Writing a successful proposal

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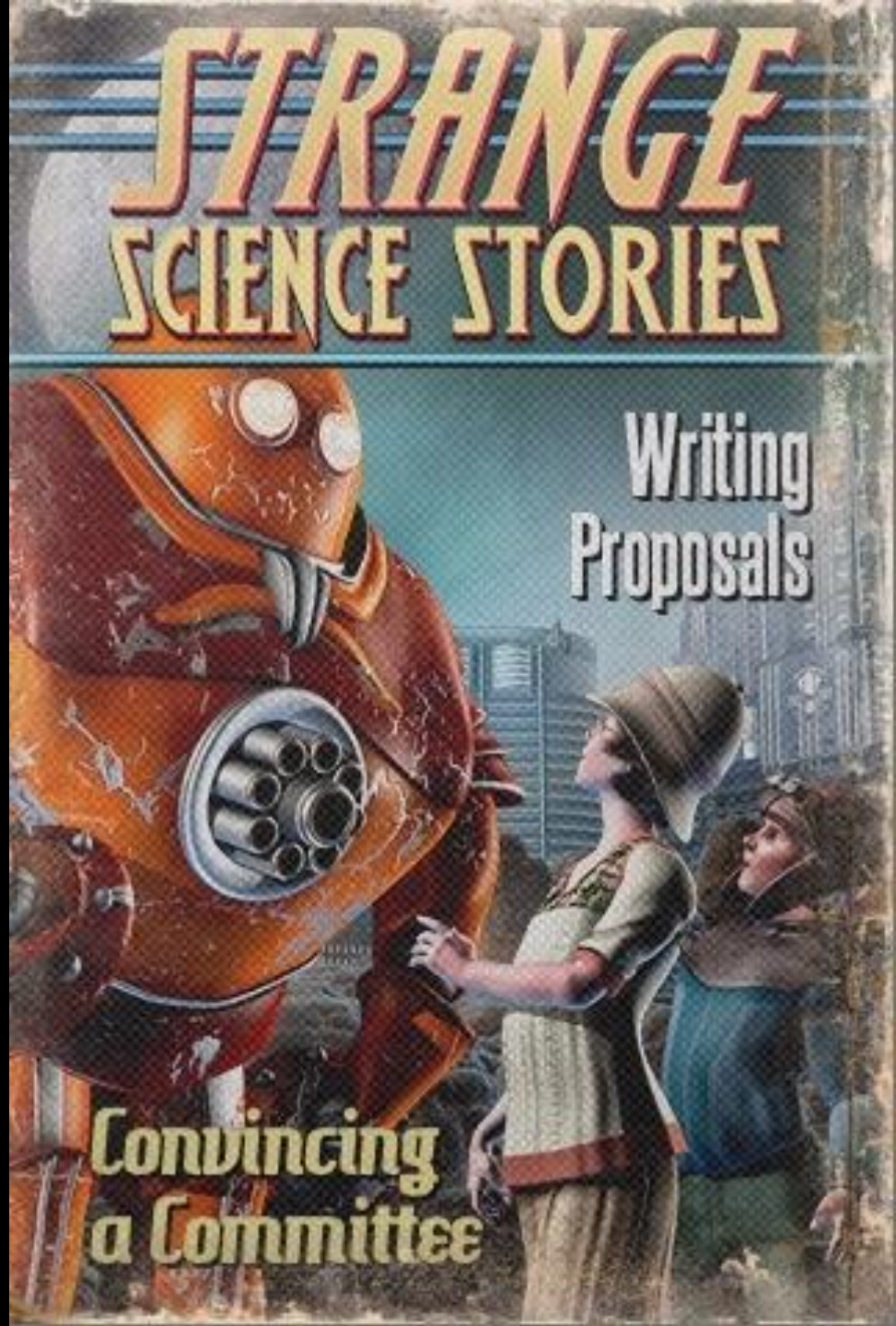

Proposals

Observing time
Supercomputing time
Grant proposal
Job application

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Observing time
Supercomputing time
Grant proposal
Job application

Likely the most important documents
you must write

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Observing time
Supercomputing time
Grant proposal
Job application

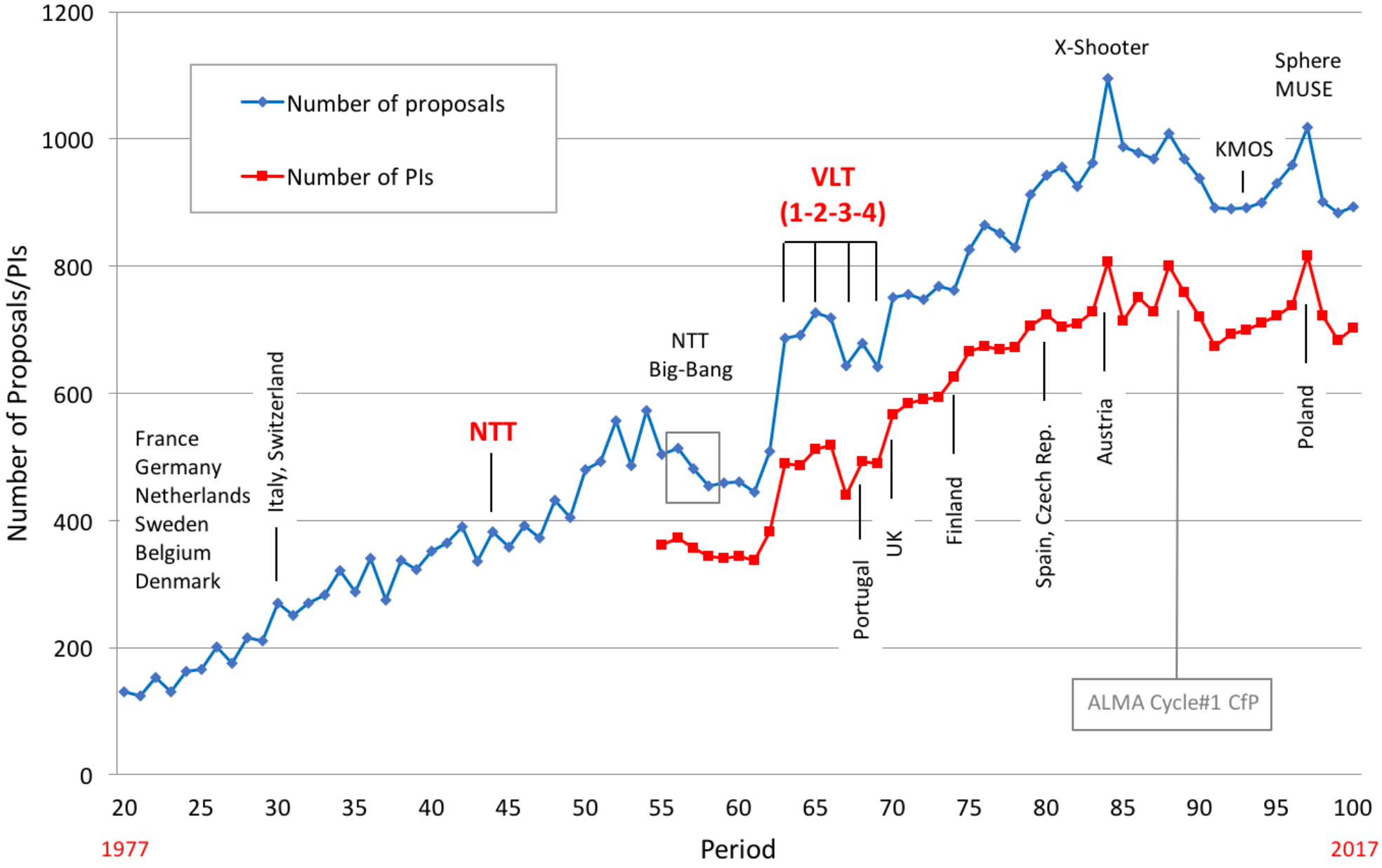
Likely the most important documents
you must write

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

Distributed peer review @ ESO

Every year, ESO issues a Call for Proposals

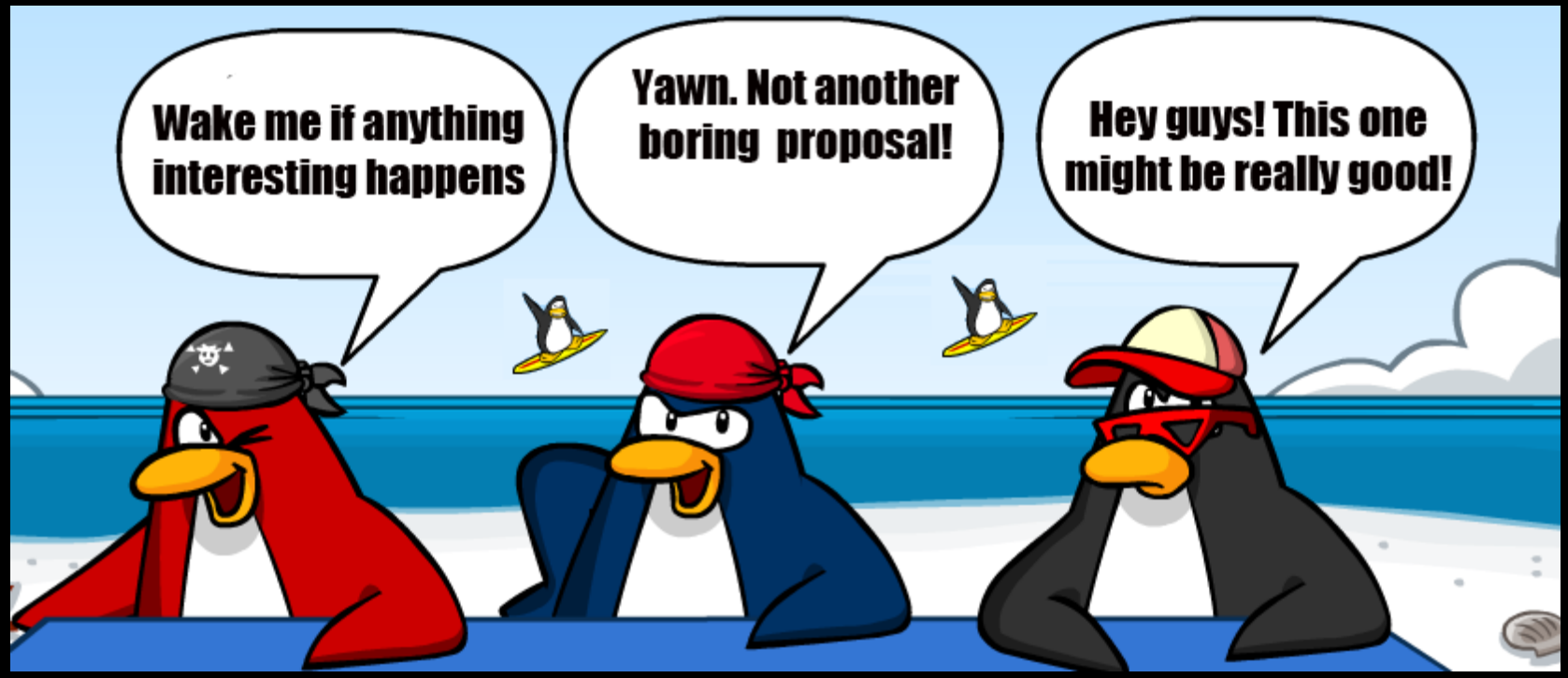
Astronomers submit their proposals

Proposals requesting > XX hours → panel

< XX hours → DPR

For every proposal submitted, the PI or their delegate must evaluate 10+ proposals

F. Patat



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

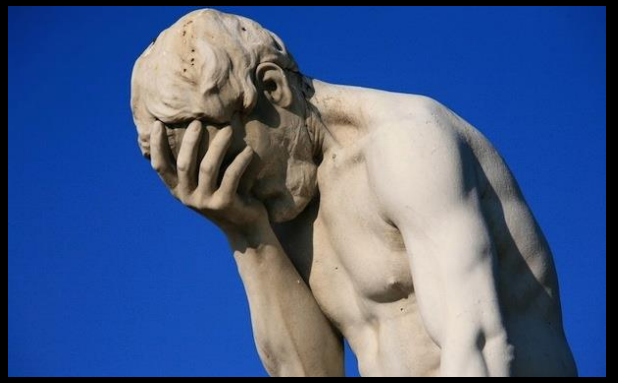
You are the expert

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

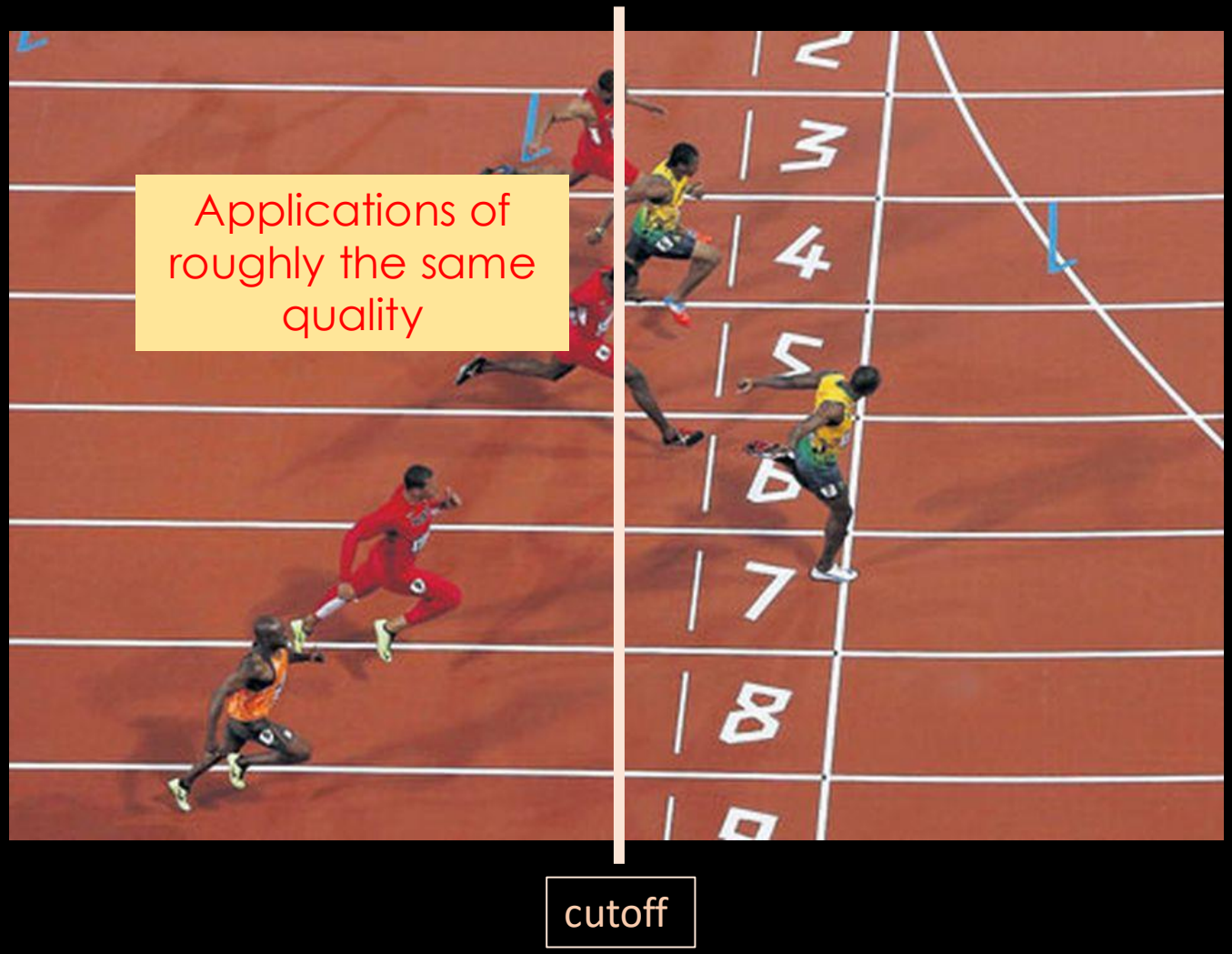
- the proposal is complete and provides all information
- quantitative arguments for the amount (of time, of money, …) requested

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

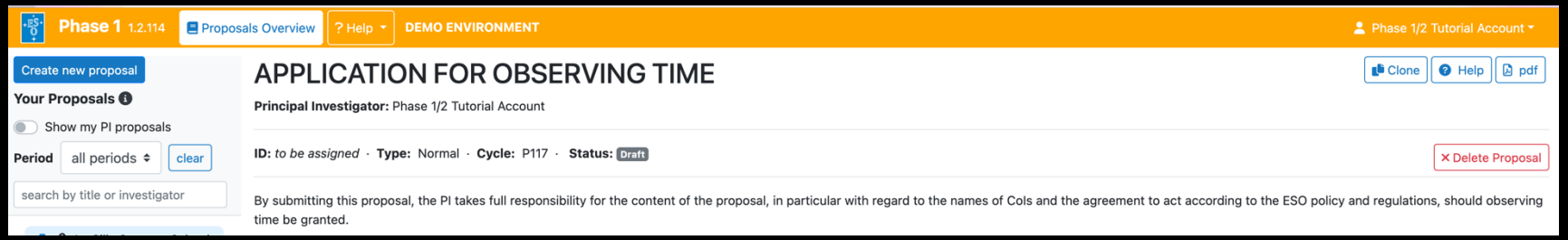
No data. Need to make up the story

Often, anonymised

F. Patat

ESO proposals: www.eso.org/p1 (or /p1demo)

- La Silla Summer School
  - Summary
  - Title & Abstract
  - Scientific Keywords
  - Tags
  - Investigators
  - Rationale
  - Targets
  - Runs
  - Targets → Runs
  - Observations
  - Remarks & Justifications
  - Awarded & Future Time Requests
  - Previous Usage
  - Applicants' Publications



ESO proposals: www.eso.org/p1 (or /p1demo)

Proposal Title **83 of 120 char**

Spectroscopic reconnaissance of nearby M dwarfs hosting habitable-zone super-Earths

Abstract **991 of 1000 char**

The characterisation of habitable-zone rocky exoplanets is arguably the holy grail of exoplanetary science. Habitable-zone super-Earths orbiting M-dwarf hosts are now at the forefront of such characterisation efforts, thanks to their relatively large spectral signatures. Significant observing time will be needed to make chemical detections in such atmospheres, even with upcoming facilities such as JWST and ELT. Furthermore, high-resolution spectroscopy will be important to uncover chemical detections in the presence of clouds and hazes. As such, we propose reconnaissance observations for two bright, nearby M dwarfs hosting habitable-zone super-Earths. This will allow us to test the SNR achievable for these targets, monitor spectral heterogeneity and assess the impact of clouds and hazes in the planetary atmospheres. These preparatory observations will pave the way for future chemical detections, and possibly biosignatures, in the atmospheres of rocky habitable-zone exoplanets.

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.

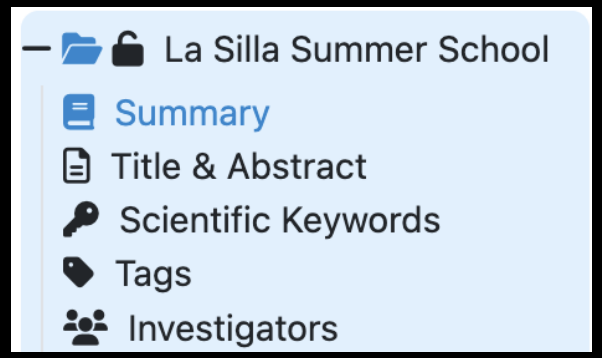
The big picture

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

ESO proposals: www.eso.org/p1 (or /p1demo)

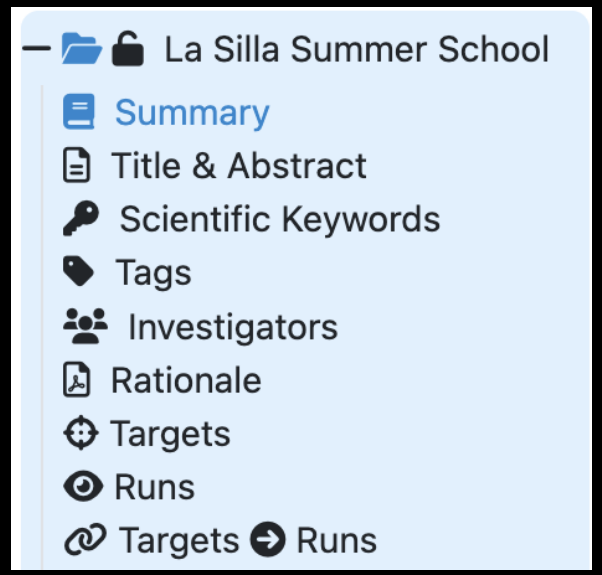


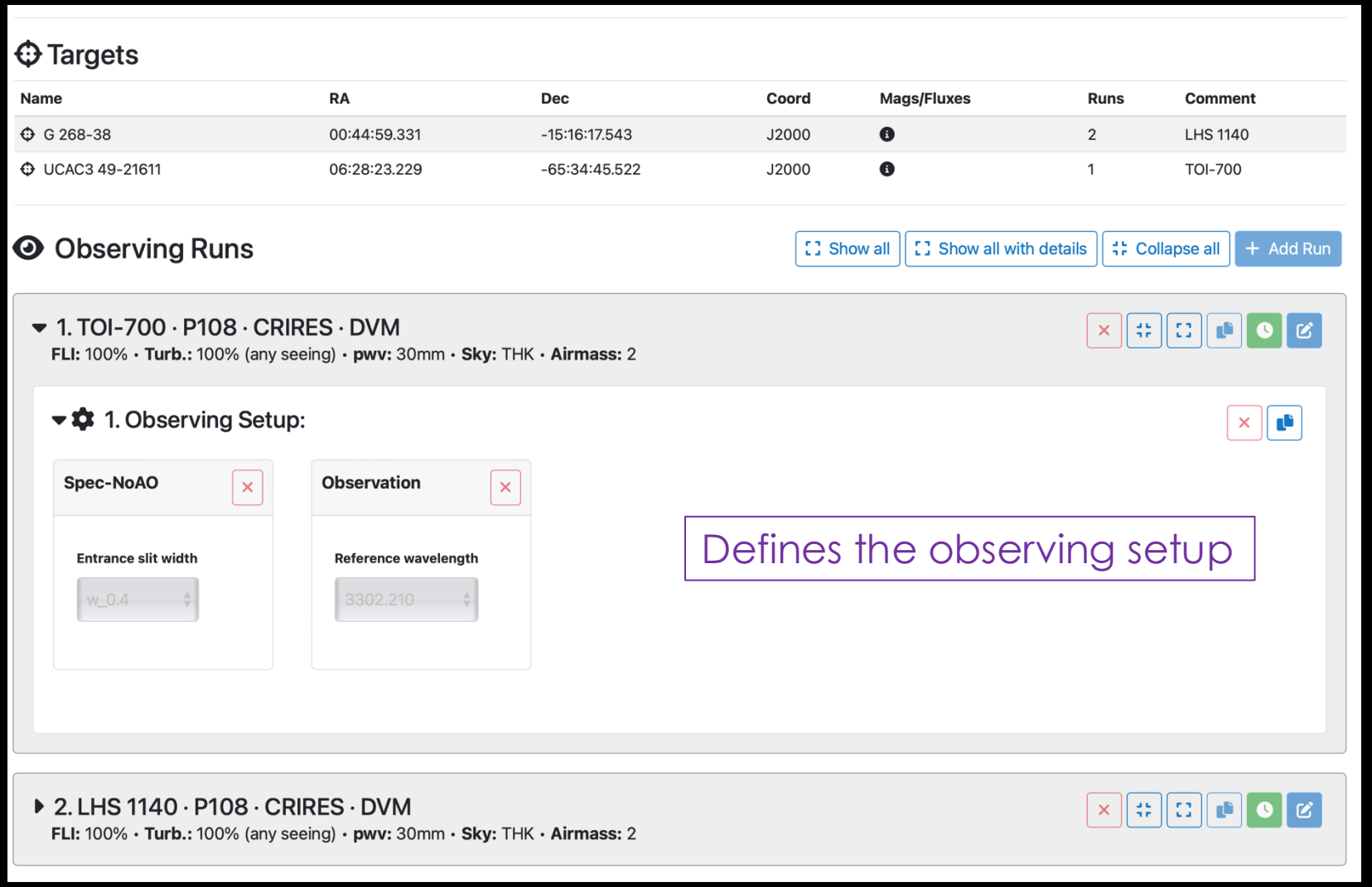
You are **Co-Investigator** of this proposal. You can view the list of Investigators.

Investigators

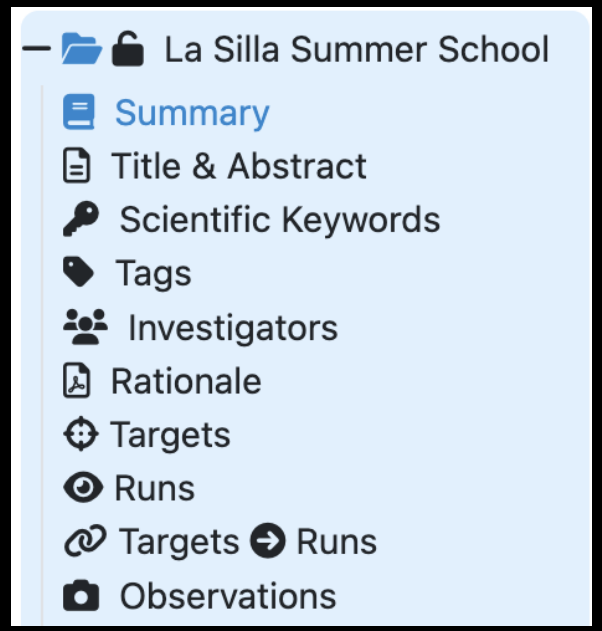
Role	Name	Email	Institute	Country	DPR Reviewer	Actions
PI	Nikku Madhusudhan	nmadhu@ast.cam.ac.uk	University of Cambridge	United Kingdom	✓	
co-I	Anjali Piette	ap763@cam.ac.uk	University of Cambridge	United Kingdom		
co-I	Savvas Constantinou	sc938@cam.ac.uk	University of Cambridge	United Kingdom		
co-I	Henri Boffin	hboffin@eso.org	ESO Garching	ESO		
co-I	Thomas Masseron	tmasseron@iac.es	Instituto de Astrofisica de Canarias	Spain		

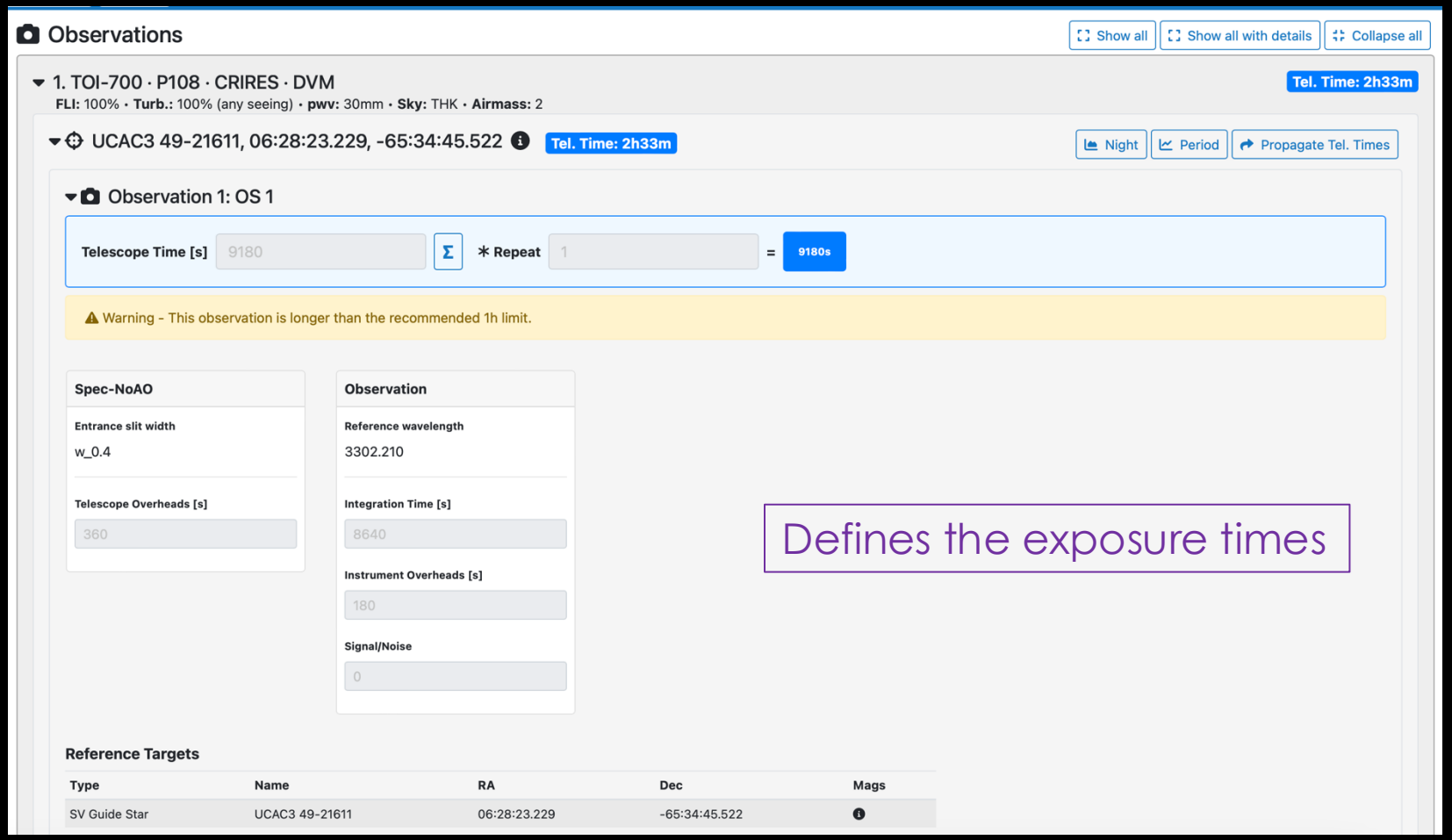
ESO proposals: www.eso.org/p1 (or /p1demo)





ESO proposals: www.eso.org/p1 (or /p1demo)





Justify time request

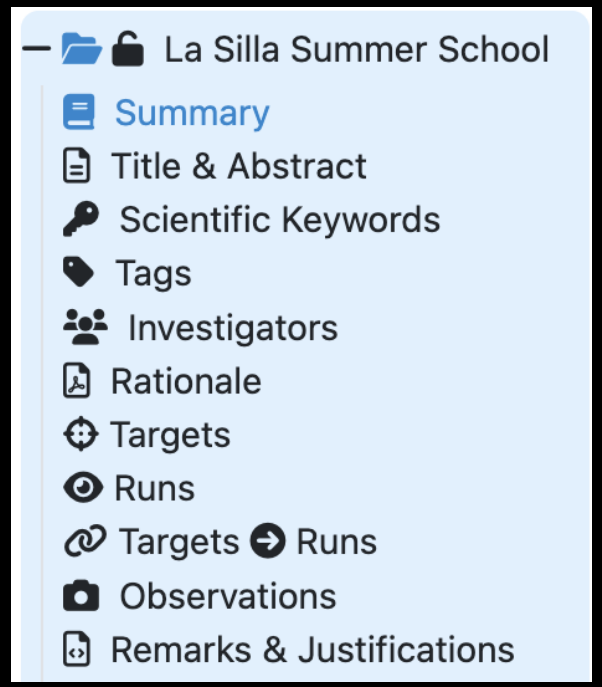
"We require 100 radial velocity measurements or about 50 hours of observing time to confirm the transiting planet TOI-007."

Referee comment: "*No justification is given why 100 measurements are needed*."

The expected RV amplitude of TOI-007 is about 3 m/s. We performed simulations as to the required number of observations. Assuming a measurement error of 1 m/s and typical sampling we find that with 40 measurements we can detect the planet with a false alarm probability of 1 % and measure the planet mass to better than 10 % (see figure 1).

Adapted from A. Hatzes

ESO proposals: www.eso.org/p1 (or /p1demo)



Time Justification 1443 of 3500 char

ℹ Please describe here a detailed computation of the necessary time to execute the observations, including time-critical aspects if any. Parameters used in the ETC should be mentioned so the computation can be reproduced.

Our goal here is to conduct a reconnaissance program for host stars of two promising planetary systems. Generally, for chemical detections using high resolution transmission spectroscopy an SNR of 50-100 per pixel per exposure is required over 50-100 exposures (Brogi et al. 2018, Sanchez-Lopez et al. 2019). For faint targets or short duration transits this is usually attained over multiple transits. In the present program we do not intend to make any robust detections of atmospheric signatures but we mainly aim to characterise the behaviour of the stellar spectra over a transit duration. This is to both assess the potential of such time series spectroscopy for future detections of atmospheric signatures of such challenging habitable-zone planets as well as to assess the effect of stellar heterogeneities on the stellar spectra during transit, as discussed in the scientific rationale. Our requirements will be sufficiently met with a baseline SNR of 50 per pixel per exposure. We find that for both targets, an SNR of ~50-60 per pixel per exposure can be achieved for 120s exposures and the following nominal sky and seeing/IQ conditions: airmass=1.2, FLI=1.0, pwv=2.50 mm, 50% turbulence category (IQ@3742nm = 0.493") and an extraction aperture of 27 pixels. We do not require AO.

Overall, we will observe one transit of each target, requiring 2 hr 33 m for TOI-700c and 3 hr 15 m for LHS 1140 b, for a total request of 5 hr 48 m.

Telescope Justification 277 of 1000 char

ℹ Please justify why the telescope requested is the best choice for this programme.

Given the challenging science goal of detecting atmospheres of habitable super-Earths, we need the largest possible aperture along with high resolution spectroscopy in the infrared at high SNR. VLT/CRIRES is the best available telescope/instrument combination for this purpose.

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/

It is essential that the proposal summarises the current state of knowledge and provides an up-to-date, comprehensive bibliography

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

The opening paragraph is your chance to grab the reviewer's attention.

Use it.

This is the moment to overstate, rather than understate, your point or question. You can add the conditions and caveats later.

Keep It Super Simple (concise, clear sentences)

Limit jargon and abbreviations

Do not use contractions or exclamation points

Make every sentence essential

Use white space, tables and figures to allow the reviewer's eyes to rest

Get rid of typos

Make sure your sentences won’t lead to confusion

“For anyone who has children and doesn't know it, there is a day care on the first floor.”

Here it may sound funny,
but in a proposal,
it will be a killing factor

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

Methodology

Do not just tell what you mean to achieve, tell how you will spend your time while doing it

A methodology is not just a list of research tasks but an argument as to why these tasks add up to the best attack on the problem

Referee comments

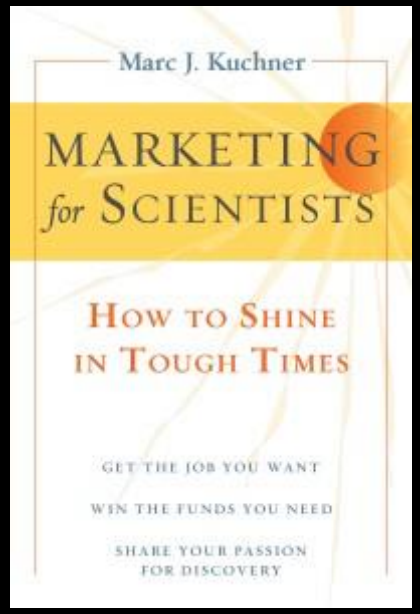
"It states that detailed dust properties will be derived and compared to models, but not many details are given. ***What models?***
No details on the radiation transfer codes for modeling the disk spectrum are presented. "

Describe what codes you will use and how your models for comparing to the data will be generated.

A. Hatzes

Methodology

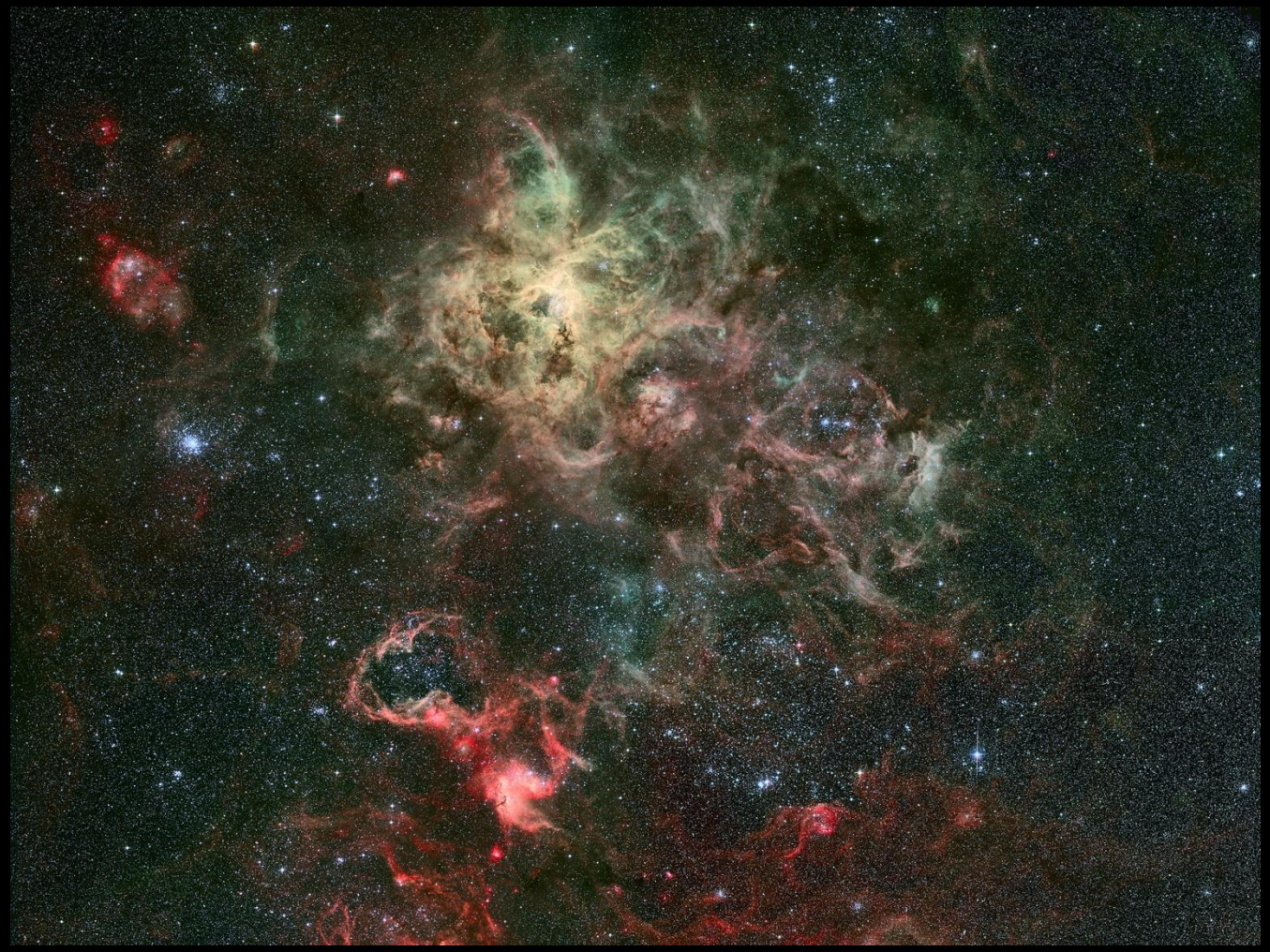
The proposal should prove that the researcher either possesses, or cooperates with people who possess, mastery of all the technical matters the project entails



Major proposals should contain 3 kind of figures

Your papers would benefit from this as well

Beautiful Butterfly Figure



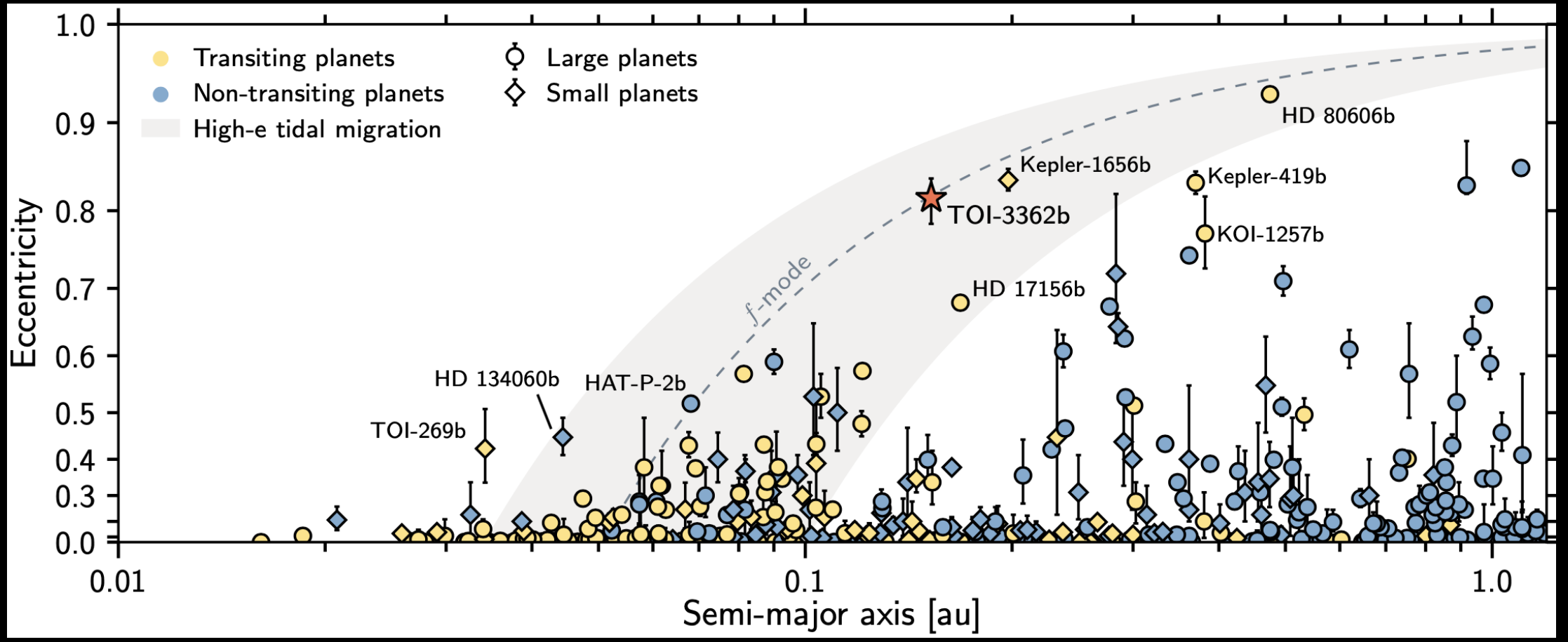
Many proposals start with one figure whose purpose is just to grab the reader's attention

– 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



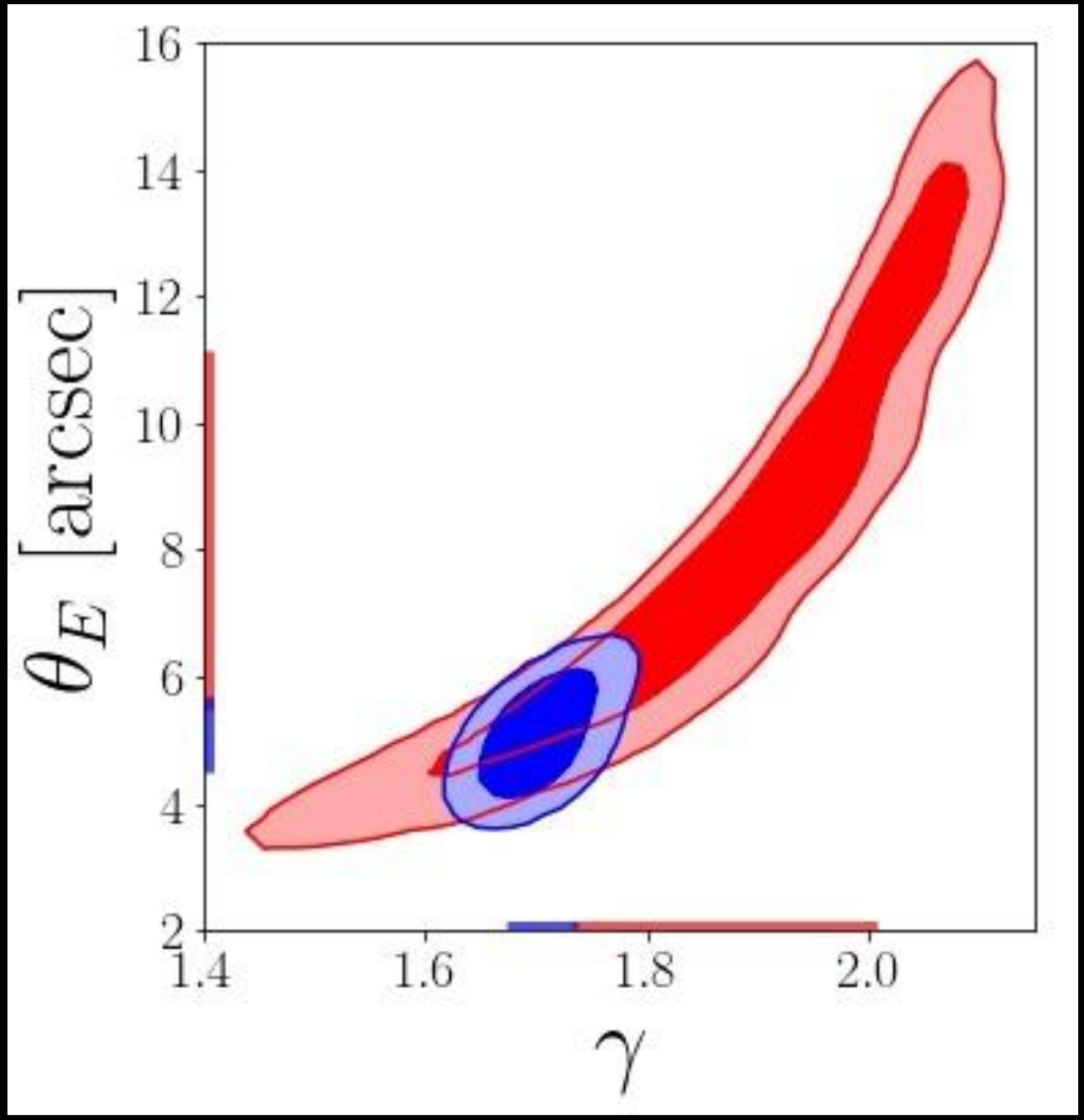
Before/After Figure

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

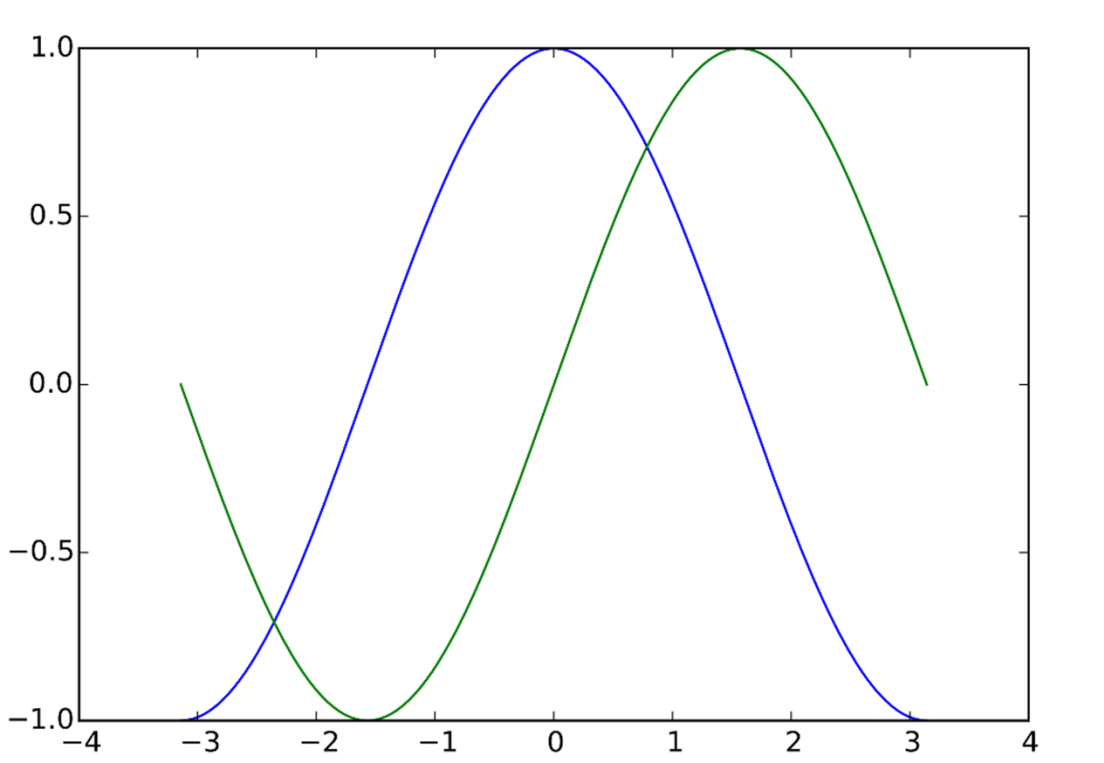
You can make this comparison in one panel, with different coloured lines or symbols

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).



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

Importance of Good Figures

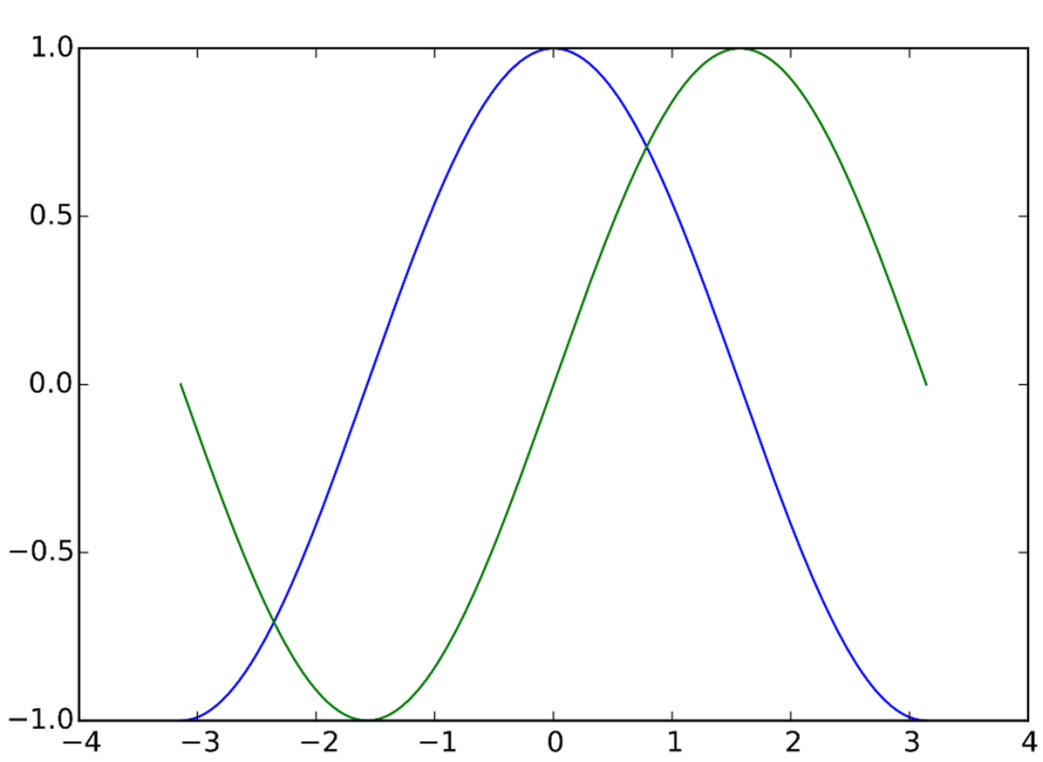


Matplotlib default

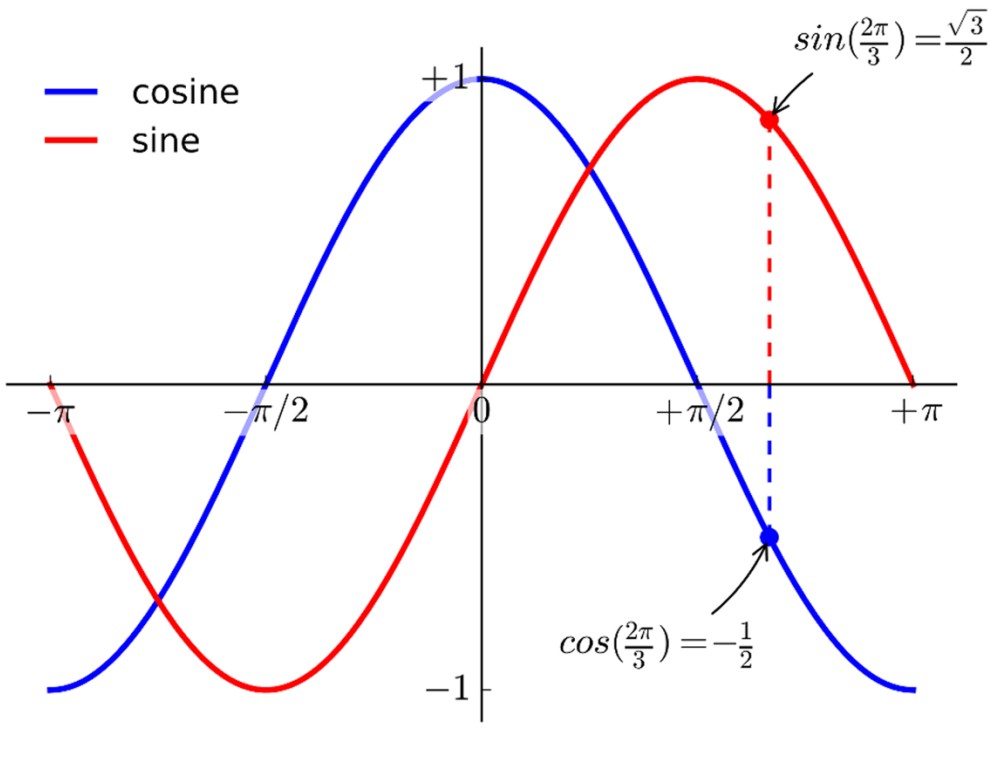
https://doi.org/10.1371/journal.pcbi.1003833.g004

Do not blindly trust the defaults

It always pays off to make nice figures!

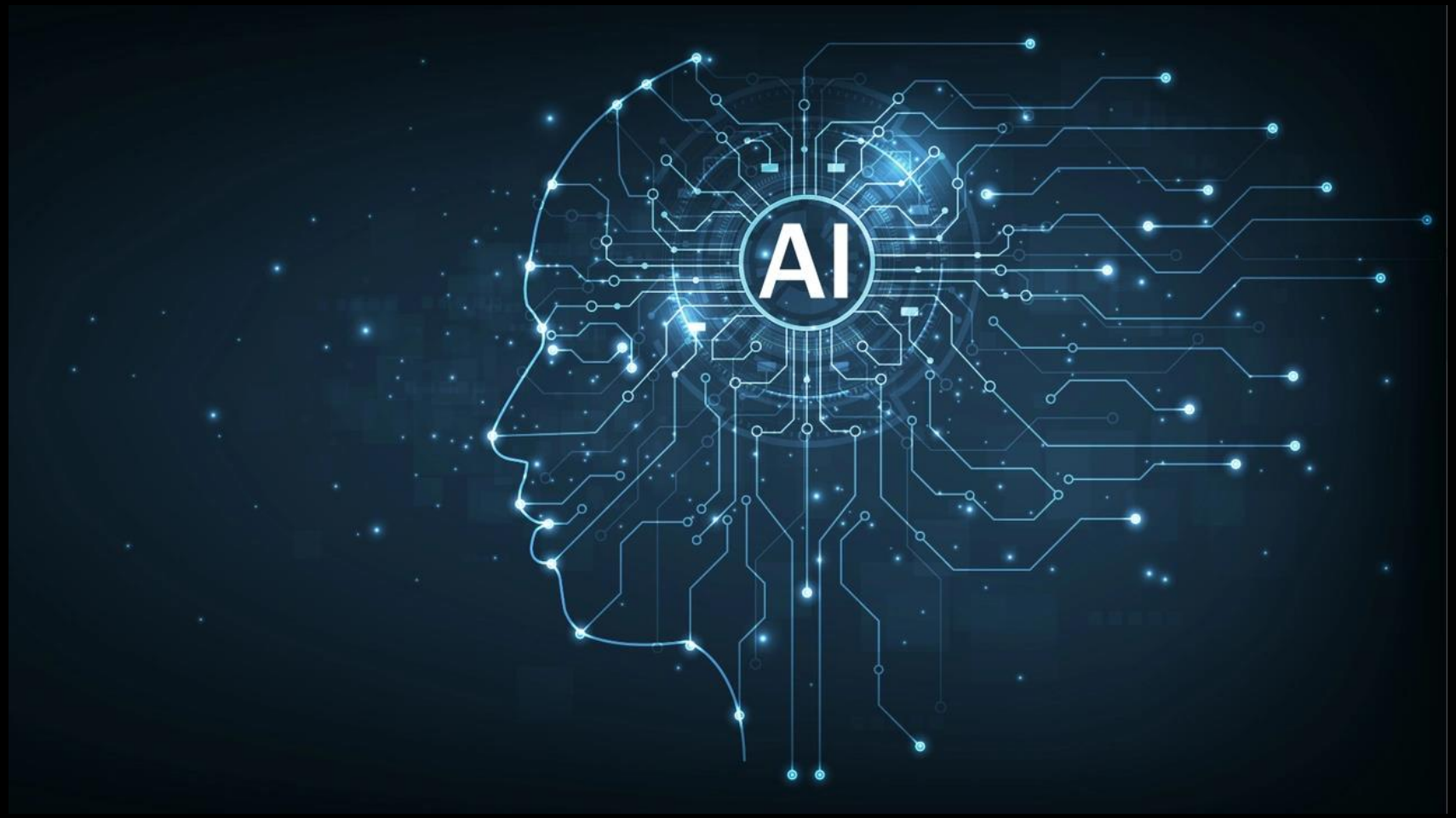


Matplotlib default



Much nicer

Use of A.I.



Intelligent use of artificial intelligence

Use LLMs as a tool to enhance your language skills

Ask them for inspiration if you are stuck with, e.g., a title, a specific sentence, or even a paragraph

Correct and proofread your own English

Use its audio mode as a conversational partner

The dangers of using A.I.

The use of LLMs will limit your learning

Using LLMs for certain sections or paragraphs can lead to different writing styles across your proposal

LLMs tend to be verbose

Lacks originality and flavour

The dangers of using A.I.

"We discourage the use of large language models (LLMs; e.g., ChatGPT) in drafting your statement, as submissions that rely on AI-generated content lack the depth and originality critical for admission to the program and are usually disadvantaged in the evaluation process."

The dangers of using A.I.

Always treat the outcome of LLMs as you would any draft, and edit, correct, proof-read, and check the results

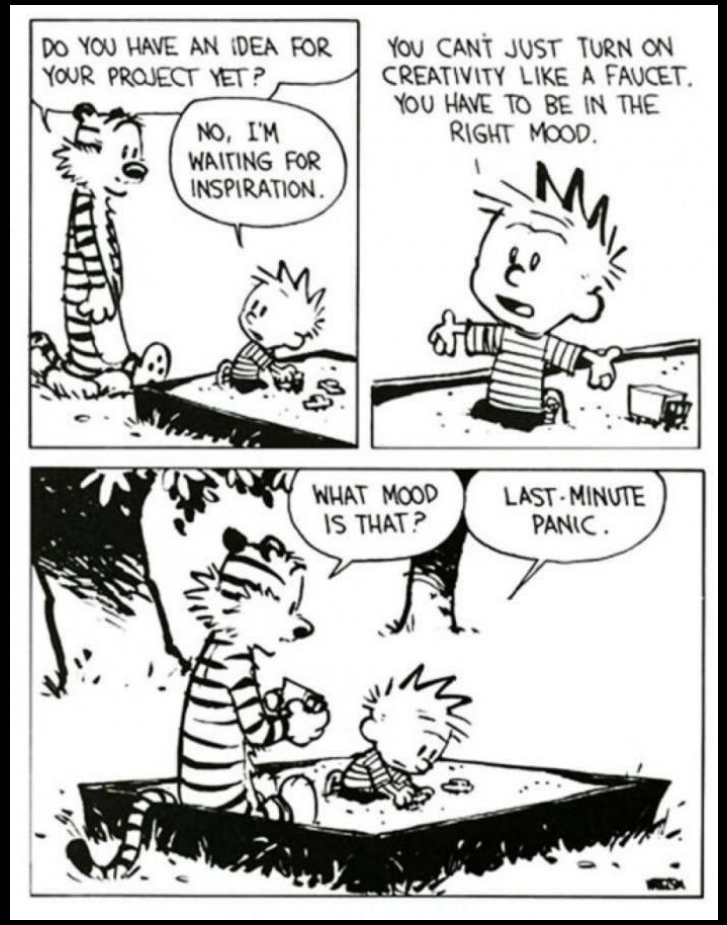
Look out for words which you would not normally use or which are not common in your field

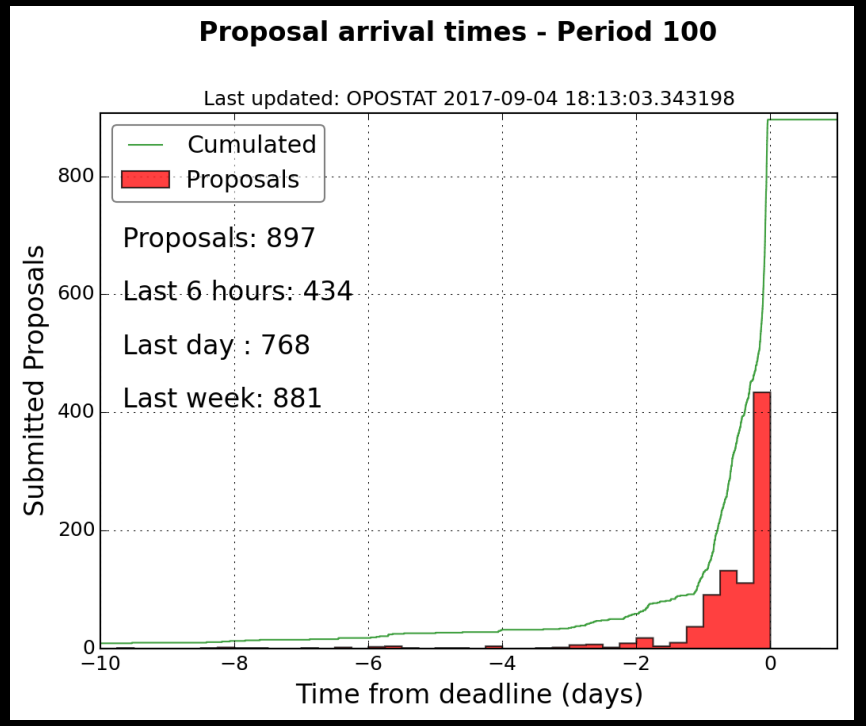
(e.g., “delve”)

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.

For more information:

nature astronomy

Perspective

How to prepare competitive proposals and job applications

Received: 3 February 2025

Accepted: 23 May 2025

Published online: 10 July 2025

Check for updates

Johan H. Knapen [1,2] ✉, Henri M. J. Boffin [3], Nushkia Chamba [4] & Natashya Chamba [5]

Writing proposals and job applications is arguably one of the most important tasks in the career of a scientist. The proposed ideas must be scientifically compelling, but how a proposal is planned, written and

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

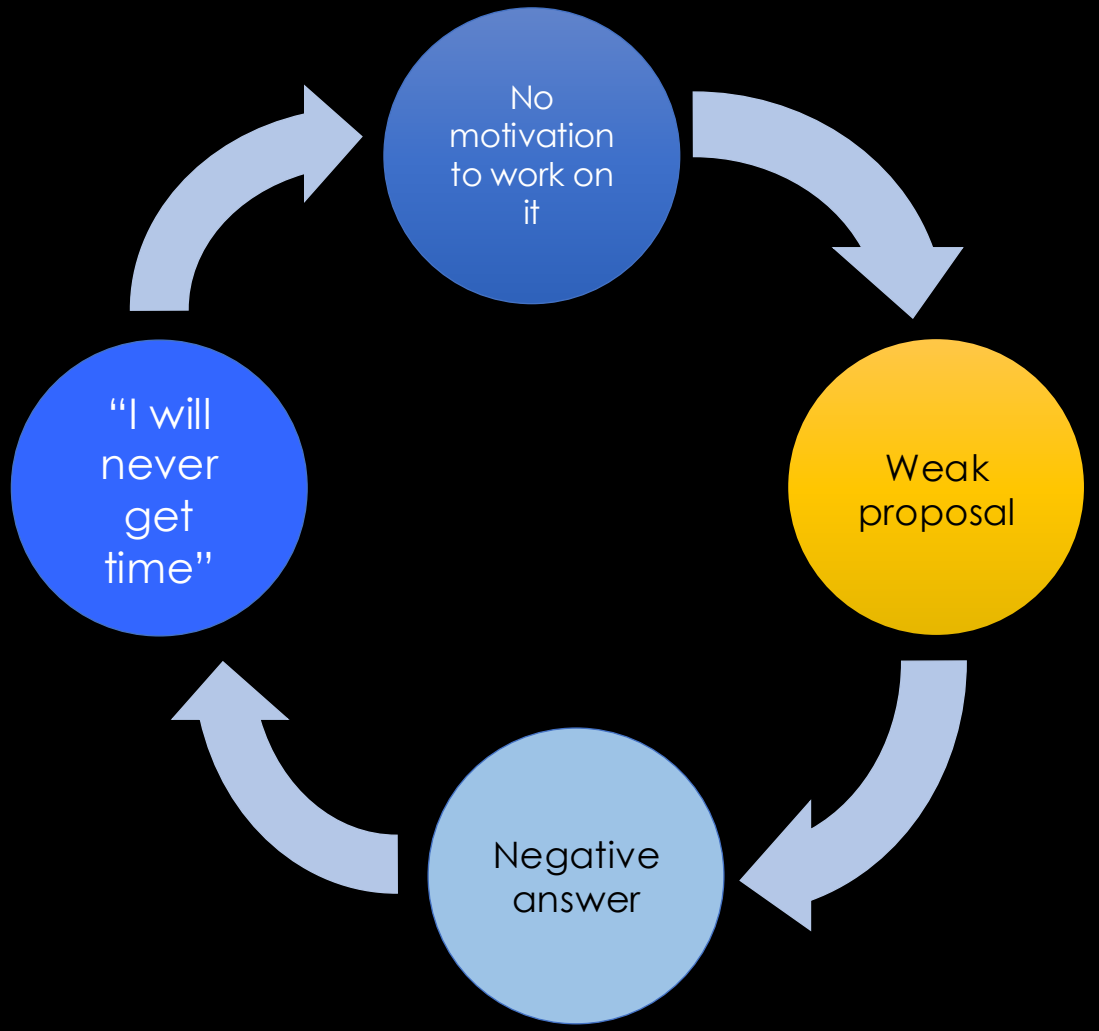
Evaluations are about proposals, not yourself

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

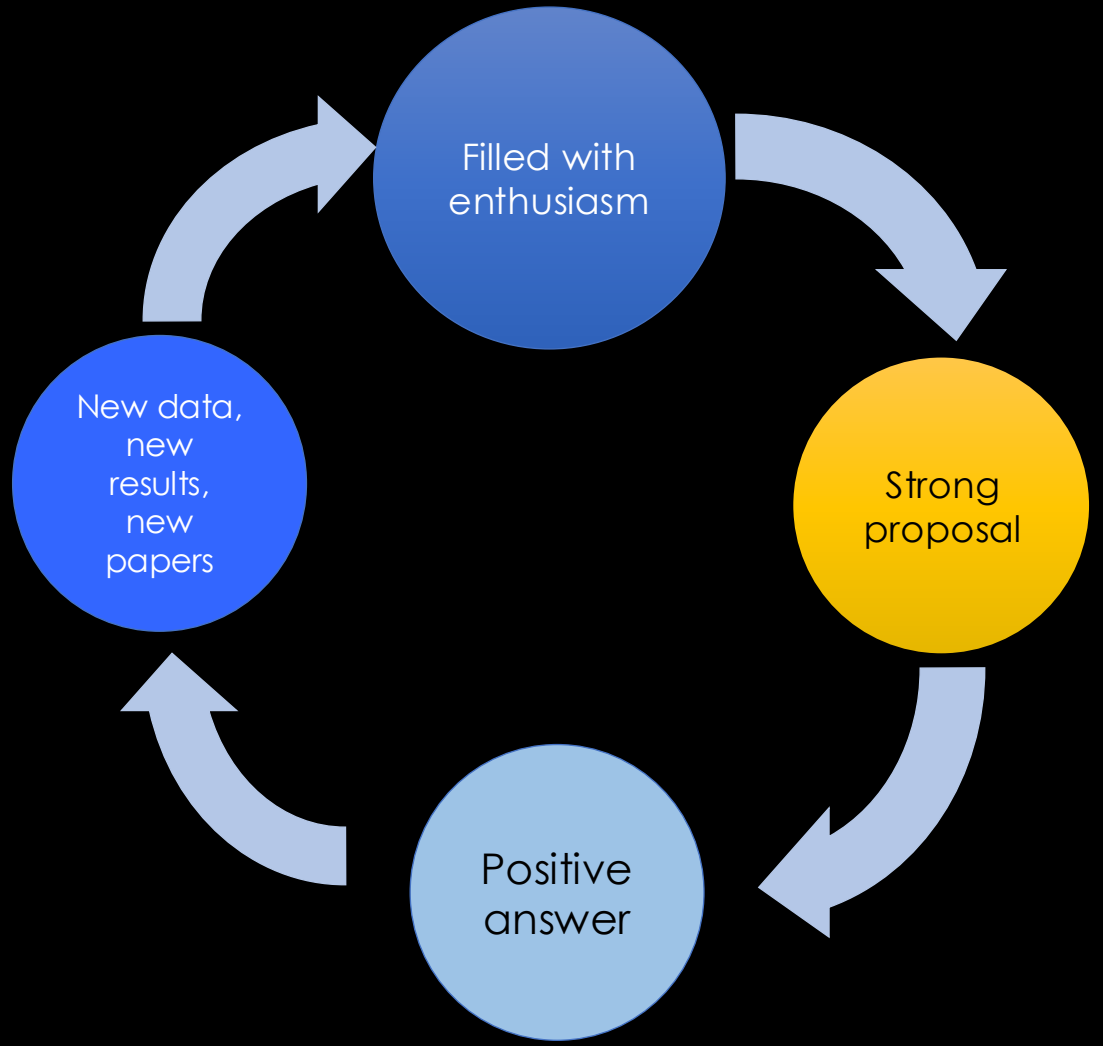
"No" doesn't mean "*You are a bad person and we hate you forever.*"

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

Vicious circle



Break the vicious circle



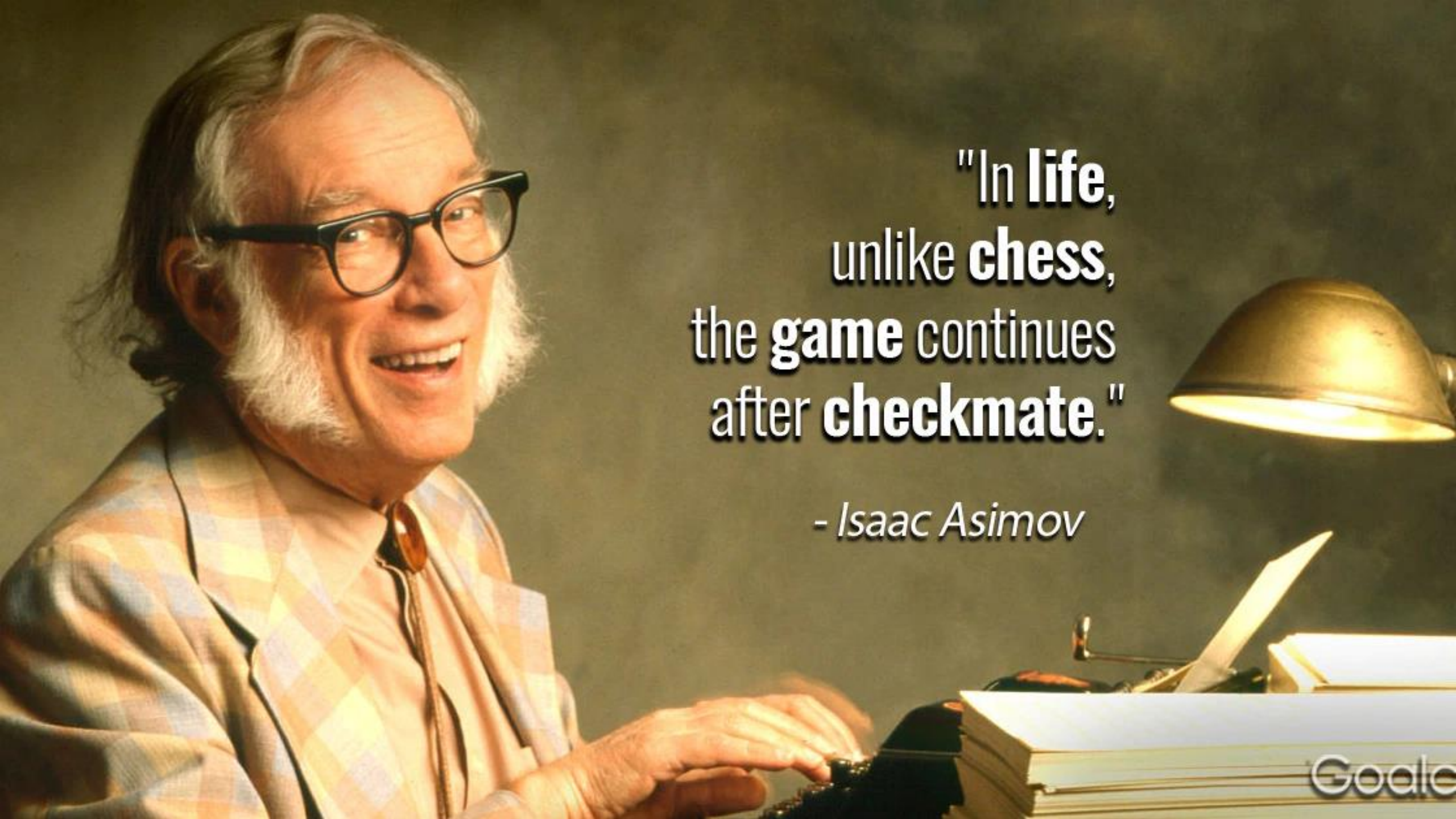
How to break a vicious cycle

Strengthen your case

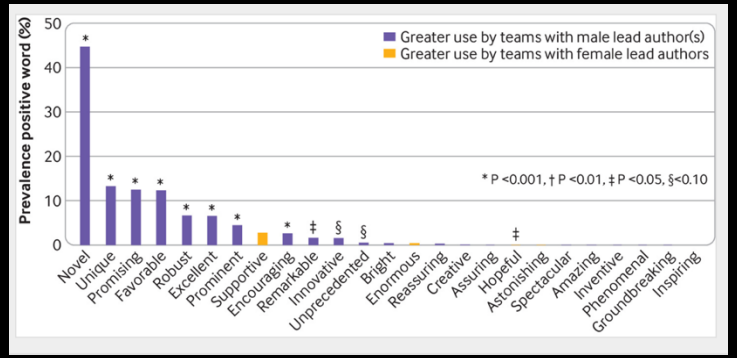
- Archive data, simulations
- Publish on-going projects
- Increase your visibility (papers, talks, meetings)

Join a virtuous cycle

- Expand your network (conferences, visits)
- Offer technical expertise


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

Gender gap



"Clinical articles involving a male first or last author were more likely to present research findings positively in titles and abstracts compared with articles in which both the first and last author were women, particularly in the highest impact journals. Positive presentation of research findings was associated with higher downstream citations."

Lerchenmueller et al. 19

"In anonymous proposals, women shouldn't refrain from using strong, positive words to emphasise their work.

In non-anonymous proposals, they need to refrain as people don't like women who brag!"

Virginia Valian 2022

1. The experiment did not work.
2. No changes were observed in any of the variables tested.
3. There is not a piece of evidence supporting this hypothesis.
4. The variation was never more than 1%.
5. None of the alternative explanations seemed likely.
6. Neither the fear of global warming nor the number of fatal accidents influence car drivers.
7. Nothing is dangerous about this method.
8. No-one noticed the discrepancy between the two sets of data.
9. In none of the samples could the desired compound be found.
10. No less than eleven substances were present in the mixture.

T. Skern

1. The experiment failed.
2. All variables tested remained constant.
3. This hypothesis lacks supporting evidence.
4. The variation was always less than 1%.
5. All alternative explanations seemed implausible.
6. Car drivers ignore both the fear of global warming and the number of fatal accidents.
7. This method is safe.
8. Everybody overlooked the discrepancy between the two sets of data.
9. The desired compound was absent from all the samples.
10. The mixture contained at least eleven substances.

T. Skern

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 realize 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

Methodology

"I will look at the relation between x and y" is not informative

Be as specific as you possibly can about the activities you plan to undertake to collect information, about the techniques you will use to analyse it, and about the tests of validity to which you commit yourself

Most proposals fail because they leave reviewers wondering what the applicant will actually do

Be quantitative

"*The properties of sun-like stars can be measured with high precision: From comparison to models, the atmospheric parameters effective temperature (Teff), surface gravity (log g), and element abundance patterns, or more general the metallicity ([Fe/H]), can be determined with high accuracy.*"

What precision or accuracy will be achieved? Quantify!

Mixing "accuracy" with "precision"

Adapted from A. Hatzes