

# Report on the 2020 STFC Astronomy Grants Round

## Prepared for the UK astronomy community

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Dear colleagues,

As we reach the conclusion of another annual round of Astronomy Grants Panel (AGP) applications, and with the grant outcomes for 2020 now announced to all applicants, I am writing to the community with a brief report on the round and issues emerging from it. This report is based heavily on the annual AGP report that was submitted in October to the STFC Science Board and the UKSA Science Programme Advisory Committee. There is also an Appendix that contains detailed information on the AGP processes, particularly those which changed in 2020, that I hope will be helpful to the community.

### Overview of the 2020 round

This was the tenth round of the STFC Consolidated Grant scheme, corresponding to the first year of the fourth three-year cycle. The 2020 assessment process coincided with the first six months of the COVID-19 global pandemic, and it will not come as a surprise to the reader to learn that this resulted in some very challenging logistics in running the assessment. These challenges enforced several changes in the normal AGP assessment and ranking process, including the introduction of the sifting of projects for the first time on the AGP, and the holding of all panel meetings online. A full summary is in Appendix 1; this main report focuses on the non-COVID aspects of the round.

The continuing 'flat cash' AGP funding line made this the toughest AGP round to date. The 2020 round comprised 249 proposed projects grouped in 47 applications and involving 287 individual applicants. These projects requested 246.7 FTE per year of post-doctoral research associate (PDRA) and technical effort. Based on the funding available, the AGP were able to recommend support for 75 of the highest-ranked projects, comprising funding for 76.6 FTE of PDRA/technical effort and various levels of support for 94 applicants (totalling 14.2 FTE). The project success rate was 30%, a new low reflecting the impact of 'flat cash', rising university costs, and growing community demand. As I write, the next UK Government Spending Review outcomes are emerging and we can but hope that UKRI's case for uplift to programmes such as that supported by the AGP will be successful.

### Applications and outcomes

Table 1 summarises the applications received in 2020 and compares them to 2017, the previous submission year for the 2020 round of applicants. Most measures of the volume of activity in the 2020 round are similar to 2017, but the requested PDRA effort increased 6%, equivalent to 8 extra PDRA posts requested per year in 2020. The average 'overbidding' in 2020 was a factor of 3.3 in terms of requested-to-current PDRA and technician effort (with a range of 1.3-6.0). This is also an increase compared to the overbid in 2017 (and consistent with the overall increase in PDRA effort requested).

The AGP was able to recommend support for:

- 75 Projects (30% of the 249 submitted);
- 71.0FTE per year of PDRA effort across 77 PDRA posts (30% of the 237.8FTE requested) and 5.6FTE per year of technical effort;
- 14.2FTE per year of applicant effort across 94 applicants (25% of the 56.8FTE per year of applicant effort requested; 33% of the 287 applicants receive some FTE).

These 'success rates' are low, indeed the lowest to date. Further, *the reader will be all too aware that unsuccessful (and successful) applicants are locked out from applying again to the AGP for three years (i.e., the true project success rate for a typical applicant is 30% every three years).*

Statistic	2020	2017
Total number of grant applications	<b>47</b>	44
Consortium applications	<b>5</b>	6
New Applicant applications	<b>9</b>	7
Number of individual applicants	<b>287</b>	288
Number of projects	<b>249<sup>1</sup></b>	255
Requested applicant staff years	<b>170</b>	179
Requested PDRA staff years	<b>713</b>	688
Requested Technician staff years	<b>27</b>	33
Average overbid on PDRA+Tech	<b>3.33</b>	2.97
Requested applicant time/PDRA+Tech time	<b>0.23</b>	0.25

Table 1: Summary of applications received in the 2020 round, compared to the last time the same institutions submitted in 2017.

### Applicant FTE

We followed our published guidelines, recommending between 15-25% FTE for each applicant for a major involvement in a project, and smaller amounts for secondary involvements, but *only* if these were *explicitly justified* in the science case and work plan. The result is a recommended total of 14.2FTE of support to applicants, compared to 16.2FTE for this round three-years previously (2017). Thus, the absolute level of applicant support recommended has declined. In 2017, 111 applicants of 288 received some FTE award (38%), compared to 33% in 2020.

The panel is painfully aware that the AGP cannot support many excellent scientists because of the need to assess cases based on the projects as presented (rather than the wider contribution of the applicants to their research fields) and the very strong competition for resource. We therefore stress, as we have previously, that AGP's recommendation to award or not award applicant time to an individual is **not** an indication of whether that person is 'research active' or not.

### Size of group/award

The median size of a recommended grant award in the 2020 round is 2.4 PDRAs with 0.5 FTE of applicant time supported. Several institutes have nothing: excluding New Applicant proposals, which typically contain only one project, in this round 8 Consolidated/Consortium Grants are recommended for no support, while 14 are expected to be awarded a single PDRA. Together these cases make up 55% of the consolidated/consortium applications submitted.

The mean ratio of the recommended number of PDRAs compared to the current baseline at ROs *already* holding an STFC Consolidated/Consortium grant is  $0.88 \pm 0.57$  and the median ratio is 1.0. In absolute terms the recommended changes in support to groups already holding CGs is  $\pm 1.5$  PDRAs; as the average award to these groups is just 2.4 PDRAs, this could correspond to a change of more than 50% in support every three years – clearly very challenging to manage.

As with previous rounds, there is no obvious difference in performance between large and small groups. The overall constrained level of funding for AGP means that the 'average' CG comprises 2.4 PDRAs and 0.5 FTE of applicant time. As with previous rounds, the vast majority of CGs 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.

### Scientific area balance

In terms of the broadest scientific areas, the ratio of recommended PDRA posts in AO/AT to that of SS/PL

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<sup>1</sup> Six projects, including two NA projects, were withdrawn during the assessment process, i.e., 255 projects were originally submitted. Three were moved to the UKSA remit, and three withdrawn by the Applicants. The FTE requested in these projects is not included in the table.

is 0.72:0.28 which is (by design) the same as the ratio of the projects proposed to the two calls. This split is the same as in the 2017 round (0.72:0.28). The success rate for projects within the individual sub-panels (e.g., AO versus AT) is dominated by small-number statistics, with the differences in success rates being due to 1-2 projects falling below or above the cut-off.

### **Gender balance and diversity**

The AGP Chair and the STFC astronomy team each year explore possible biases in AGP's decision-making. For many years we have explored possible biases related to gender. We note that the four main sub-panels are all at least 50% women, although the three-person 'Technology Expertise' panel is all men, as are the Chair and Deputy Chair (this will change in 2021).

In 2020, there were 287 Applicants across all proposals. 10 do not disclose their gender in their Je-S user profile<sup>2</sup>. Of the remaining 277 applicants, 21% were female, while 22% of the 94 funded applicants were female. Of the submitted projects, 21% were led by a female, and 24% of the funded projects were led by a female. Thus, the fraction of funded female applicants is statistically consistent with the fraction of female applicants to the round.

The AGP and STFC are keen to extend this routine monitoring of outcomes to include other diversity, for example ethnic origin. However, we are reliant on Je-S user profiles being up to date to do this, and we encourage all future applicants to revisit and update their Je-S profile wherever possible. *We emphasise that no personal information on applicants from their Je-S profile is visible to any panel member (including the Chair) at any point in the process, including after the round has concluded.*

### **Concluding remarks**

Figure 1 is the by-now traditional figure illustrating the evolution of grant volume and community size, updated for the 2020 round. Between 1995 and 2006, posts awarded tracked community size. This was achievable because the overall science budget doubled after 1997. After 2006, strong community growth continued but the number of PDRA posts dropped dramatically. Grant funding has now stabilised, but at an historically lower level. This is reflected in Figure 1, with the numbers of PDRA's involved in science exploitation increasing from a low point in 2010, but still below the historic baseline. We note that this figure presents PDRA posts (i.e., the number of individual posts rather than the FTE), with the 77 posts recommended equating to 71.0 FTE of PDRA effort.

The conclusion to be drawn from Figure 1 remains unchanged from recent rounds: an academic working on astronomy research has access on average to less than 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. In the face of a flat-cash budget, maintaining even these PDRA numbers can only come, in part, at the cost of reducing awarded applicant FTE (see Figure 3).

As the community will be aware, the world-class UK astronomy community benefits from significant ERC support (the previous Chair's analysis from 2018 demonstrated that between 5-10% of the community hold ERC grants, providing around £8-9M of equivalent funding in each CG round). This high success rate reflects both the quality of the UK's astronomy research community, and its ability to leverage previous support from STFC into significant research investment, equivalent to about one-third of the AGP budget each year. This success has offset some of the drop in STFC support due to flat cash. If this ERC funding is indeed removed – as perhaps now is likely – or replaced by UK schemes that are not as generous to blue-skies research, there would be an obvious and very significant threat to the community's ability to fully exploit STFC and UKSA's investment in facilities.

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<sup>2</sup> The Je-S user profile is limited and only allows "Male / Female / Not disclosed".

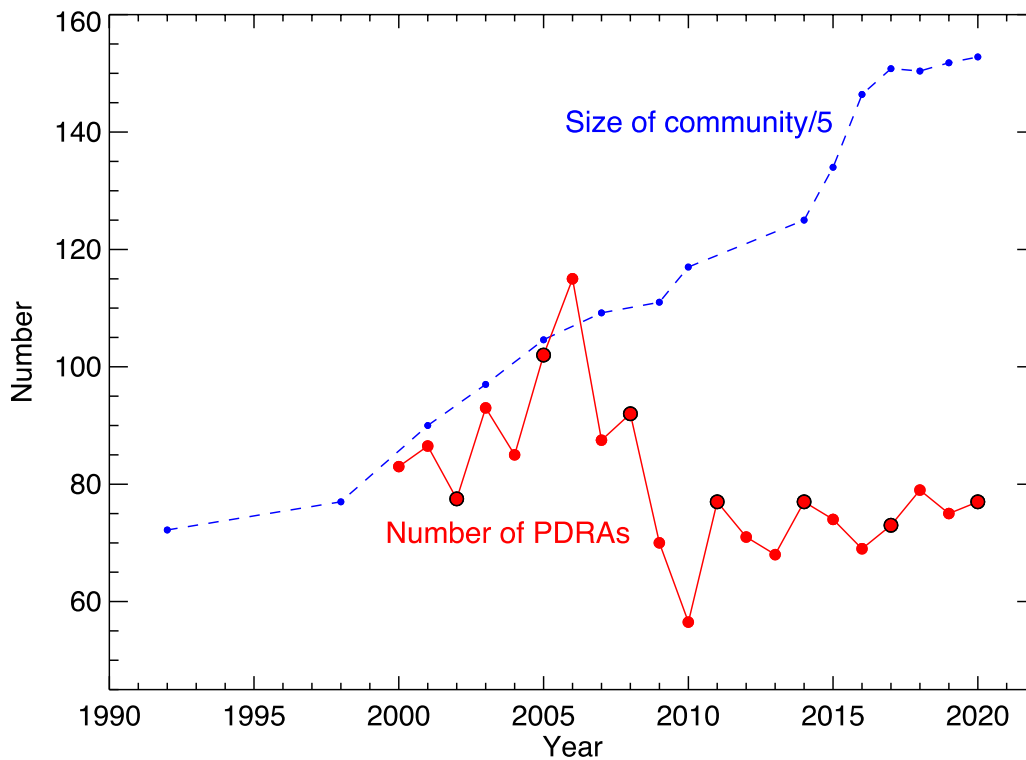


Figure 1: The long-term evolution of PDRA support provided by STFC/PPARC astronomy grants compared to the growth of the UK's academic astronomy research community. The PDRA numbers represent the number of posts awarded in each round (so the average number of PDRAs in place is three times as large) and 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 on grant applicants in the CG rounds since 2013. It includes academic-equivalent senior fellows as well as academic staff. Note that the size of the community has been divided by 5 for comparison with the PDRA awards, with roughly a third applying in each round. The previous submission years for the current round are identified by black circles.

This danger should be clear from Figure 2 and Figure 3. Figure 2 shows the evolution of the community demand (requested PDRA/technical FTE and applicant FTE) since the start of the CG scheme in 2011, compared to the awarded FTE. Figure 3 shows the scheme success rates (defined in three different ways) over the same period. Throughout this period, the ERC funding success enjoyed by the UK astronomy community has reduced the pool of applicants to the AGP'. The addition of a further 15-20 applicants each round, together with their PDRA requests, may clearly put the CG scheme under even further pressure.

The figures also illustrate the fluctuations in demand levels and success rates within the three Years of each Round. Focusing in particular on the PDRA line, the three Years started broadly equivalent in size (Figure 2) but all saw a sharp increase in demand in Round 2, an increase that has continued into Round 4 for Year 1 (the 2020 round) but levelled or even fallen in Years 2 and 3. The sizes of each year are not static as new groups enter the process, and other groups grow or decline in size. But, as will be clear, an increase in demand in a flat-cash funding environment can only ever result in declining success rates. This in part drives the low 30% success rate in 2020.

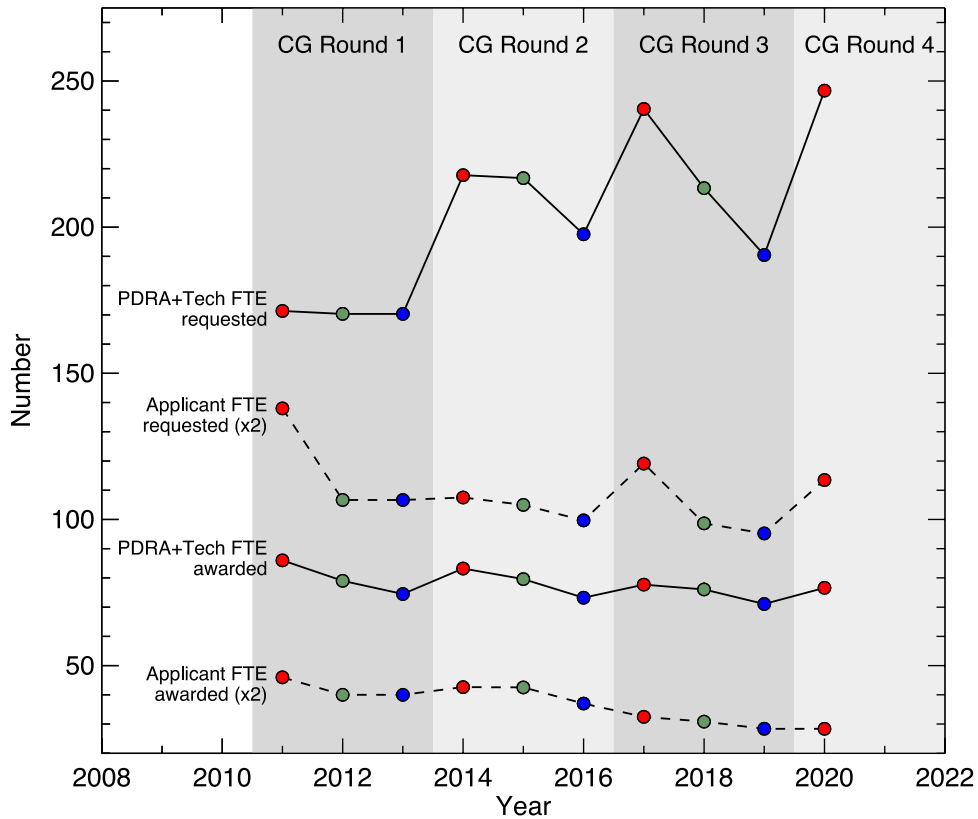


Figure 2: The evolution of the requested PDRA+Technical and applicant FTE together with the awarded PDRA+Technical and applicant FTE, since the start of the CG process. Each colour (red, green, blue) denotes (mostly) the same set of ROs and Applicants in the three years of each round. Although the demand from the community has largely stabilised since Round 2, Year 1 (red points; inc. 2020) shows a continued growth in requested PDRA FTE. The awarded PDRA+Tech FTE is only slowly decreasing with time (from 83FTE in 2014 to 77FTE in 2020); in a flat-cash funding environment with rising university costs, this can **only** be achieved at the expense of the observed drop in the awarded applicant FTE (21.3FTE to 14.2FTE over the same period).

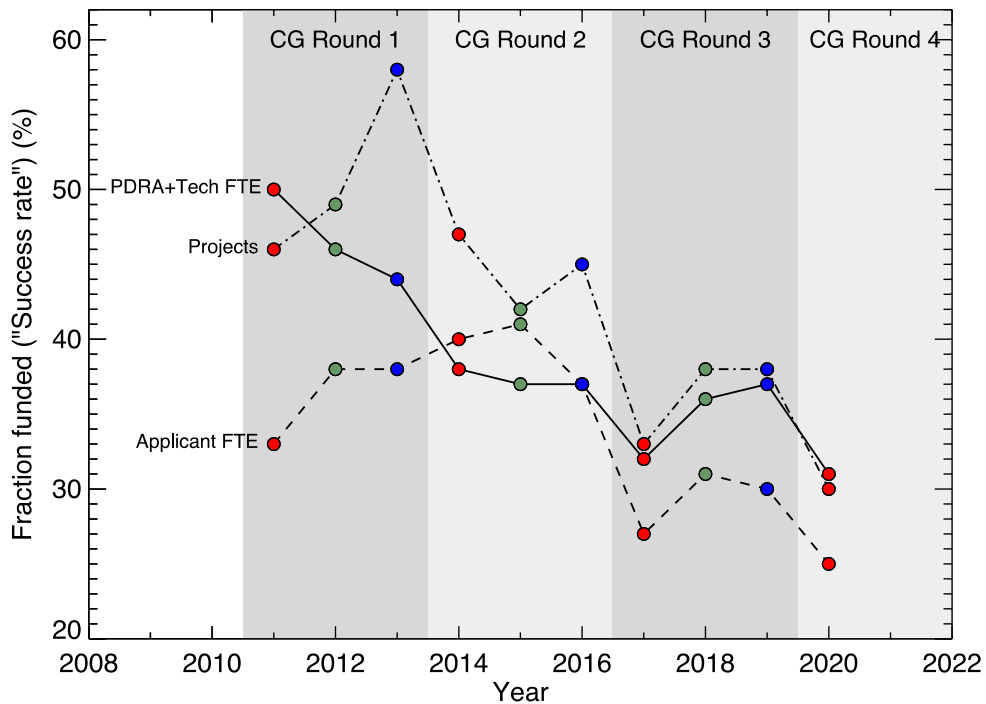


Figure 3: The 'success rates' of the CG scheme over time according to the fraction of projects funded, applicant FTE funded, and PDRA+Tech FTE funded. As in Figure 2, the colours denote the same set of ROs and applicants. Each year in each round has seen a general decrease in all the success rate metrics since Round 2, a result of 'flat cash', increasing costs, and (in part) increasing demand.

Finally, we emphasise a point made in previous Chair's reports. Since Round 3 the levels of applicant time we can recommend has remained low due to the limited budget. The mean level of recommended applicant time per funded applicant is 15% FTE, and for most academic staff these modest awards are their sole fEC support from a UKRI body. This is compounded by the fact that most research-active staff (193 from 287 in the current round, or 67%) have not succeeded in obtaining support at all and are locked out of applying for AGP funding from STFC for three years. We reiterate two especially serious problems:

- (i) fEC support is failing in its intended aim of replacing the old dual-funding system. If AGP had funded 15% FTE for all applicants judged research-active, regardless of whether they proposed a successful PDRA-project, that would reduce the PDRA/Tech effort that AGP could support by nearly half, from 76 to around 42 FTE. This would mean a typical academic would have a 16% chance of obtaining PDRA support in each three-year cycle. Awarding an average of 20% FTE to the majority of applicants would reduce the PDRA numbers to around 25.
- (ii) Many universities are using funded applicant time (e.g., DA time or overhead recovery) as an indicator of whether someone is 'research active', which has serious implications for career development and promotion. From the AGP's point of view, this assumption is *very misguided*: the AGP typically judges the overwhelming majority of applicants to be research active (based on the evidence of publications and recent track record). But many internationally-competitive researchers are simply failing to obtain resource given the limited funds available.

In conclusion, the long-standing and fundamental problem that faces the AGP is the insufficient level of funding made available in the astronomy area for exploitation and blue-skies technical development. The frustration and disappointment felt by the 70% of unsuccessful applicants in this round stem from this. This is due to i) the combination of a flat-cash grant line and inflation; ii) the ever-increasing above-inflation employment costs of academic, PDRA and technical staff; iii) the rising cost of overheads (indirects) charged by universities, iv) the development of ever-more capable facilities, experiments and missions, in which STFC/UKSA have invested, that demand increased PDRA support for exploitation; and iv) a continued (slow) growth in the number of academic researchers working in this area. Some of this problem has historically been mitigated by the success of many UK-based researchers in winning ERC support – but this may soon disappear with Brexit, leaving a very significant shortfall. This provides further arguments that the CG process in the Astronomy area is rapidly becoming unfit for purpose (and as some in the astronomy community argue, is already unfit for purpose). Although the CG scheme will continue for 2021, the finalisation of the ongoing implementation work on replacement schemes is to be warmly welcomed.

## **Acknowledgements**

This year it has been a particular privilege observing both the panels and STFC astronomy team working exceptionally hard in an exceptionally challenging year and uncertain times. The panel's dedication and professionalism in reading the hundreds of documents over the summer and grappling with the online panel meetings, all while preparing for a very different and highly-pressured academic year, has been extraordinary. We also thank the community for producing the 700 or so reviewer reports that are so essential for the AGP process – particularly as these were produced in April and May, the time of national lock-down and huge pressures, both professional and personal, on everyone.

Special mentions to Daniel Brown, the AGP Deputy Chair, who stepped into the breach at short notice, and Chloe Woodcock at STFC, who provided the support for both AO/AT and SS/PL in a supremely efficient and effective manner. The review process is run by an extremely dedicated STFC office team who provide an exemplary level of support to the panel and the community. The panel and the wider community are always indebted to their professionalism and commitment.

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### Appendix 1 – The AGP 2020 Process

#### Overview

The AGP proposal call is split into two independent grant calls: one covering solar studies (SS) and planetary science (PL) (the ‘SS/PL’ call) and the other observational astronomy (AO) and theoretical astronomy (AT) (the ‘AO/AT’ call). Most applications to the AGP are for three-year Consolidated Grants (CGs) to support astronomy research within a single Research Organisation (RO). It is not unusual to receive multiple CG applications from within the same RO in any given round, with proposals coming from distinct departments or similar organisational units within the RO, or in response to one or both of the two AGP calls each year. *However, each department within an RO may only respond to each of the two AGP calls once every three years.*

Further, each department may only submit a *single* CG proposal covering its entire research programme in the area covered by that call. Thus, most CG proposals contain multiple distinct projects led by different subsets of the applicants, with usually one per PDRA per project, but occasionally more complex, and sometimes for applicant FTE only. Although some applications have cross-cutting resource requests, for example in computing, the AGP essentially evaluate and rank individual projects.

A Consortium Grant is essentially a CG but is proposed jointly between researchers in more than one RO, with a common research programme. Individuals can be applicants on a CG proposal or a Consortium Grant proposal, but not both.

Finally, New Applicant (NA) proposals provide a route for eligible researchers based at CG-holding ROs to apply for AGP support. This route is used by academics who are appointed between CG review cycles to seek funding to support their research until they join their RO’s next CG application. NA proposals thus invariably contain only a single project.

Proposals submitted to the two AGP calls are each assessed by a pair of sub-panels: The AO and AT sub-panels handle proposals to the AO/AT call and the SS and PL sub-panels assess those to the SS/PL call. A *Technical Experts* sub-panel provides expertise on the AGP to appropriately tension technical and exploitation/theory projects. In this round, these panellists were required for the AO/AT meeting only.

#### Initial Review Stages

The 2020 round coincided with the first six months of the COVID-19 global pandemic. This brought a number of very significant challenges to the AGP process and for our panellists, enforcing changes in the normal AGP assessment and ranking process. Nonetheless, the initial stages proceeded in a similar manner to earlier rounds.

Every project in each proposal was assigned to the relevant sub-panel (AO or AT; SS or PL). The appropriate sub-panel chair then selected a panel member (*Introducer*) for each project. A *Lead Introducer* was also chosen for each proposal as a whole, with responsibility for overseeing the review of the whole proposal, including assessing Pathways to Impact plans, Data Management plans, and any outreach requests. The *Introducers* then lead the selection of external reviewers, the setting of panel questions, the discussion at the panel meeting where required, and the preliminary resource recommendations if appropriate.

Each project is also assigned 5 additional *Readers*, selected from both sub-panels in each call, who read the project in detail, and provide pre-meeting initial assessments. These use the AGP assessment criteria (described below). Sub-panel chairs were also required to read and score all projects in their sub-panel.

In 2020, the initial review stages were:

1. The applicants’ *Pathways to Impact* and *Data Management* documents were graded as either *acceptable* or *unacceptable*, with unacceptable documents being returned to the applicants for revision;
2. Reports by external reviewers for every project were obtained (with a goal of  $\geq 3$  reports per

project and a minimum of 2);

3. An opportunity for applicants to respond to both external reviewer reports and specific 'Panel Questions', this year in a single combined stage;
4. An initial assessment of each project before the meetings by Introducers and Readers using the AGP assessment criteria (below);
5. Preliminary resource recommendations for each project were submitted by the Introducers.

These stages were carried out in line with previous rounds.

### The Sifting Process

Due to the COVID-19 pandemic, all AGP panel meetings were required to be held online and no face-to-face (F2F) panel meetings were possible. It became rapidly apparent during April and May that the normal '8-hour-day' September panel meetings, where the discussion of each project averages 8-10 minutes, were impossible to translate directly to online meetings:

- Video meetings are less productive than face-to-face meetings and take longer to cover the same material, and
- There are limitations to the useful length of video meetings, and we were particularly aware that panellists may also have had unforeseen non-work pressures on the dates of the meetings (early September, coinciding with the widely-covered full reopening of schools in much of the UK).

In planning the online panel meetings, we assumed that each project discussed would typically take 15 minutes, around twice the length allocated at a normal AGP F2F meeting. We also assumed that 2x2.5-hour sessions per day, with a break in each session, was the maximum productive length of meetings.

The inescapable conclusion was that to ensure that the number of proposals assessed at the online panel meetings was manageable and conducive to effective discussions, the number of projects discussed needed to be reduced. For AO/AT, we estimated a capacity to discuss around 75 projects over the 4-day meeting (41% of the 182 AO/AT projects submitted), and for SS/PL, a capacity to discuss around 40 projects during the 2.5-day meeting (55% of the 73 SS/PL projects submitted).

This required the AGP to identify projects that did not require discussion *prior to the panel meetings*. This included both projects ranked at lower end of the ranking list that historically would rarely be recommended for funding, and the very highest ranked projects that historically would rarely not be recommended for funding. *In both cases, the exact order of the ranked project has no bearing on the final funding decision, as ranking detail is only needed about the funding cut-off.*

Although the use of such 'sifting' processes is without precedent in the AGP, similar sifting processes are used for certain schemes in other Research Councils and UK funding agencies<sup>3</sup>. The detailed sifting method used is not described here (an analysis of how it performed when applied to the previous 3-year CG cycle is included in Appendix 2), but in short the sift process took all the preliminary scores from the Introducer and Readers for every project (all scores were standardised for each panel member), and used these to automatically produce an *initial* ranked list of projects. The list of projects was anonymised during this process and individual projects could not be identified. This ranked list was then split into three groups:

- The lower-ranked projects (below the 47.5<sup>th</sup> percentile), which were not discussed at the meeting or considered further for funding;
- The top-ranked projects (above the 82.5<sup>th</sup> percentile), which were assumed to be recommended for funding without discussion at the meeting;
- The middle-ranked (about 35% of projects), which were discussed and ranked as normal in the panel meetings.

These levels were chosen to be centered on an approximated (and estimated) eventual funding cut-off of 35% of projects (i.e., the 65<sup>th</sup> percentile). The three lists were then deanonymised, and made available

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<sup>3</sup> For example: the [MRC](#) peer review, the [AHRC](#) peer review college, [UKRI Future Leader Fellowships](#), etc.



to the panels in advance of the sub-panel meetings (with ranking order removed from each list), who had the opportunity to recall a *limited* number of projects from both the lower-ranked and top-ranked groups that they felt warranted discussion at the panel meetings.

### **The Panel Meetings**

The pairs of sub-panels for the two separate calls met together: first the AO and AT sub-panels, followed by the SS and PL sub-panels. To ensure consistency, the AGP Chair and deputy Chair attended all meetings to observe, steer, ensure consistency and offer policy advice.

All middle-ranked projects, plus any recalled projects, were discussed in turn. The Introducer of each project summarised the project and proposed scores, with a 'round-table' discussion then following. Final scores for each project were agreed around the panel. This led to a final ranked list of projects for each of the two calls. When all projects in each call had been scored, the pair of sub-panels in that call reflected on the ranked list, resolved any tied projects in the ranking, and had the opportunity to recall any projects for further discussion if required. All the meetings were also open to attendance by programme managers from both STFC and UKSA, in line with the dual-key system.

Following each sub-panel meeting, resource recommendations were made for each project by the sub-panel Chairs and the AGP Chair and deputy Chair. This was performed in a separate meeting to ensure that the precious time in the online panel meetings was used as effectively as possible, and were guided by the preliminary recommendations submitted by the Introducers.

Following the two panel meetings and resource recommendations, the final steps were:

- Merging of the ranked project list from the two separate calls by a subset of the AGP. Following earlier rounds, this was performed under the assumption that the quality of the projects submitted to the AO/AT and SS/PL calls was the same, and thus both calls have the same project success rates;
- Recommendation of outcomes to Science Board/SPAC and approval to commit;
- Formal notifications to applicants.

In previous CG rounds, project-specific panel feedback has been provided in the outcome letters sent to proposal PIs. This is usually drafted by the Introducer of each project based on the panel discussion, and a final reading and consistency checking by the Lead Introducer of the proposal, the deputy Chair, and Chair. As a result of the changes in the AGP assessment process this year, in 2020 there is no project-specific panel feedback available: the panel did not discuss the top and lower-ranked projects, and thus there is no panel feedback that can be given for these projects. In the interests of consistency for all applicants, and after extensive discussion, the panel also took the difficult decision not to provide feedback for middle-ranked projects.

### **The AGP assessment criteria**

To provide a quantitative basis for grading projects, each was initially assessed against a standard set of evaluation categories, based on those given in the STFC [Research Grant Handbook](#). These categories have remained largely unchanged since the 2015 round and in 2020 they were as follows (with weighting in brackets):

1. Importance of the proposed research (6);
2. International leadership (5);
3. Feasibility of the proposed work (5);
4. Productivity of the Applicant(s) (3);
5. Environment and management of group (2);
6. Strategic value to STFC/UKSA (2);
7. Productivity of any named PDRA (2);
8. Urgency of proposed work (2).

We note that category 7 has a default score used for unnamed PDRAs.

### Notes on Procedure

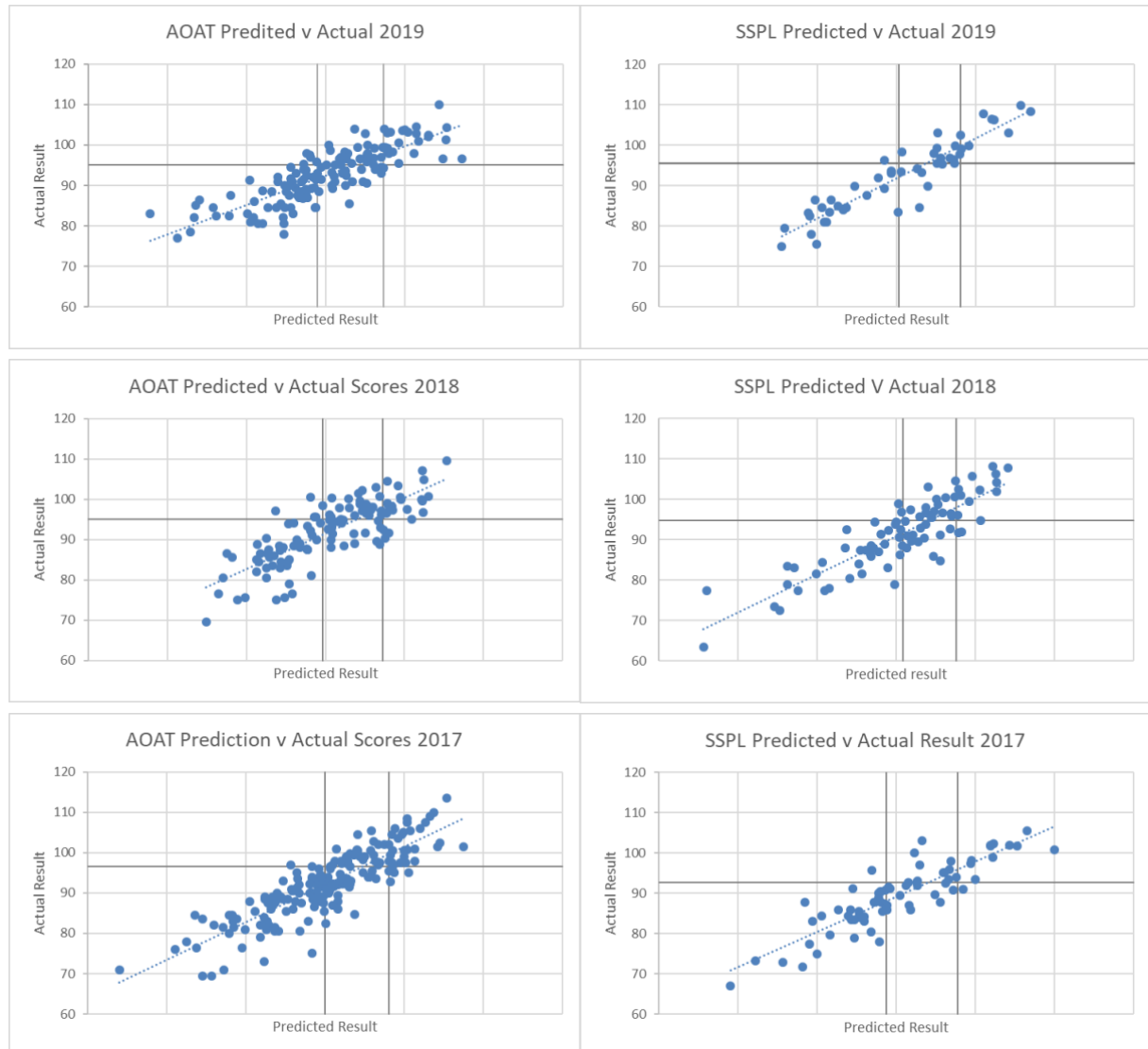
We describe here two further important points of the review process:

- (i) The AGP ranks projects across the whole observational, theoretical and technology astronomy/astrophysics programme, and each project is therefore judged by a panel drawn from across this range of expertise. The AGP seek advice from expert reviewers, with each project introduced by a panel member who has familiarity of the relevant field. The whole panel contributes to the discussion and agrees on the final assessment. There are occasions when the panel's recommendations may appear to contradict the reviewers' comments. But the panel will see around 700 reviewer reports each round, many of which are positive, and critically is required to tension every project against all the other projects. We invariably have far more projects with broadly positive reviews than can ever be funded in the current flat-cash funding climate.
- (ii) A factor which can indirectly influence the levels of AGP support to an individual applicant is the availability of alternative (non-AGP) funding. **Explicitly, the AGP does not rule out applicants who have been successful in securing alternative funding** – but it is the responsibility of applicants holding related awards to demonstrate **clearly** that the projects they are proposing to AGP lie well outside the remit of their other grants. Typically, this is most relevant to applicants who also hold research fellowships (e.g., STFC Ernest Rutherford Fellowships, Royal Society University Research Fellowships) and EU/ERC funding. Applicants often find this difficult to do as they must make the case that the proposed research is of the highest scientific priority (to stand a chance of being supported by AGP) but also why they are not using the flexibility of their existing funding to undertake the work. As a result, some very active researchers are not recommended for PDRA or applicant FTE support through the CG scheme.

## Appendix 2 – Analysis and Robustness of Sifting Process

To determine the efficiency and robustness of the sift process introduced by necessity in 2020, it was tested against each of the rounds in the last AGP cycle, i.e., the 2017, 2018, and 2019 rounds, and the predicted project ranking from the sift algorithm compared against the actual final panel ranking. The algorithm was tested to confirm that: (a) it was a good predictor (i.e., there was a reasonable relationship between the predicted score and the final panel scores); and (b) the number of errors made was small (i.e., lower-ranked projects that were recommended for funding, and top-ranked projects which were not recommended for funding). The two panel meetings (AO/AT and SS/PL) were processed separately.

### Is the algorithm a good predictor?



The plots above show the results of the 2020 sifting approach ('Predicted Results', in arbitrary units) compared to the actual panel result ('Actual Result', in the AGP scoring system) for the AO/AT and SS/PL calls in 2019, 2018, and 2017. In both cases a reasonable linear fit is found (with good coefficient of determination,  $r^2$ , values). The scatter about the line can be estimated by the  $\sigma_{res}$ , the standard deviation of the residuals. The horizontal line indicates the actual funding cut-off, and the vertical lines are the 47.5<sup>th</sup> and 82.5<sup>th</sup> percentiles (i.e., the sifting levels needed in 2020).

The fit parameters for each year and panel are:

	AO-AT		SS-PL	
	$r^2$	$\sigma_{res}$	$r^2$	$\sigma_{res}$
2019	0.67	3.84	0.85	3.47
2018	0.64	4.57	0.75	4.43
2017	0.74	4.24	0.77	3.96

The  $r^2$  values all indicate strong linear correlations (they are all well above the 0.1% significance level). The  $\sigma_{res}$  values are reasonable but also indicate a degree of scatter about the linear fit, which indicates a risk of inaccuracies for more aggressive sifts.

### What are the number of errors made by the algorithm?

As the actual funding results for the 2017-2019 rounds are known, the number of errors made by the 2020 algorithm for each panel/round can be determined by comparing the predicted lower/top-rank lists with the actual funding list. These are summarised in the following table:

Panel	2017	2018	2019	Full cycle
AOAT	2.7% (5)	6.3% (8)	4.1% (6)	4.2%
SSPL	2.8% (2)	4.9% (4)	2.0% (1)	3.5%
Combined	2.8%	5.8%	3.6%	4.0%

This shows the percentage of projects that were incorrectly classified in each round/panel, that is either projects flagged for lower-ranking that were eventually funded, or projects flagged for top-ranking that were eventually not funded. The number of ‘errors’ is provided by round and panel, and combined figures are given. The numbers in brackets indicate the actual number of projects misclassified in each round/panel.

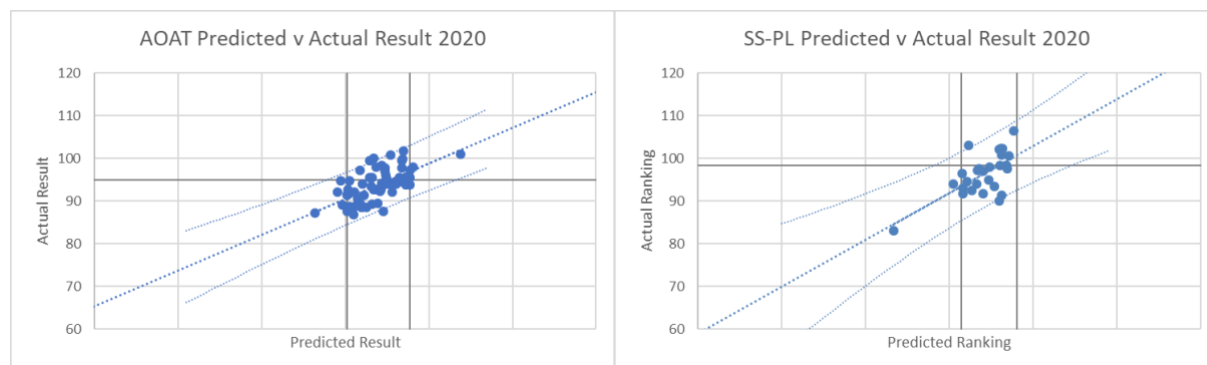
This indicates that an error rate of 4.0% might be expected when applying the algorithm to the 2020 round. For the 2020 round, with a total of 255 projects submitted, this error rate equates to an expected 10 projects (7 in AO/AT and 3 in SS/PL) that might get incorrectly lower- or top-ranked.

As a guard against lower/top-ranking projects in error, after the sift results are known panel members were able to recall projects they believe may have been ranked in error. We thus allowed AO/AT to recall up to 8 projects (4 for each sub-panel) and SS/PL to recall up to 4 projects (2 for each sub-panel).

### Post-round evaluation

After the panel meetings were completed and the anticipated funding cut-off determined, a final evaluation of the performance of the sifting was possible. This was carried out by performing a comparison of the initial ranking of projects that were scored (primarily the middle-ranked list, with recalled projects added) with their final scores in a similar manner to the previous rounds. Recall that the panel were not informed of the ranking within each sifted list.

For each panel, a linear regression was performed and the  $r^2$  and  $\sigma_{res}$  values calculated. These are summarised in the following plots.



These are displayed on the same axes scale as the plots for the 2017-2019 rounds, although only the

middle-ranked projects and recalled projects (that were discussed and scored in the panel meetings) are shown. The thresholds for the lower-, middle-, and top-ranked lists are indicated by the vertical lines, and the funding cut-off by the horizontal lines (note the SS/PL scores are the pre-merged scores, hence have a slightly different absolute calibration for the funding cut-off, corrected during the merging process).

The best fit regression line is shown, and a 95% confidence interval is included to indicate where the lower- and top-ranked projects would be predicted to lie. The horizontal extent of the confidence interval is set to match the extent of the pre-sifting ranking.

The  $r^2$  and  $\sigma_{res}$  values are summarised in the following table (with the 2017-19 values included again for comparison):

	AO-AT		SS-PL	
	$r^2$	$\sigma_{res}$	$r^2$	$\sigma_{res}$
2020	0.40	3.02	0.43	3.80
2019	0.67	3.84	0.85	3.47
2018	0.64	4.57	0.75	4.43
2017	0.74	4.24	0.77	3.96

The  $r^2$  values are lower, which reflect the reduced horizontal range in the data due to the absence of the lower- and top-ranked projects, and the reduced number of data points associated with this. However, they are significant at the 0.1% level providing confidence that the sifting process performed acceptably. Additionally, the  $\sigma_{res}$  values are comparable to those found for the previous rounds.

Finally, we note that for the few projects that were recalled (those that fall outside the vertical delimiters in the plots), none of the outcomes were changed after discussion and ranking (i.e., lower-ranked projects were not funded, and top-ranked projects did not fall below the funding cut-off), although a couple came close.