PHY 517 / AST 443:
Observational Techniques in Astronomy

Lecture 5:

Proposals
Time Allocation Committee

Telescope time proposals

- writing (successful) proposals is an essential part of being a researcher
- ... at the latest, when you need to apply for funding
- observational astronomers need to submit proposals for telescope time

Example: Hubble Space Telescope

- proposal deadline once per year (~April)
- typically ~1000 proposals
- ~20% success rate
- open to anyone

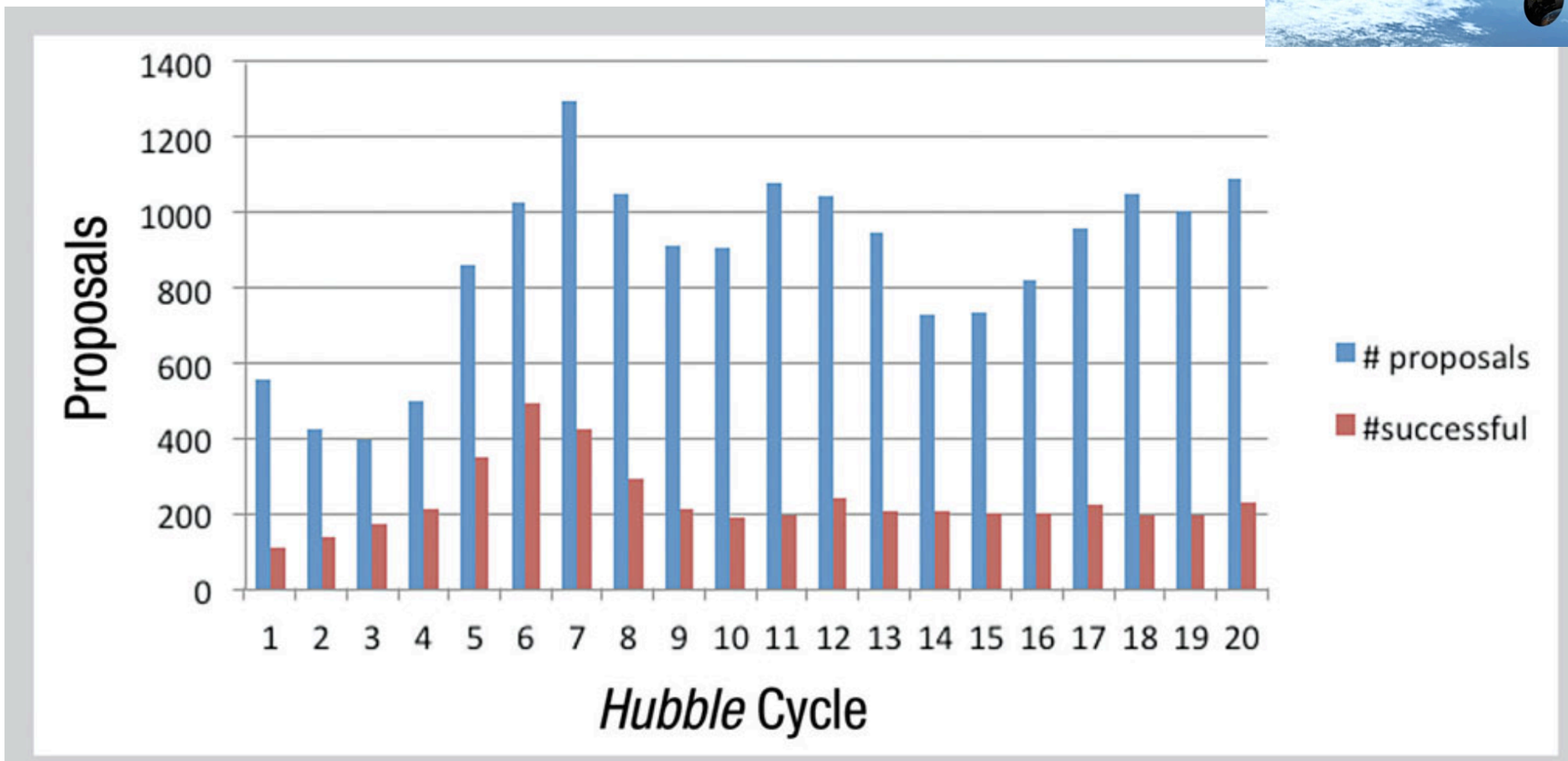


Figure 1: *Hubble* proposal pressure by number of proposals. The blue histogram shows the number of proposals submitted each cycle; the red shows the number accepted. The Cycle 7 statistics include the cycle 7N and 7AR proposals. The oversubscription ranges from 2:1 in Cycle 6 to more than 5:1 since SM4.

STScI

NOAO

- NOAO = National Optical Astronomical Observatories
- US national research & development center for ground-based night-time astronomy
- manages most telescopes with US-wide access
- own facilities: Kitt Peak National Observatory (KPNO, Arizona), Cerro-Tololo Inter-American Observatory (CTIO, Chile)

- Calls for Proposals 2x per year; deadlines end of September and end of March

ESO

- ESO = European Southern Observatory
- manages the Very Large Telescope (VLT; Chile)
- also open to anyone; preference for European projects only in direct conflicts

- Calls for Proposals 2x per year; deadlines end of September and end of March

ALMA

- ALMA = Atacama Large Millimeter Array
- multi-national project
- proposals through respective managing facilities, e.g. for US: NRAO = National Radio Astronomy Observatory

- proposals ~1x per year

ALMA observatory

Other

- some facilities are not open-access, but only available to researchers at the institutions / countries who built / finance them
- for example:
  - Keck telescopes (mostly CalTech, University of California + University of Hawaii)
  - Subaru telescope (mostly Japan + University of Hawaii)

PHY517 / AST443 proposals

- each of you will write a telescope proposal for your Lab 3 observations

- in Lab 1 and Lab 2, you have learned the 2 most common techniques used in optical astronomy: imaging and spectroscopy

- use your knowledge of these techniques to propose other interested measurements!

- note: the science goal has to be different than Lab 1 and 2

PHY517 / AST443 proposals

- Proposal deadline: **Tuesday, Oct. 15, 5pm (strict !)**

- Time Allocation Committee: **Monday, Oct. 21**

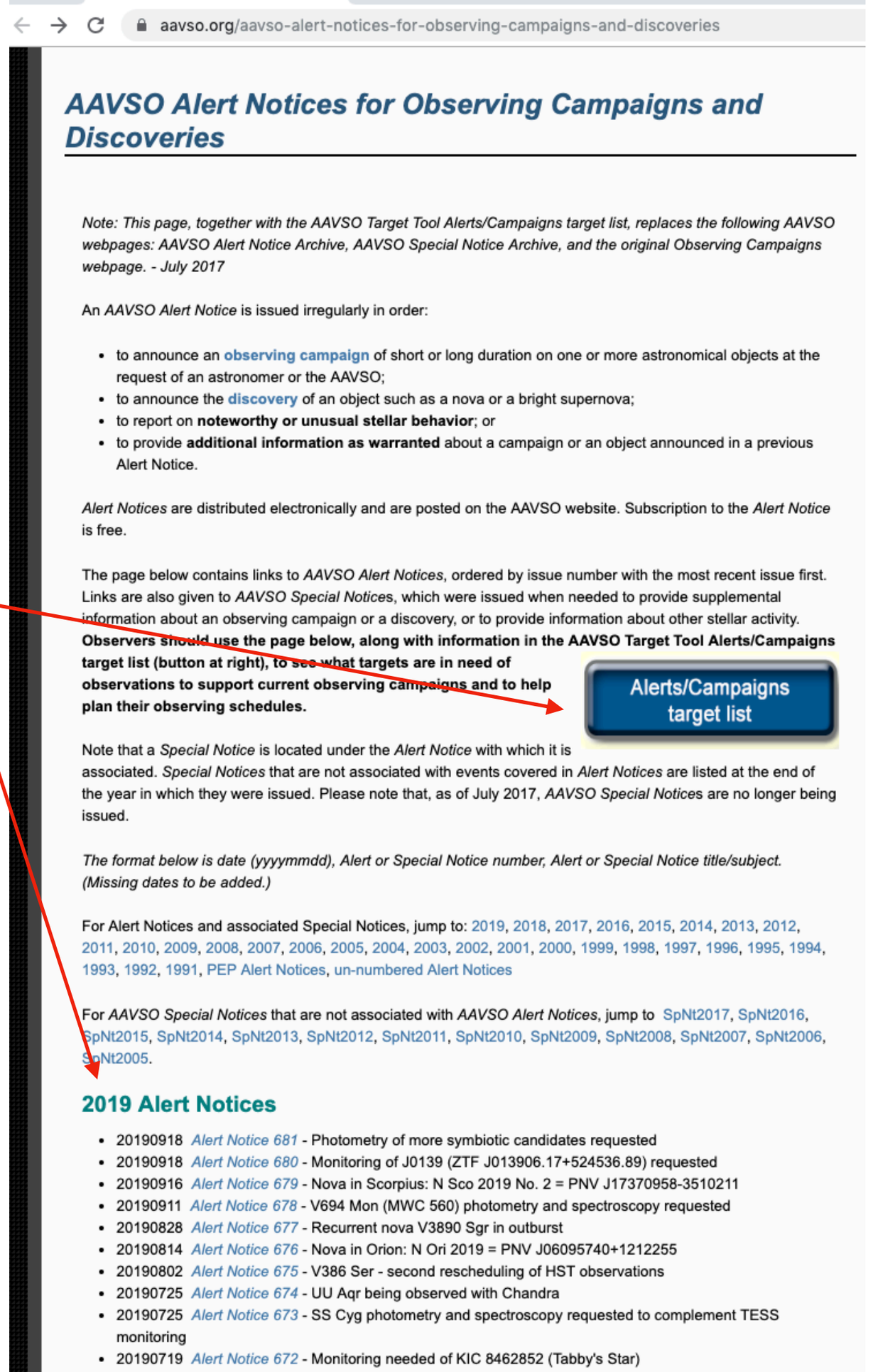
How to write a good proposal

- come up with a good idea!
- figure out the technical details
  - what filters / gratings / bands
  - exposure times
  - observability

Possible resource: AAVSO

American Association of Variable Star Observers (AAVSO):

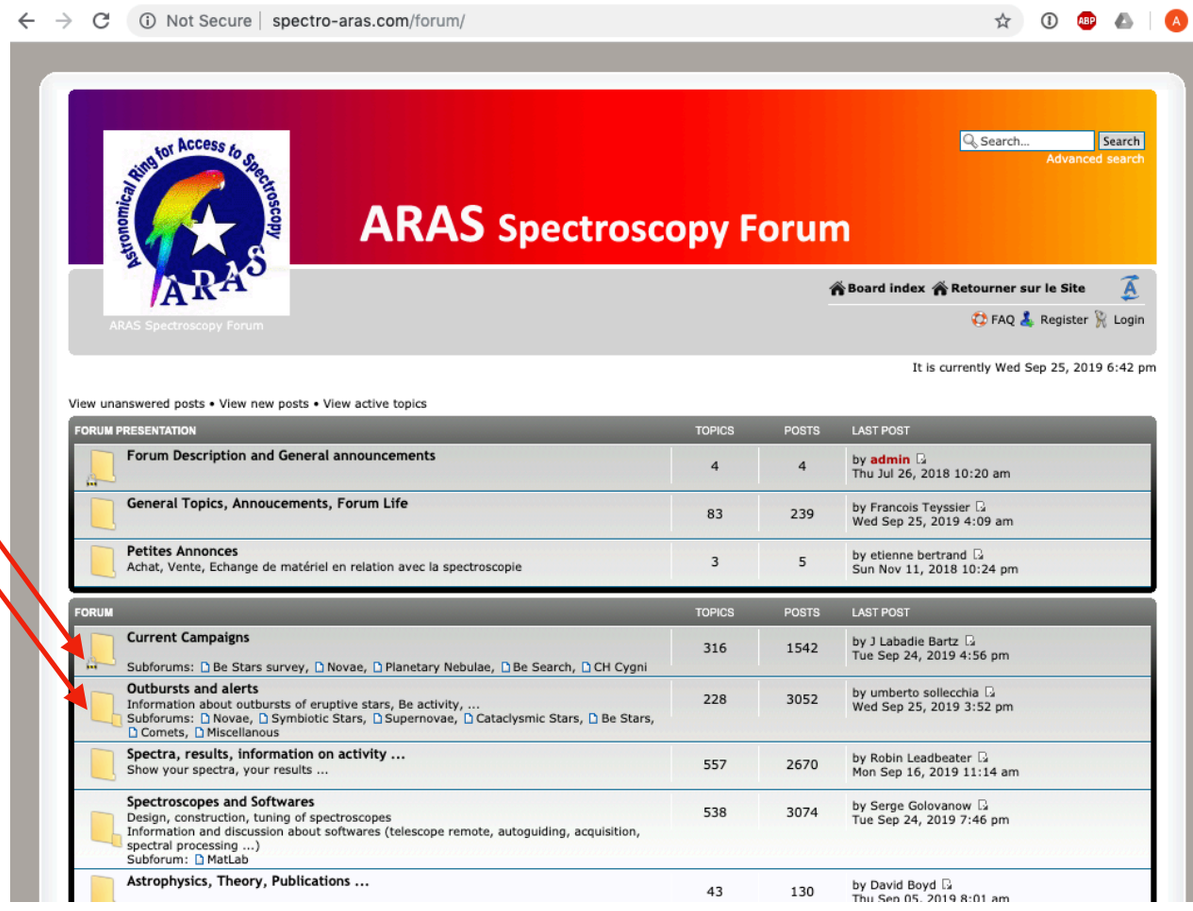
- "alert": call for observations by small telescopes, issued by scientists
- could pick one (or more) of these as basis for your proposal
- try to maximize science output
  (1 single 10-minute observations probably not very exciting)
- note: you will have to research the topic to write your science case



Possible Resource: ARAS

Astronomical Ring for Access to Spectroscopy (ARAS):

- observing campaigns and alerts, specific for spectroscopy
- could pick one of these as basis for your proposal
- note: you will have to research the topic to write your science case



Possible Resource: basic astronomy

- think back to your introductory astronomy class (e.g. AST203)
- there are some "classic" measurements, e.g. color-magnitude diagrams
- you could choose one of these
- make sure that there is a measurement goal!

- *Q: What would you try to measure with a CMD?*

Possible Resource: astro-news

- check astronomy news (e.g. Sky & Telescope)
- are there new discoveries where you could contribute useful data?
- research the scientific background

- make sure that there is a measurement goal!
- example: "*I want to take a picture of this comet*" is not a quantitative measurement goal

Technical Feasibility

- as important as your scientific justification is the technical justification

- *imaging*: from Lab 1, you have an idea of what magnitude star requires what exposure time
  - can scale to other magnitudes with CCD signal-to-noise equation (recall that $mag \propto log[flux]$)
  - make sure to justify choice of filter(s), too

Technical Feasibility

- as important as your scientific justification is the technical justification
- *spectroscopy*: from Lab 2, you have an idea of what emission line flux requires what exposure time (look up publications on your nebula)
  - for continuum emitters: look up exposure time guidelines in spectrograph manual
  - make sure to also justify choice of grating

Time Request

- the target observing period is Oct. 22 - Nov. 8 (+ a bit later if moonlight not a concern)

- make sure your targets are observable!
- we will schedule 3 nights for each group; you will observe on the first night with good weather
- try to be flexible in your time request

- if targeting transient sources: we cannot accommodate real Target-of-Opportunity requests (where your observations override somebody else's on a timescale of hours) - make sure you can do something with the nights you're given

- specify the nights you are *not* available (e.g. night before a mid-term / GRE)

Proposal Structure

- cover sheet
  - abstract
  - PI and CoI ~~names~~ SBU IDs
  - time request
  - telescope / instrument / set-up request
- Scientific Justification
  - limited to 1 page
- Technical Justification (be concise)
- Figures, Tables, References, Object lists

Scientific Justification

- describe your project to a knowledgeable, but non-expert audience
- make it exciting / important!
- build on (your) previous work / experience - make sure to convey that you have done all the preparations
- polish the text - typos and carelessness are distracting

Technical Justification

- describe your proposed observational set-up in detail
- explain every part (telescope, instruments, filter, etc.)
- most important: explain and document the exposure time request
- professional instruments have Exposure Time Calculators to relate signal-to-noise and exposure time

AST 443 / PHY 517 proposals

deadline: Tuesday, **Oct. 15, 5pm** (strict!)

proposal template available on github:
https://github.com/anjavdl/PHY517_AST443/wiki/Proposals

blind review: list only your SBU ID as author!

your labmates are your Co-Is, make sure to check their availability

Time Allocation Committees

- proposals are reviewed by panels of researchers, chosen by the responsible agencies (e.g. HST - STScI)
- panels are assembled by topical groups (e.g. cosmology)
- every panelist has to read every proposal assigned to that panel, typically ~80
- preliminary grades submitted online
- 2-day meetings to discuss all proposals and finalize grades

AST 443 / PHY 517 TAC

- date of TAC meeting: **Oct. 21**
- you will be assigned a list of proposals to evaluate and grade
- you will have to send in grades and comments for all proposals on your list before **midnight, Oct. 20** (also strict)

AST 443 / PHY 517 TAC

- you will be primary reviewer for one proposal, and secondary reviewer for another proposal
- during the TAC meeting, the primary and secondary reviewers will lead to discussion of each proposal, but *everybody will be expected to take part*
- the PI of the proposal and their collaborators, as well as PIs of directly competing proposals, will leave the room

AST 443 / PHY 517 TAC

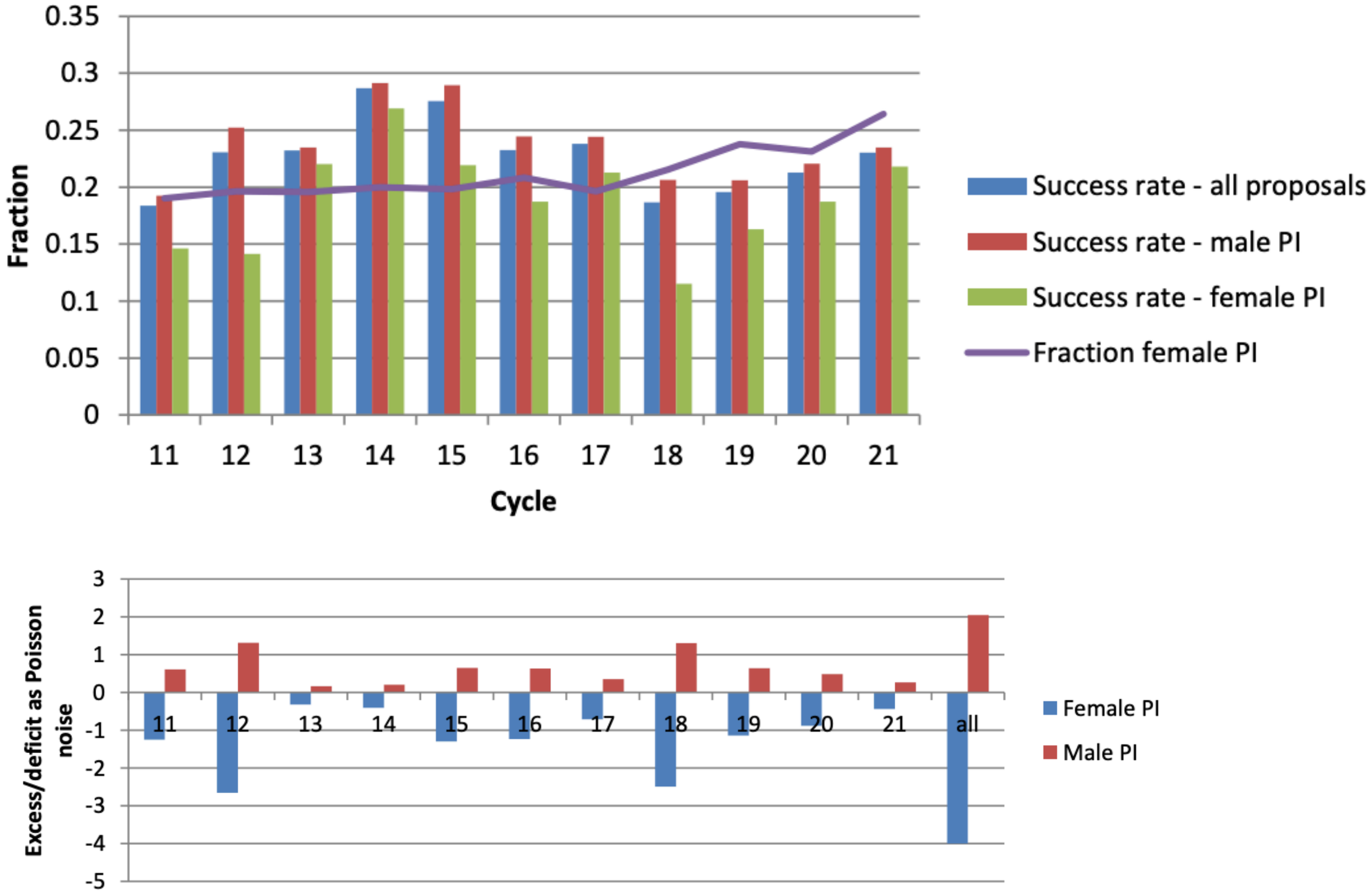
- after each discussion, you will re-grade the proposal via secret ballot
- we will rank the proposals based on the final grade
- *each group observes its top-ranked proposal* (if technically feasible, and schedulable)

- after the TAC meeting, the primary and secondary reviewer will collate the comments into a final evaluation of that proposal

Avoiding unconscious bias

- Unconscious / implicit bias: our judgment is biased by stereotyped expectations
- has been well documented in much of society, e.g.:
  - identical applications / teaching evaluations with female / colored names are ranked worse than those of males / whites
- Reid (2014): success rates of Hubble proposals by female PIs systematically lower than those by male PIs

Avoiding unconscious bias



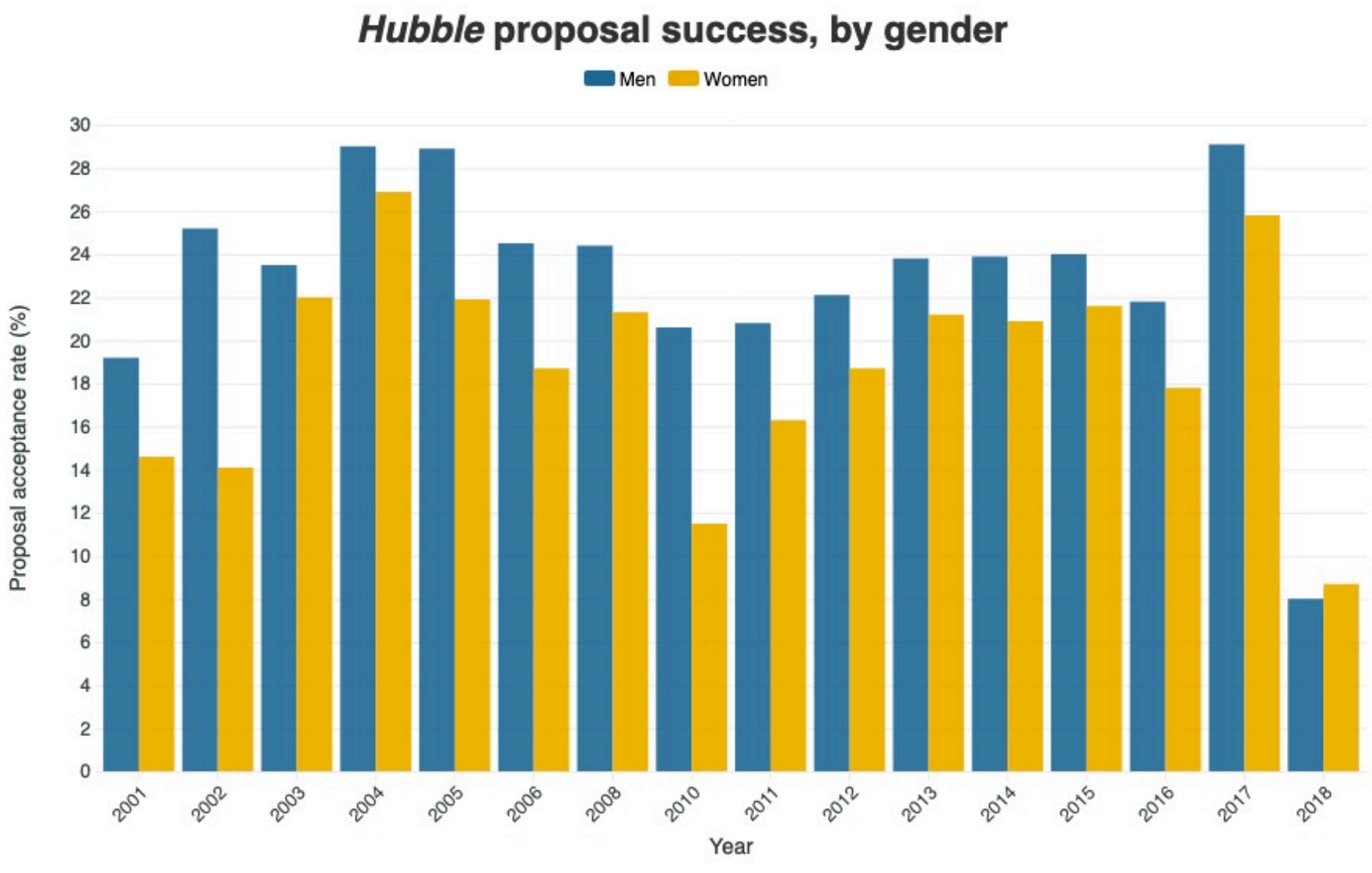
Reid 2014

Avoiding unconscious bias

- In 2018, the Hubble TAC was conducted dual-anonymously
  - PIs were not identified; had to avoid identifying themselves in the narrative
  - Reviewers were told not to guess the proposers

Avoiding unconscious bias

- In dual-anonymous review: male/female success rates were even!



Strolger & Natarajan 2019

- Implementation for other observatories being considered

Further Reading

- Reid 2014: Gender-based Systematics in HST Proposal Selection. https://ui.adsabs.harvard.edu/abs/2014PASP..126..923R/abstract
- Strolger & Natarajan 2019: Doling out Hubble time with dual-anonymous evaluation. https://physicstoday.scitation.org/do/10.1063/PT.6.3.20190301a/full/