

UNIVERSITY OF GLASGOW

Academic Standards Committee – 25 May 2018

Periodic Subject Review: Review of Physics and Astronomy held on 15 February 2018

Mrs Ruth Cole, Clerk to the Review Panel

Review Panel:

Professor Moira Fischbacher-Smith	Assistant Vice-Principal (Learning and Teaching), Panel Convener
Professor Sarah Thompson	University of York, External Subject Specialist
Dr Bethan Wood	Senate Assessor on Court
Mr Joshua Horsman	Student member
Professor Scott Roy	School of Engineering, Cognate member
Dr Janis Davidson	Learning Enhancement and Academic Development Service
Mrs Ruth Cole	Senate Office, Clerk to the Panel

1. Introduction

- 1.1 Physics and Astronomy is one of seven Schools in the College of Science and Engineering. The School offers Honours and Integrated Masters degrees and Postgraduate taught degrees, most of which are accredited by the Institute of Physics.
- 1.2 The last Periodic Subject Review took place in 2012 and found the School to provide a supportive and progressive learning environment, enriched by strength in research and broad engagement with the external environment. Recent increases in student numbers and the School's ambitions for future growth were identified as presenting a number of challenges.
- 1.3 Preparation of the Self Evaluation Report (SER) was led by the Head of School and a small group of academic staff. Feedback on a draft was invited from all staff. Input from students was gathered through a focus group facilitated by the Learning Enhancement and Academic Development Service. The Review Panel found the SER to be detailed and informative, highlighting areas of good practice as well as some of the challenges currently faced in the School and the work underway to address these.
- 1.4 The Review took place over a one-day visit during which the Panel met with: the College Dean (Learning and Teaching), Professor John Davies; the Head of School, Professor Martin Hendry; the Director of Learning and Teaching, Professor Paul Soler; and Dr Stephen McVitie. The Panel also met with 25 members of staff, seven demonstrators (Graduate Teaching Assistants), four postgraduate students and seven undergraduate students. The School engaged positively in preparations for the visit and the Panel found discussion at the various meetings to be informative and stimulating.

2. Context and Strategy

2.1 Staff

- 2.1.1 Current staff numbers in the School were as follows: 44.5 Research and Teaching, 5 Learning, Teaching and Scholarship, 88 researchers, 26.1 technicians, 18.9 administrative support.
- 2.1.2 The staff : student ratio for 2016-17 was 1:16.1 which, as noted in the SER, was currently the lowest ratio for Physics and Astronomy amongst the Russell Group institutions.

2.2 Students

Student numbers for 2016-17 are summarised as follows:

Enrolled students	
Astronomy 1	138
Exploring the Cosmos 1X, Y	323
Introductory Physics	6
Physics 1	274
Science Skills	77
Astronomy 2	68
Physics 2	178
Physics 2T	81
Physics 3	140
Physics 4, 5	114
Astronomy 3, 4, 5	160
PGT Masters	27

2.3 Range of Provision under Review

The Review Panel considered the following range of provision offered by the School of Physics and Astronomy:

Undergraduate

BSc/BSc (Hons)/MSci (Hons)

Physics

Physics with Astrophysics

Chemical Physics

Astronomy and Physics

Physics and Applied Mathematics

Physics and Mathematics

Astronomy and Mathematics

Computing Science and Physics

MSci (Hons)

Chemical Physics with Work Placement

BSc/BSc (Hons)

Physics and Pure Mathematics

Other undergraduate courses not associated with a specific degree programme:

Exploring the Cosmos 1X and 1Y

Science Skills

The Science of Musical Instruments and Acoustics

Introductory Physics

Physics 2T: Programming under Linux

Also, contributions to:

Science Fundamentals 1X and 1Y (Chemistry)

Level 2 Life Sciences

Postgraduate Taught Programmes

MSc Astrophysics

MSc Physics: Advanced Materials

MSc Physics: Nuclear Technologies

MSc Theoretical Physics

MSc Physics: Energy and Environment

MSc Sensor and Imaging Systems

2.4 Strategic Approach to Enhancing Learning and Teaching

2.4.1 The SER set out a strong vision of teaching that was embedded in, informed by, and prioritised alongside, the thriving research in the School. During the various meetings undertaken in the visit, it was clear to the Review Panel that this vision was shared by staff and understood by students. All staff were expected to teach, and it was interesting to note that teaching duties broadly included coverage of lectures in the early years; and researchers did not only teach subjects close to their own research interests. Students recognised the value of having access to cutting edge research groups, both in terms of the choice of projects available and in the way that lecturing staff incorporated reference to their own work in lectures.

2.4.2 One of the most prominent themes throughout the Review was the increasing pressure on the School arising from a significant reduction of the staff : student ratio. The number of students admitted was rising as was the proportion progressing through to completion of the five-year Integrated Masters. The SER stated the position as follows: 'An approximate doubling of undergraduate students since 2008 has been accompanied by only an approximate 10% increase in academic staff numbers over the same interval.' (p. 5.) The staff : student ratio at the time of the previous Periodic Subject Review was 1:11.8, whereas for 2016-17 it had fallen to 1:16.1. The SER also included reflection on the disappointing performance of the School in the 2016-17 National Student Survey, with overall satisfaction having fallen from 95.0% to 82.8%, with a particularly weak standing in relation to the timely return of feedback on assessment, at 50%. During the course of the Review it was evident to the Panel that the School staff were determined to find ways of addressing those issues that had the most direct impact on the student experience, but that the current poor staff : student

ratio significantly limited their capacity to sustain existing support and develop new ways of working.

2.4.3 In the various meetings undertaken during the Review visit, as well as in many of the sections of the SER, the pressures arising from this situation were referred to. Direct impacts were mentioned such as space in the Kelvin Building being under severe pressure and the size of small group teaching sessions increasing. Indirect consequences included staff finding it difficult to devote time to developing their teaching and the range of possible forms of assessment, and more generally, simply 'to think' and to deliver the student experience that they aspired to. The Review Panel welcomed the inclusion of the results of a staff survey carried out for the Periodic Subject Review. There was a wide range of comments covering such issues as the challenge of balancing research and teaching commitments and the need for more administrative support. While many of the comments reflected very heavy workloads and serious concerns regarding the increasing student numbers, there was also a strong theme of collegiality in the School, with staff recognising that colleagues at all different levels were fully engaged in the work that needed to be done and offering support to each other. The students were also aware of the challenging situation. They referred to how their own experience was negatively impacted (for example, advisers or supervisors being pushed for time or sometimes seeming 'inaccessible'). However, the students appeared to have some understanding of the reasons for this and believed that staff in the School were doing what was possible within the available resources. The Review Panel concluded that within the School there remained a shared commitment to delivering the best possible student experience, and a sense that colleagues were facing the difficulties in a collegial manner. The Review Panel **commends** the School for this. While the question of staff resourcing was outwith the scope of the Review, the External Subject Specialist attested to the impact of staff : student ratio on the student experience. During the visit the Panel explored with the various groups the ways in which the pressures might be managed pending improvements in the staffing situation and while any newly appointed staff grew into their roles.

3. Enhancing the Student Experience

3.1 Admissions, Retention and Success

Recruitment

3.1.1 The Review Panel noted that the School had a Recruitment and Retention Committee with a broad range of activities. Since the last Periodic Subject Review undergraduate numbers had been growing, despite entry requirements having increased. Undergraduates who met with the Review Panel referred to a variety of reasons for having chosen to study at Glasgow, including awareness of the strength of research in the School, as well as the attractions of the campus and the city. At the staff meeting it was noted that the numbers being recruited significantly exceeded the target number set by the School. Staff expressed their concern that there would be a continuing negative impact on the NSS results in the coming years as the very large cohorts progressed through to the end of their studies.

Widening access

3.1.2 The SER described the well established and extensive work undertaken by the School in engagement with schools and teachers (for example, over the last two years more than 100 Advanced Higher Physics pupils had come to the School to undertake experiments for their projects). Efforts to target priority schools had had impressive

results, with the SER noting that for the student cohorts registering in 2013, 2014 and 2015 more than 25% had a widening participation status. The Review Panel was pleased to note that monitoring by the School found that progression rates for these students were very similar to that for the overall cohorts. The Review Panel **commends** this achievement.

Progression

- 3.1.3 Undergraduate students were admitted to either the BSc (four year) or the MSci (five year) degree track. The end of second year represented the key decision point, as to whether students would continue on the same track or switch to the other degree. This depended in part on their level of performance demonstrated to that point but also on their own preference, which reflected their likely career aspirations. The curriculum for both programmes remained the same in third year so in some circumstances it was still possible for BSc students to transfer to the MSci at the end of third year. In recent years the number of students choosing the MSci track had been increasing. For the School, it was encouraging to see the greater aspiration of students to achieve the Masters level exit qualification (and this tended to be associated with students wishing to pursue a Physics-related career). However, the increasing number of students undertaking the M-level project posed a challenge in terms of supervision and a continued increase in numbers was expected for the coming years.

Postgraduate Taught Provision

- 3.1.4 Since the previous Periodic Subject Review the number of PGT students had doubled, though numbers remained small. The students who met with the Review Panel referred to a number of different reasons for coming to study at Glasgow, including awareness of the high quality research in the School, and recommendation from a Glasgow alumnus ambassador in their home country. Pre-departure events in their home country had been appreciated by international students but a pre-session programme held at Glasgow had not been found helpful to one student as it had been geared towards Engineering rather than Physics. The students who had not studied for their undergraduate degree in Glasgow told the Panel that the transition had been difficult due to their very different prior educational experience (see paragraph 4.1.12). The Panel encourages the School to pursue this further with the current cohort of students.

Equality and Diversity

- 3.1.5 The Review Panel noted the School's excellent work, described in the SER, in promoting equality and diversity. In relation to gender equality, this was recognised in the award of Juno Champion and Athena Swan Silver status. The Review Panel **commends** this on-going work.

Careers

- 3.1.6 The taught postgraduate students who met with the Panel expressed the view that their studies at Glasgow were providing them with good broad skills and first-hand experience of research, which would be valuable for progressing into further research. They spoke about how their own plans were likely to become clearer once they embarked on their final project. They had found their Advisers to be helpful in thinking about their options. The SER described some of the activities promoting the development of graduate attributes including the Skills Revolution course and sessions delivered by the Careers Service. (This is referred to further at paragraph 4.1.17.)

3.2 Supporting Students in their Learning

- 3.2.1 It was clear to the Review Panel, through information provided in the SER (for example, all PGT students being allocated an Adviser of Study) and through discussions with the various different groups at the Review visit that the School was committed to providing a supportive and inclusive learning community for its students, with staff striving to be accessible to students to provide support where required, but also by taking steps to involve students in the life of the School more widely (for example, by inviting undergraduate students to participate in Research Colloquia).
- 3.2.2 In the SER there was reflection on the fact that the student focus group held in advance of the Periodic Subject Review had revealed that for some students the sense of community in the School was weak. This was attributed in large part to the pressures from increasing student numbers (for example, resulting in larger-sized small group teaching, referred to at paragraph 4.1.10) but it was also noted that a lot of teaching, particularly at Honours, took place in locations other than the Kelvin Building because of the centralised allocation of teaching accommodation. The weakening of a geographical base for students was believed by staff to be associated with a weakening of a sense of belonging to the School. In discussion with undergraduate students, however, the Panel heard how in Honours the sense of identification with the subject was particularly associated with their major project work, when they were working closely with their supervisor.

4. Enhancement in Learning and Teaching

4.1 Learning and Teaching

Dissemination of innovation and good practice

- 4.1.1 Learning and Teaching good practice and innovation were disseminated within the School. Ideas were sometimes shared through the Teaching Committee (though it was noted that not all class heads were members of the committee), informally among teaching groups (e.g. by the class head to all staff teaching on that year), and there was exchange of practice at undergraduate and postgraduate level through the joint teaching of integrated Masters and taught postgraduate Masters students.
- 4.1.2 As staff typically taught for no more than five years on any course, there was a general spread of information regarding the different teaching methods in use. Moodle was organised by year groups so all staff teaching on that year could see what other staff were doing. Also, in recent years, the School had benefited from many of the innovative practices introduced by staff on the Learning Teaching and Scholarship track. At the student focus group prior to the Review visit, students reflected that it was sometimes possible to identify lecturers who had recently undertaken the PGCAP because of the different approaches to teaching that they adopted. (This contrasted with less favourably received teaching styles; for example, the over-reliance on powerpoint as highlighted at paragraph 4.1.21.)
- 4.1.3 At the staff meetings it was noted that the School was not prescriptive about the teaching methods that staff should use and this academic freedom was valued. On the other hand, the Review Panel noted a small number of comments in the Staff Survey indicating that on taking over the delivery of a course, there had been very little information regarding what was expected or basic introductory information regarding the structure of the course and its assessment.
- 4.1.4 The Review Panel was pleased to hear that, as a group, demonstrators had the opportunity to reflect at the beginning of one semester on how the labs had gone in the previous semester, and that they were encouraged to share their ideas with staff for future practice.

4.1.5 The SER alluded to the fact that the more informal methods of dissemination of ideas and practices had their limitations, particularly due to the now larger School, and that there would be value in pursuing a more formal mechanism for including all staff in such dissemination, facilitated with the support of the Learning Enhancement and Academic Development Service. The Head of School also referred to the potential for establishing valuable links between Lecturers on the LTS Track in other Schools for the sharing of new ideas.

4.1.6

The Review Panel **recommends** that the School reflect on the various mechanisms by which good practice is currently disseminated and develop a more systematic means of sharing innovations and good practice to all staff within the School with a view to delivering a more consistent learning experience across all programmes. The School might also consider defining a set of minimum expectations for staff and students to ensure some consistency in delivery, whilst not restricting academic freedom and innovation. In making this recommendation the Panel noted the proposal referred to in the SER for the introduction of a regular staff event for this purpose. The Panel also recognised the particularly valuable role played by class heads in supporting the staff involved in teaching in their respective years. This included the oversight of Moodle, and the dissemination of information to the staff about programme level issues. The Panel considered this to be **good practice** and encourages the School to continue to use this role as a key focus for work in this area.

Problem solving skills

4.1.7 It was clear to the Review Panel that the development of students' problem solving skills was of high importance to the School. The SER referred to the courses Problem Solving Workshop and General Physics Workshop in this regard. It was also a theme in the Computing Teaching interim report (referred to at paragraph 4.1.15). It was gratifying that the issue of how to promote the ability of students to solve problems for themselves was raised by demonstrators and students at their meetings with the Panel, indicating that both demonstrators and students also recognised the importance of this area.

4.1.8 In relation to lecturing, the students' view was that the best teaching was where the lecturer worked through various stages of a problem in real time, allowing them to fully grasp all the steps, or where the lecturer demonstrated some of the steps, and allowed the students sufficient time to arrive at the intermediate steps by themselves. Some of the postgraduate students spoke of the challenging transition to postgraduate study; in their undergraduate degrees the focus had been on absorbing knowledge rather than on working independently and it was therefore particularly important for them that lecturers demonstrated the steps involved in derivations in order for them to be able to develop the required skills.

4.1.9 In relation to labs, the undergraduate students felt that in year 1 they were required to complete the labs rather than to understand them, and that the demonstrators sometimes simply 'fixed' things rather than explaining what the problem had been. The demonstrators also talked about the challenge for them of guiding students through the labs, giving them enough help to enable them to complete the work themselves, and also in the context of the lab assessment interviews, to prompt students appropriately to find their way through a problem. (See also paragraph 4.2.6.)

The Review Panel **recommends** that the School review the training provided to demonstrators in relation to their supporting undergraduate labs, with particular emphasis on promoting problem-solving techniques for the students both in completing the labs and in being assessed by interview.

Small group teaching

4.1.10 There was a discussion with the undergraduate students about the small group tutorials and, again, this touched on their importance for students developing problem-solving skills. As student numbers were growing, group size was also growing. At the focus group in advance of the review, students had given a clear message that the small groups were important. The undergraduate students who met with the Review Panel referred to significant variation in how the groups were run and the kind of work that was covered. They noted how if the group was too big they felt unable to raise particular issues they had, and they referred to the fact that attendance at the groups often fell away. In contrast, the undergraduates referred to groups for which they were required to sign up, which were limited in size and for which clear tasks were set in advance. These groups were appealing because the students could be confident that any difficulties they were having with the material would be addressed. The Review Panel noted the view expressed at the staff meeting, that when additional staff resourcing became available, a priority would be to support small group tuition, with the aim of reducing group size again. The views expressed by staff appeared to be consistent with those of the students, that this was a highly valued aspect of the teaching and that reducing the group size was likely to have a significant positive impact on the student experience.

4.1.11 The Review Panel **recommends** that the School reflect on the feedback received in relation to small group teaching to minimise inconsistency in what was currently delivered and to review the potential for varying the format so as to maximise meaningful attendance and response to the issues on which students wished to have more input. This might benefit from some external comparison with peer institutions that also value small group provision as well as with other Schools in the College that continue with the practice such as Mathematics and Statistics.

Joint teaching of Masters students

4.1.12 The postgraduate students who met with the Review Panel came from a range of different academic backgrounds and countries, and expressed frustration at sometimes attending lectures alongside MSci students where there appeared to be an assumption that the MSc students had the same background knowledge as the MSci students. This was not always the case and when they had raised this, it seemed to the MSc students that they were simply expected to catch up themselves on any background knowledge that they were missing. It was recognised that efforts made by the School to improve transition to study had been beneficial, but there remained challenges where MSc students with varied familiarity with academic material studied alongside a large cohort with shared familiarity with that same academic material.

Project work

4.1.13 The SER articulated the value placed by the School on the Project work carried out by undergraduates in their final year of study. Staff were committed to ensuring that students had a high quality research experience. Despite the pressure from increasing student numbers, the School's view was that it was important to offer an individual project rather than moving to students working in pairs. Both groups of students who met with the Panel spoke of the desirability of the opportunity to participate in renowned research groups. For some, awareness of this feature of the School's provision had been significant in their decision to come to study at Glasgow. In discussion with PGT students, it was noted that students were notified of the available projects and were invited to express their preferences. In addition, they were encouraged to approach staff with their own proposals, which the students regarded very positively. The Panel **commends** the School for its continuing commitment to supporting an individual project offering a high quality research experience.

Writing skills

4.1.14 The Review Panel learned about a recent change to the fourth year curriculum for integrated Masters students: in response to an identified weakness in the key skills of report writing, the fourth year practical project had been replaced with the Physics Literature Project, which offered students the opportunity to look in-depth at a chosen research topic. The undergraduate students acknowledged that there was value in this but they were concerned that the change meant that in fourth year they undertook no practical work and could be short of experimental practice for the crucial project in fifth year. The Panel **recommends** that the School reflect on the concerns being voiced by students regarding the lack of practical work in year 4 and consider how best to either reassure students that this should not put them at a disadvantage or incorporate some element of advanced practical work into the curriculum.

Programming

4.1.15 The Review Panel noted the on-going work in relation to the teaching of programming in the curriculum. This issue had been raised at the student focus group held in advance of the Periodic Subject Review, and it was also raised in the Panel meeting with the undergraduate students, who felt that there was a big jump from second year to third year in terms of what they were expected to be able to do, and that they were not sufficiently prepared for this. Other comments included that the lack of programming put students at a disadvantage when looking for internships, and that they felt that in relation to their programming skills they were generally not well prepared for a career as a physicist. While teaching expertise in programming was potentially available from other parts of the College, the School saw the embedding of computing in the teaching of many of its own courses as being preferable to delivering specific courses on programming. The Panel noted that a Working Group on this issue had produced an interim report in May 2017, putting forward a wide range of proposals and areas for further investigations. The Review Panel **recommends** that the School continue this work to focus efforts on revising the provision of computing teaching in the curriculum.

Study abroad

4.1.16 The SER noted the number of students undertaking either one semester or one session of study abroad in the last six sessions. The number ranged from two to ten. In the SER it was explained that students were encouraged to undertake study abroad during their second year. The undergraduate students who met with the Review Panel noted that in order to go abroad in semester 1 of second year they were required to put themselves forward during their first semester at the University. At that point many of them had not felt ready to consider that possibility and the strong view was expressed that more interest would be generated if study abroad opportunities during third year were promoted. The Review Panel **recommends** that, with a view to the achieving the University's strategic target for at least 20% of students to experience a period of international mobility, the School review its approach to promoting study abroad in year 2 and investigate the feasibility of promoting opportunities for a year or a semester abroad during third year, as is the norm across the University.

Links with industry

4.1.17 In the SER it was explained that opportunities for industrial placements were limited. In relation to possible future careers, the Undergraduate students who met with the Panel spoke about the School's research-focus though they also said that the Careers Service were active and helpful in promoting alternative career pathways and in promoting internships. The Skills Revolution course in third year involved a number of representatives from industry attending over two days. More generally, guest lecturers were also brought in where possible. In discussion with the Review Panel, the Head of

School indicated that furthering links with industry had already been identified as an area for future development. The Panel noted that links with industry offered the potential for alleviating some of the burden on School staff in relation to the supervision of student projects. The students also referred to such links representing valuable work experience relevant to finding employment after graduation. There was currently some activity in this area on PGT programmes through the External Advisory Board. There was an aspiration to broaden the work of the Board to encompass undergraduate students and the Head of School expressed the view that there could be value in involving some College-level input as well. In view of the potential benefits to be gained both by staff and students in this area, the Review Panel **recommends** that the School moves forward with this work as a priority.

Curriculum Design

- 4.1.18 In the SER it was noted that since the last Periodic Subject Review there had been no major changes to the Physics and Astronomy curriculum, though there had been careful reflection on 'vertical integration' of the learning over the course of students' progress through their four or five years, with a gradual building on the knowledge and skills as required for accreditation by the Institute of Physics. On-going review of the curriculum was managed by the Teaching Committee, whose membership included five Learning, Teaching and Scholarship (LTS) staff. The Review Panel welcomed the evident openness to student input to developments and noted in particular the Physics Education and Communications course through which Honours students completed a placement in a school and developed their own teaching resources.

Portfolio of courses

- 4.1.19 In light of the pressure on staff time, the Review Panel explored with the Head of School the question of whether there had been reflection on the number of Honours optional courses being offered. Since the last Review, there had been some rationalisation where overlap of content had been identified. Some courses had been identified for possible discontinuation where student numbers had been low, but as student numbers had increased significantly more recently, the School had judged that the range of options on offer were still viable. There was high value in researchers teaching in their own specialist areas, but staff in the School accepted that they were also required to teach across the curriculum, in broader areas. The Head of School noted that there was no difficulty in allocating staff to teach in years 1 and 2, and that lecturers were encouraged to bring in material from their own research where possible. It was noted that since the last Review, there had been some refocusing in the School on teaching within its own area, having withdrawn, for example, from the level 1 Engineering Physics, which was now taught by the School of Engineering.

Approach to Intended Learning Outcomes

- 4.1.20 Intended Learning Outcomes were available and properly incorporated into programme specifications. In the SER there was a helpful explanation of how these aligned to the relevant QAA Benchmark Statement in terms of skills, knowledge and behaviours.

Technology Enhanced Learning and Teaching

- 4.1.21 In the Panel meetings with the undergraduate and postgraduate students, it was clear that students valued the provision of course notes and other supporting materials made available through Moodle. There were interesting discussions on the range of teaching methods employed by staff, but a common theme with the different groups was the dislike of over-reliance in lectures on powerpoint and a strong preference for staff to work through examples and problems in real time, and for the teaching to be

supported by detailed notes made available on Moodle and the directed use of supporting text books (including weekly formative assessment tasks).

- 4.1.22 Class heads had responsibility for their Moodle sites and checked to ensure that all staff had populated the sections required (notes, past papers, model answers, etc). Students reported that there was some inconsistency in what was provided and the School is encouraged to address this, in tandem with work that is on-going in the University to establish a minimum expectation of what should be covered on Moodle for every course offered.
- 4.1.23 The School was developing a number of innovative teaching methods harnessing different forms of technology. In the SER use of the flipped classroom was described, with material set in advance of the lectures, so that students could identify that part of the material that they had found the most problematic and this then became the focus for the lecturer in teaching time, promoting engagement by the students with the learning.

4.2 Assessment and Feedback

- 4.2.1 Undergraduates in years 1 and 2 were assessed by end of course exams and a range of continuous assessment, while in the Honours years most courses were assessed solely by an end of course exam. Alongside such courses at Honours, lab work and project work meant that for the year as a whole, a significant proportion of the assessment was not based on exams. However, at the student focus group held in advance of the Review, students had expressed a desire to have more continuous assessment during the Honours years on the non-lab/project courses.
- 4.2.2 Staff meeting with the Review Panel advised that formative assessment was offered in a number of forms, and that this included some peer marking and self-assessment. The small group tutorials offered the opportunity to practise, and receive feedback on, assessment similar to what would be in the end of course exams. Staff expressed the view that students perhaps did not fully understand this link and the Panel encourages the School to address this.
- 4.2.3 A working group, led by the Convener of Learning and Teaching, was currently looking at options for introducing more continuous assessment but the School's view was that significant development of continuous assessment would currently be particularly challenging in the face of the considerable pressures on staff time. The Review Panel wished to encourage the School to consider making use of other options such as peer feedback, which could have a significant positive impact for students without being staff resource heavy. This would not only be helpful for preparing students for exams but also in developing graduate attributes. The Panel also encourages the School to seek ways of communicating to students its overall assessment strategy, given students' apparent perception of the assessment being overly reliant on exams.
- 4.2.4 The postgraduate students raised the fact that there was a heavy load of end of course exams in the spring diet. Various views were expressed, including that having exams at the end of semester 1 would mean that the material was fresher in the mind after the teaching, but on the other hand they were still relatively new to the University and would have little time to assimilate the material before the exams. The students were pleased to note that they would be having a mock exam on semester 1 material.

Feedback on Assessment

- 4.2.5 Information was provided to students on the timing of the provision of feedback on assessment, and there was a commitment to the return of feedback in years 1 and 2 on continuous assessment in time for subsequent submissions. The SER described the range of methods of feedback, including generic whole class feedback. For project

work students were assessed, and feedback provided, not only on the final submission but also on their performance in the lab throughout.

Assessment of labs

- 4.2.6 The Review Panel was interested to learn about the assessment of labs. The assessment of labs in years 1 and 3 included short interviews conducted by demonstrators. The demonstrators told the Panel that conducting the interviews was challenging and that they would welcome some extra training for this work, particularly where they were interviewing more than one student at a time, for only 10 minutes, and were required to give the grade 'on the spot'. One of the demonstrators noted that it had been particularly helpful to observe an experienced member of staff before carrying out their own interviews.
- 4.2.7 The undergraduate students told the Review Panel that they were sometimes unclear about how the grading was being applied: they could not always see the relationship between the task required and the feedback, and felt the grading could be inconsistent. Their view was that it would be helpful to have more guidance on how they could have improved their grade, and there appeared to be a particular issue concerning how to achieve the very top grades, when no 'errors' had been identified in their work. Staff advised the Panel that some work had already been undertaken in redesigning the feedback form in response to dissatisfaction from undergraduates and the clearer structure now encouraged more structured feedback. Recent NSS results had been improving in relation to assessment and feedback. Nonetheless, given that students clearly articulated some frustration associated with wanting to receive feedback on their learning and not just a grade, the Panel encourages ongoing discussion with students about how feedback on lab activities can be more effectively and consistently communicated.
- 4.2.8 At the meeting with staff it was noted that lab heads had a role in ensuring consistency in grading and in the amount of feedback provided in the different sections of the feedback form, and that the demonstrators worked together as a group to assess the actual lab-books. The grades were very important to the students because so much of their assessment took the form of end of course exams. The undergraduates noted that in year 3 more credit was given for their ability to demonstrate understanding of the labs (rather than simply completion of them), which they appreciated and they felt that their grade was more of a reflection of their own work than was the case in year 1 when pairs of students were assessed together and were usually awarded the same grade.
- 4.2.9 The Review Panel **recommends** that the School review the training and support provided to demonstrators in relation to assessment of the undergraduate labs, with particular emphasis on achieving consistency in the amount of feedback provided to students, the provision of feedback that will identify to students how they can improve their grades (including how to achieve the highest grades), and the delivery of adequate preparation for their conducting of interviews. The demonstrators' view (paragraph 4.3.6) was that statutory GTA training was of limited value in relation to labs, as the focus was more on classroom based teaching and the Panel notes that some work is already underway on these matters in the College of Science and Engineering. (See also paragraph 4.1.9.)

Engagement with the Code of Assessment and Assessment Policy

- 4.2.10 The SER set out how the School applied the Code of Assessment, including the appropriate mapping of percentage outcomes to the alphanumeric scale of Schedule

A. The Review Panel also noted the clear and helpful assessment calendar, made available to students, describing the different components of assessment and how they were scheduled.

4.3 Resources for Learning and Teaching (staffing and physical)

Staffing

- 4.3.1 The School operated its own workload model, and the Head of School explained to the Review Panel his view that it offered useful flexibility in the allocation of tasks. Teaching commitments and other School roles were allocated in consultation with staff members and there was regular rotation of roles. This included a policy of normally no member of staff teaching the same course for more than five years, which helped to keep the presentation of material fresh.

Administrative support

- 4.3.2 One of the recommendations made at the Periodic Subject Review held in 2011-12 concerned the need for teaching administrative support. The Review Panel understood that discussions had been on-going regarding the best way of facilitating this and that some progress had been made (for example, a single teaching administration email inbox had been established). However, from the SER and discussions with staff, it was evident to the Panel that much academic staff time was still engaged on numerous essentially administrative tasks (for example, data entry, attendance monitoring, and checking of allocated teaching accommodation, which sometimes involved conducting negotiations with other staff members to swap lecture rooms). This was a source of considerable frustration and lost academic time. The administrative support that was provided was highly valued by colleagues but staff did not have sufficient capacity to undertake more. There were inefficiencies in having academic staff undertaking occasional tasks which administrative staff would be able to complete on a more consistent basis. It was the Panel's view that academic staff were undertaking more teaching-related administrative tasks than in other parts of the University, and would benefit from increased administrative support for a range of tasks such as examinations administration. This would allow academic staff to focus on evolving teaching and assessment practice, and would create a more sustainable teaching administration function within the School. At the staff meeting it was also noted that the School was currently under-staffed in terms of technical support, and that this added to the non-teaching/non-research load being carried by academic staff. The Panel **recommends** that the School continue to review possible means of alleviating the administrative burden currently carried by academic staff. The Panel is not able to recommend resource investments per se, but would stress the need for this aspect of administrative support to be considered from a strategic perspective so as to create capacity for the learning and teaching developments identified elsewhere in this report. The Panel also notes that the College is currently conducting a comprehensive review of support services, and this may impact on the School's response to this recommendation.

Learning and Teaching Space

- 4.3.3 The Review Panel was pleased to note the refurbishment of Astronomy teaching accommodation at the Acre Road Observatory which had taken place since the previous Periodic Subject Review in 2012. This had facilitated significant enrichment of the lab work now being undertaken by students. Similarly, serious limitations in the accessibility of the Kelvin Building had been highlighted in the previous Review, and detailed plans were now in place to address this, with work anticipated to be undertaken over the summer of 2018. The SER noted that it was a matter of regret that serious accessibility issues had taken so long to resolve.

- 4.3.4 The Review Panel noted that many Annual Monitoring Reports highlighted problems with timetabling, room allocation and appropriate space for lectures. This reflected intense pressure on teaching accommodation across the whole University.

Engaging and Supporting Staff

Early career support

- 4.3.5 The Review Panel met with a number of staff who were either participating in the early career programme or had recently completed it. They told the Panel that on the whole they felt well supported in their roles, and that there had been careful management of their workload with staged increases in their teaching commitments. All staff had a mentor who was available to provide support particularly in relation to their progression through the early career structure, but more broadly they found colleagues willing to provide information and support as required and the value of these informal networks was acknowledged. The Review Panel recognised the School's approach in the management of early career staff as **good practice**. Staff acknowledged the value in some of what was covered in the Postgraduate Certificate of Academic Practice but the general view was that it represented a big commitment in relation to its practical usefulness.

Demonstrators (Graduate Teaching Assistants)

- 4.3.6 Demonstrators played a key role in the delivery of teaching, particularly in supporting the undergraduate labs. The Review Panel heard from the demonstrators that allocation of duties was arranged in consultation with the School Registrar and that there was a degree of flexibility, allowing some to request additional work. Regrettably some demonstrators had experienced a delay in receiving payment for their work, with semester 1 payments not being received until December. The demonstrators had all completed the statutory training though this was of limited value in relation to labs, as the focus was more on classroom based teaching. There was some discussion of the potential for training videos to be produced, possibly for both Physics and Chemistry lab demonstrators, to cover the supporting of labs and carrying out the associated assessment. The demonstrators who met with the Review Panel felt that in general they were well prepared for labs by sessions with the lab head and technical staff or demonstrators who had carried out the work before. (See also paragraph 4.1.9.)
- 4.3.7 The undergraduate students who met with the Review Panel had had a somewhat mixed experience: they found that the demonstrators in the main were helpful but were sometimes stretched in years 1 and 2 given the large number of students in the lab and some seemed unsure of how to solve problems that arose. Their impression was that labs in year 3 seemed to be better staffed.

5. Academic Standards

- 5.1.1 The Review Panel was satisfied that the evidence provided for the Review showed that robust processes were in place for course and programme approval (aligning with the requirements of Subject Benchmarking and accreditation), and for the quality assurance of teaching and assessment. External Examiner reports were positive and the Panel noted that where an issue of concern had been raised concerning articulation with a partner institution's degree regulations, it had been properly discussed with the School and a response provided in liaison with the Senate Office.

Student Feedback

- 5.1.2 Some frustrations were expressed by the undergraduate students regarding the staff-student liaison committee. One rep noted that, despite contacting students in advance

of meetings and inviting them to bring forward issues for discussion, there was very limited engagement. Others knew of issues that students had brought forward that had then not been raised by the rep at the meeting, sometimes because the rep had not been in attendance. The SER noted that it was possible that a clash between the course evaluation survey window and student rep surveys in advance of SSLC meetings was unhelpful in this respect. Some of the students meeting with the Review Panel said that they had never seen any feedback from SSLC meetings and did not know how to access the information. There was a view that if responses to issues raised at SSLC could be made more visible to all this would promote student engagement too. The Panel noted that minutes from meetings were posted on Moodle, so more proactive awareness-raising might be needed. Reference to the class reps website could be useful in this respect.

- 5.1.3 During the Review visit there were a number of discussions on course evaluation. Response rates were variable. Undergraduates expressed the view that it was not clear that responses went to someone other than the lecturer. For some, this fact, combined with the anonymity of the survey, made it a preferable means of providing feedback as compared with the SSLC. The Review Panel was disturbed to hear from staff that some of the feedback given through course evaluation surveys was inappropriate and personally offensive, which undoubtedly was the very undesirable result of anonymity. The Panel **recommends** a review of the wording of the University's message inviting students to complete course evaluation surveys, to include a clear direction on the unacceptability of such comments.
- 5.1.4 In discussion with the Review Panel, the undergraduate students noted that (as reported in the SER) staff responses to the course evaluation feedback varied, with some reporting to the class direct and some posting the information on Moodle. From the meetings with the Panel, it was clear that staff welcomed students raising issues in whatever way suited them, and that the students knew that staff wished to understand their views and were likely to provide a response.
- 5.1.5 The undergraduate students told the Review Panel that they were unclear as to how labs were evaluated. The students had responded to a survey being carried out by 3rd/4th year students but did not know what had been done with the information that had been gathered. At the meeting with staff it was noted that the lab survey carried out by students was not complete by the end of the labs and this meant that the feedback loop was not being closed with the cohort who had provided the responses. It was acknowledged that this would be straightforward to address and the Panel **recommends** that this is taken forward.

6. Collaborative provision

- 6.1.1 The SER described the School's involvement in two doctoral training centres, which were collaborations with the University of Edinburgh and Queen's University, Belfast respectively. These projects also involved the Schools of Engineering (both) and Chemistry (Edinburgh only). The associated PGT provision included placement options in industry and throughout the programmes there was a strong emphasis on skills training for future employment in industry.

7. Summary of perceived strengths and areas for improvement

7.1 Key strengths

The Review Panel identified the following areas as key strengths:

- Staff who, in the face of considerable challenges, are dedicated to delivering the best possible student experience
- Integration into teaching of strength in research
- Equality and Diversity, particularly in relation to gender and widening access.

7.2 Areas for improvement

The Review Panel highlighted the following areas for improvement:

- Review of academic time engaged on administrative matters
- Study abroad
- Assessment and feedback in relation to undergraduate labs.

Specific recommendations addressing these areas for work are listed below, as are a number of further recommendations on other matters.

8. Conclusion

The Review Panel welcomed an open and constructive engagement with the School of Physics and Astronomy. While facing considerable pressures, the School maintains a strong collegial approach to providing a student experience which is stimulating and well supported.

The Review Panel, guided by the views of the External Subject Specialist confirmed that, at the time of the Review, programmes offered by the School of Physics and Astronomy were current and valid in light of developing knowledge in the discipline and of practice in its application.

8.1 Good Practice

The following good practices were identified in order of appearance in the Report:

Good Practice 1

The Panel recognised the particularly valuable role played by class heads in supporting the staff involved in teaching in their respective years. This included the oversight of Moodle, and the dissemination of information to the staff about programme level issues. The Panel considered this to be good practice and encourages the School to continue to use this role as a key focus for dissemination of good practice within the School. [Paragraph 4.1.6]

Good Practice 2

The Review Panel met with a number of staff who were either participating in the early career programme or had recently completed it. They told the Panel that on the whole they felt well supported in their roles, and that there had been careful management of their workload with staged increases in their teaching commitments. All staff had a mentor who was available to provide support particularly in relation to their progression through the early career structure, but more broadly they found colleagues willing to provide information and support as required and the value of these informal networks was acknowledged. The Review Panel recognised the School's approach in the management of early career staff as good practice. [Paragraph 4.3.5]

8.2 Commendations

The Review Panel commends the School on the following, which are listed **in order of appearance** in this report:

Commendation 1

One of the most prominent themes throughout the Review was the increasing pressure on the School arising from a significant reduction of the staff : student ratio. The staff : student ratio for 2016-17 was 1:16.1 which, as noted in the SER, was currently the lowest ratio for Physics and Astronomy amongst the Russell Group institutions. The Review Panel concluded that within the School there remained a shared commitment to delivering the best possible student experience, and a sense that colleagues were facing the difficulties in a collegial manner. The Review Panel commends the School for this. [Paragraph 2.4.3]

Commendation 2

The SER described the well established and extensive work undertaken by the School in engagement with schools and teachers (for example, over the last two years more than 100 Advanced Higher Physics pupils had come to the School to undertake experiments for their projects). Efforts to target priority schools had had impressive results, with the SER noting that for the student cohorts registering in 2013, 2014 and 2015 more than 25% had a widening participation status. The Review Panel was pleased to note that monitoring by the School found that progression rates for these students were very similar to those for the overall cohorts. The Review Panel commends this achievement. [Paragraph 3.1.2]

Commendation 3

The Review Panel noted the School's excellent work, described in the SER, in promoting equality and diversity. In relation to gender equality, this was recognised in the award of Juno Champion and Athena Swan Silver status. The Review Panel commends this on-going work. [Paragraph 3.1.5]

Commendation 4

The SER articulated the value placed by the School on the Project work carried out by undergraduates in their final year of study. Staff were committed to ensuring that students had a high quality research experience. Despite the pressure from increasing student numbers, the School's view was that it was important to offer an individual project rather than moving to students working in pairs. Both groups of students who met with the Panel spoke of the desirability of the opportunity to participate in renowned research groups. For some, awareness of this feature of the School's provision had been significant in their decision to come to study at Glasgow. In discussion with PGT students, it was noted that students were notified of the available projects and were invited to express their preferences. In addition, they were encouraged to approach staff with their own proposals, which the students regarded very positively. The Panel commends the School for this continuing commitment to supporting an individual project offering a high quality research experience. [Paragraph 4.1.13]

8.3 Recommendations

The following recommendations have been made to support the School of Physics and Astronomy in its reflection and to enhance provision in relation to teaching, learning and assessment. The recommendations have been cross-referenced to the paragraphs in the text of the report to which they refer and are **ranked in order of priority**. The Review Panel notes that several of the Recommendations relate to areas already identified by the School for further development.

Recommendation 1

The Review Panel recommends that the School continue to review possible means of alleviating the administrative burden currently carried by academic staff. The Panel is not able to recommend resource investments per se, but would stress the need for this aspect of administrative support to be considered from a strategic perspective so as to create capacity for the learning and teaching developments identified elsewhere in this report. The Panel also notes that the College is currently conducting a comprehensive review of support services, and this may impact on the School's response to this recommendation. [Paragraph 4.3.2]

For the attention of: The Head of School
For information: The Head of College, Dean of Learning and Teaching

Recommendation 2

The Review Panel recommends that the School reflect on the various mechanisms by which good practice is currently disseminated and develop a more systematic means of sharing innovations and good practice to all staff within the School with a view to delivering a more consistent learning experience across all programmes. The School might also consider defining a set of minimum expectations for staff and students to ensure some consistency in delivery, whilst not restricting pedagogic freedom and innovation. In making this recommendation the Panel notes the proposal referred to in the SER for the introduction of a regular staff event for this purpose. [Paragraph 4.1.6]

For the attention of: The Head of School
For information: Dean of Learning and Teaching

Recommendation 3

The Review Panel recommends that the School review the training provided to demonstrators in relation to:

- their supporting undergraduate labs, with particular emphasis on promoting problem-solving techniques for the students both in completing the labs and in being assessed by interview. [Paragraph 4.1.9]
- their assessment of the undergraduate labs, with particular emphasis on achieving consistency in the amount of feedback provided to students, the provision of feedback that will identify to students how they can improve their grades (including how to achieve the highest grades), and the delivery of adequate preparation for their conducting of interviews. The demonstrators' view (paragraph 4.3.6) was that statutory GTA training was of limited value in relation to labs, as the focus was more on classroom based teaching and the Panel notes that some work is already underway on these matters in the College of Science and Engineering. [Paragraph 4.2.9]

For the attention of: The Head of School
For information: The Dean of Learning and Teaching
Ms Nathalie Sheridan, LEADS

Recommendation 4

The SER noted that the number of students undertaking either one semester or one session of study abroad in the last six sessions ranged from two to ten. In the SER it was explained that students were encouraged to undertake study abroad during their second year. The undergraduate students who met with the Review Panel noted that in order to go abroad in semester 1 of second year they were required to put themselves forward during their first semester at the University. At that point many of

them had not felt ready to consider that possibility and the strong view was expressed that more interest would be generated if study abroad opportunities during third year were promoted. The Review Panel recommends that, with a view to the achieving the University's strategic target for at least 20% of students to experience a period of international mobility, the School review its approach to promoting study abroad in year 2 and investigate the feasibility of promoting opportunities for a year or a semester abroad during third year, as is the norm across the University. [Paragraph 4.1.16]

For the attention of: The Head of School

Recommendation 5

In the SER it was explained that opportunities for industrial placements were limited. In discussion with the Review Panel, the Head of School indicated that furthering links with industry had already been identified as an area for future development. The Panel noted that links with industry offered the potential for alleviating some of the burden on School staff in relation to the supervision of student projects. The students also referred to such links representing valuable work experience relevant to finding employment after graduation. There was currently some activity in this area on PGT programmes through the External Advisory Board. There was an aspiration to broaden the work of the Board to encompass undergraduate students and the Head of School expressed the view that there could be value in involving some College-level input as well. In view of the potential benefits to be gained both by staff and students in this area, the Review Panel recommends that the School move forward with this work as a priority. [Paragraph 4.1.17]

For the attention of: The Head of School

For information: Dean of Learning and Teaching

Recommendation 6

The Review Panel recommends that the School reflect on the feedback received in relation to small group teaching to minimise inconsistency in what is currently delivered and to review the potential for varying the format so as to maximise meaningful attendance and response to the issues on which students wished to have more input. This might benefit from some external comparison with peer institutions that also value small group provision as well as with other Schools in the College that continue with the practice such as Mathematics and Statistics. [Paragraph 4.1.11]

For the attention of: The Head of School

Recommendation 7

The Review Panel learned about a recent change to the fourth year curriculum for integrated Masters students: in response to an identified weakness in the key skills of report writing, the fourth year practical project had been replaced with the Physics Literature Project, which offered students the opportunity to look in-depth at a chosen research topic. The undergraduate students acknowledged that there was value in this but they were concerned that the change meant that in fourth year they undertook no practical work and could be short of experimental practice for the crucial project in fifth year. The Panel recommends that the School reflect on the concerns being voiced by students regarding the lack of practical work in year 4 and consider how best to either reassure students that this should not put them at a disadvantage or incorporate some element of advanced practical work into the curriculum. [Paragraph 4.1.14]

For the attention of: The Head of School

Recommendation 8

The Review Panel noted the on-going work in relation to the teaching of programming in the curriculum. The Panel noted that a Working Group on this issue had produced an interim report in May 2017, putting forward a wide range of proposals and areas for further investigations. The Review Panel recommends that the School continue this work to focus efforts on revising the provision of computing teaching in the curriculum. [Paragraph 4.1.15]

For the attention of: The Head of School

Recommendation 9

The Review Panel was disturbed to hear from staff that some of the feedback given through course evaluation surveys was inappropriate and personally offensive, which undoubtedly was the very undesirable result of anonymity. The Panel recommends a review of the wording of the University's message inviting students to complete course evaluation surveys, to include a clear direction on the unacceptability of such comments. [Paragraph 5.1.3]

For the attention of: The Senate Office

Recommendation 10

The undergraduate students told the Review Panel that they were unclear as to how the teaching of labs was evaluated. The students had responded to a survey being carried out by 3rd/4th year students but did not know what had been done with the information that had been gathered. At the meeting with staff it was noted that the lab survey carried out by students was not complete by the end of the labs and this meant that the feedback loop was not being closed with the cohort who had provided the responses. It was acknowledged that this would be straightforward to address and the Panel recommends that this is taken forward. [Paragraph 5.1.5]

For the attention of: The Head of School