

## **Report on the 2019 STFC Astronomy Grants Round**

**Prepared for the UK astronomy community**

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Dear colleagues,

It has become a tradition that at the culmination of each annual round of grant applications to the STFC Astronomy Grants Panel, the AGP chair writes to the community with a brief overview of the round. This report is usually circulated late in the year, once the outcome of the round has been formally communicated to the applicants. However, various factors outside the AGP and STFC Astronomy's control slightly delayed the UKRI approval required before Kim Burchell's team could send out the formal offer letters to applicants. Obviously, it would have been inappropriate to comment on the round before the applicants were informed of their outcomes, but with this now completed, my report can be circulated.

### **Overview of the 2019 round**

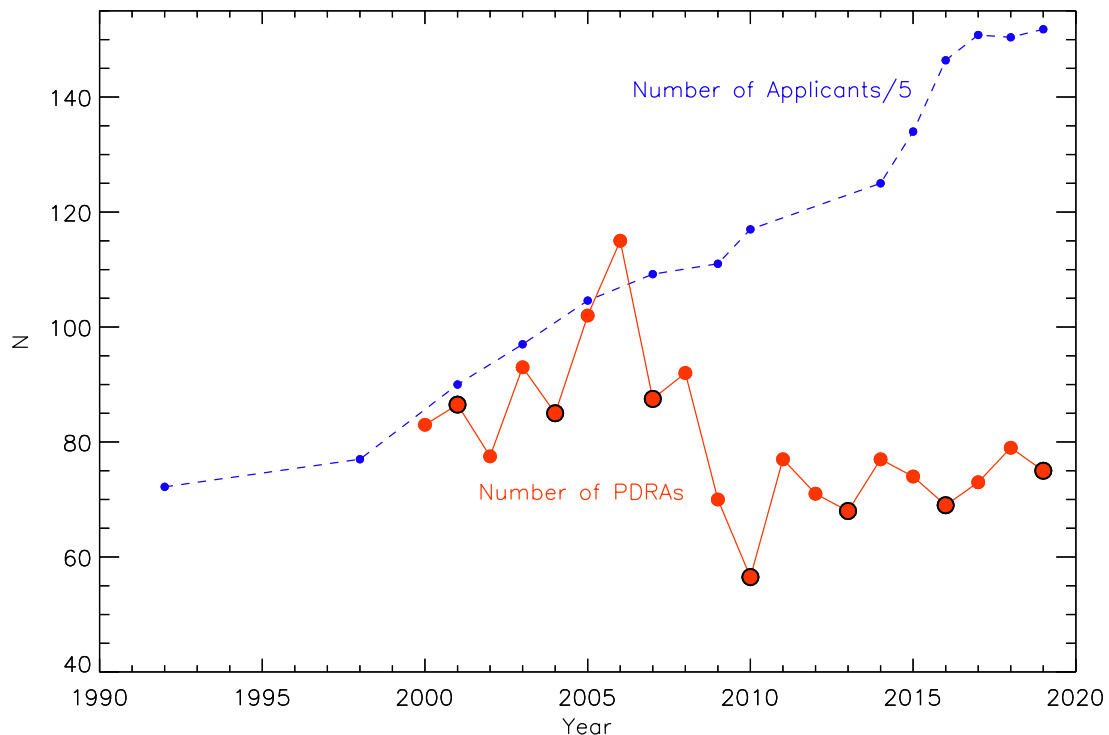
This was the ninth round of the consolidated grant scheme, corresponding to the final year of the third three-year cycle. The AGP process has remained unchanged this year. With this in mind, I shall not repeat the full description of the process and timeline that was included in my 2018 community report. The funding provided by STFC for exploitation/blue-skies development through AGP has been under sustained pressure since before the start of the consolidated grant scheme. In a flat cash environment, 2019 has proven to be yet another brutally competitive round with tremendous pressure on the numbers of PDRA, technicians and applicants supported.

The 2019 AGP round comprised 194 proposed projects grouped in 33 applications and involving 215 individual applicants/co-applicants. Altogether these projects requested 190 FTE of post-doctoral research associate (PDRA) and technical effort. Ultimately, based on the resources available, AGP was able to recommend support for the 74 highest-ranked projects, comprising funding for 75.5 FTE of PDRA and technical effort, plus various levels of support for 103 applicants (totalling 14.2 FTE) costing approximately £9.9M per annum overall.

This outcome will leave six of the Consolidated/Consortium Grant applications with no PDRA support from this round, with the applicants locked out for reapplying for another three years. A further six Consolidated/Consortium Grant applications have recommended awards of just 1 PDRA. Together these twelve grants make up 44% of the Consolidated/Consortium proposals in this round. For those groups where AGP were able to recommend support, the best outcome is typically flat-funding in terms of PDRA numbers, compared to their existing support (the mean ratio of the recommended number of PDRAs compared to the current baseline at institutes *already* holding an STFC Consolidated/Consortium grant is 0.99).

### **Applications and outcomes**

Figure 1 illustrates the evolution of grant volume and community size over the recent decades. Between 1995 and 2006, the PDRA posts awarded roughly tracked community size. This was achievable because the overall science budget doubled after 1997. After 2006, community growth continued but the number of PDRA posts dropped dramatically. Over the past nine years, grant funding has roughly stabilised, but at a historically low level. This is reflected in Figure 1, with the numbers of PDRAs involved in science exploitation increasing from a low point in 2010, but still below the historic baseline and well below the level of support in the mid-2000s.



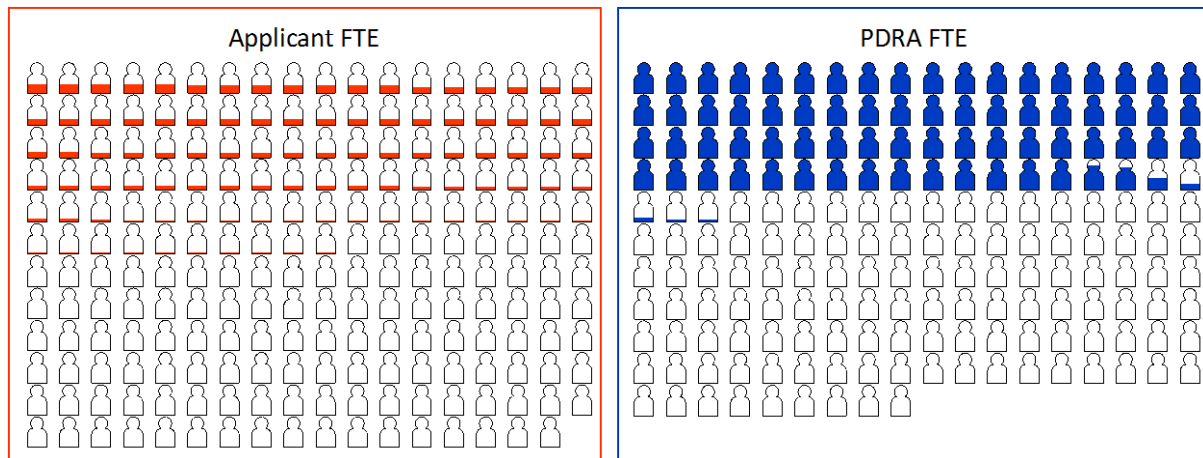
**Figure 1:** The evolution of PDRA support provided by STFC/PPARC astronomy grants compared to the growth of the UK's academic research community. The PDRA numbers represent the number of posts awarded in each round (so the average number of PDRAs in place is three times as large) and do not include Technician posts. The number of potential applicants is based on returns made to the STFC Education and Training committee until 2010 and then derived from the total number of grant applicants in the consolidated grant rounds since 2013. It includes academic-equivalent senior fellows as well as academic staff. Note that the Applicants line has been divided by 5, so that it can be compared with the PDRA awards, and roughly a third of applicants will apply in a given round. The previous submission years for the current round are identified by black circles.

Figure 1 suggests a level of ~85 PDRA posts for this baseline, compared to 75 PDRA posts recommended in the current round, with the level of support which AGP can offer having plateaued. We note that this figure presents PDRA posts (i.e. the number of individual posts rather than the FTE), with the 75 posts recommended equating to 70.5 FTE of PDRA effort. While the growth of the community of applicants continues, the rate of growth has lessened over the most recent rounds. However, the ratio of PDRAs to staff is at a very low level (less than one PDRA per three full-time academics) since the cuts imposed in 2010. Moreover, in the face of a flat-cash budget the recovery in PDRA numbers in recent years has come in part at the cost of significant pressure on applicant FTE.

Note that the number of applicants within the community continues to grow. As in the previous rounds, 2019 saw submissions from a number of new researchers. These included a newly-constituted university group, six applications accepted under the New Applicant guidelines, as well as general growth in pre-existing research groups. However, the ratio of resources requested by applicants compared to their current AGP funding level, sometimes referred to as the “overbid”, is closer to a factor of two than a factor of three for the second-round running. This comes about because, despite continued growth in the absolute number of applicants (up 3% since this cohort of applicants last submitted Consolidated Grants in 2016), the total requested applicant FTE has fallen by 5%, the number of projects proposed has dropped by 4%, and the requested PDRA and technical staff effort have both fallen slightly (4% and 3%, respectively). This is consistent with the UK astronomy community responding to the strong guidance (offered consistently for several years) that in the current financial landscape, it is unrealistic to overload grant applications with projects

that stand little chance of being funded. But overall, the conclusion to be drawn from Figure 1 remains unchanged from the recent rounds: an academic working on astronomy research has access on average to a third of an STFC-funded PDRA at any one time, or equally that they can expect to be awarded three-years of PDRA support once every decade.

The number of applicants requesting support was 215, of which 103 (48%) are recommended for funding. For this applicant time, sometimes referred to as “the FEC”, the AGP followed published guidelines, recommending between 15-25% FTE for a major involvement in a project, and smaller amounts for secondary involvements, but *only* if these were explicitly justified in the science case. The net result, taking the available budget into account, is that AGP was only able to recommend a total of 14.2 FTE of support to applicants this round, compared to 18.5 FTE for this round three-years previously. Thus, the absolute level of applicant support recommended has declined somewhat since 2016, but is broadly in line with the fraction of applicants supported in the 2017 and 2018 rounds. The mean level of recommended applicant FTE awarded per funded applicant (0.15 FTE) is very similar to the average FTE awarded to successful applicants in the 2018 round (0.15 FTE) and the 2016 round when these applicants were last reviewed (0.16 FTE). This distribution of applicant FTE is presented schematically in Figure 2 with the equivalent data for the PDRA posts supported included for completeness.



**Figure 2:** Left: the FTE fraction of applicants (indicated by red shading) supported in the 2019 AGP round. Unfilled icons indicate applicants who were unsupported. Right: the equivalent FTE fractions (indicated by blue shading) of PDRA posts supported in the 2019 AGP round.

In absolute terms the recommended changes in support to groups already holding STFC Consolidated Grants are relatively modest: the typical change is  $\pm 1.2$  PDRA. However, when seen in the light of an average Consolidated/Consortium Grant size of just 2.6 PDRA (calculated over the three rounds of the 2016-2019 cycle) this could correspond to a significant change in support every three years, which is clearly challenging to manage. However, since the highly competitive ranking process predominantly focuses entirely on the quality of the science proposed in future projects, large relative changes in the recommended support are possible, both upwards and downwards. As with previous rounds, there is no obvious difference in performance between large and small groups. A handful of large institutes are recommended for more significant levels of resource, but as noted above can suffer from significant changes to their baseline. As with previous rounds, the majority of Consolidated Grants being awarded by STFC in the AGP area are not able to provide the basic level of research support originally envisioned by the scheme’s instigators.

Following the recommendations of the previous AGP round to STFC Science Board in October 2018, the AGP Chair and the STFC astronomy team undertook a piece of work to explore possible biases in AGP’s decision-making. This was a substantive safeguarding exercise spanning the three AGP rounds in 2016, 2017 and 2018, the findings of which were reporting in the AGP Chair’s report to the

community (circulated on 23 November 2018). It found no evidence of bias within the AGP's decision-making, either on grounds of gender or institution. As a brief update to that large-scale exercise, we are able to report that 17% of the 215 applicants to the 2019 round were female, while 21% of the 103 funded applicants were female. The fraction of funded female applicants is statistically in line with the fraction of female applicants to the round.

### **Reflections on the AGP**

The 2019 round marks my final year as Chair of the STFC AGP. I would therefore like to take this opportunity to share some reflections the challenges and constraints. The ongoing fundamental problem that faces AGP is the insufficient level of funding made available in the astronomy area for exploitation and blue-skies technical development. This is due to the combination of a flat-cash settlement and the inflation of costs, the development of ever more complex and capable facilities and the continued growth in the number of academic researchers working in this area.

While this problem has been mitigated by the success of many researchers in winning ERC support, a very significant shortfall remains. The world-class UK astronomy community benefits from significant ERC support, with between 5-10% of the community receiving ERC funding. This high success rate reflects both the quality of the UK's astronomy research community, and also its ability to leverage previous support from STFC into significant research investment, equivalent to about one-third of the AGP budget. This contribution has offset some of the drop in STFC support shown in Figure 1, but if this ERC funding stream were to be removed – a very real risk due to Brexit - there would be a very significant threat to the community's ability to fully exploit the STFC and UKSA's investment in new facilities.

Over the past three rounds, the levels of applicant time AGP has been able to support has remained disappointingly low due to the limited budget. The mean level of support per funded applicant is around 0.15 FTE. For many academic staff, these modest awards are their sole support from a UKRI body. This is compounded by the fact that a large fraction of research active staff (between 50-60%) do not succeed in obtaining support at all and are locked out of applying for exploitation/blue-skies development funding from STFC for three years. Of course, the tension between supporting applicant time and PDRA posts remains under constant review. The balance between the number of PDRAs, the number of applicants, and the level of applicant time supported is not even a zero-sum game, since the flat cash funding available to the AGP is eroded due to inflation. But in terms of distributing the funding differently, if, for example, the AGP had awarded 0.15 FTE for the majority of applicants to the 2019 round, regardless of whether they proposed a successful PDRA-project, it would have cost roughly half of the entire AGP budget for the round and would have reduce the PDRA/Tech effort that AGP could support from 75 to around 55 FTE. Awarding an average of 20% to the majority of applicants would reduce the PDRA numbers by almost half, meaning that an average academic would have access to <10% of a PDRA at any time (or equally would have less than a 1-in-10 chance of obtaining PDRA support in each three-year cycle, equivalent to being awarded a total of three years of PDRA support in their entire careers). This is clearly not sustainable. However, the AGP is also acutely aware that some universities are using funded applicant time (FEC recovery) as an indicator of whether someone is "research active", which has serious implications for career development and promotion. My predecessors and I have argued strenuously that this assumption is very misguided. Based on the evidence of publications and recent track record, the overwhelming majority of AGP applicants are demonstrably research active, but many internationally-competitive researchers are failing to obtain resources simply because of the limited funds available.

If we are to address the large fraction of applicants that go unfunded without further eroding the pool of astronomy PDRAs supported by the AGP, then the only option available is to reduce the average applicant FTE, effectively spreading the available resource even more thinly. To try and nudge the community in this direction, note that the guidelines for the 2020 round have been

adjusted to slightly reduce the maximum level of applicant FTE that can be requested for any individual applicant.

One of the responsibilities of the AGP Chair role is working with the STFC team in dealing with unhappy applicants. The fundamental challenge facing AGP is that the available budget is insufficient to fund even the highest priority group of proposed research projects. As a consequence some world class research cannot be supported. Quite understandably, this can cause significant disappointment, frustration, and sometime anger. The vast majority of communications from unsatisfied applicants are courteous and constructive, but there are some common concerns raised that it may be helpful to highlight. Paraphrasing, these include:

- “The outcome didn’t match the reviews”: there are undoubtedly occasions when the panel’s recommendations appear to be at odds with the reviewers’ comments, but the panel works within a more tightly-constrained reference frame than the reviewers and, unlike the reviewers (who typically see a handful of projects at most), the panel is required to tension each project against all the other submitted projects. Ultimately, the number of projects with positive reviews exceeds the number of projects that the AGP budget can support, so some with excellent reviews will not be funded.
- “The panel does not have expertise to assess my proposal”: the remit of the AGP is vast, from terrestrial materials exploited as analogues for planetary surfaces to theoretical considerations of the first moments of the universe, from space probes to supercomputers, from machine learning to technical development projects. It is simply impossible to have a global expert from every micro-discipline of astronomy on the panel, but the size and composition of the AGP is kept under constant review, with upcoming applications being a key factor in the appointment process. This panel then takes advice from expert reviewers, with around 700 reviews being sought each year. As noted above, the expert input comes from “reviewers” (who offer advice) and not “referees” (who make decisions), but this input is crucially important and factors heavily in the panel discussion. AGP must rank proposals across the whole astronomy programme and therefore the case has to be made to and judged by the panel, making use of the expert reviewers. However, the panel may have lingering concerns that are not addressed in the proposal or the applicant’s responses to the reviewers’ comments that impact upon a project’s ranking.
- “My university has made new appointments that AGP has not supported”: in terms of supporting newly-appointed staff, there is a “New Applicant” route that allows individuals to apply for funding out of synchronisation with their institution’s CG cycle. If their science case is compelling, and sufficiently highly ranked, then it will be recommended for support, but such cases are ranked using the same criteria as other CG projects and there is no ring-fenced budget to support new applicants. Statistically, although few in number, New Applicant proposals tend to have a slightly higher success rate than CG applicants overall (approximately 50% for New Applicants). This is most probably a filter effect since New Applicants are likely to be recent appointments in highly competitive academic posts, with well-honed science cases and an effective “sales pitch”. However, appointment decisions at research organisations are beyond the remit of the AGP and funding cannot be assured for new appointments.
- “I’ve worked in this field for XX years and always had STFC funding”: under the Consolidated Grant system, which has been in place for almost a decade, previous success is not a guarantee of future success. The case for the applicant track-record is considered (as presented in the case), but that is only one part of the assessment. STFC’s assessment criteria explicitly indicates that the scientific excellence (or technical innovation), in terms of the specific objectives of the project, and the international competitiveness of the proposed work are key assessment categories against which a proposal will be judged. A compelling

argument must be made in the case presented to the panel. Space in the proposal is obviously limited and too much emphasis on past achievements can hamper the applicant's ability to make a clear case for the specific programme of work to be undertaken in the proposed project.

Ultimately, the reality of the brutally competitive AGP funding landscape is that many very strong proposals are not supported because there is insufficient funding. Many of the projects that have gone unfunded were fundamentally sound, with excellent reviews, but were pipped to the post by projects with, for example, a clearer articulation of the world-leading science to be addressed, a more compelling methodology describing how the goals would be achieved, a better workplan and timeline, a more comprehensive risk mitigation strategy, or better justified resource requests.

At the time of writing, the future of Consolidated Grants is unclear. STFC is currently considering how to respond to the recommendations of a review of Consolidated Grants lead by Prof Alison Davenport (Birmingham University) that reported in 2019. While some in the STFC-supported community are relatively sanguine about Consolidated Grants, others feel the scheme is less than satisfactory. Nevertheless, the Consolidated Grant scheme will continue for astronomy grant applications in 2020. Regardless of the details of any future funding scheme, the key challenge is the overall level of exploitation funding. If Consolidated Grants are ultimately replaced by some other structure, some alternative form of demand management is likely to be required in place of the current system of three-year lockouts.

### **Acknowledgements**

It has been both a tremendous privilege and a huge challenge to serve as the Chair of AGP for the past three years. In total, I have spent eight years on the AGP and I shall miss working with many of the wonderful academic colleagues who gave up their summers to read hundreds of documents and attend panel meetings in Swindon. It is difficult to communicate to those who have not witnessed it first-hand the professionalism and conscientiousness of the panel members as they constantly strive to deal with applications fairly and consistently within a massively constrained funding envelope. The AGP Deputy Chair, Lyndsay Fletcher, deserves special mention since the Chair's role would be impossible without an effective lieutenant who can share some of the load. I am especially grateful for her no-nonsense approach, her forensic-level eye for detail and her companionship during many shared journeys up and down the west coast main line. Last, but not least, the crucial role of the STFC astronomy team cannot be overstated. I am indebted to Kim Burchell, Tracey McGuire, Colin Vincent and Chloe Woodcock for their unwavering support, guidance and patience during my term as Chair. Although funding Astronomy research in the UK within current restrictions continues to be extremely challenging, the astronomy team work tirelessly to optimise the situation within the constraints in which they must operate and provide unwavering support to the community of AGP applicants, both directly and behind the scenes. As a community, we are lucky to be supported by this team.

Jim Wild

Lancaster, January 2020.