Meg Urry, Brett Blacker, Glenn Miller, Palle Moller, Meg Urry, Brett Blacker, Glenn Miller, Palle Moller, Proposal Solicitation and Selection for the 21st Century
Abstract

A crucial part of the science mission of an observatory or space mission is creating the program of observations to be executed. Most missions have a “general observer” program where observations are selected for broader community definition. The pros and cons of each approach are examined and the requirements and technologies are identified.

The process of time allocation involves proposing, reviewing, and selecting the scientific program of observations. A less obvious, but perhaps more important cost is batching the current process via “paperless” and “groupware” process streamlining. The time from concept to data receipt to analysis is increased which decreases the ability to respond to new scientific developments and increases the general operational overhead of handling a large batch of observations.

In this paper we explore three experimental steps to achieve an optimal proposal selection process: streamlining the current process via “paperless” and “groupware”, use of a “steady state” process which accepts submissions continuously, and a “voting” method which decreases the ability to respond to new scientific developments and increases the general operational overhead of handling a large batch of observations.
Overview

Today’s Proposal Solicitation and Selection Process

Areas for Improvement

Three Candidate Approaches

Pros and Cons

Enabling Technologies

Measuring the Selection Process
Proposal Selection

An extremely important process determines the scientific results from an observatory and shapes the careers of its users. Observatories are oversubscribed, typically by a factor of 4. The most recent HST solicitation (Cycle 7) saw 1298 proposals submitted, 297 accepted (23%). 21,734 orbits were requested, 3304 accepted (15%).
Today's Process: Preparation

"Call for Proposals" and other documentation prepared and published by observatory staff, etc...

Must understand observatory and instrumentation by reading documents, consulting with observatory staff, etc...

Astronomer writes proposal and submits by deadline

By observatory
Today's Process: Peer Review

- Proposals assigned to one or more reviewers
- Reviewers read and grade proposals
- Observatory staff reads proposals to note any technical feasibility issues
- Most proposals are of high quality. Very few flawed proposals (either from a technical or scientific standpoint)
Today's Process: Selection

Proposals are assigned to panels by specialty (e.g. cosmology, hot start, planets).

Panels discuss proposals, make ranked list of proposals available for resources, e.g. number of orbits.

Observatory provides guidelines for overall "Time Allocation Committee" (TAC).

TAC merges rankings of panels, make ranked list.

Results of TAC advisory to Director.
Proposers notified of results

Proposers may appeal

Today's Process: Notification
Today's Process

Space and ground based observatories follow this general process.

Typically an annual (space-based) or bi-annual (ground-based) solicitation "cycle" follows this general process.
Today's Process is Expensive

- Mailing paper copies of proposals to reviewers/panelists/TAC members
- Recruiting Panel and TAC members
- Logistics of Panel and TAC meetings (travel, hotel, meeting rooms)
- Tracking system for proposals
- Observatory staff needed to manage logistics and tracking

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Today's Process is Expensive
Today's Process is Slow

Necessary to have mechanism for "out of cycle" requests.

Long lead time from birth of idea to receipt of data - typically about 2 years from date of proposal submission.

Makes it difficult to quickly respond to newly discovered results.

"Today's Process is Slow"
Today's Process is Inflexible

Batching proposals into cycle creates peaks in processing, e.g., computer resources needed at submission deadline, e.g., computing power.

If you allocate too much time, then it takes observatory to handle meetings.

If you allocate too little time, then observatory will be idle at times.

Process is sensitive to initial prediction of available observing time:

- If you allocate too little time, then observatory will be idle at times.
- If you allocate too much time, then it takes even longer for observers to get data.
For 21st Century Observatories

Community

Highest quality science is selected from selection process while still ensuring Must decrease cost of administering
Three Approaches

1. Streamline current process with "paperless" and "groupware" technologies

2. "voting" method

3. "steady state" process which accepts proposals at any time and reviews continuously

What are benefits and drawbacks?

What enabling technologies are required?
Many observatories have taken steps in this direction. Many observatories have taken steps in this
direction.

Proposal preparation aids: Call for Proposals

email; automatic acknowledgment

STScI accepts proposals electronically via

Exposure time calculators for instruments.

and Instrument Handbooks are on WWW.

Includes libraries of astronomical objects (e.g. stars, galaxies)

Streamline Current Process

STScI accepts proposals electronically via

Exposure time calculators for instruments.

Many observatories have taken steps in this direction.
Additional Areas for Improvement

2. Distributed Panel and TAC meetings

3. Triage process

1. Electronic Review of proposals
Electronic Proposal Review

make notes in margins, etc.

Can read on an airplane (or beach), can
preferred form for reviewing proposals.

Many reviewers note that paper is the

Grade and comments

distribution of proposals, secure return of

Within Today's technology: secure

Electronic Proposal Review
Enabling technology: truly portable computers

- Extremely lightweight (e.g., Newton or Pilot Weight) and very rugged
- Display capacity of 8.5x11 inch sheet of paper. (At 300 dpi, this is a 2550x3300 display)
- Workstation speed and data storage
- Connected to Internet at all times

Electronic Review (contd)
Enhancing technology: "data mining" or "agent" technology which can identify similar proposals to facilitate fair comparison.

When reviewing 100 proposals it can be difficult to find similar proposals in submitted and executing pools.
Improvements from current tools which are order of magnitude greater than teleconference or video conferencing or "groupware" technologies. Truly effective "groupware" technologies which are order of magnitude improvements from current tools do not preserve the benefits of primitive, do not preserve the benefits of primitive face to face meetings. Today's methods for collaboration are still primitive and still do not preserve the benefits of primitive face to face meetings. Distributed Panel and TAC meetings.
Given high rejection rate (factor of 4:1 is typical), most of Panel review is spent discussing proposals which will not be executed.

**Triage Process** could identify the proposals which are either very good or very poor.

- **Con:** Without review by panel, difficult to provide proposer with meaningful feedback. Possible that innovative proposals might not get sufficient consideration.

- **Pro:** Triage process could identify proposals which are either very good or very poor.
Voting

Pro:
- widest possible community participation
- proposals via WWW, allow community to grade
- proposals available to community

Con:
- could politicize selection process?
- easier for unselected proposals to be plagiarized?
Cosmology versus stellar proposals
allocations for scientific disciplines, e.g.

Proposals can be submitted at any time
Proposals are reviewed “continuously
Panelists review “at home” and submit
grades and comments electronically
Proposals are selected from the topmost ranked proposals

Would likely still have guidelines for

Steady State Selection
Pros of Steady State

- Increases lead time for observations
- Allows more flexible response to changes
- Decreases volume of "work in progress"
- Decreases proposal process
- Eliminates need for separate out of cycle
- Science which is based on recent results
- Encourages "science induced" proposals, i.e.,
- Decreases lead time for observations
Current TAC process allows global look at entire cycle's worth of observations.

Act of assembling TAC members at observatory gives community insight into the observatory and they return home with positive impressions of observatory as fair.

Cons of Steady State
Today’s selection process is “open loop”. Was the best science actually selected? There is no direct measurement of quality of the selection process.
In practice this is made difficult by two factors:

1. A controlled experiment is impossible, i.e.,

2. How do you measure "quality of science" best

one is running two independent TACs, executing on two telescopes and measuring which one is best.
Quality of Selection

Although measuring quality of science is very difficult, this should not prevent observatories from making some reasonable attempts at assessing quality of the selection process.
Possibilities for Measurement

Examples of measurements that are related to quality:

- Science Citation Index measures how often papers are cited. Could use this as a measure of impact.
- Observatories and their funding agencies could identify most important scientific results and relate back to TAC rankings.

These could have review committees.
Selecting proposals is one of the most important jobs of an observatory. Today's process can be improved to provide better service at lower cost. Important jobs of an observatory and electronic review and distributed meetings are areas for major technology improvements. Many improvements require no new technologies. Observatories should measure their selection process.