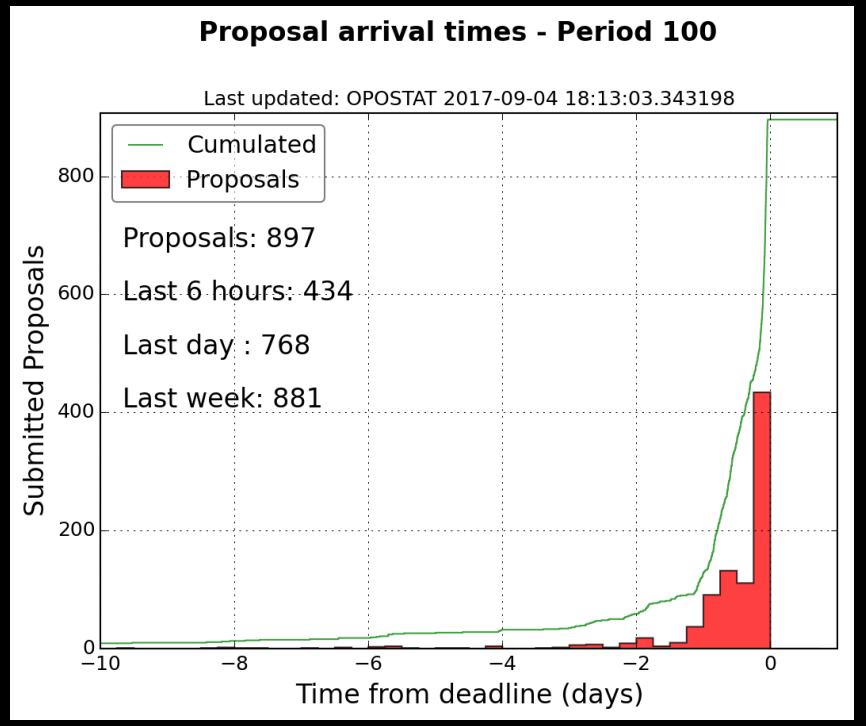
Adapted from A. Hatzes

To write a good proposal takes a long time

Start early

Don’t wait for the last minute…





Waiting so late may jeopardise your proposal and is not kind for your colleagues.

Get ready for setbacks

Fairly competitive job market

ERC funding rates typically less than 15 percent

Telescope time oversubscribed by factors 3–10

Rejection rates for papers submitted to some scientific journals are traditionally 70 to 80 percent

To fall and to rise

Beatles were rejected by Columbia, HMV, Pye, Philips, and Oriole

Decca Records rejected them: "guitar groups are on the way out" and that "the Beatles have no future in show business"

Five months later, the Beatles signed with George Martin at Parlophone, an imprint of EMI

Need to learn from these

You will get MANY rejection letters

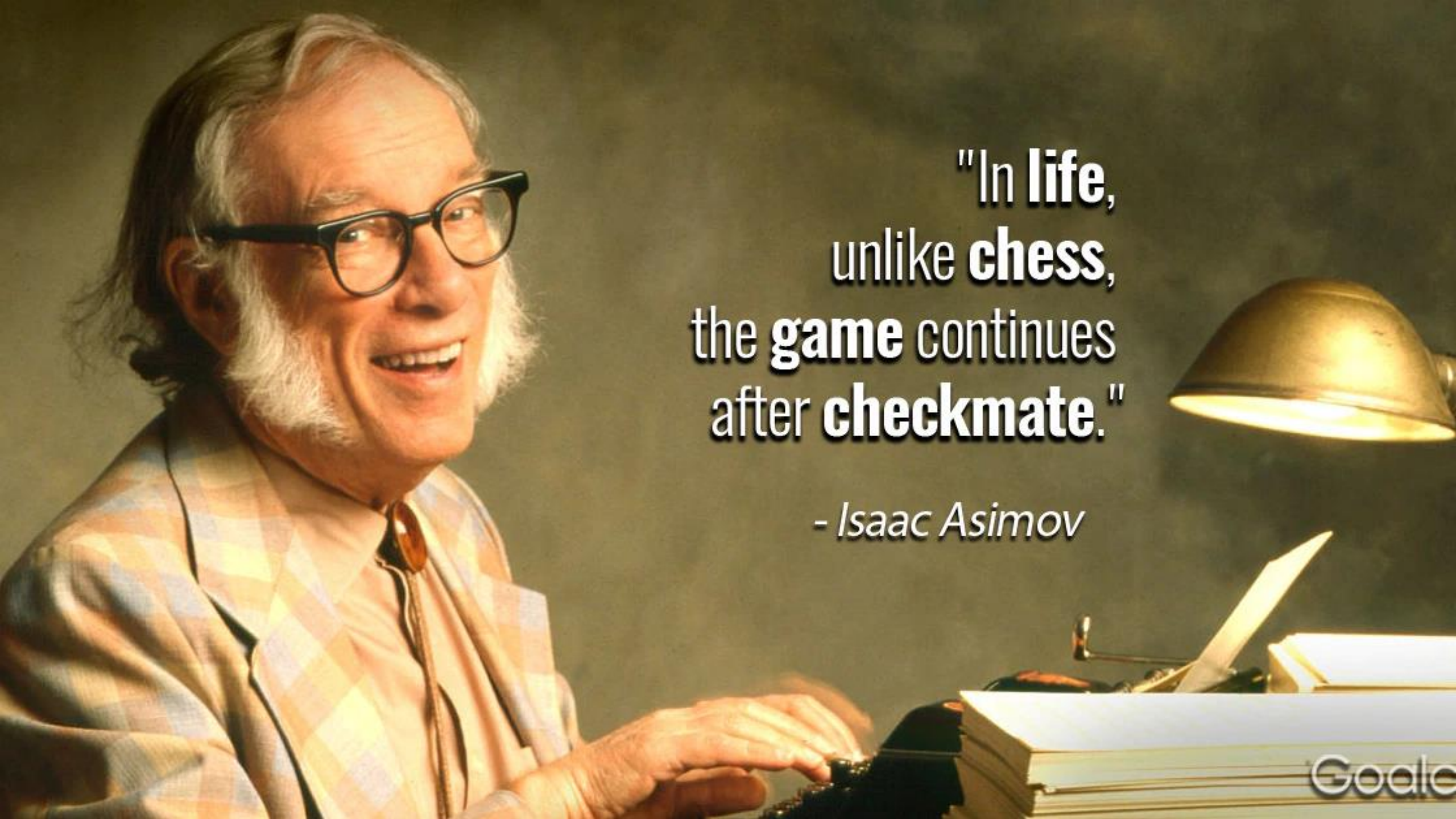
Learning from unsuccessful proposals

Evaluations are about proposals, not yourself

It is not because they have rejected you once, that you shouldn't try again

"No" doesn't mean "*You are a bad person and we hate you forever.*"

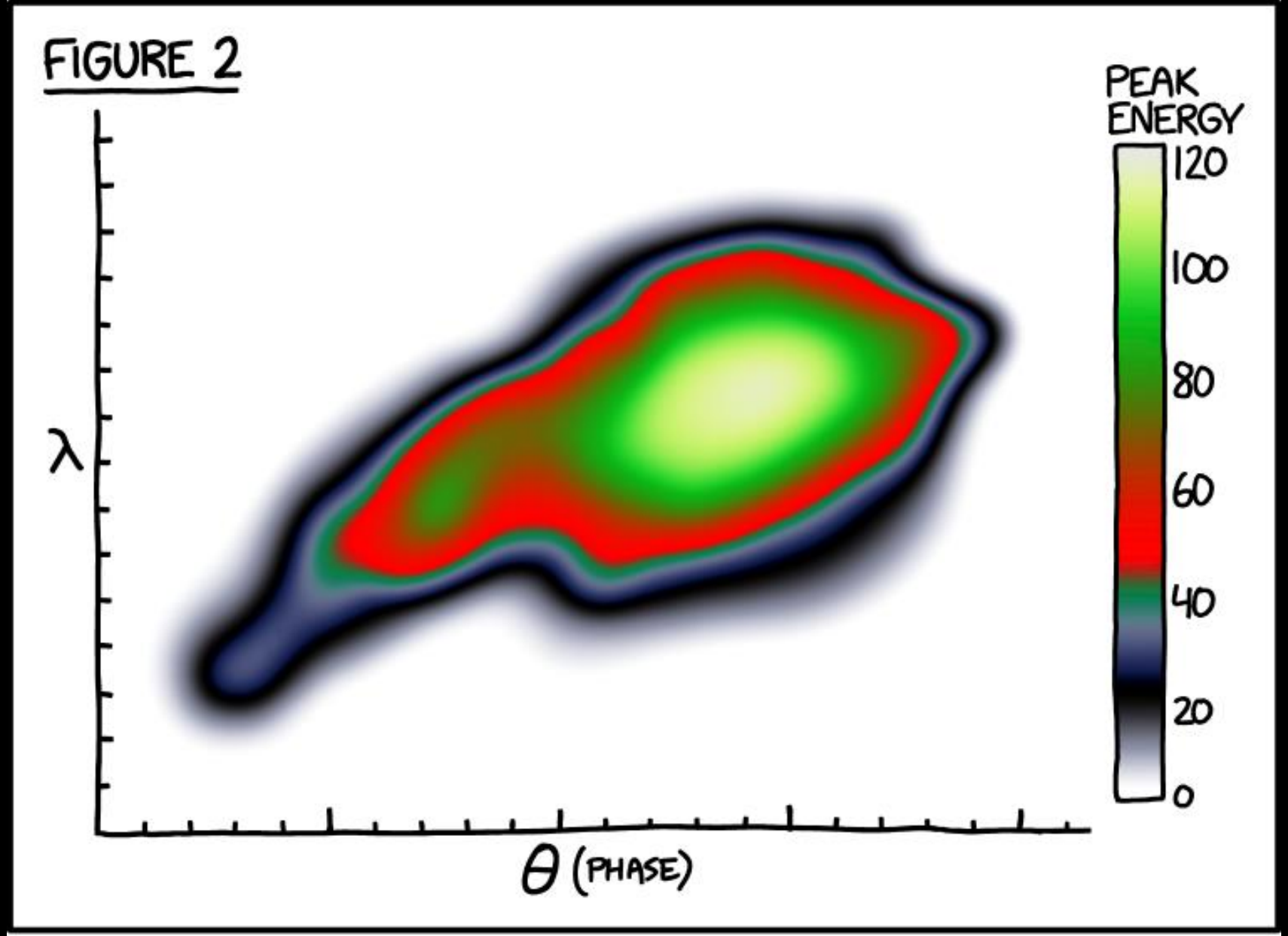
Often, it just means "*No thanks, not this time.*"


"In life,
unlike chess,
the game continues
after checkmate."
- Isaac Asimov

Some comments about figures

(this is also useful for your talks)

Figures are meant to demonstrate evidence vividly



EVERY YEAR, DISGRUNTLED SCIENTISTS COMPETE FOR THE PAINBOW AWARD FOR WORST COLOR SCALE.

Colour pallets

COMPLEMENTARY COLOURS

Good for showing differences in datasets

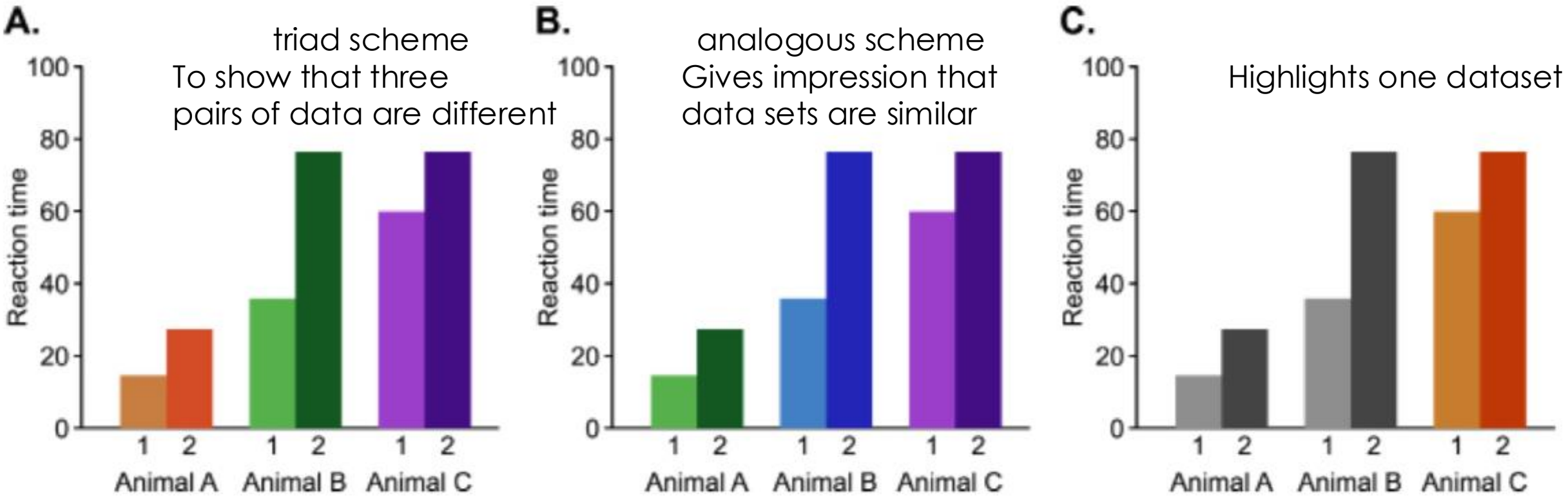
ANALOGOUS COLOURS

Good for showing similarities in datasets

TRIAD COLOURS

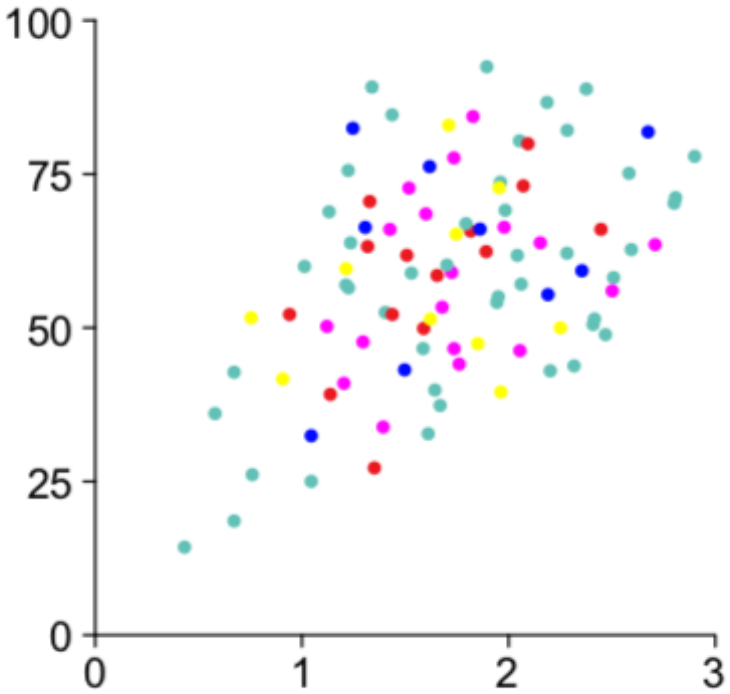
Good for showing differences in datasets with more variety than complementary colours

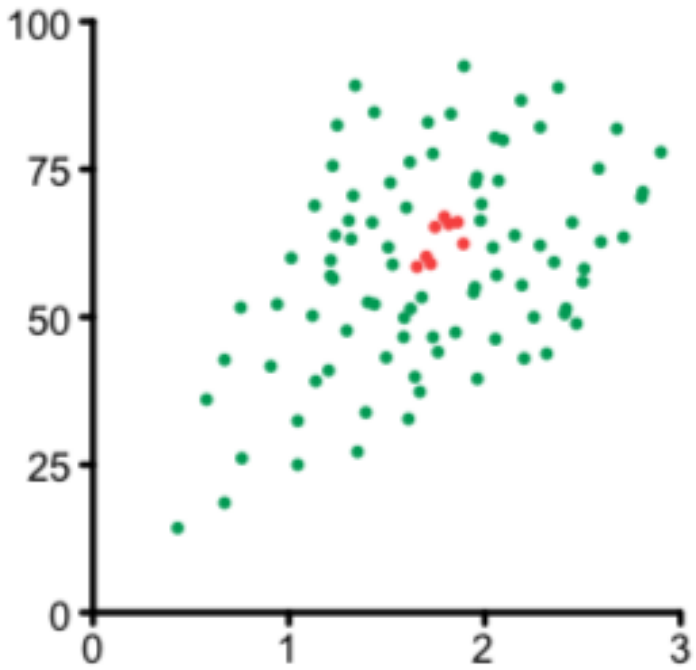
Colour pallets

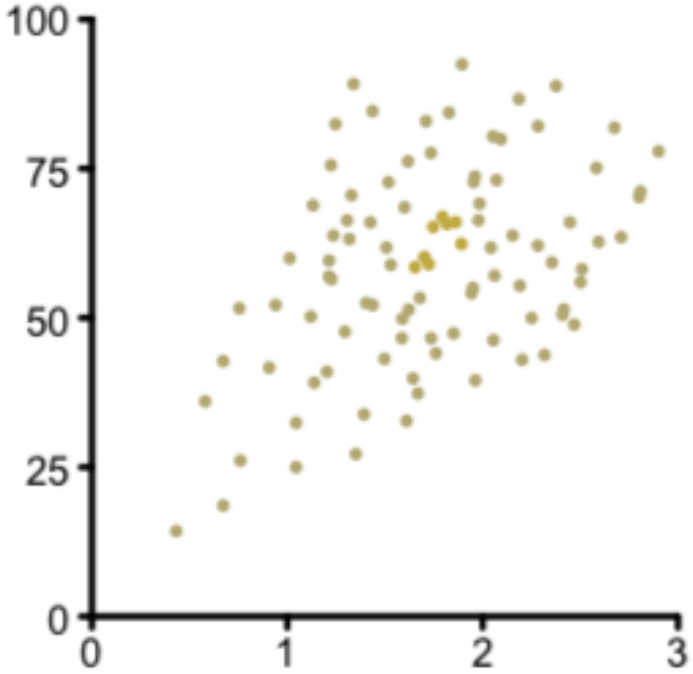


WHEN IS COLOR BAD?

Too many colours kill the colours







How colour-blind people will see it

Instead of using red and green, you can use purple and green.

Generating accessible images

Do not use rainbows. Use a perceptually uniform colour map, such as viridis or cividis

Generating accessible images

Do not use rainbows. Use a perceptually uniform colour map, such as viridis or cividis.

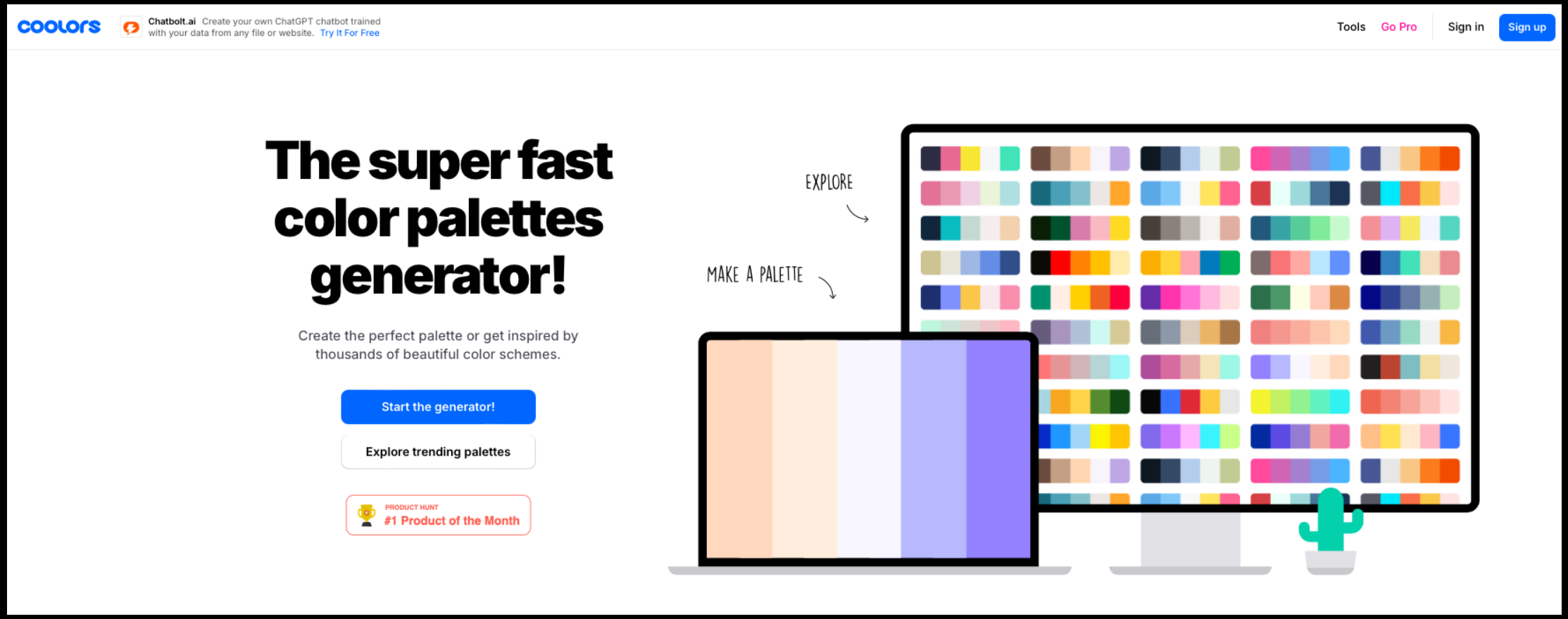
Avoid red Especially in combination with green

Go grey. Check your figure in greyscale, or by completely desaturating it

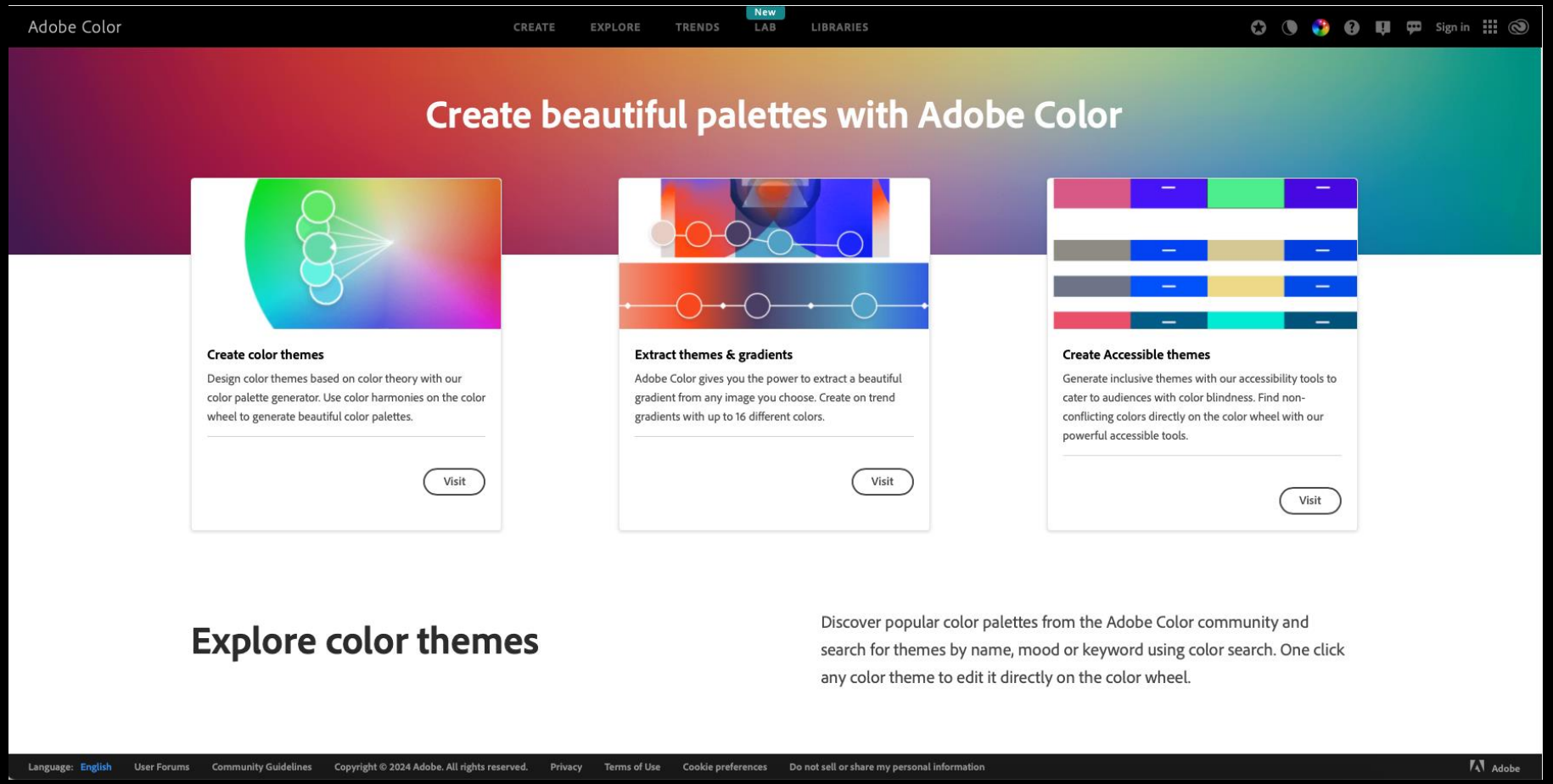
Pick a palette. Choose one that works for everyone

Think bigger. Use features such as shapes and line textures to disambiguate colour

https://coolors.co

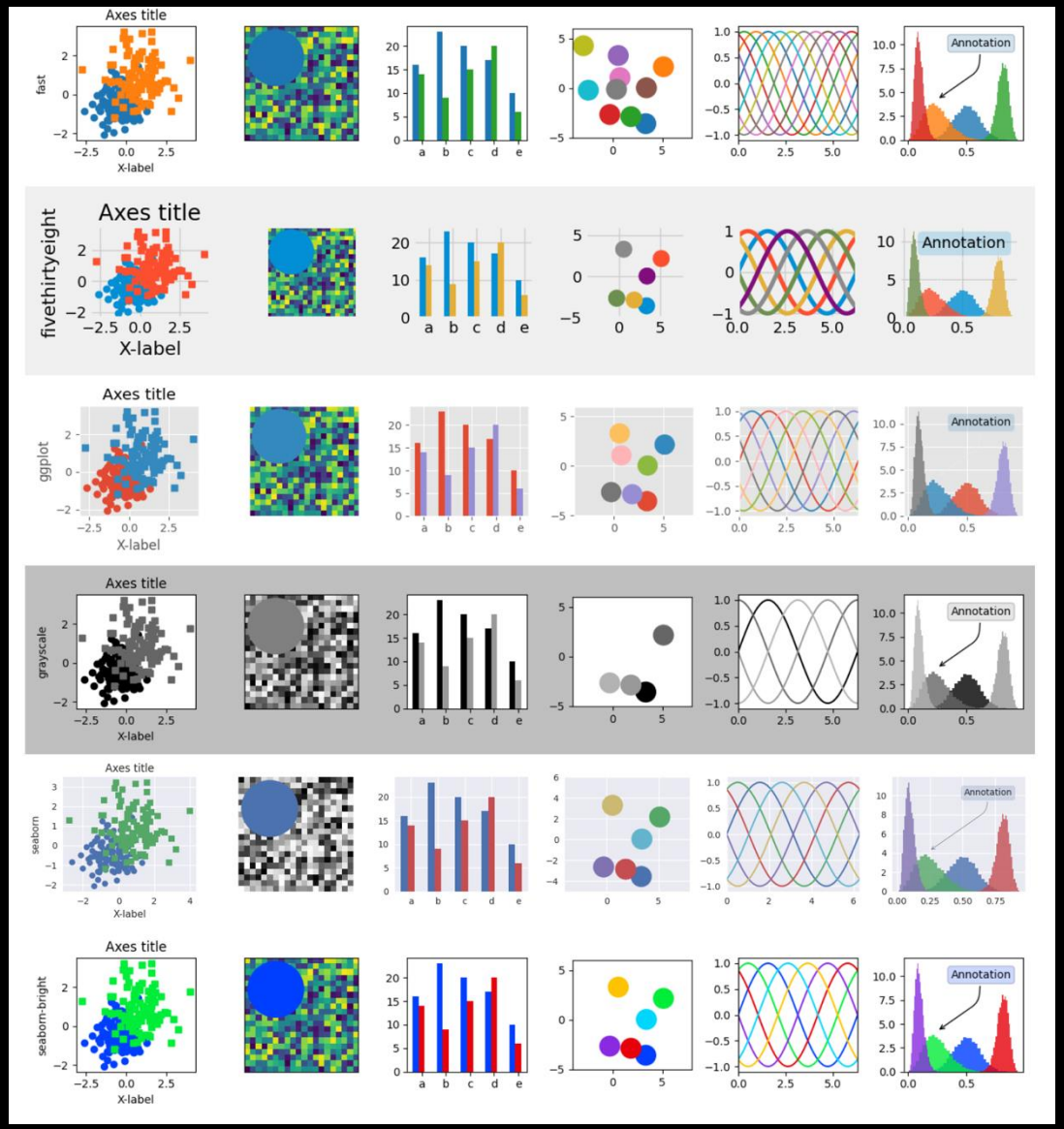


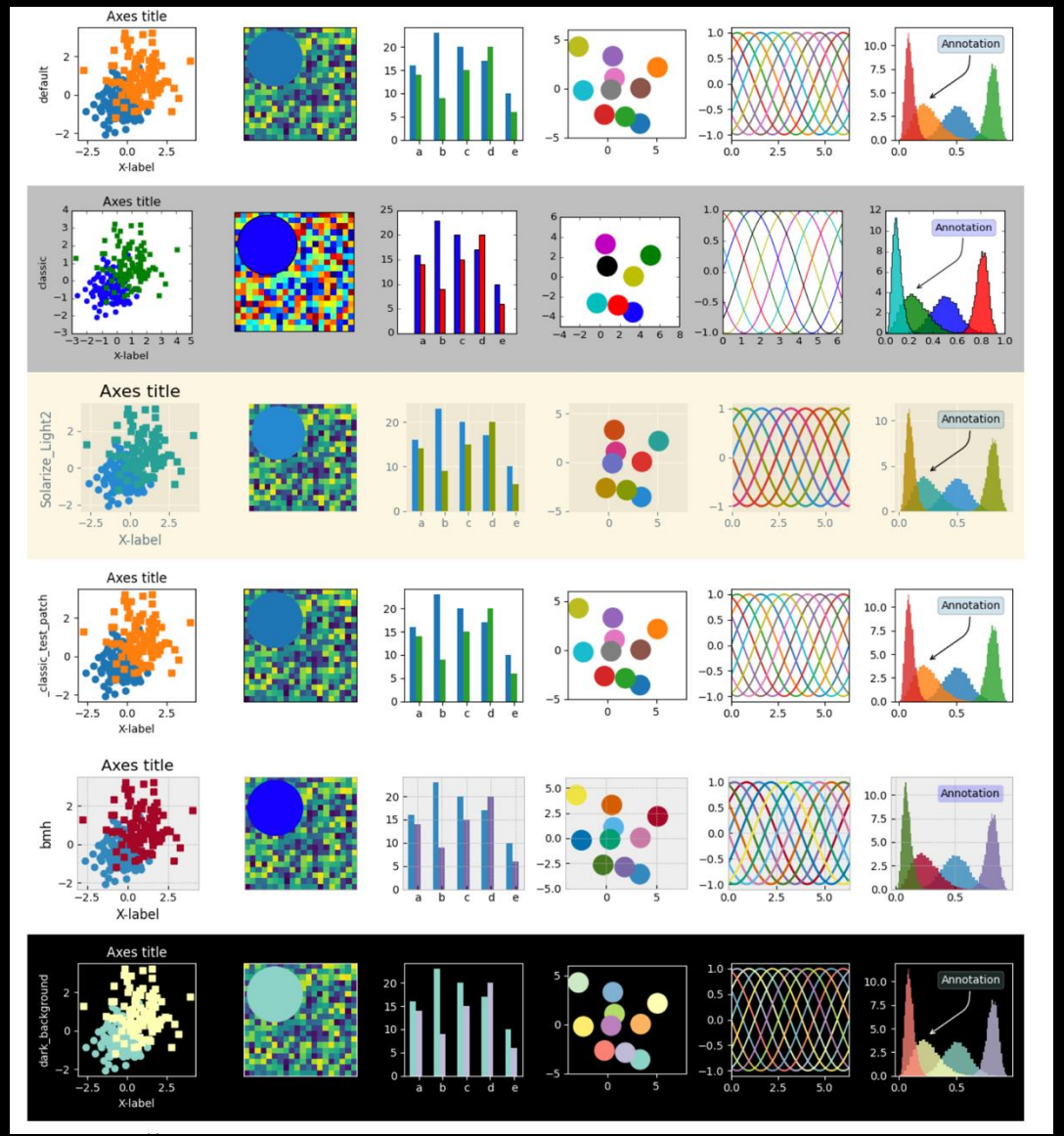
https://color.adobe.com



https://matplotlib.org/stable/gallery/style_sheets/style_sheets_reference.html

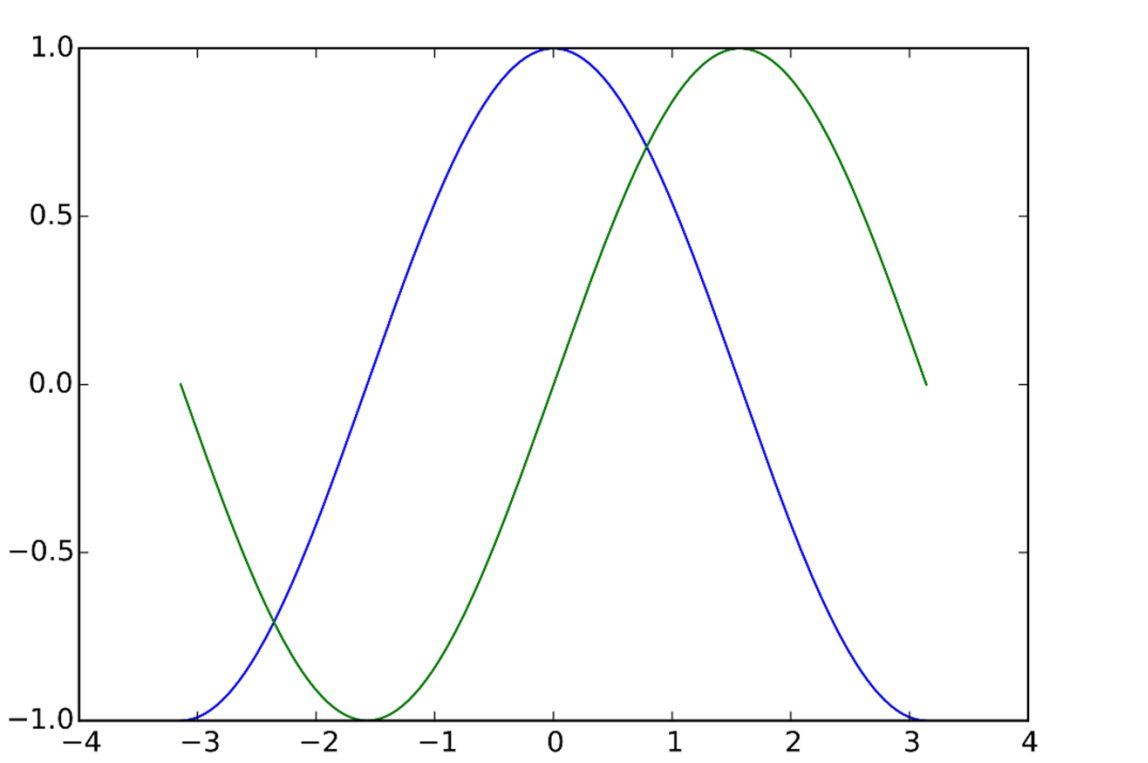
Matplotlib Plot Styles





https://doi.org/10.1371/journal.pcbi.1003833.g004

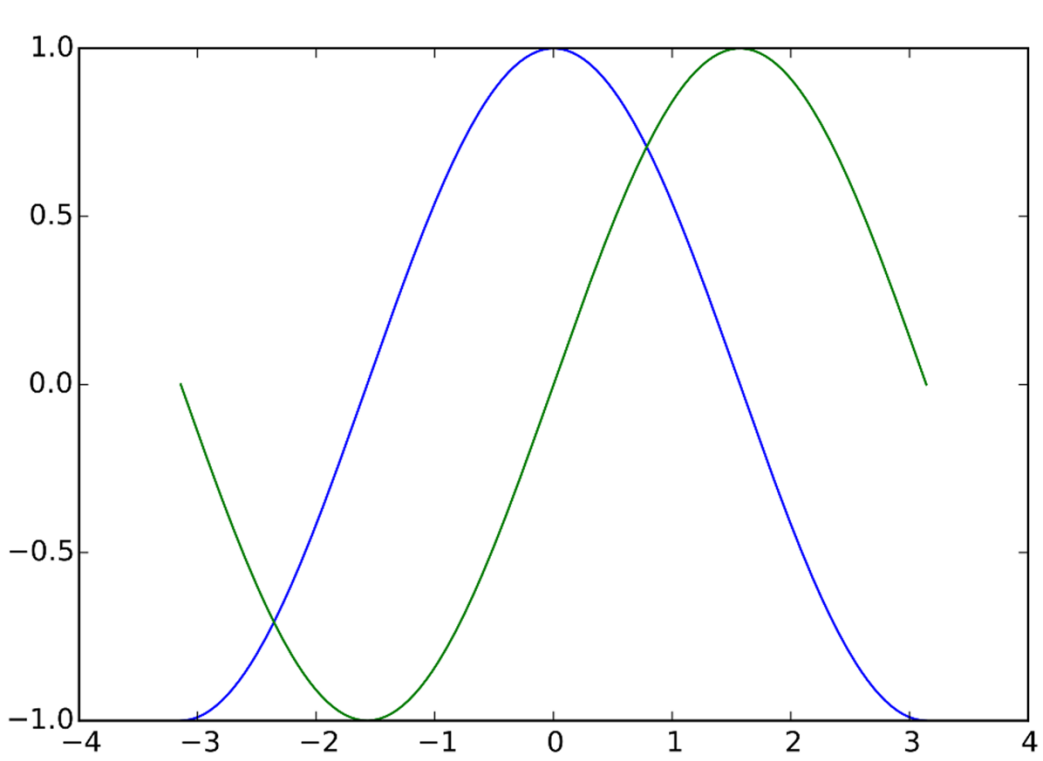
Do not blindly trust the defaults



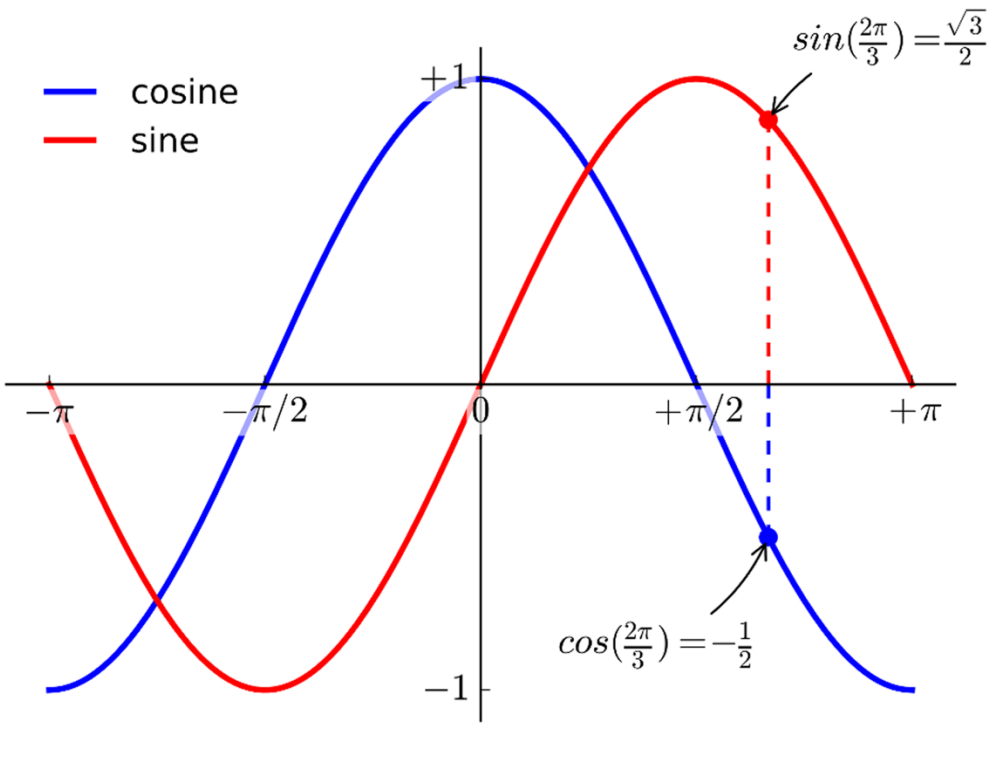
Matplotlib default

https://doi.org/10.1371/journal.pcbi.1003833.g004

Do not blindly trust the defaults

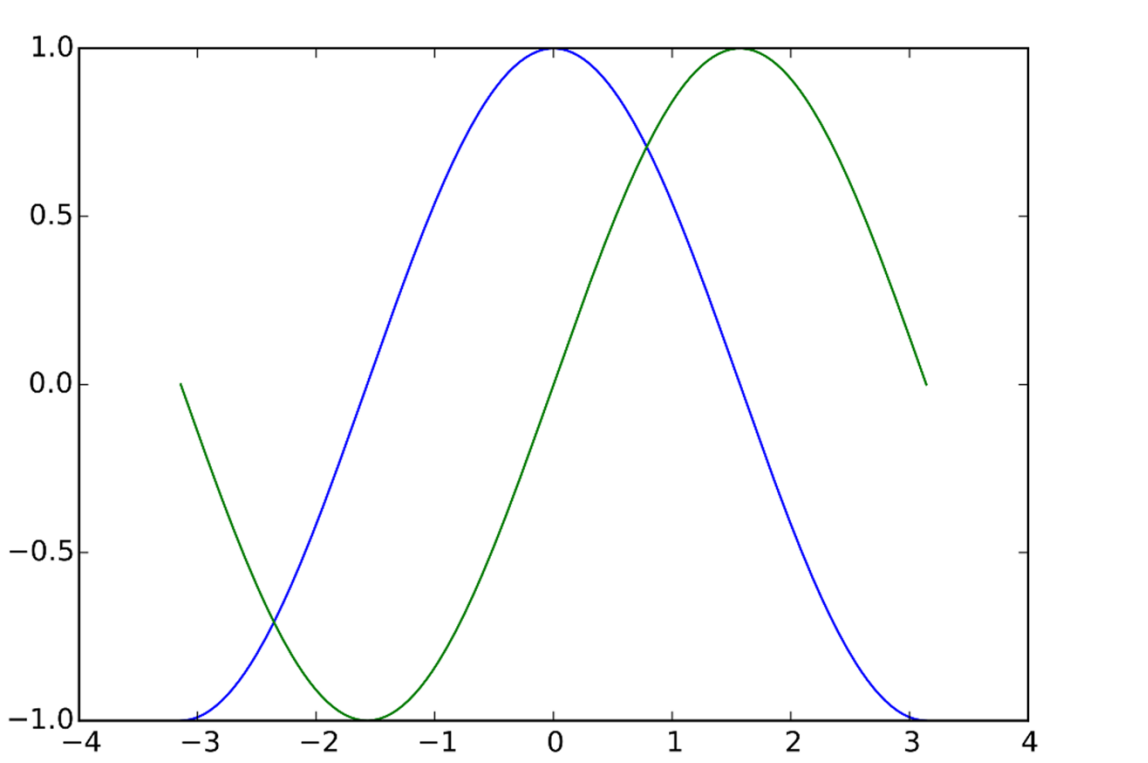


Matplotlib default



Much nicer

Do not blindly trust the defaults

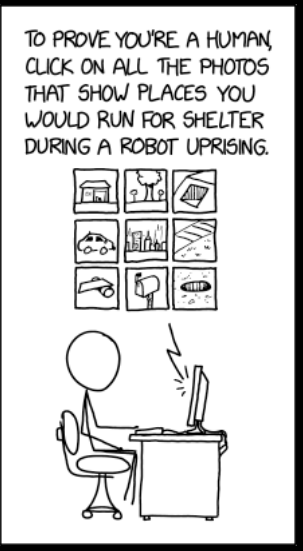


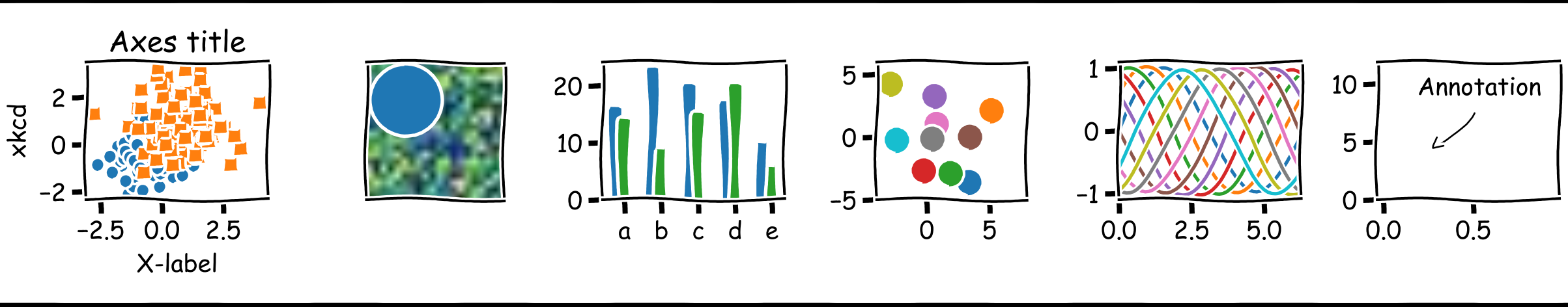
Matplotlib default

Beware also of tick and ticklabel defaults!

They are often too small!

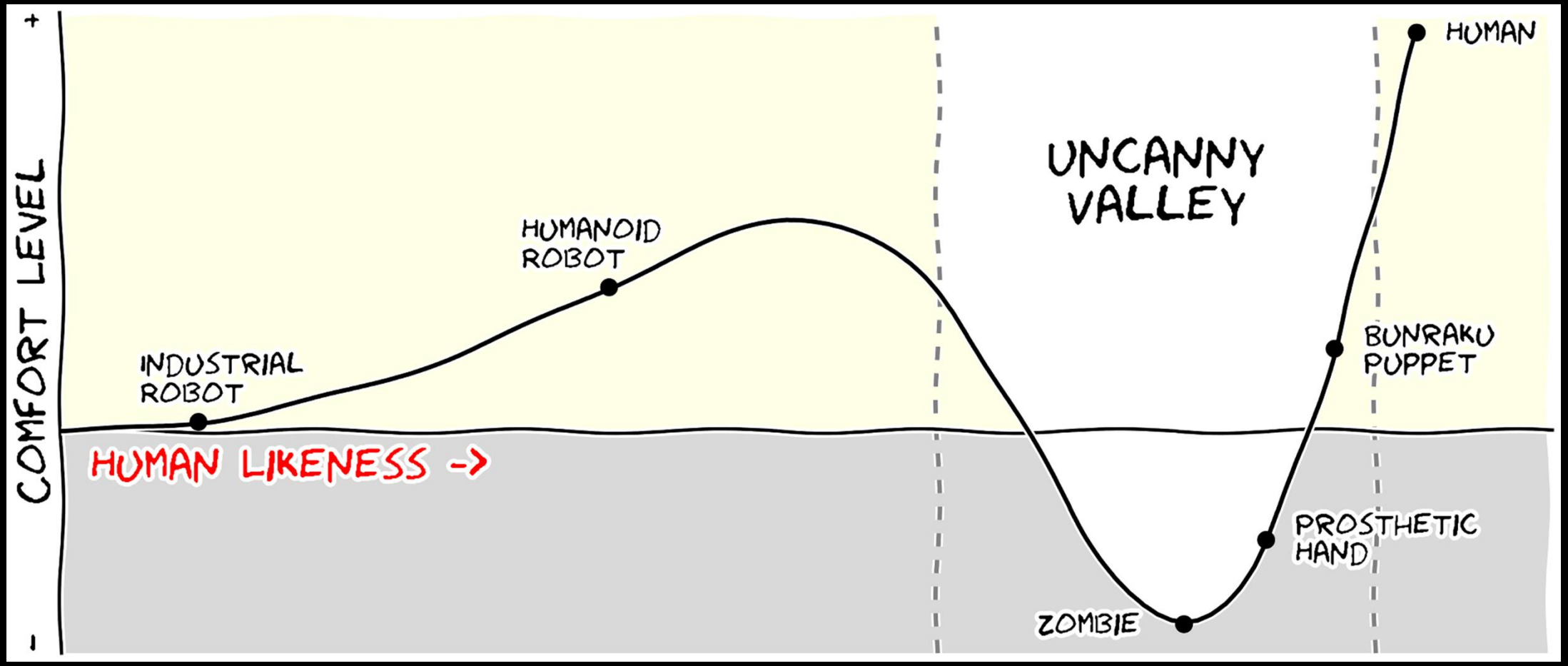
plt.xkcd()


TO PROVE YOU'RE A HUMAN, CLICK ON ALL THE PHOTOS THAT SHOW PLACES YOU WOULD RUN FOR SHELTER DURING A ROBOT UPRISING.


Axes title
xkcd
2
0
-2
-2.5
0.0
2.5
X-label
20
10
0
a
b
c
d
e
5
0
-5
0
5
1
0
-1
0.0
2.5
5.0
10
5
0
Annotation
0.0
0.5

https://doi.org/10.1371/journal.pcbi.1003833.g008

Message Trumps Beauty



Correlating our comfort level with the human-likeness of a robot

Using a sketch style conveys to the viewer that the data is approximate, and that it is the higher-level concepts rather than low-level details that are important

Figures

As for text, look for good and bad examples

Is there anything that frustrates or irritates you? Too much text? Text too small? Poor labelling? Horrible font?

Ask yourself: is this something I wish I had done?

What would I do to make this better?

Figures

As for text, look for good and bad examples

- ✓ Is there anything that frustrates or irritates you? Too much text? Text too small? Poor labelling? Horrible font?
- ✓ Ask yourself: is this something I wish I had done?
- ✓ What would I do to make this better?

Experiment!

Figures are like words

- ✓ It is not because you have created them that you have to use them
- ✓ Delete if needed

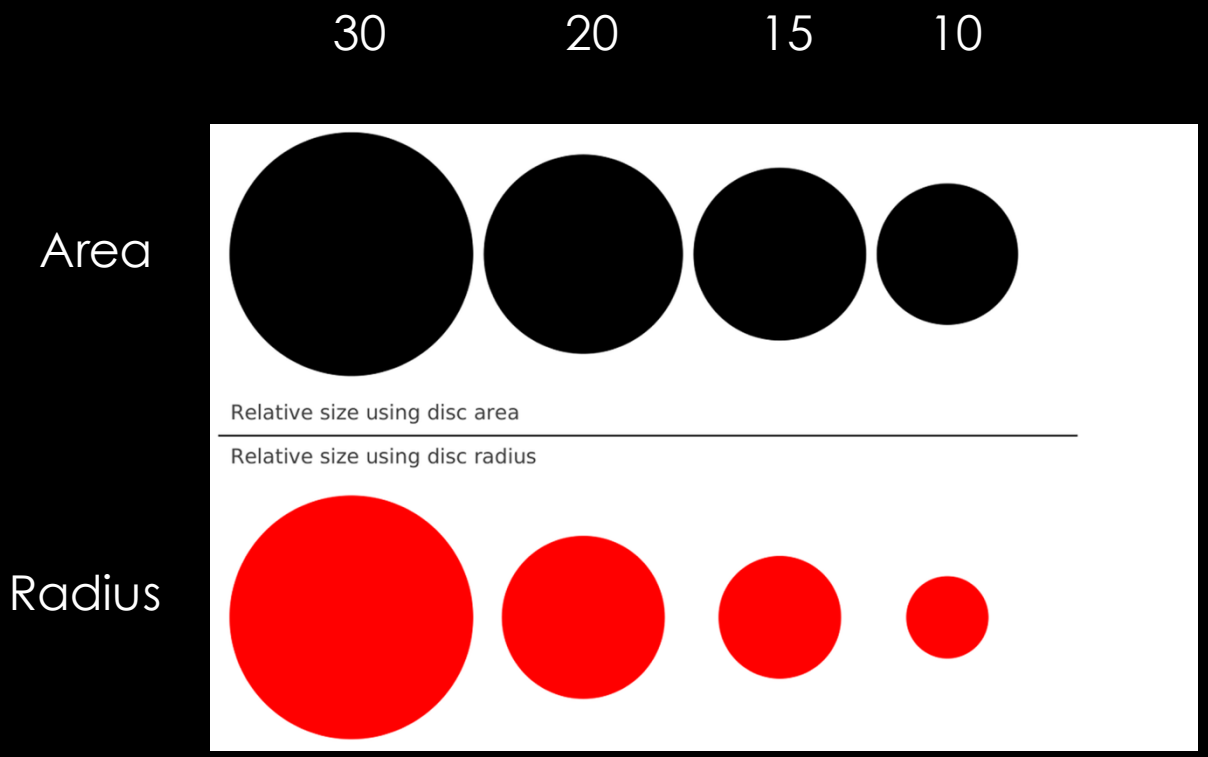
Referee report of a paper by a student who didn't follow advice

"Almost every figure is illegible in some way, with either font size or symbol sizes being much too small, or colours being too faint or lines too thin so that they are practically invisible to the eye.

I recommend the authors print out their paper and try to read their figures in order to find the places where text and symbols needs to be increased in size, colours need to be darkened, and lines need to be thickened."

https://doi.org/10.1371/journal.pcbi.1003833.g006

Do not mislead the reader



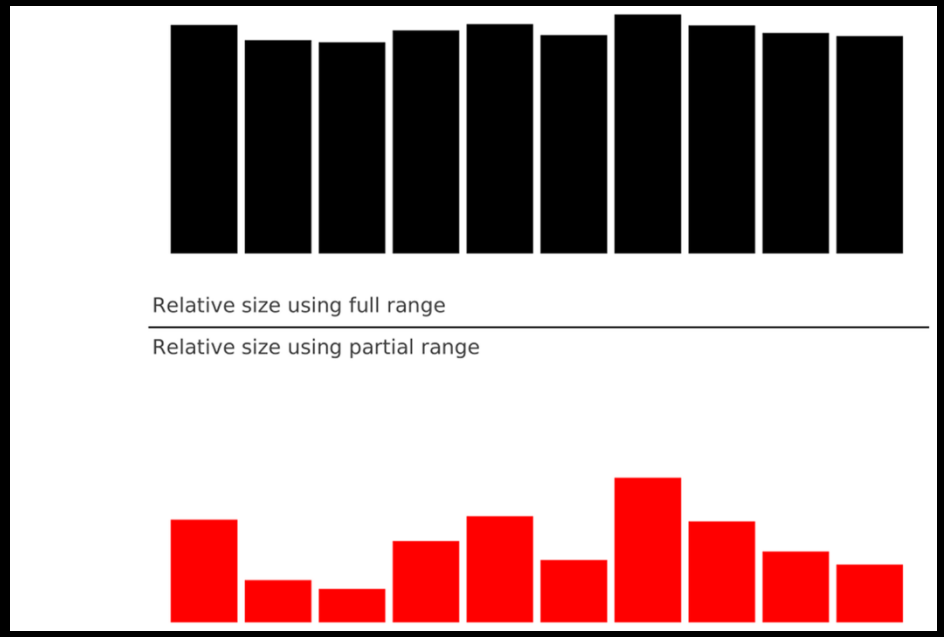
Using the radius, which is often the default, is misleading

https://doi.org/10.1371/journal.pcbi.1003833.g006

Do not mislead the reader

Same values

Seems similar

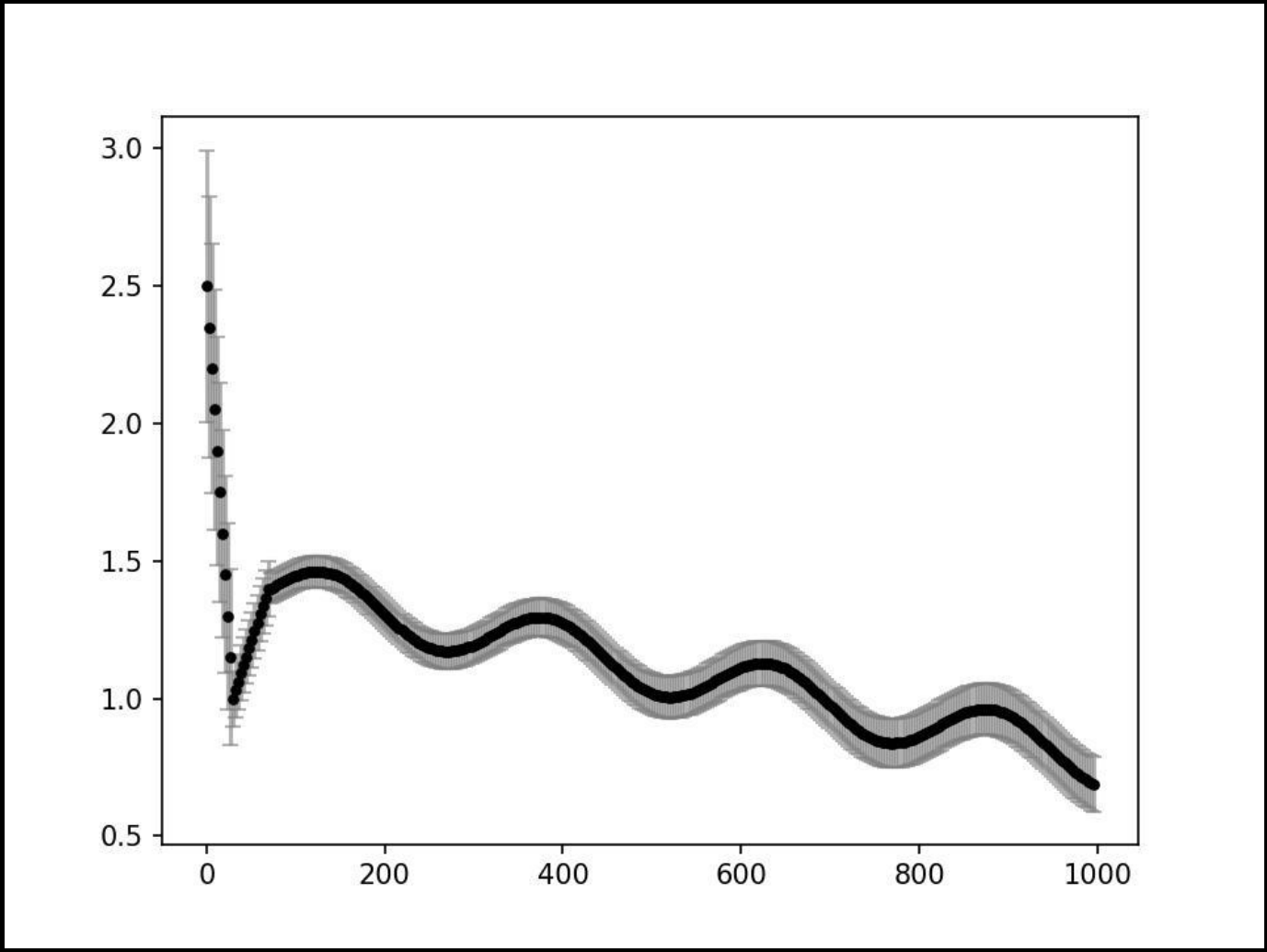


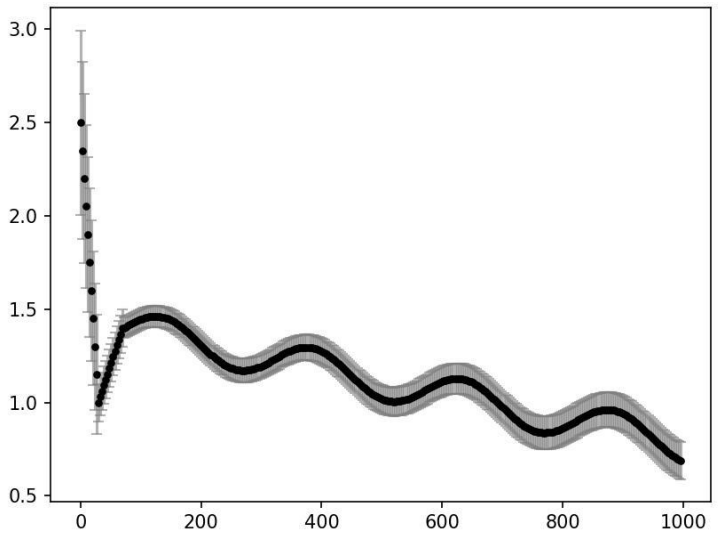
Range 0-100

Seems very different

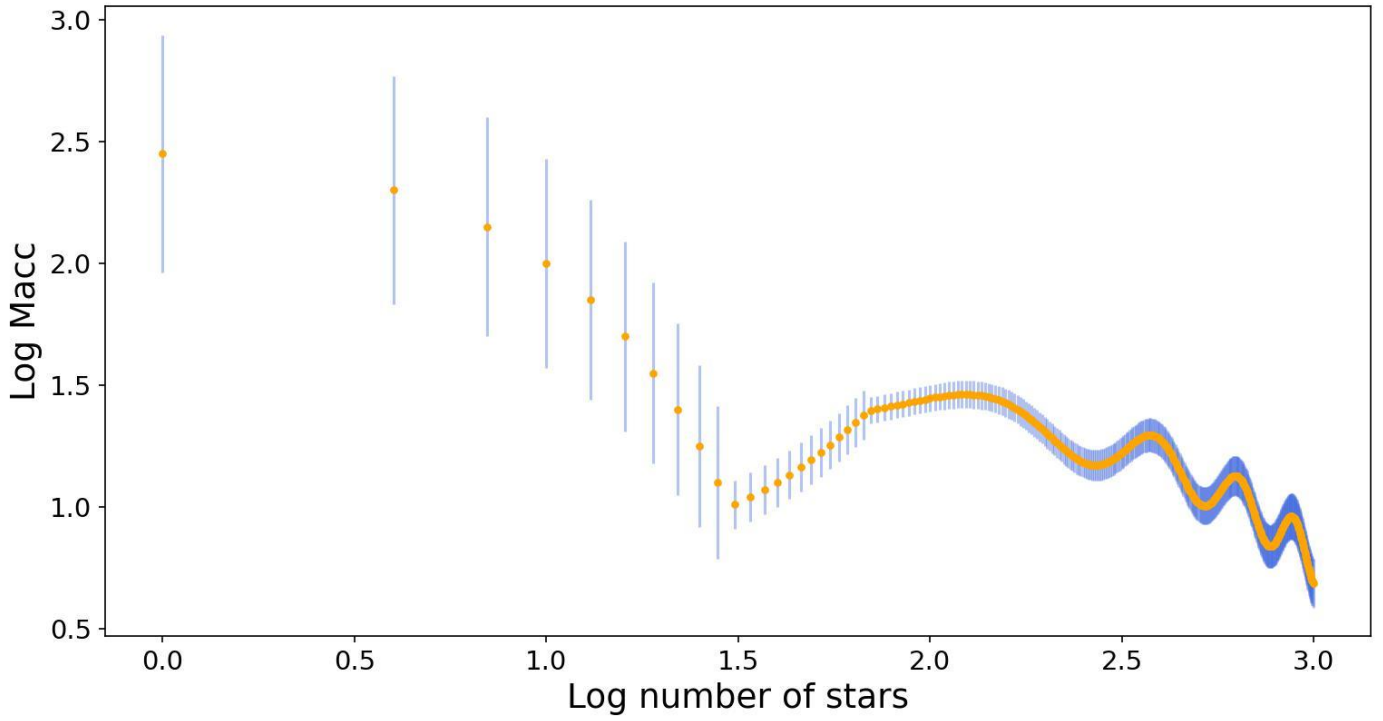
Range 80-100

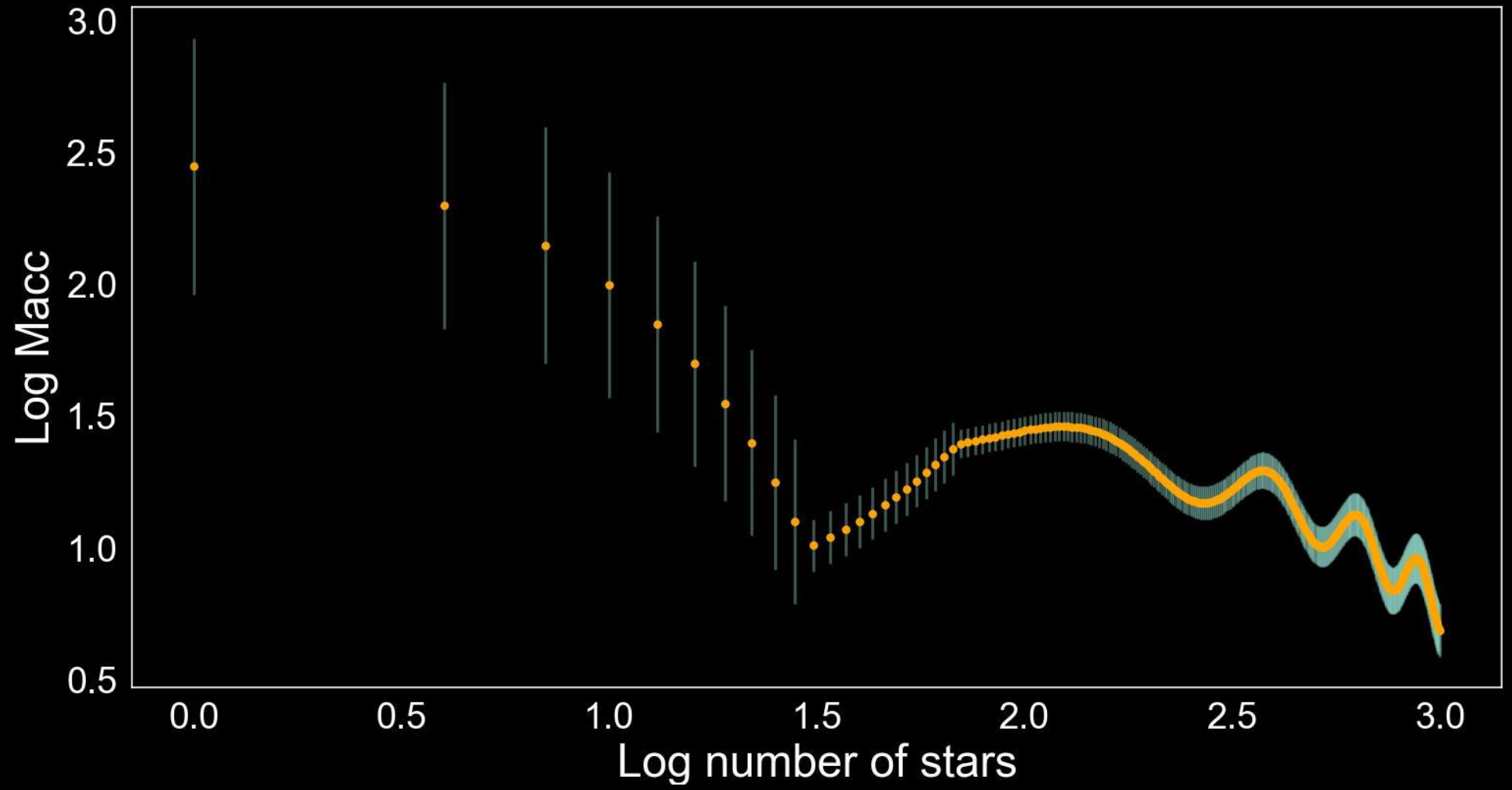
Use correct scale

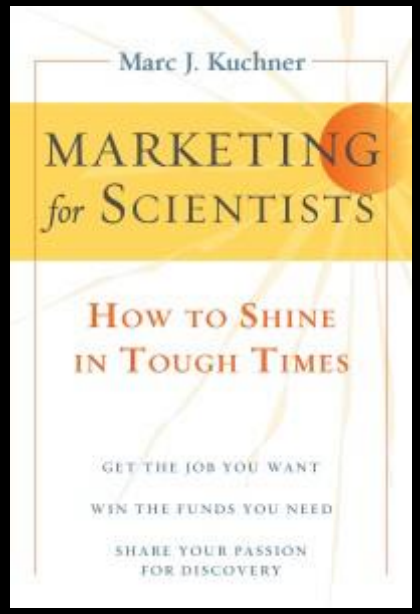




Use correct scale and fontsize



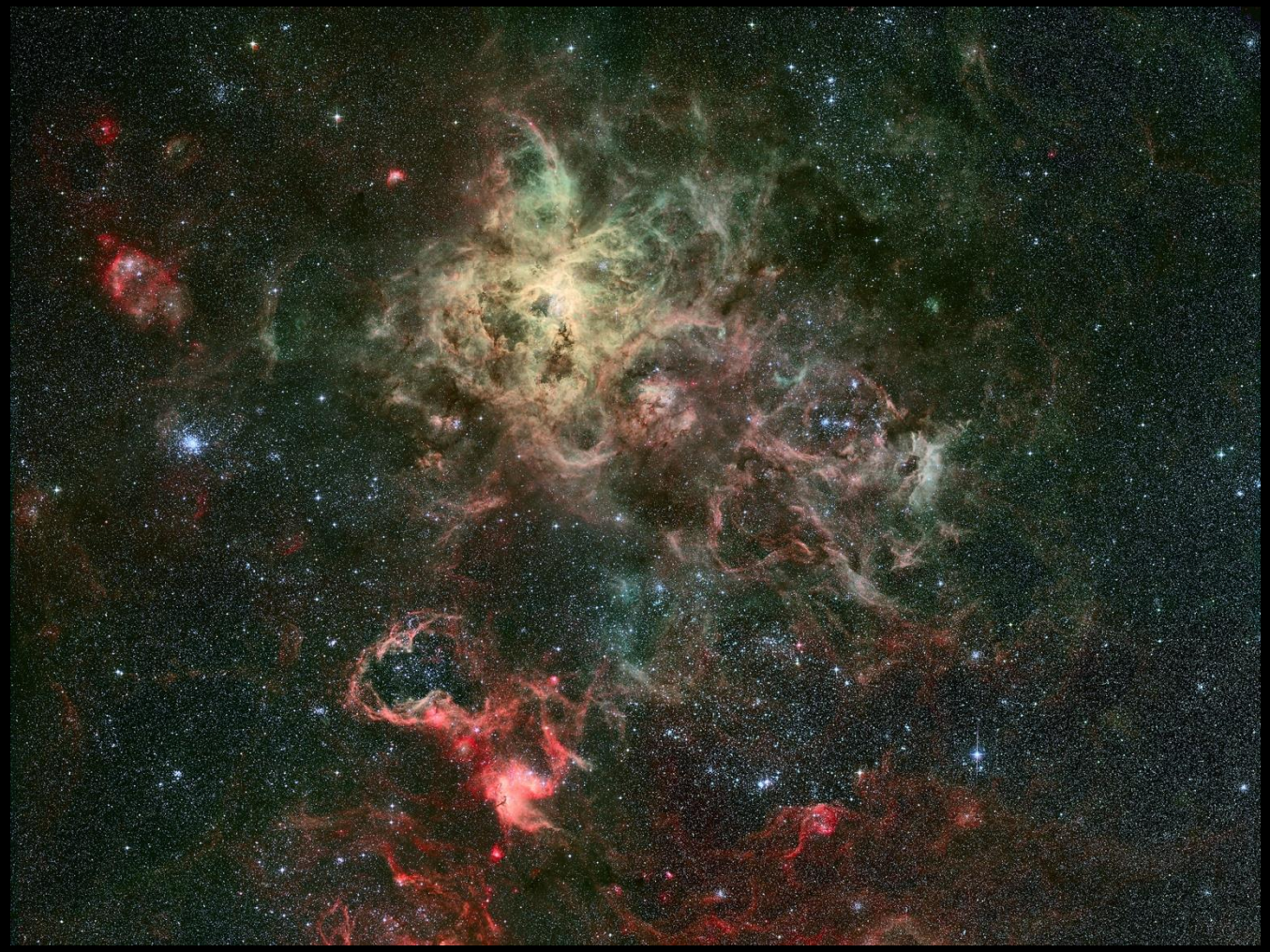

3.0
2.5
2.0
1.5
1.0
0.5
Log Macc
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Log number of stars



Major proposals should contain 3 kind of figures

Your papers would benefit from this as well

Beautiful Butterfly Figure

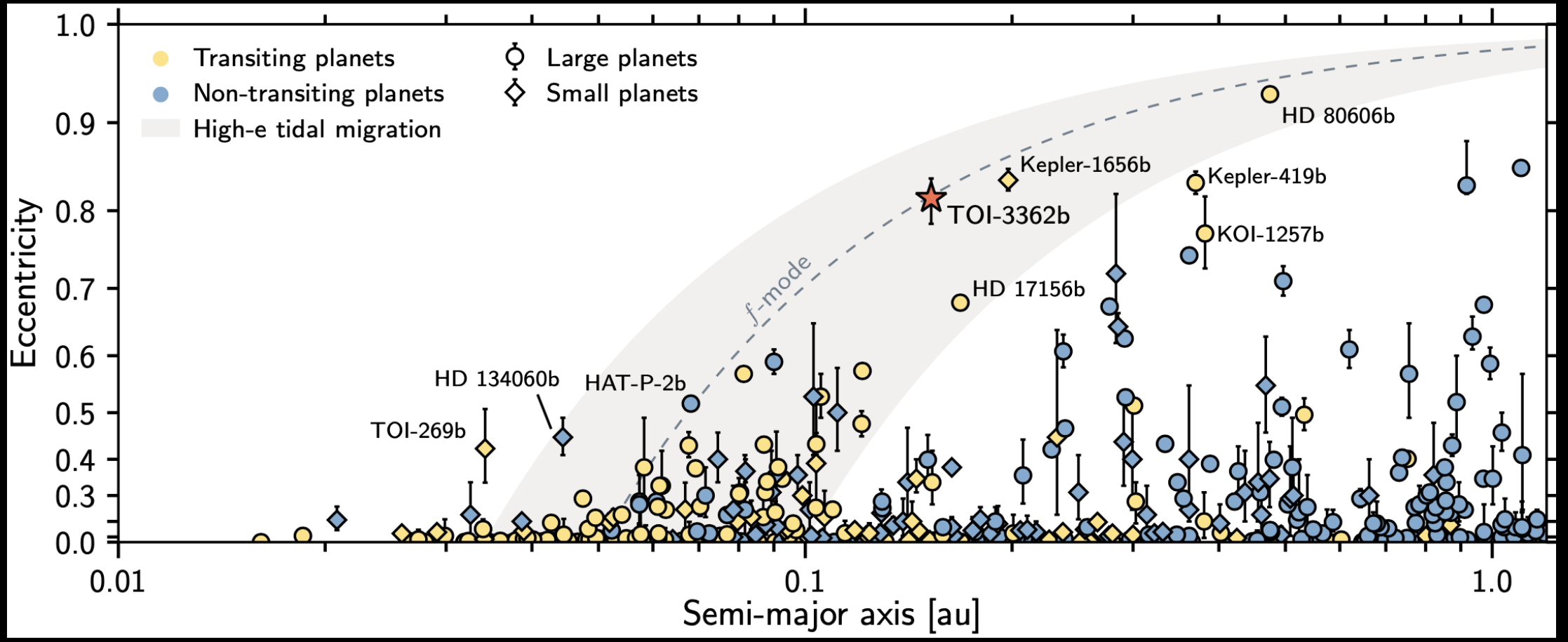


Many proposals start with one figure whose purpose is just to grab the reader's attention
– A pretty picture –

They also make good introductory slides for a talk.

Family Portrait Figure

A figure that sums up the contributions of everyone else in the field, a figure that plots as many people's data or theories on it as possible



Before/After Figure

Every proposal should have one

Show your readers an example of what they have now and next to it, an example of what they can expect to get if they fund your proposal

You can make this comparison in one panel, with different coloured lines or symbols

Contour plots with the distributions of the Einstein radius of the lens galaxy as a function of the exponent of the power-law mass profile of the lens galaxy. In red, a system with only ONE lensed background source: there is a clear degeneracy between the parameters gamma and the Einstein radius, which defines the mass distribution of the lens. If we find a system with TWO background sources (at different redshifts) we can break this degeneracy (blue contours).