NASA Astrophysics R&A: Proposal Quality and Funding Rates

The issue of proposal quality is a crucial one for understanding changes in proposal funding rates, and indeed is a driving question for determining appropriate agency responses moving forward.

First, the data show that the number of proposals submitted to the core NASA Astrophysics R&A programs has undergone a dramatic increase over the past decade (Figure 1). From FY05 to FY15, the number of proposals increased from ~500 to ~810 (increase of ~60%). The overall increase in available funding was much more modest, from ~$71M to $80M (increase of ~13%), leading to a decline in funding rates from ~30% to ~18%. This decrease of ~40% in funding rate mostly, but not entirely, mirrors the ~60% increase in the number of proposals; evidently the average amount awarded per successful proposal decreased by ~20%. It is not known from the available data whether this decrease in average funding per award is due to a decrease in the average request. In any case, if not for this decrease in average amount awarded to cushion the blow, the funding rate would have dropped to an extremely low level of ~12%.

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Comment [1]: This is probably answerable, just need to request data from NASA.

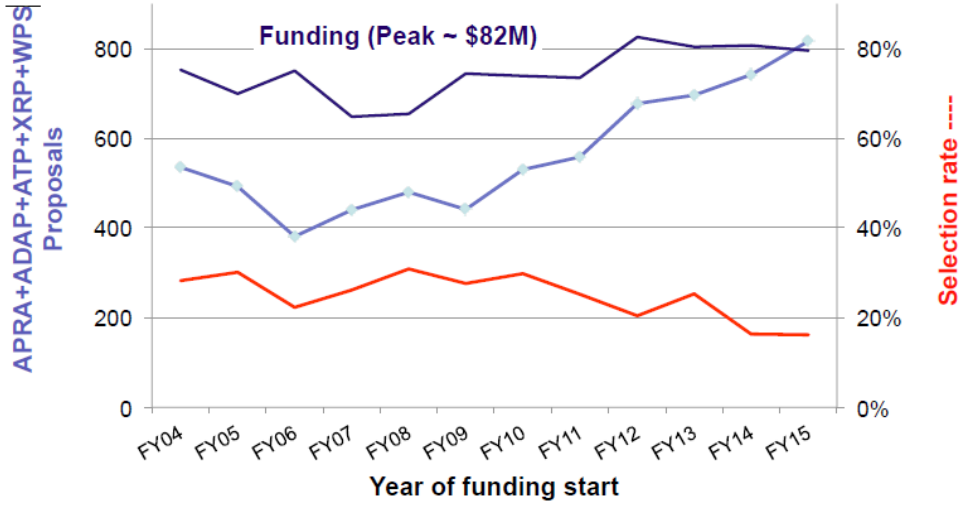

Figure 1: Funding amount (dark blue), number of proposals (light blue), and funding rate (red) for NASA Astrophysics R&A programs, from FY04 to FY15.

It is possible in principle that the dramatic increase in the number of proposals being received by NASA Astrophysics R&A programs is being driven by a "shotgun" approach in which investigators submit many more proposals of lower quality than in the past. This would suggest that the grants system is being "abused" and that the agencies are being over-burdened by needless processing of poor proposals. In that case, a response to limit the number of proposal submissions might be clearly warranted.

However, the data indicate that this is not the case. Figure 2 compares the distribution of proposal grades in FY12 and FY13. Technically, proposals receiving scores of "Good" or higher are fundable in

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Comment [2]: Ideally we would show a comparison spanning ~10 years. Need to ask NASA for this.

principle, however here we consider only relatively strong proposals with grades of "Very Good" or "Excellent". Between FY12 and FY13, the distribution of proposal scores indicates a small drop in proposal quality: The fraction of proposals rated VG or better dropped from 339/726 (46.7%) to 299/713 (41.9%), a shift in proposal quality of -10%. However, the decrease in funding rate among these strong proposals was much larger: The fraction of proposals rated VG or better dropped from 51% to 39%, a decrease in funding rate of 24%. As noted above, this decrease in funding rate would have been even larger if not for an offsetting decrease in average award amount.

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Comment [3]: We should be able to quantify this; need to ask NASA.

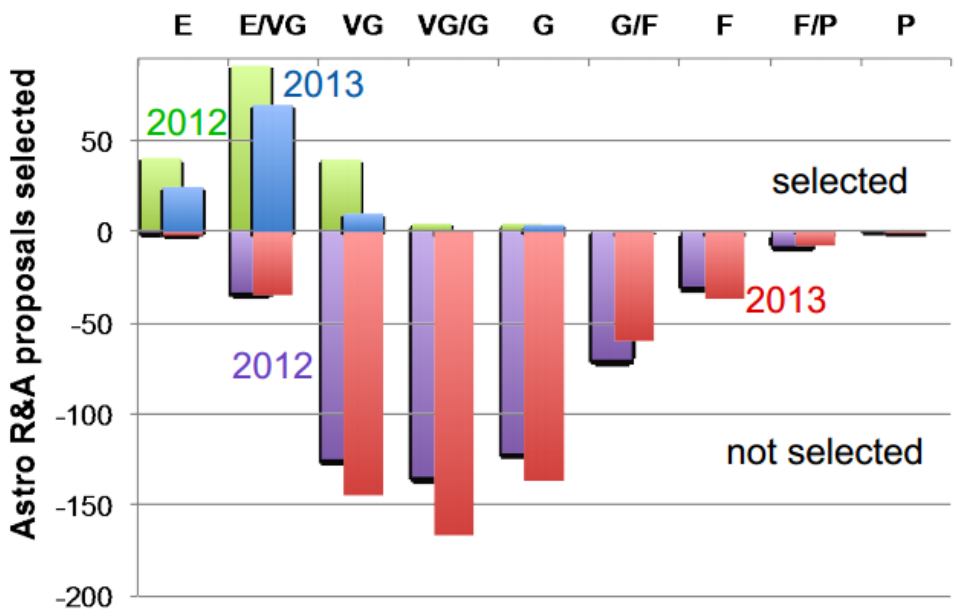

Figure 2: Number of NASA Astrophysics R&A proposals selected (above zero on vertical axis) or declined (below zero) in FY12 and FY13.

These measures of proposal quality are necessarily imperfect. In particular, review panel discussions of proposal merit may in general lead to adjustments in final proposal rankings relative to those of the initial review scores, and these final panel rankings do not have associated scores as do the individual reviews. However, in practice there is a very strong correlation between individual reviewer scores and final panel rankings, and moreover the reviewer scores are preserved regardless of the outcome of the panel discussions, thus we regard the reviewer scores as a reliable metric for assessing absolute proposal quality.

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Comment [4]: It should be possible to show this: Ask NASA for relationship between reviewer scores and final selection rate from Figure 2.

On the one hand, it is heartening that strong proposals (rated VG or higher) continue to have a reasonably good (~39%) chance for success, even if at a decreased funding level. On the other hand, it is distressing that a clear majority of the very good science that otherwise *could be done* is not being supported. This suggests that the system of NASA Astrophysics facilities and archival data products are

providing ample capacity for objectively very good science, but the R&A grants programs are not sufficiently resourced to support all of the high-quality science potential nor the workforce of proposers and their early-career trainees otherwise ready to execute this science.

Finally, a related question is the degree to which the large increase in the number of proposals is being driven by a larger number of proposals per investigator. To assess this we would need to see a list of institutions that received these funds (or at least just PI institution) for the most recent year and for 2004 (or however close to that we can find reliable data). Our guess is that there are more astronomers requesting funding from institutions that historically either have not sought or have not been awarded NASA funds.

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Comment [5]: Get this from Hashima?