HOW TO WRITE AN X-RAY PROPOSAL

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Abstract

The *Chandra* observing proposal process is described. Suggestions are given to minimize the pain of proposal submission and to maximize the chance of getting observing time.

1 Chance of success

Each year there are 700–800 proposals for *Chandra* observations, archival work, and theory projects. Because of observing time and funding limits, only about 200 are accepted, one in four. The numbers for Cycle 5 were:

Table 1: *Chandra* Cycle 5 proposals

type	submit	accept	observing time
Normal	606	173	70 ks average
Large Project	68	10	300–1000 ks
Archive	71	17	
Theory	40	8	
total	785	208	19,400 ks

Chandra proposals are solicited once a year. The *Call for Proposals* contains schedule and rules. The *Proposer's Observatory Guide* contains instrument descriptions. Software for feasibility calculations, information, and help are available at http://cxc.cfa.harvard.edu

2 Content

If a proposal is truly excellent, and the review panel recognizes this, it will quickly be approved. However, 85% of proposals submitted are considered "good" and reviewers spend most of their time ranking the "good" proposals. Your challenge is to write the proposal so the excellence of the project is clear to the panel; or, at least, produce a clear, pleasing document that will stand out in the pack of "good" proposals.

A proposal has three vital parts: Science goals, feasibility, and suitability of *Chandra* for the project. The panel must be convinced that the science derived from an observation will be interesting. The proposal must show that the observing time requested will produce enough signal (counts for X-rays) to do the job. It must also demonstrate that *Chandra* capabilities (e.g., arcsecond resolution) are needed.

You can write a single proposal for *Chandra* time and VLA/VLBA time. The *Chandra* review can award up to 3% of VLA/VLB time to such proposals (subject to approval of the NRAO Director) The proposal must show that both *Chandra* and the NRAO instrument are essential to meet scientific objectives, and must demonstrate feasibility for each.

3 Format

Two sections comprise a *Chandra* proposal: The Target Form contains investigator information, target details, and instrument settings. The Science Justification is a little science paper; length limited to 4 pages (6 for Joint Proposals or Large Projects), explaining the scientific basis of the project and showing feasibility calculations.

Take care to avoid mistakes. Misspelling investigator or institution names negate the use of the computer to find conflicts of interest. Every year at least one proposer puts first names in the last name boxes. Errors in target coordinates can prevent the review organizers from finding target conflicts.

Every year there are ~ 25 gross errors in target coordinates submitted; for example,

Target: MS0735+7421 @ RA = 07 41 50.3, Dec = -74 14 50.6, and

Target: Tololo 0109$-$383 @ RA = 13 35 22.1, Dec =

−42 32 20.0.

A latex template is supplied which will produce an easy-to-read Science Justification. Keep in mind that reviewers have to read 60–70 proposals. Documents with tiny font, small margins, or small figures with minuscule captions will not be enthusiastically received.

The organizers enforce page limits by removing any excess pages.

4 Submission

All proposals must be submitted electronically using the RPS software. Before the deadline, errors can be corrected and proposals resubmitted. No post-deadline submissions are accepted. Each year we get 1000 submissions for 800 proposals. There are 600 submissions in the last day and 100 in the last hour. People wait until the last hour, submit the proposal, then read it, then hurriedly resubmit or call to explain the special circumstances leading them to request a late submission. "I accidentally sent an early version of our proposal." is not uncommon. Late corrections to the Science Justification are not accepted.

5 The peer review

Proposals are divided among 12 or 13 panels according to science topic. Each science topic is covered by 2 or 3 panels so proposals can be placed to avoid conflicts. There are $\sim$ 65 proposals/panel and 8 reviewers/panel.

Before the review, each panelist reads all proposals and assigns a preliminary grade. These grades are used for Triage. The first task for each panel is to view the list of the lowest-ranked proposals. The bottom 25% ($\sim$ 15 for each panel) are then eliminated from further consideration. However, if a panelist thinks any proposal in this group should be considered further, it can be resurrected and discussed with the rest.

The panel then discusses and grades the remaining 50 proposals - about 10 minutes for each! Each has been assigned a primary and a secondary reviewer who are responsible for a detailed reading of the proposal, presentation to the panel, and writing of a report communicating the grade and panel comments for the proposer.

On the third day of the review, the Large Projects, already graded by the topical panels are discussed and ranked by a Big-project panel which awards 20–30% of the observing time.

6 Advice

We go to a great deal of trouble to find competent reviewers and to avoid conflict of interest in the review process. All proposers are treated equally. Reviewers are conscientious and fair but this is an intense process. There is a lot to accomplish in a limited time. Proposers should retain the perspective of Ecc 9:11 where, "the race is not to the swift, nor the battle to the strong, nor bread to the wise, nor riches to the intelligent, nor observing time to the writers of good proposals, but time and chance happen to them all".

- Start early. Don't wait until the last minute.
- Write some of the description for someone who is not an expert in the field. Remember some of the panel do not work in your specific area and the proposal has to survive triage.
- Print the proposal and read it before submitting.
- Avoid unnecessary Co-investigators. Reviewers cannot participate in reviews of proposals for which they are CoIs and sometimes for those which have CoIs from their institutions.
- Volunteer to be a peer reviewer. Having seen the process you will be able to write better proposals.