



Proposal Writing ....  
... for Fun and Profit  
... and for a career



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# Preamble

- All the opinions expressed are mine ..... your individual mileage may vary.
- You are experimental scientists ... learn from your experience
- You are part of a community ... learn from their experience ... use them as test particles
- Don't be afraid to ask for help

You are telling a story to someone



# AXO

## Committees - its how the peer-review world works.

- Committees are composed of people.
  - But ... members are always overworked, don't have enough time, enough background or enough of whatever you're applying for.
  - Are subject to all the same frailties as you and me
- Best to assume your proposals will be read with
  - no background in your research
  - no interest in your research
  - not enough time to read proposal properly
- And assume *oversubscription* is at least a factor of 3



# Telescope Time Allocation

- Telescope time is *very* competitive
  - In any one semester the applications for the use of any large optical telescope will exceed the available time by a factor of at least four ... more for VLT, Gemini and HST.
- Each time assignment committee (TAC) member will usually read all the proposals (often 50-200), and evaluate them for scientific merit, feasibility and timeliness.
  - TACs are charged with maximising scientific return (ie publications) for the observatory.
  - Proposals are graded relatively.



# Grant Funding (eg. ARC)

- In a major program like ARC Discovery (ie APD, ARF, APF, FF + grants to support research) only 20-30% of proposals received can be supported.
- ARC
  - 6 panels in College of Experts (aka Expert Advisory Panels).
  - Astronomy falls into Physics, Chemistry and Geosciences.
  - 13 members on PCG panel, every proposal assigned to at least 2.
  - One astronomer on panel (at most)P
  - Proposals worth between \$150-800k p.a.

The logo for AXO features the letters 'A', 'X', and 'O' in a bold, black, sans-serif font. A red crosshair is positioned over the 'A' and 'X'.

# ARC Grant Funding

- ARC has ‘hierarchies’ of readers
  - CoE members review 70-130 proposals.
  - OzReaders review 10-20 proposals.
  - “International Readers” review 1-3 proposals.
- *Your proposal **will** be read by a non-expert, and their ability to understand your proposal is critical.*
- And they’ll also be reading ~20-80 other proposals across a range of disciplines.



# Three degrees of Ignorance

Funds for a major new telescope

- For any proposal, I believe your text needs to be able to be **read and understood** at three degrees of ignorance

- Expert astronomer in your field (eg paper referee)
- Astronomer with vague knowledge of your field
- Astronomer with no knowledge of your field
- Scientist not in your field
- Politician



# Three degrees of Ignorance

- What can we conclude.
  - Avoid jargon
  - Put proposal in the broadest context possible first.
  - Introduce to most ignorant reader first
  - Explain to next most ignorant reader next
    - Hopefully by now your most ignorant reader can follow this.
  - Explain to next most ignorant reader next
    - Hopefully everyone can now follow this.
    - And if they really won't, structure in such a way ignorant readers can see they don't *need* to know





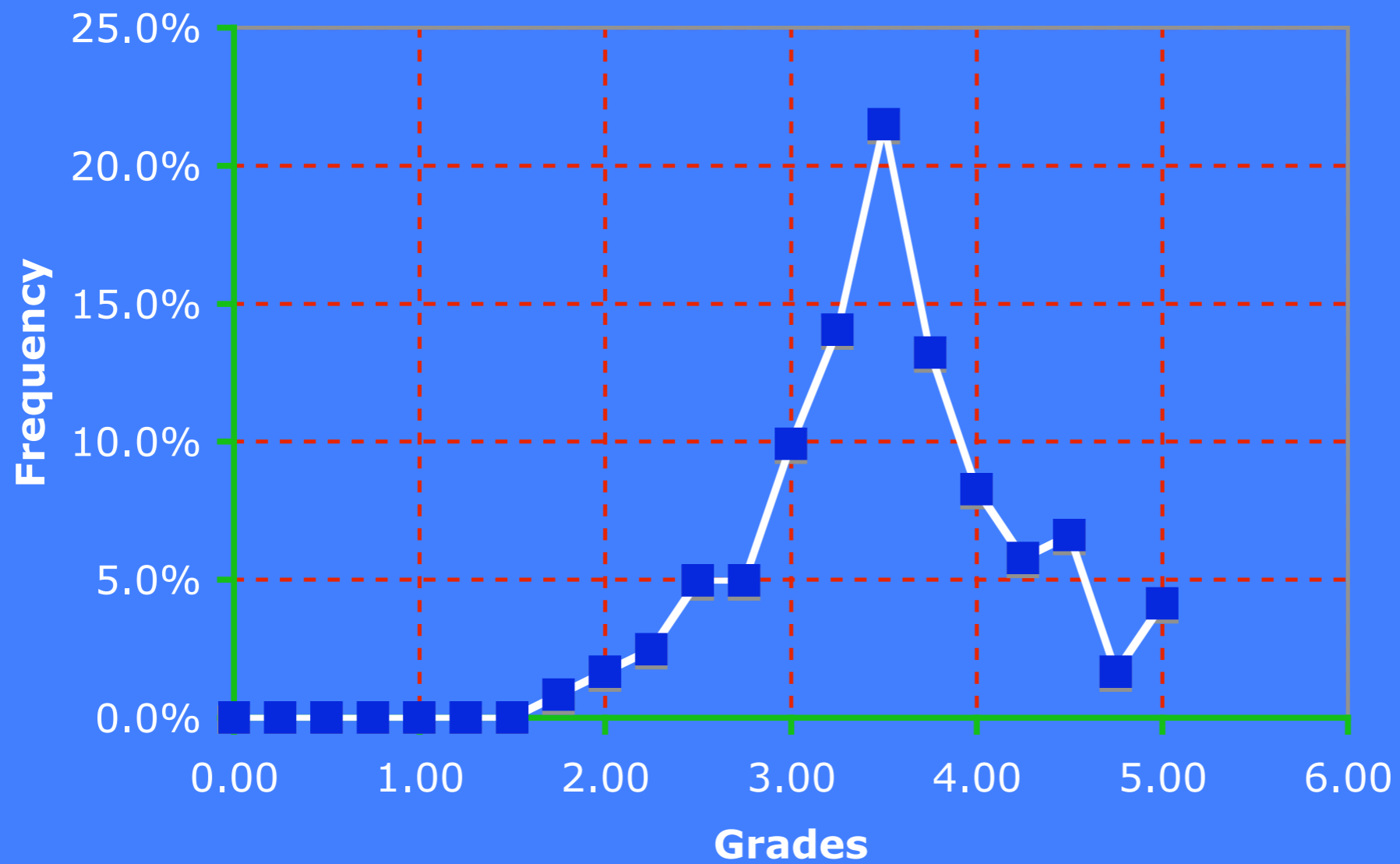
# Grading Proposals

- Proposals are graded by several people, combined & ranked
  - Final grade is an estimate of worth of a proposal.
  - So it has **uncertainty** - rms  $\sim 0.5 / 5$  is common.
  - Distribution function roughly Gaussian, with FWHM  $\sim 0.5-1 / 5$ .
  - In any one round of proposals
    - A few proposals will stand out as being clearly the best, and a few will stand out as being awful
      - Most fight it out in the middle.
  - Small differences in the proposal (as opposed to the science) can make all the difference.



# Some data.

**ATAC Grades combined from  
01B,02B,05A**



Mean = 3.44  
Median=3.42  
SD=0.7



# Time to wake up ..

- You be the Time Allocation Committee for the Lunar FarSide Observatory for Semester 2100A.
- You have 1/2 an hour to read, discuss and grade 6 proposals in TACs of 6 people each.
- You have one LFO night to allocate
- You each have roles to play on the TAC





# AXO What to Do

- **Put science in broader context!**
- What problem you will address, why it is interesting, what you'll do to address it, demonstrate you can succeed.
- Be concise ... but tell a well-reasoned “story”
- Avoid acronyms
- Use helpful figures
- Understand the rules and address the grading criteria! Understand how the reviewers will get the proposal? Will your figures show up?
- Get the technical details right (but in a technical section).



# What not to do

- Listmania - few goals usually better than 20, and few theories to be chosen from usually better than 20 to be “constrained”
- Ignore the grading or funding criteria
- Rage at the panels - its not their fault they don't have enough money or telescope time.
- Waffle
- Use jargon - can't emphasise this enough
- Just assume everyone *knows* this scientific area is the most compelling thing ever done.



# What NOT to do

- “These objects are really cool, and we’d like to learn more about them ...”
- “We’d like to discover the first \_\_\_\_\_.” (Insert brown dwarf,  $z=8$  galaxy, black hole, .....
- Avoid a “blizzard of questions”
  - it is better to concentrate on 1 or 2 things you will answer than 4 or 5 things you might answer.
- Nothing reflects as poorly as stupid mistakes
  - Like applying in the wrong semester, with the wrong instrument, or a no longer current detector.
  - Or leaving out essential information (like how bright or how many are your targets).



# What NOT to do

- Don't submit proposals which are badly written - if English (or French or Spanish nor whatever) is not your first language, get a collaborator who can proofread/rewrite it for you.
- Don't plow into an obscure discussion of a peculiar class of objects, without placing them in context.
- Don't present dense blocks of undifferentiated text
- Avoid programs aiming to obtain data and to then develop a postiori understanding
  - Make a hypothesis and test it.
  - Don't say we'll work out what's going on once we have the data.





# A few things to think of

- Would you want to read this proposal? Late at night? On the bus? On a plane? Along with 40 others just like it?
- Would you be able to read and understand this proposal in under 5m per page?
- Can you FIND the main points in the proposal without reading the whole thing in all its gory detail?
- Imagine its your hard earned money ....



# Astronomers are Scientists

- ie you should make hypotheses, and then test them
- You are not (or should try to pretend that you are not) just observers.
  - Don't aim to "discover" things or find "first" something
  - Don't work out what's going on after you have data.
  - Try to establish whether something is true or not.
  - TACs & Funding agencies want to see proposals which will get value for money.



# First, formulate your experiment

- Have a clear idea of the problem you will attack
  - “What question am I trying to answer?”
  - “Is it interesting?”
  - “Is it timely?”
- Then determine what finite set of observations are need to *conclusively* answer that question.
  - If the question, or the set of observations, becomes too big, then break it down into a series of smaller problems, and attack each of those in turn, with a separate project for each.
- It must be clear to you, so you can clearly explain it to someone who is not an expert in the field.



# Writing

- Clear Expression - keep language clear and simple.
- Layout - lead reader through the text.
- Length - minimise! Don't use all the space just because you can
- Well Reasoned - your thought processes must be clearly expressed. Eg.
  - Here is the scientific background =>
  - A Question we'd like to answer =>
  - The Observations we'd like to carry out =>
  - The following positive or negative results.



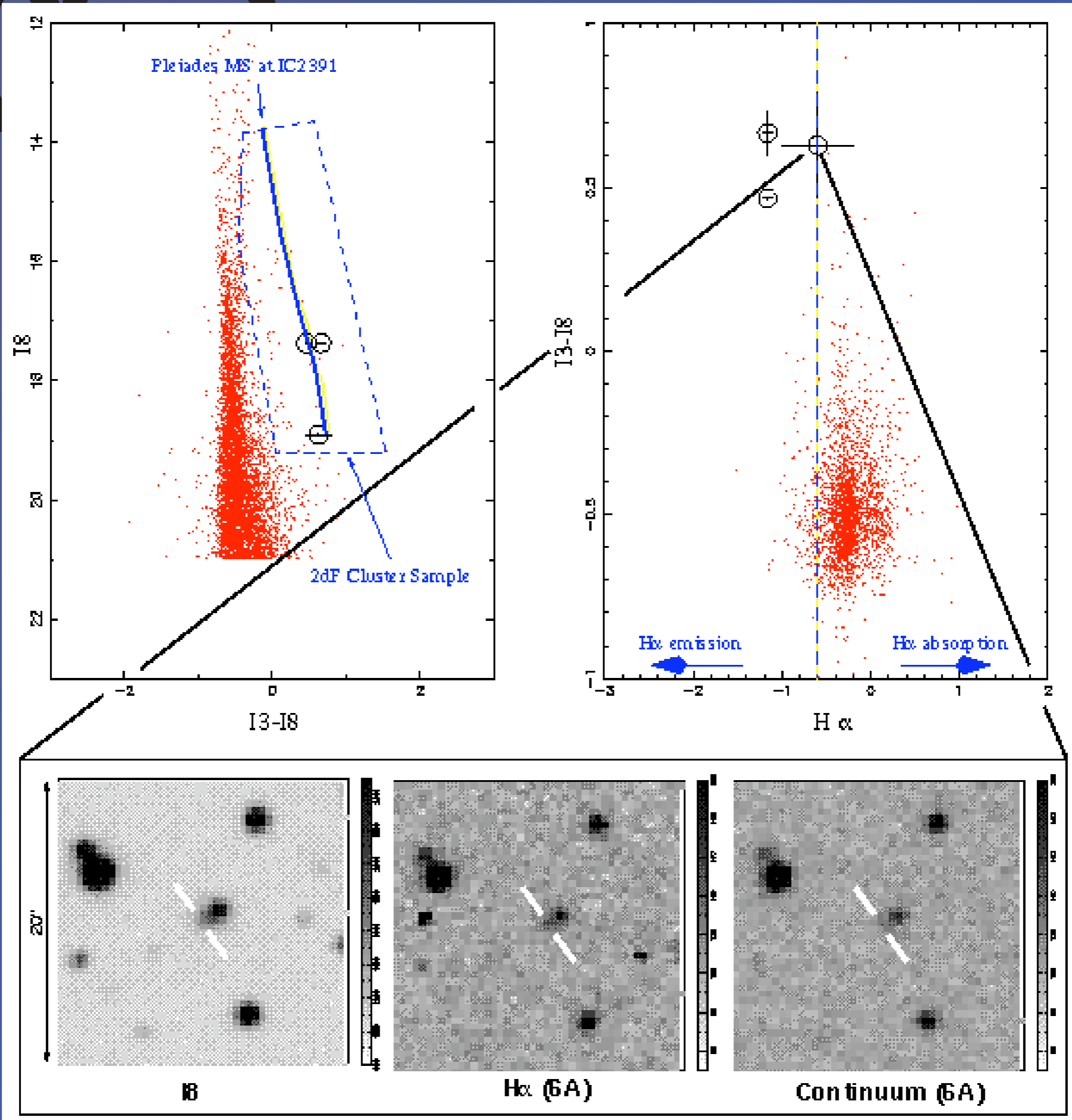
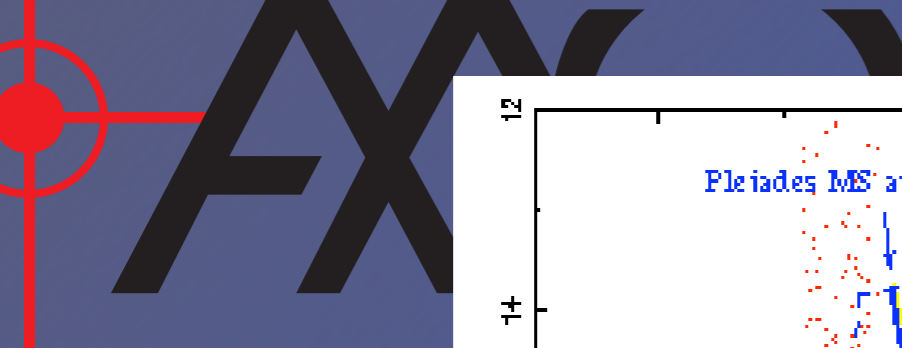
# The Project

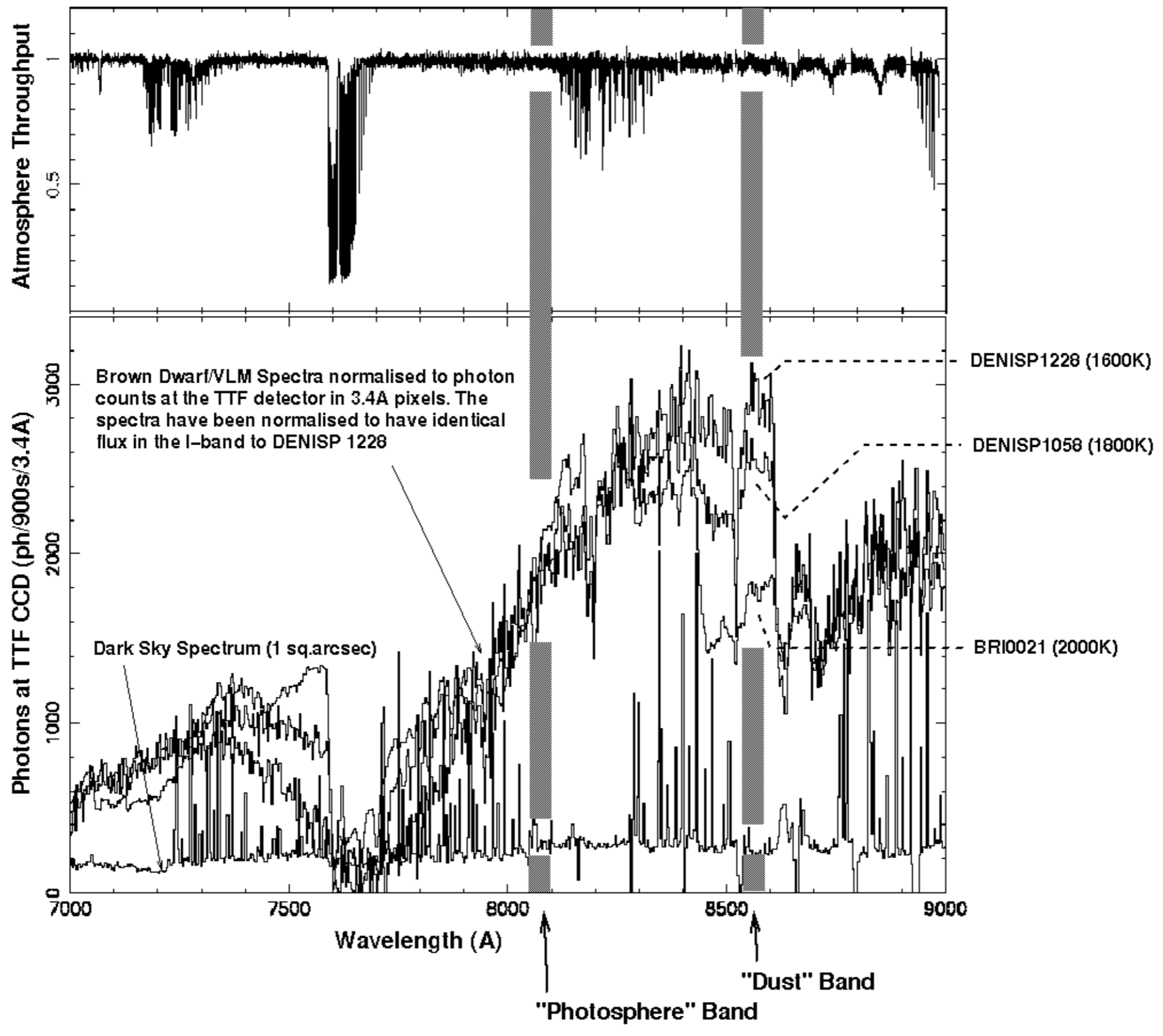
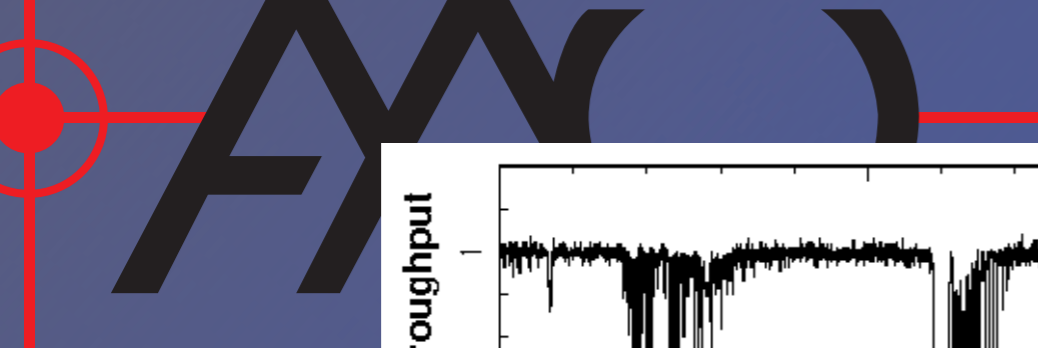
- A well defined experiment with clear positive and negative outcomes. Ideally the experiment will be constructed such that either result is interesting and worth publication. TAC gets a guaranteed publication.
- Finite - TACs hate to see the same proposal again and again. If your proposal will take time in more than one period, then estimate how much and say so, and why. TACs will avoid starting projects which look like they might turn into continuous applications for time.



# Figures

- Use Figures
  - They save words, and can be much, much clearer.
  - Make sure your figures are well annotated.
    - Notations on the figure are better than in the caption. Eg. use xfig, GIMP, Word, Powerpoint to add notes, arrows etc to GIF or Postscript file.
  - Make sure the figure will reproduce
    - Avoid colour or grayscales for ARC proposals.









# Technical Cases

- Why have you chosen the instrument you have? Is the instrument somehow unique?
- Justify the time you ask for
  - How bright are your targets? How many of them are there? What S/N do you need to achieve your scientific goals? How long do you need to expose (based on the Observatory's sensitivity estimates, and/or your experience)?
- Remember
  - Use figures - especially schematics of any complexities in your science case or observations, as much as possible.
  - Keep it brief.



# AXO ARC details

- Address the *grading guidelines*
  - 40% Track Record, 30% Significance & Innovation, 20% Approach & Methodology, 10% National Benefit.
  - If you don't have 3-4 refereed papers per year over 5 years (or equivalent scientific track record), you may be better off spending time on writing papers this year rather than a grant application
  - **Justify** your budget.



# After the TAC rejects you ..

- The next thing you must do is find out why!
  - Many TACs (eg. ATAC and PATT) provide feedback on the TACs evaluation.
  - If you didn't get time you need to revise your proposal for next time taking these comments into account
  - You can also contact TAC members to ask if they have any comments on what you can do to improve the proposal
  - Don't attack the TAC
  - ***Its your job to make the proposal understandable, not the TACs job to understand it.***



# AXO Conclusion

- When writing a proposal you are “marketing” your project.
  - So try to ensure your marketing is better than your competitors!
  - Remembering scientists are a very critical advertising market
  - But they are looking for enjoyable, understandable proposals to read.