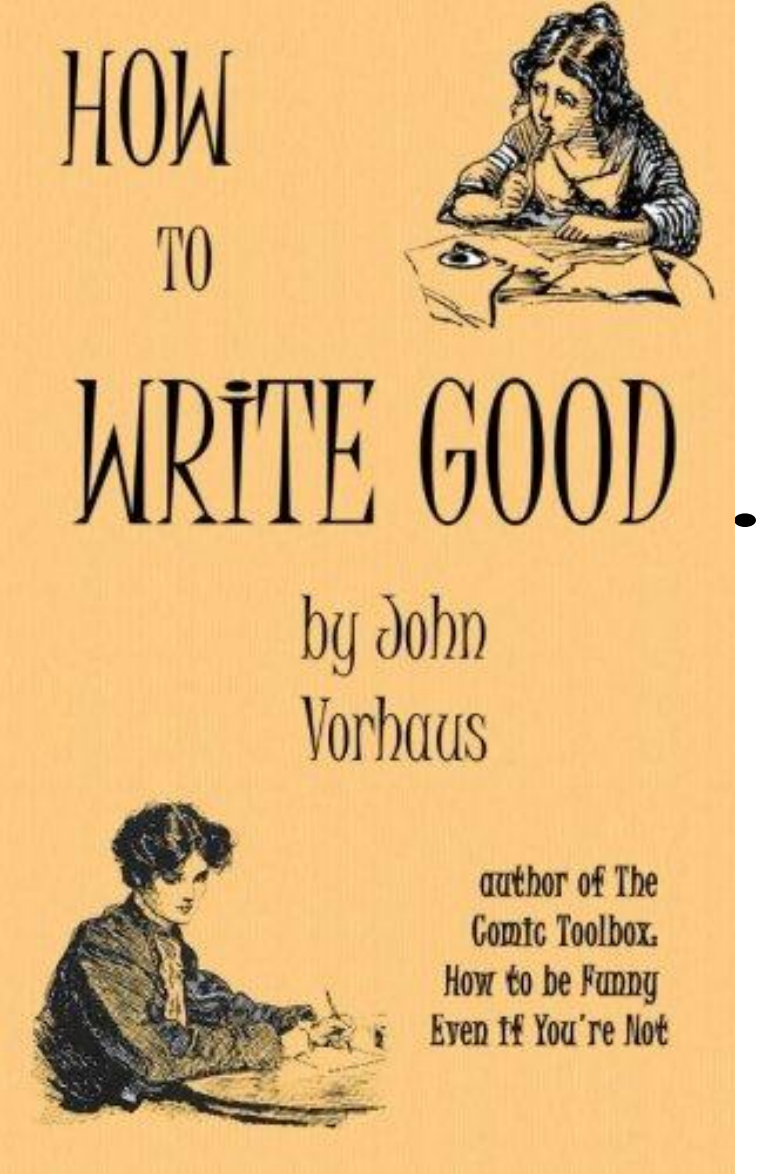


...OBSERVING PROPOSAL

Joanna Molenda-Żakowicz

Astronomical Institute, Wrocław University
Wrocław, POLAND

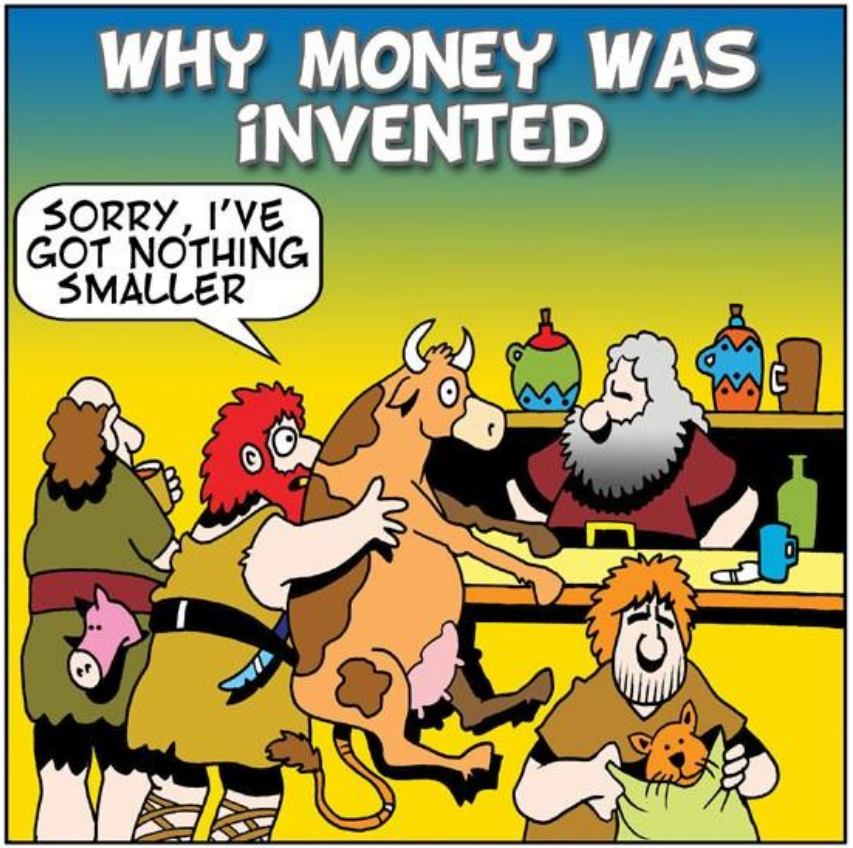
Uniwersytet Wrocławski

SOLARNET

Why to write a proposal?

You have a good scientific question that you want to get answered.

Why to write a proposal?



In the USA, NASA is the biggest funder of astronomy through research grants related to successful observations.

Grants are predominant means of paying for post-docs, PhD positions, and even own salary.

The same becomes more and more frequent in Europe.

You need money (or work) ((or both)).

You have a good idea for an observation. Why not just do it?

Many others also have good scientific questions to get answered.

Resources are limited and the competition is strong.

There is a significant oversubscription of the available facilities
(oversubscription = time requested/available.)

Example - the call A07 for Chandra
- 725 submitted proposals, 125 accepted proposals.

Most proposals will be rejected (the percentage of accepted proposal is 10-30.)

The Cost of Doing Astronomy

Astronomical instrumentation is expensive.

Agencies need good proposals to ensure that the telescope or satellite produces best. ⇒ Oversubscription is good !

Example: W. M. Keck Observatory (near the summit of Mauna Kea, Hawaii) houses two telescopes, each with a 10-meter diameter primary mirror and equipped with state-of-the-art instruments used for research in astronomy and astrophysics at optical and infrared wavelengths.

The Cost of Doing Astronomy

The Observatory is managed via a partnership between the founding partners UC, Caltech, and NASA. The Keck Observatory capital costs were borne primarily by Caltech through two grants from the Keck Foundation of $70 M (1985) and $74.5 M (1992) and an additional ~$30 M from NASA.

In addition to the operations costs, the Observatory competes for external funding to upgrade instrumentation (including adaptive optics) and to build new instrumentation. The success rate in the NSF TSIP, MRI and ATI programs has been high ($33 M in grants from federal sources and ~$17 M from private sources have been raised for Keck instrumentation and adaptive optics since 1993).

The Cost of Doing Astronomy

The productivity of UC and other researchers from Keck Observatory is very high.

The discoveries from Keck include some of the most profound and historically important scientific discoveries of the last 20 years.

UC astronomers have been the recipient of an extraordinary number of international prizes including multiple Shaw, Gruber, and Kavli prizes, a MacArthur Fellowship, Crafoord Prize, Nobel Prize and the National Medal of Science. Most of the prizes awarded were based on work done at Keck.

The Cost of Doing Astronomy in Different Wavelengths

Optical:

- DSAZ (Calar Alto Observatory): 2.2 m: 3000 EUR/Night
- ESO 2.2 m (La Silla): 7,000 EUR/Night
- ESO NTT (La Silla): 10,000 EUR/Night
- ESO VLT (Paranal): 59,400 EUR/Night
- HST: 39,600 EUR/hour (HST: cost was $9.6 billion between 1990 and 2009)

Radio: VLBA: 740 EUR/hour (assuming building cost of $85 Million)

X-Rays: Chandra: 28,000 EUR/hour (Annual operating cost $65 million including guest observer program, and cost to launch: $2.5 billion depreciated over 15 yr lifetime.)

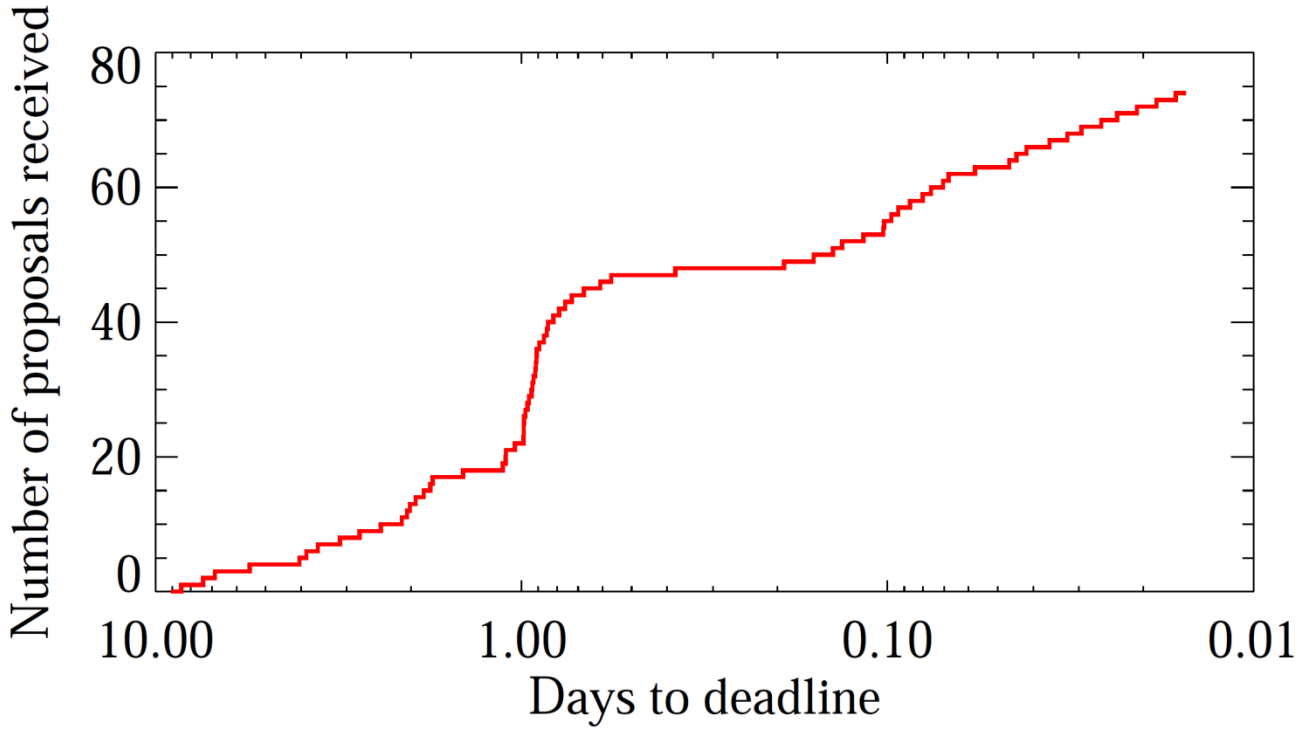
The Proposal Process

Agency or observatory sends out a call for proposals "Announcement of Opportunity" (AO)

- **X-rays**: typically once per year
  - Chandra, INTEGRAL: Spring
  - XMM-Newton: Fall
  - Suzaku: December
- **Optical**: typically 2 times per year
  - e.g., ESO: 1. April for the period 1. October - 31. March
- **Radio**: often trimesters

Multiwavelength campaigns require significant planning
(you can spend/waste all of your time writing proposals)

Proposal Submission



Arrival of proposals for INTEGRAL A07 KP deadline

Proposal submission is usually done via www interface or specialized software.

Make sure that the software works well before deadline !

Proposal Review

Preparation for review (around 1 month).

1. Formal checks of proposals (100-800 depending on facility)
   - Does proposal obey the rules and regulations?
   - Is the page or word limit correct?
   - Are the objects allowed to be proposed?
   - Is your proposal technically feasible?
2. Proposal assigned to one of a few subject areas (e.g., stars X-ray binaries, galaxies, etc.)
3. Proposal is sent to the specific review panel.

Proposal Evaluation - 1

1. What is the scientific context of the proposed observations? How do they fit in with and extend ongoing research?

2. How will the proposed observations impact research in the sub-field, in the field, or even in astronomy as a whole?

3. What is their value as a research project?

4. Have the objectives been declared to be important or endorsed by a national science-oriented body?

Discussion of any one of these items would suffice. Although illuminating something we don't understand is scientifically justifiable, it is not enough to make a proposal competitive. This bullet is often referred to as providing the "Big Picture".

Proposal Evaluation - 2

1. What hypothesis will be tested?

2. What competing scenarios will the observations likely distinguish between?

3. Which of several interpretations is being tested which, if rejected, will simplify the picture significantly?

4. If a complex model is being tested, what are the criteria of the test?

5. What are the implications for the uniqueness of the model if the fit to the proposed data is good?

Proposal Evaluation - 3

A concise statement of the observing plan (instrumentation, data products, and methods of reduction and analysis, weather/seeing constraints) and specific scientific goals help the TAC understand what the end result of the proposed observations.

Remember! The TAC is reading 25-35 proposals over a few days, so clear, short sentences make for a better understanding of what the proposer is setting out to accomplish.

The TAC is charged to evaluate only what is presented in the proposal, do not assume they are an expert in your field.

Proposal Evaluation - 3. weather

Proposal Evaluation - 3. weather

Proposal Evaluation - 4

1. Are the observations needed to verify a newly-announced and unexpected result which could affect the course of research in a field or change the current paradigm?

2. Are the observations time-critical and infrequent?

3. Do they have to be carried out this (tri)mester?

4. Do they represent a target of opportunity (hard to predict but important scientifically)?

Proposal Evaluation - 5

1. Are the proposed observations particularly suited to the local skies, telescopes or instrumentation?

2. Is the proposed telescope and instrumentation the best suited for the proposed science?

3. Is the proposed observing procedure adequate?

4. Are the proposed observations parts of a dissertation?

Good numbers to keep in mind

- 50-80 proposals per panel
- 5-8 reviewers per panel
- Reviewers are specialists in the general subject area, but not in the subject of your proposal !
- All reviewers are supposed to read all proposals
- Each reviewer is primary reviewer on 10-15 proposals
- Each reviewer is secondary reviewer on another 10-15 proposals

Panel Meeting

X-ray: Depending on satellite done centrally (NASA, INTEGRAL) or distributed throughout Europe (XMM-Newton).

Optical: most often done centrally (e.g., ESO).

Radio: Often done by telecon or even anonymously.

Proposals are discussed: 10 ssminutes per proposal !

Panel votes to give new grade. At the end of the 1st day, a new priority ordered list of proposals exists, which is already very close to the final list.

After the Panel Meeting

1. Agency sends out rejection and acceptance letters
2. 6-18 months after proposal deadline: Observations are performed.
   - Grade A: definitively
   - Grade B: probably
   - Grade C: possibly ("filler target"; fillers are needed to optimize observing efficiency)
3. Typically 1 year after data are received by PI, data become public.

Tips and Tricks: Do your Homework

1. Read and understand instructions for proposers: page limit, submission software,. . . - formalities matter!

2. Convince others that your programme is interesting and important. This also helps you in formulating the proposal and your scientific questions.

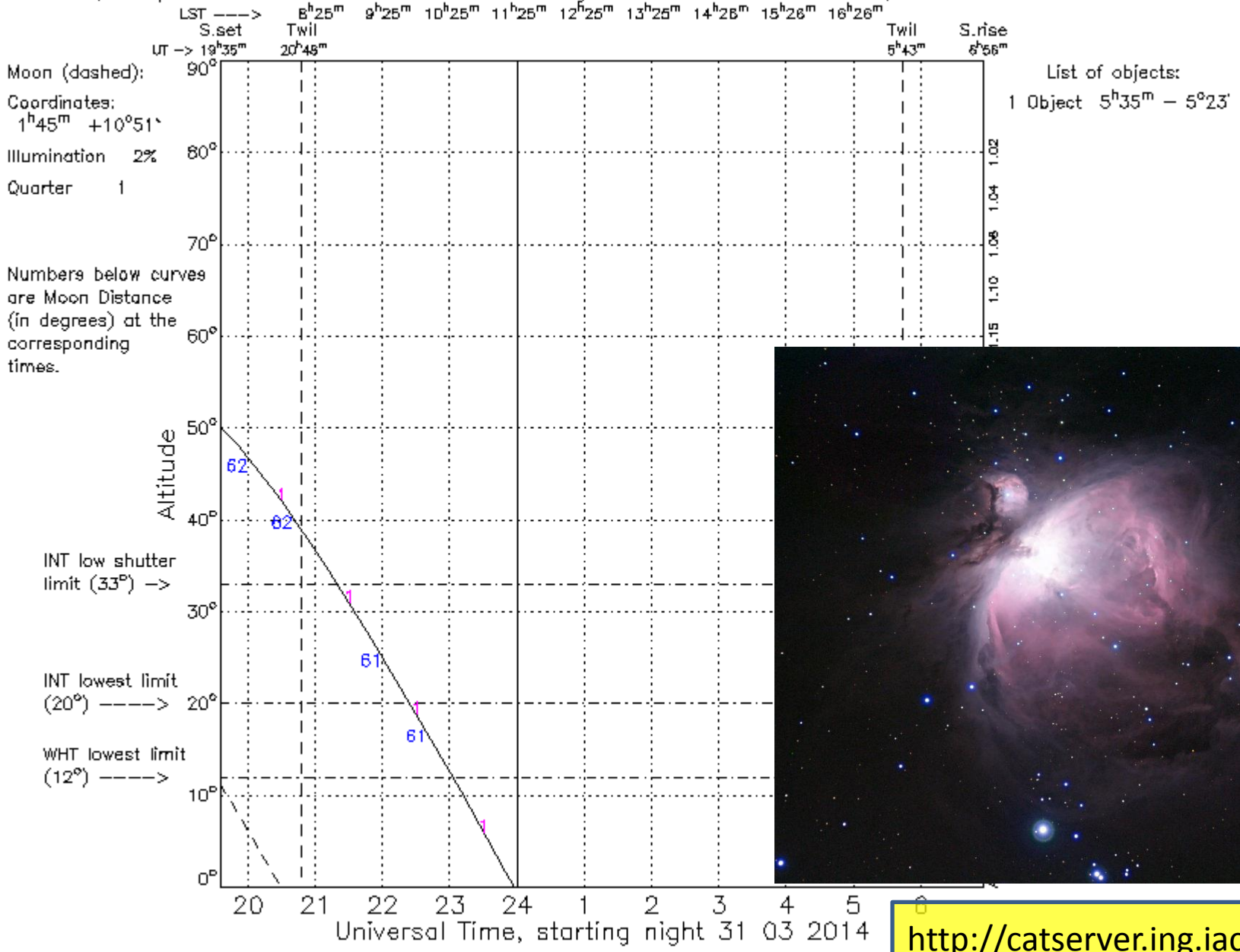
Tips and Tricks: Do your Homework

3. Check archives for same/similar observations.

4. Understand your instrument. Do a rough feasibility study, check visibility of source, estimate S/N, are there other facilities you could use?.

5. Read the relevant documentation on the instrument you plan to use.

Altitudes, Roque de los Muchachos Observatory 342.1184E 28.7606N, 2326 m above sea level



http://catserver.ing.iac.es/staralt/

Tips and Tricks: Structure

1. Abstract - The only thing all reviewers will read !

2. Introduction - Why is this science interesting? What are the open questions? Big picture?

3. Scientific Justification - Why is your observation interesting? How will you do the analysis?

4. Technical Feasibility - Prove that the observation is doable !

Rule of thumb: If the 1st page is not interesting and does not state what you want, your proposal will not get accepted.

Example of a successful Hinode Observing Proposal (HOP)

http://www.isas.jaxa.jp/home/solar/hinode_op/hop_list.php

HINODE Operation Plan (HOP) accepted on 18-mar-10

HOP No.	HOP title
HOP 0159	CORE: Chromosphere-Corona connection

plan term 2010/04/19-2010/04/25

proposer name : De Pontieu e-mail : bdp[at]lmsal.com

contact person in HINODE team name : De Pontieu e-mail : bdp[at]lmsal.com

Example of a successful Hinode Observing Proposal (HOP)

http://www.isas.jaxa.jp/home/solar/hinode_op/hop_list.php

Abstract:

We aim to investigate the connection between chromospheric and coronal dynamics by exploiting recent observations and analysis that have revealed the presence of ubiquitous rapid upflows with velocities of order 50-150 km/s in the lower solar atmosphere (De Pontieu et al., 2009a, McIntosh & De Pontieu, 2009a,b). We observed signatures of these events with a broad range of imaging and spectroscopic instruments (SOHO/SUMER, Hinode/SOT-EIS-XRT, and Swedish Solar Telescope, SST) in the chromosphere (in the form of spicules or RBEs -- rapid blue-shifted events, De Pontieu et al., 2009a, Rouppe van der Voort et al., 2009) and in the transition region (TR) and corona (in the form of blueward asymmetries of TR/coronal spectral line profiles, and propagating disturbances in coronal imaging). Preliminary analysis suggests that these upflows are part of a previously undetected, but relentless transfer of mass between the dense lower atmosphere and tenuous corona in which a potentially significant amount of plasma may be heated to coronal temperatures at very low heights, in the upper chromosphere, TR and low corona.

Example of a successful Hinode Observing Proposal (HOP)

http://www.isas.jaxa.jp/home/solar/hinode_op/hop_list.php

Abstract:

We propose to obtain coordinated measurements with SOT, EIS, XRT and SDO to address a variety of unresolved issues:

Do these occur at the footpoint regions of loops across whole active regions, or only at the edges?

How do the upflow speeds vary with temperature?

How well correlated are the chromospheric upflow events (observed as Doppler shifts in H-alpha) to the faint upflowing signals observed in the TR and corona?

How ubiquitous is the apparently sometimes quasi-periodic recurrence of these events, and on what timescale do they recur? Have these upflow events previously been interpreted as a signature of propagating slow-mode magnetoacoustic waves in coronal loops?

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Example of a successful Hinode Observing Proposal (HOP)

http://www.isas.jaxa.jp/home/solar/hinode_op/hop_list.php

Requests:

Images with Al poly filter configuration at 30s cadence with AEC exposure for a FOV of 384"x384". These data will allow us to track propagating disturbances in the corona. We will investigate the correlation between these "blobs" with the line asymmetries observed with the EIS fast raster. This XRT program should be run during the high cadence SOT-NFI/SP program for one hour.

Example of a successful Hinode Observing Proposal (HOP)

http://www.isas.jaxa.jp/home/solar/hinode_op/hop_list.php

Other participating instruments :

Time window in day: We are hoping to get STEREO high cadence data, which means that it would be best if the Hinode 1 hour run was started at the beginning of the hour (STEREO high cadence programs run in blocks starting at the even hours: e.g., 6 to 8 UTC)

Time frame: we need a nice active region, and are hoping to use SDO/AIA data as well, so ideally this program would run from the middle of April onward.

Scientific Justification

Is the most important part of the proposal. Here you must explain the aim, significance, expected results, impact in the research field, and originality of your proposals.

Answer (to yourself):

1. Will these observations result in good science?
2. Have these observations been done before?
3. Is this telescope/instrument really necessary?

Scientific Justification

1. What kind of phenomenon to be observed, its significance and impact for the research field, future development of research field?
2. What kind of sources and frequencies to be observed, why they are proposed?
3. Why this instrument is required?
4. What kind of observations to be necessary to achieve the scientific goal?
5. What is the expected results and data (intensity, structure, time variation, spectra, etc.?
6. What kind of analysis to be conducted to obtain the phenomenon and parameters, what kind of theoretical models to be compared, and how to interpret the data?

Scientific Justification

Do not assume the reviewers are experts in your field !

What is the broader impact of your science? Tell the reader about the links between your program and bigger questions. Be as specific as you can when describing these connections.

Lots of proposals start with important questions, but do not present a convincing link between the proposed observations and the answers. How will this program advance our understanding? Sometimes, a "decision tree" structure is useful, but don't over simplify. How will you test the things you want to test?

Scientific Justification

Do you have theoretical backup?

- If so, the value of your proposal is enhanced. For example, if your proposal aims to determine the element abundances in an M dwarf or an S0 galaxy, it will be useful if you can show that you have the ability to obtain theoretical line strengths as a function of abundance.

- If you wish to determine the amount of dark matter in a cluster of galaxies, it helps if you can show that you have simulations which indicate that the proposed data will suffice to do this.

Scientific Justification

Target selection: It is useful to explain why you selected your specific target(s).

- For example, if you wish to determine the amount of dark matter in the galaxy cluster Abell A2218, explain why this cluster is a better target than other clusters.

- Every hour is precious. Justify what you need! Explain why the science requires the S/N, depths, field of view, sample size, etc. requested.

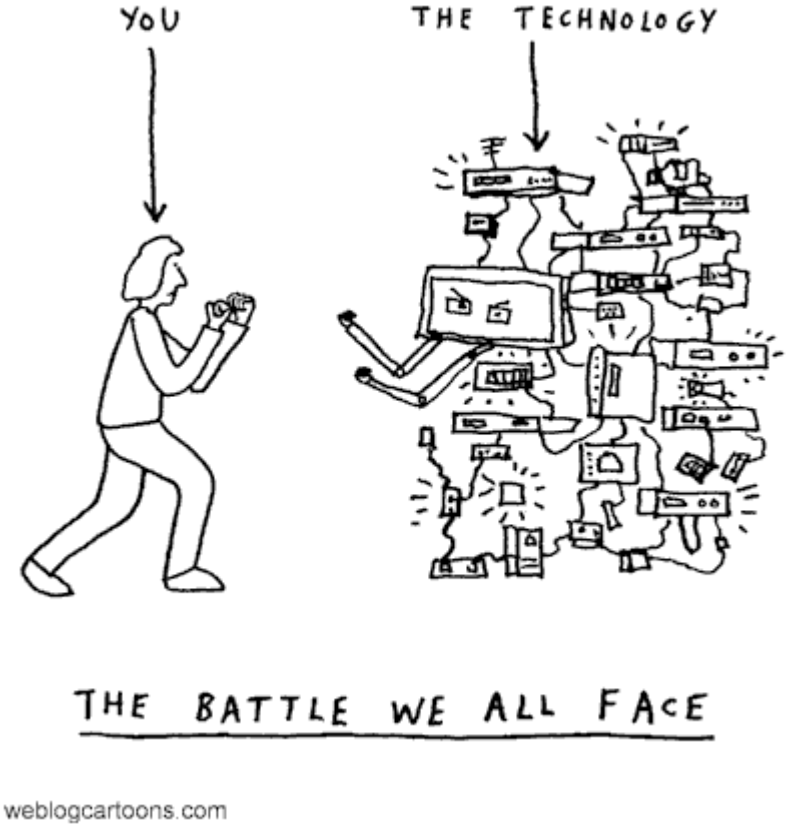
Scientific Justification

- Why did you choose this particular instrument/telescope? If it can be done just as well on a smaller telescope, then the proposal is easily killed.

- What makes this program unique? Explain and justify how your program will improve over previous work (the readers may not be aware of previous work, so explain it to them). Show that you are aware of existing data and that they are insufficient.

Technical Justification

- Observations which are technically impossible will not be approved even if they have scientific importance.
- Make sure you can do what you say you want to do. Check exposure time calculations, field of view, overheads, resolution (spectral, spatial).
- Why do you need a particular lunar phase? If you are requesting dark time, what is the impact on the program if you get grey time?

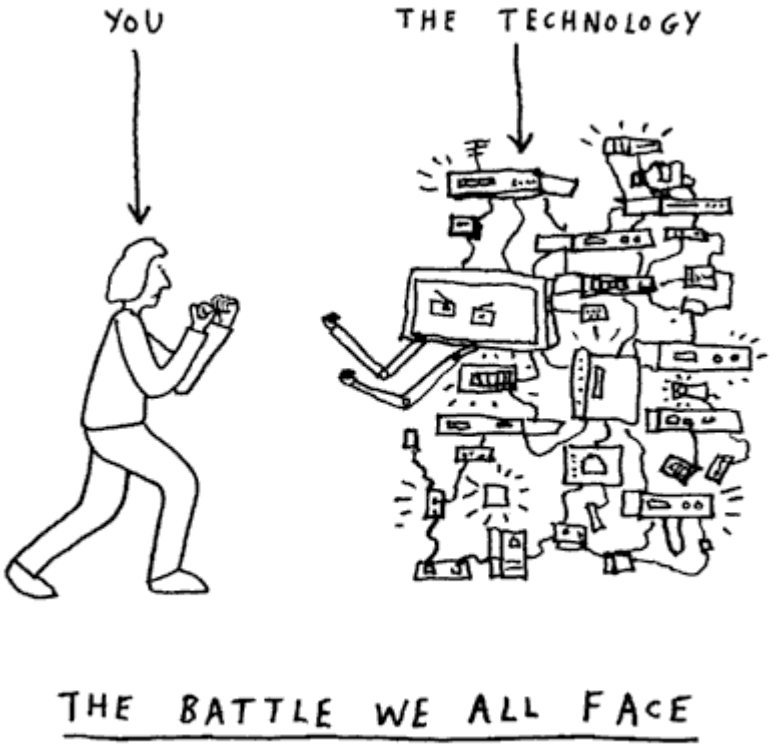


Technical Justification

- How much time is the target visible in a given night for the request semester? Use, e.g., Skycalc.

- Justify the seeing you need. Example: "In 0.8" seeing, dark skies (Moon < 3 days), and airmass < 1.4, we can achieve S/N=5 in 4 hours of integration (5 x 2880s). Each field will also need a total overhead of 19 min for acquisition (13 min), setup (1 min) and readout (1 x 5 min). To observe six fields, we request 25.9 hours of observing time."

- How will you do your calibrations? For classical observing, this is part of your requested time (if the calibrations are not day time or twilight).



The Plan and the Team

Is the team experienced and has relevant end-to-end expertise?

Who will do the observing? The data reduction? The analysis and modelling?

Do these people have the time to work on this project?

What is the plan for data reduction? Think about retrieving relevant archive data and show you can analyse it (when applicable).

The Plan and the Team

What previous work done by the PIs and co-Is is relevant to this program?

You should show that you have thought carefully about the issues in going from observing to science.

Are students/postdocs involved? Is training a part of the program?

Do you have the financial resources to support this research? (Not necessary, but does not hurt to show).

Use check-lists for testing

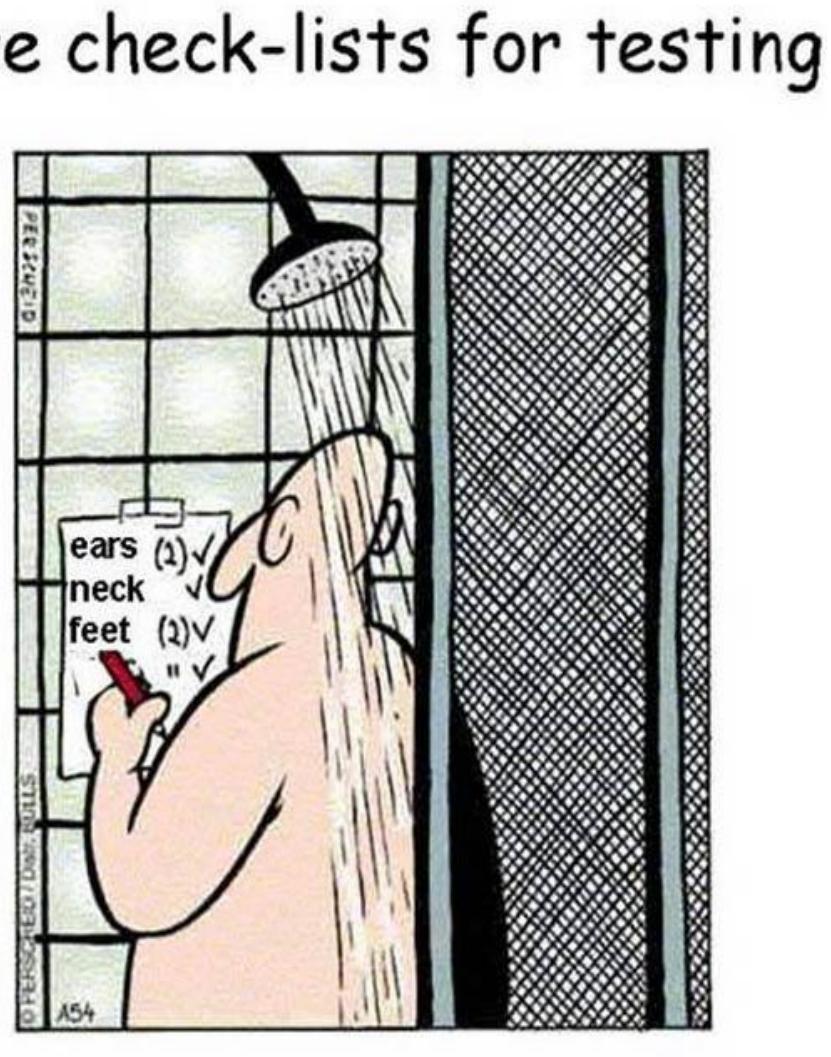
1. Is this a good well-justified scientific idea?
2. Have you included an introduction and put your project in a broader context for the non-expert?
3. Have you argued that this project will significantly advance the field?
4. Have you been specific about the goals of this particular observing run and how they relate to the broader significance of the project?
5. Will the observations result in "hard" science (determine physical quantities, test a model, etc.)?

6. Is your scientific team well-balanced?

7. Have you justified the choice of telescope?

8. If supplementary observations are required at another telescope, have you indicated the status of these observations and suggested an alternate plan, if they are unsuccessful?

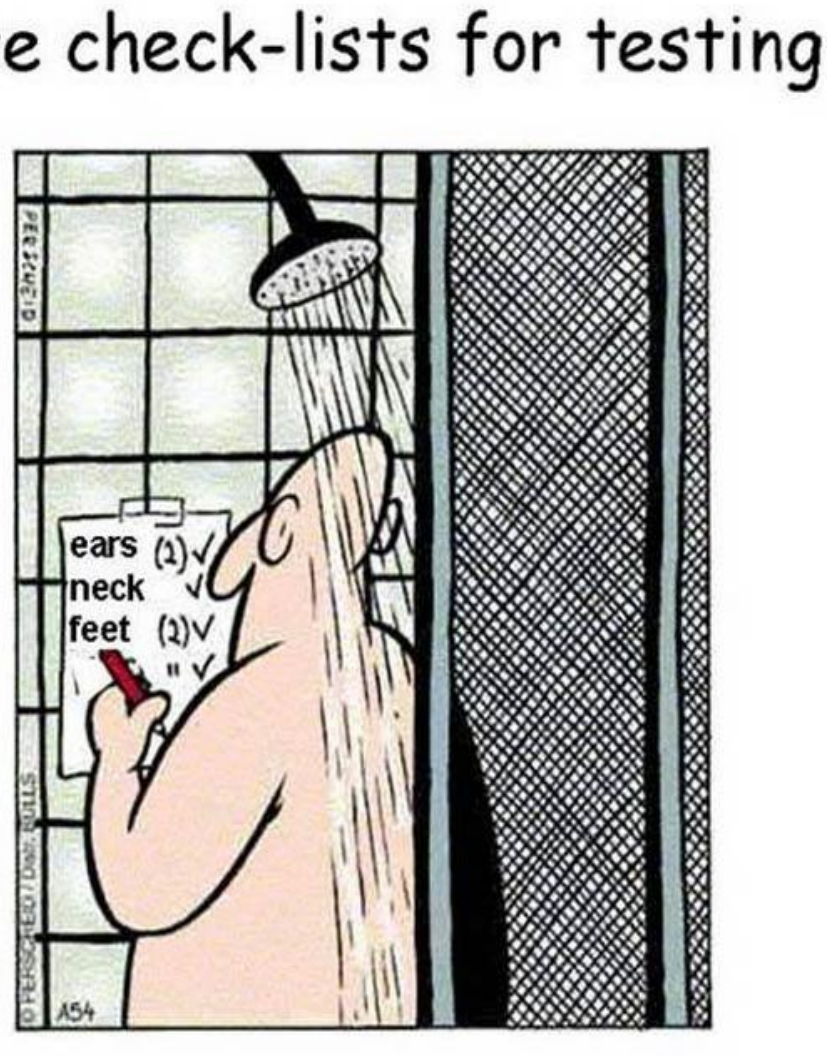
9. Is the observing strategy well planned and explained?



10. Have you justified the choice of sources, frequencies, lines, etc.?

11. Have you indicated how the data will be analysed?

12. Can the technical set-up, as described, achieve the stated goals of the observations?



Other Tips

- Assume that the readers will spend 15 min reading the proposal and 10 min discussing. Make key facts easy to find (sample size, targets, observing plan). Do not assume it will be read word-for-word from beginning to end.

- The reader does not want to read a novel. Get to the important points quickly in the proposal.

- The abstract is very important, so don't write it at the last minute. After reading the abstract the reader should know what you are planning to do and why.

Other Tips

- Make good use of figures. Refer to them in the text. Have full descriptive captions.
- It often helps to show an example of what you will observe on the sky, or an example from archive data.
- Do not violate the rules (page limits, word count, PI affiliation, etc).
- Pay attention to special requests by observatories.

Special requests by observatories

NASA/KECK: Applications must include complete lists of the objects to be observed, their magnitudes and their approximate equatorial coordinates. Applications without such lists will be rejected.

The number of target objects required should be justified.

If new or unusual techniques are to be used, make clear how observations and calibrations will be obtained.

Brief description of the status of large telescope time that has been awarded during the past 2 years, such as progress with data reduction and publications.

Special requests by observatories

ESO: Who will be interested in your results? Maybe only the proposer... but maybe all astronomers working on the same object, on the same class of objects, and indeed maybe many astronomers in different fields of interest.

It is useful if you assess this in the proposal. The wider the possible interest in your results, the higher the ranking of your proposal.

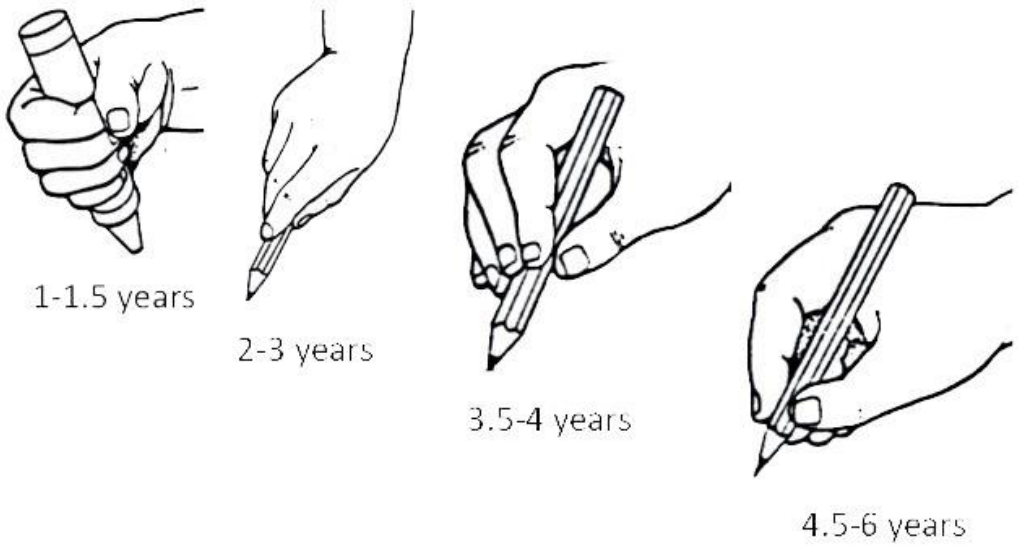
Request for Services and Requests for Travel

In many observatories observers are required to file a Request for Services prior to their observing run.

Personnel are strongly encouraged to arrive at the observatory at least 12 hours prior to the start of their observing time. They are also required to get sufficient sleep before driving back. Getting adequate sleep is necessary to prevent either telescope/instrumental or vehicular accidents.

Tips and Tricks: Writing Style

- Proposals will be read by non-specialists. Give your proposal to an astronomer friend.
- Proposals will be read in a hurry. Panel has very little time, and little patience! Use the KISS-principle (KISS = Keep it simple, stupid!)
- Be explicit in what you want to do. Use boldface to emphasize an important point.
- Get to the point immediately.



Tips and Tricks: Writing Style

Avoid jargon, acronyms, or complicated language. Use good English (have a native speaker read the proposal.)

If the referees don't understand what you want, you have lost.

Because of oversubscription, panels are looking for arguments to kick you out, not to keep you in !

Tips and Tricks: Work under Pressure

1. Technical challenges: you and the telescope, the telescope and the world,
2. Weather conditions,
3. Sleep deficiency, time-zone changes and difficulties of travelling,
4. Scientific program - not always easy to realize for the beginners,
5. Teamwork: you and the technicians, you and the other scientists,
6. Your task for now: write your own proposal.

Further Reading

1. Jörn Wilms Dr. Karl-Remeis-Observatory and ECAP "How to write a (potentially successful) observing proposal"
   http://pulsar.sternwarte.uni-erlangen.de/black-hole/1stschool/coursematerial/proposals.pdf

2. Judith Irwin "WRITING A GOOD OBSERVING PROPOSAL"
   http://jach.hawaii.edu/JCMT/applying/irwin_goodprop/goodprop.html

3. Leibundgut, B. ESO proposals (Prague, 2009)
   http://www.eso.org/~bleibund/talks/Proposals_Prague09_pub.pdf

4. Fomalont, E. Preparing a competitive radio proposal (Santa Fe, 2004)
   http://www.aoc.nrao.edu/events/xraydio

5. Seward, F.D. How to write an X-ray proposal (Santa Fe, 2004)
   http://www.aoc.nrao.edu/events/xraydio