

UNIVERSITY OF GLASGOW

Report from the Review of Departmental Programmes of Teaching, Learning and Assessment of the Department of Chemistry held on Friday 25 April 2003

Review Panel

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| Professor Robin Leake | Vice-Principal (Estates & Buildings) and Territorial Vice Principal (Science and Engineering) [Convener] |
| Dr Vicky Gunn | Teaching and Learning Service |
| Professor David O'Hagan | Professor of Organic Chemistry, School of Chemistry, University of St. Andrews |
| Professor Richard Pethrick | Professor of Chemistry and Head of Department of Pure and Applied Chemistry, Strathclyde University |
| Professor John Sewell | Senate Assessor on University Court |
| Ms Wendy E Muir | Senate Office [Panel Secretary] |
| Mrs Alison Spurway | Senate Office [Observing] |

A. Introduction

- A.1 The Department of Chemistry was last reviewed internally in session 1992-93 and had been the subject of a Faculty Review in the autumn of 2002. The Department received a rating of 'Excellent' in the (SHEFC) Teaching Quality Assessment held in 1994 and a 4 rating in the 2001 Research Assessment Exercise.
- A.2 The Department had provided a self-evaluation report (SER) and supporting documentation in accordance with the University's requirements for the Review of Departmental Programmes of Teaching, Learning and Assessment.
- A.3 The Panel met with the Head of Department and Deputy Head of Department, Professor Chris Gilmore and Dr Bob Hill, respectively and subsequently with key staff. The Panel also met with four probationary members of staff and with seven post-graduate demonstrators who represented hourly-paid staff. The Panel received written submissions from two MSc students and met with approximately twenty undergraduate students, from all levels of the, and across the range of, degree programmes offered by the Department.
- A.4 The Panel considered the following range of provision offered by the Department:
Honours Master in Science (M.Sci.) degree programmes:
Chemistry* (4 year course)
Chemistry with Work Placement* (5 year course)
Chemistry with European Placement* (5 year course)
Chemistry with Medicinal Chemistry *(4 year course)
Chemistry with Medicinal Chemistry with Work Placement* (5 year course)
Chemistry with Medicinal Chemistry with European Placement* (5 year course)
Chemical Physics* (4 year course)

Honours B.Sc. degree programmes:

Chemistry*
Chemistry with Medicinal Chemistry*
Chemical Physics
Environmental Chemistry
Environmental BiogeoChemistry
Environmental Chemistry and Geography (joint degree)

B.Sc. designated degree programmes:

Chemistry
Chemistry with Medicinal Chemistry
Environmental Chemistry
Biology and Chemistry (joint degree)
Chemistry and Mathematics (joint degree)
Geography, Chemistry and the Environment (joint degree)

Various components of the Honours years might also be taken as modules contributing to B.Sc. (General) or B.Sc. (Designated) degrees.

- A.5 The Royal Society of Chemistry (RSC) had accredited the BSc Honours programmes in Chemistry and in Chemistry with Medicinal Chemistry in 1996/97. In March 2003, the Department of Chemistry submitted those degrees marked with an asterisk above for accreditation with the RSC.

B. Summary Report

- B.1 The Department of Chemistry offered a broad spectrum of degrees with recent developments in Chemistry with Medicinal Chemistry and Chemical Physics and the introduction of work placements. These developments indicated a responsiveness by the Department to the changing requirements of the chemical industry, to tracking changes and to appreciating the contemporary emphasis in international Chemistry including developing research and teaching programmes at the Chemistry-Biology and Chemistry-Materials interfaces.¹ The Department had a good history of producing well-qualified graduates for careers in professional Chemistry and other areas. The Department was clearly aware of the QAA Chemistry subject benchmark statements and it was evident that the subject-benchmarking criteria had been addressed, where appropriate. The Department provided opportunities for acquiring, developing and assessing transferable skills which was also consistent with the benchmark statements. Aims and intended learning outcomes were set out in full in all course handbooks and it was considered that there was a strong link between the intended learning outcomes and assessments.
- B.2 The Review Panel was pleased to note that recruitment to Chemistry was still vibrant particularly when compared with national trends and the Department was pro-active in its liaison with schools and through its involvement in the pre-University summer school. It was also aware of the range of entrants to Chemistry and responsive to their differing needs with the provision of additional support to students in their early years through extra tutorials and pre-laboratory sessions plus the monitoring of weaker students.
- B.3 Academic staff used a range of learning and teaching approaches and the students particularly appreciated these. Each course was supported by a handbook in which course descriptions were set out in a clear and user-friendly way. The Department also demonstrated good attention to progression through the levels. The Department demonstrated pro-active and well-embedded procedures for self-reflection and review of provision with the recent examples of the reviews of Physical Chemistry and General Chemistry 1.

¹ This was consistent with the RSC/APSRC International Review of UK Chemistry (Whitesides, 2003)

- B.4 The Panel applauded the early careers advice given to students which commenced at Level 1 and at each subsequent level of provision, involving the University Careers Service and recent graduates from industry and other vocations. The Department had made use of internal and external resources to enhance the quality of its provision through the development of the Interactive Teaching Units supported through the University's Teaching and Learning Development Funds and the LTSN Chemistry Subject Centre. Staff were also involved in personal development planning for students using resources developed by the RSC and attending LTSN conferences on this matter. Students from Year 2 onward were encouraged to use the RSC Undergraduate Skills record.
- B.5 The Panel found the meeting with undergraduate students to be an extremely positive experience; the students exhibited enthusiasm for their courses and appreciation of the efforts of staff in being responsive and in providing an interesting and valuable educational experience.
- B.6 External examiners' reports testified that standards were high and that the Department was responsive to the comments made in external examiners' reports. The Department followed standard University practices (student feedback questionnaires, staff student liaison committee, annual course monitoring reports, etc). Staff were very responsive to student feedback, which the students appreciated. The Department also reviewed the effectiveness of teaching by analysing student performance in examinations.
- B.7 The Review Panel recognised that the Royal Society of Chemistry (RSC) had changed its policy on the accreditation of degree programmes and would normally only accredit MSci degrees. Degree programmes that were either joint with another subject, delivered at BSc Honours level or having insufficient depth in Chemistry would in future not be accredited by the Society. The Panel learnt that all the Department's programmes had been recognised by the RSC. The Department was in discussion with the RSC about accreditation of its MSci programmes and fully expected some of them to be accredited by the RSC early in 2004.
- B.8 The Review Panel concluded that the provision under review was of a very high standard. However, the Panel considered that there were a number of areas for development to further strengthen provision. These are discussed below along with associated recommendations.

1 Range of Provision

1.1 Range of Degree Programme

The Panel explored with the Head and Deputy Head of Department if, in their view, the Department was offering too many degrees as some programmes had very small student numbers. It was their view that the range of degree programmes offered was an attraction in terms of student recruitment and that there was efficiency in terms of teaching as there was a significant commonality in the courses contributing to different degree programmes. It was a departmental aim in introducing any new degree programmes (including new joint degrees with other departments) not to increase the teaching load and to use existing courses. The Panel noted that Level 3 courses had been designed to meet the requirements of those who wish to enter teaching.

1.2 MSc/Postgraduate Diploma in Environmental and Analytical Chemistry

The Panel had a number of concerns about the MSc/Diploma in Environmental and Analytical Chemistry in relation to low student numbers and compliance with the Scottish Credit and Qualifications Framework (SCQF). It had been noted from the SER and supporting documentation that while the programme attracted a lot of enquiries, actual student numbers were extremely low (6, 4, 0, 1 and 2 in the past five years). The main reason given for the low numbers was the difficulty of obtaining funding; students were mainly from the EU or overseas. The SER also indicated that the programme did not require much in the way of additional resources as it used existing courses in the main. The programme comprised a

foundation section plus a core and option sections. The foundation section was generally at undergraduate Level 2 with the core and option sections at undergraduate Levels 3 or 4. A project was also a requirement of both the MSc and PG Diploma but of varying lengths. Given the Level of courses, the Panel was concerned that the MSc was not compliant with the SCQF definition for a Masters degree which was that at least 150 SCOTCAT points out of 180 should be at the Scottish Masters level. The Panel noted the generally positive comments in the written submissions from the two students currently on the programme, both of whom were from overseas. The comments from the external examiner for this programme were also noted, including the comment in one report on students' views that some had found it detrimental to morale for post-graduate students to be in lectures with Level 2 undergraduates. The Review Panel **recommends** that the Department should seriously consider withdrawing the MSc in Environmental and Analytical Chemistry. Should the Department decide not to withdraw the programme then it must become compliant with the requirements of a Masters degree within the Scottish Credit and Qualifications Framework.

1.3 *Environmental Chemistry*

Environmental Chemistry undergraduate and taught post-graduate teaching was provided by the Environmental, Agricultural and Analytical Chemistry section of the Department. It appeared to the Panel that this section operated as a relatively self-contained unit. The undergraduate environmental Chemistry students who met with the Panel commented that they did not feel part of the mainstream Chemistry Department. The Panel noted from the Executive Summary of the Faculty Review of the Department of Chemistry the recommendation that the future of the Environmental and Agricultural Chemistry should be considered and that there was a possibility of aligning this Section with the Centre for Geosciences once this was firmly established. The Panel concurred with the recommendation from that Review.

2 **Aims and Intended Learning Outcomes**

Programme Aims

The Panel had received details of programme aims as part of the supporting documentation for the review. It was also noted that the SHEFC TQA report from 1994 had recommended the introduction of explicit aims at the programme level. Whilst the Department had made some progress in the development of programme aims, the Panel considered that further work was required. For example, there was insufficient distinction between the Designated and Honours degree programmes and between the different subject disciplines offered by the Department. The Review Panel **recommends** that the Department, in conjunction with support from the Teaching and Learning Service, further develop programme aims and intended learning objectives for the range of programmes offered by the Department.

3 **The Curricula**

3.1 *Mathematics*

3.1.1 The Review Panel discussed at some length in all meetings the issue of mathematical content and teaching at different stages in the undergraduate curriculum. At Level 1, the Department offered the General Chemistry 1 module: this was mainly a service course for other departments in the University, particularly in the biological sciences. Some students choosing to study biological sciences lacked school qualifications in chemistry, physics and mathematics. It was noted that those students intending to study Chemistry generally undertook the Chemistry 1 module in their first year. As the Department succeeded in recruiting students from the biological sciences, the lack of a formal mathematics qualification might prove problematic as students progressed through the Levels. The Panel was told that General Chemistry 1 was in the process of being reviewed with a view to replacing it with a Science foundation module. This was

currently at the planning stage with a team comprising members of the Faculty of Biomedical and Life Sciences and the Departments of Chemistry, Physics and Mathematics.

3.1.2 The Panel recognised that the lack of mathematical skills amongst students entering the sciences was a major problem nationally. The Panel acknowledged the steps that the Department was taking in order to address the issue of poor mathematical ability and that it had introduced remedial Mathematics tutorials to assist students. The undergraduate students who met with the Review Panel commented that they would have been put off studying Chemistry had mathematics been a requirement on entry. The students acknowledged that the range of degrees offered by the Department could cater for varying mathematical ability and background and recognised that Physical Chemistry had a higher mathematics content. However, it was the view of some students and academic staff, and of the Review Panel, that students' comprehension of the whole curriculum was less good overall where students had a poorer understanding of mathematics. The Panel was informed that the recent review of Physical Chemistry would bring together the two current courses of Chemistry 3 and Chemistry with Medicinal Chemistry 3 into one core programme with a view to making Physical Chemistry more accessible to those who had difficulty with mathematics

3.1.3 Students told the Panel that they were provided with a handbook on mathematics and were directed to textbooks but it was their general view that it was difficult to learn mathematics from a book. Academic staff, including the probationary staff, recognised the need to apply mathematics to the context of what was being taught and not to be too theoretical. It was also recognised that part of the problem was the students' lack of confidence in their own mathematical ability. The Panel recognises the difficulties the Department faces in enthusing students about the study of mathematics so the Panel **recommends** that the Department should:

- (i) develop a strategy to integrate mathematics in an applied context with a view to overcoming student concerns about their mathematical abilities
- (ii) discuss possible strategies with the Teaching and Learning Service and the Mathematics Department;
- (iii) explore working with the Faculty Effective Learning Advisor in supporting student learning in the early years with a view to setting mathematics in context and enhancing student comprehension and confidence in mathematical aspects of the curriculum.

3.2 *Theoretical Vs Applied Approach to Teaching the Curriculum*

The Review Panel noted from the subject information provided for students (e.g., course handbooks) and from discussions with undergraduate students and academic staff that efforts were made to apply Chemistry in context. Nevertheless, the Panel considered that there were other areas which might benefit more from presenting material less theoretically within handbooks, teaching and in module titles. It was considered that the applied approach had been used more extensively within Chemistry and in Chemistry with Medicinal Chemistry and that there might be greater scope for extending this approach within Chemical Physics, for example with more explicit reference to recent Nobel prize winners, etc. Some detailed suggestions had been provided by Professor O'Hagan which would be passed to the Department for consideration. The Panel **recommends** that the Department should continue to implement an applied approach to the teaching of the curriculum and should give consideration to extending this approach to Chemical Physics or to making it more explicit.

3.3 *Health and Safety Training*

Given the importance of health and safety to Chemistry, the Panel was interested to learn about the training provided by the Department. Academic staff advised the Panel that students were made aware of health and safety issues from the outset of their studies within the Department. Early in Levels 1 and 2 a safety talk was given. At Level 3, several hours were spent on this aspect, with the use of video materials and appropriate cross-referencing to relevant regulations. Environmental Chemistry 3 contained a specific component on safety training, which was assessed. With respect to the work placement elements of certain degree programmes, the Panel learned that the Department was collaborating with placement organisations (e.g., Glaxo Smith Kline) to develop a Code of Practice on health and safety and related issues. The Panel was of the view that the Department was addressing health and safety adequately.

4 **Assessment**

4.1 *Fourth Year Projects*

In the meetings with the Head and Deputy Head of Department and key academic staff, the Panel explored the matter of the assessment for fourth year projects. The Panel was informed of, and satisfied with, the moderation arrangements in place but had some concerns that the Department did not use an outline-marking scheme for the assessment of projects. It was noted that such schemes were used in other parts of the University (e.g., engineering) and also within the Chemistry Department at Strathclyde. Such schemes assisted in standardisation of marking across projects by allocating a certain percentage of marks to different aspects of the project. The Panel **recommends** that the Department should consider the introduction of a marking scheme for the assessment of fourth year projects and should seek guidance from other parts of the University (e.g., Teaching and Learning Service, Faculty of Engineering etc.) and from other Chemistry departments on possible models with a view to increasing the standardisation of marking across projects.

4.2 *Assessment of Teamwork*

The Review Panel was advised in the meeting with key staff that team-work was assessed at Level 3 when students had to undertake projects as a group. Currently, academic staff did the assessment. The Panel suggested that a component of student peer assessment of projects could be helpful and beneficial for group-work as it could help to overcome plagiarism which was a concern expressed in the meeting with undergraduate students in the context of working in pairs in laboratories. The Panel **recommends** that the Department gives consideration to student peer assessment of teamwork and should invite the Teaching and Learning Service to provide guidance on how this might be implemented.

4.3 *Marking of Laboratory Reports*

4.3.1 In the light of comments noted in student feedback questionnaires regarding possible variation in marking standard of laboratory reports by postgraduate demonstrators and given that laboratory reports contributed to the final assessment, the Panel explored the moderation arrangements in most meetings. The Panel was told that demonstrators were given a detailed marking brief and that academic staff in the laboratories monitored marking by demonstrators. In addition, the Panel was advised in the meeting with key staff that the Department was using software for monitoring the marks allocated by demonstrators and that this had shown that there was very little spread in the marking range. In exploring the matter with the postgraduate demonstrators, it appeared that undergraduate students were rarely failed as it was considered that poor marks could seriously de-motivate students, particularly those who lacked confidence or prior experience. Getting the students to redo the experiment or spending time going through the experiment with the student was the demonstrators preferred approach. The Panel

recommends that academic staff should give more guidance to postgraduate demonstrators on how to deal with students who perform poorly in laboratory experiments.

- 4.3.2 It was noted that marking was done only within laboratory sessions and that, in the view of postgraduate demonstrators, this contributed to approximately a third of the time within a session. Queues could build-up for attention by demonstrators as students were meant to get one experiment marked before moving on to the next. However, some students did not stick to this pattern and 'stacked-up' experiments to be marked. The Panel was told that where this happened, some demonstrators would only mark one experiment and then send the student to the back of the queue to discourage such practice. (See paragraph 5.4.1 for more detail and paragraph 5.4.3 for associated recommendation.)

4.4 *Code of Assessment*

- 4.4.1 The Panel noted from the SER that the Department had some concerns about the new Code of Assessment, in particular the rules for aggregation of grades. The Panel **recommends** that the Department should report to the Vice Principal (Learning & Teaching)/Clerk of Senate any real concerns encountered as a result of the implementation of the Standards section of the Code of Assessment so that these might be addressed by the Assessment Working Group.
- 4.4.2 It was noted that student course handbooks at Levels 1 and 2 contained some information on grade point averages but there was no similar information within those for Levels 3 and 4. In addition, the grade descriptors provided did not reflect those contained within the new Code of Assessment (page Gen 30). The Panel **recommends** that fuller details should be provided within student handbooks on the descriptors for attainment of intended learning outcomes so that students are aware of the definitions of the different levels of performance at non-honours and at honours levels.

5 **Learning and Teaching**

5.1 *Work Placement*

- 5.1.1 The Department had first introduced a work placement element to the Chemistry degree in session 2001-02. Those students who met with the Panel who had chosen the work placement route were very positive about their experience and considered themselves to be better chemists as a result. It was noted that the students considered that they had received very good support from the Department in terms of preparation for the placements (such as guidance on preparation for interviews etc.). However, it was their view that there was a need for more work on reintegrating students back into academic study after the year away from the University, particularly as they were joining a different cohort. The matter of reintegration had also given rise to some concerns about what students would be examined on as they might not have had contact with a particular subject for two years. Some students who had not undertaken a placement commented that they felt at a disadvantage in terms of their personal development and the view was expressed that there was a need for better promotion of placement opportunities.
- 5.1.2 The Panel learnt that a placement officer had recently been appointed (one of the probationary members of staff) in recognition of the need for further development in this area. The Department was in the process of looking at the Faculty of Biomedical and Life Sciences placement programme as a model of good practice and, as was mentioned earlier, was collaborating with placement companies such as Glaxo Smith Kline. The main aim was to produce user friendly documents for students. The Deputy Head of Department informed the Panel that students were currently sent tutorial packs

whilst on placement but there were plans to develop some web-based learning materials for those who were on their year out. It was also noted that academic staff would like to see more supervision of those students on work placement and plans were afoot to visit all students more than once whilst on placement. Currently students did have regular contact with academic staff via email or phone.

- 5.1.3 The Panel recognises and supports the action being taken by the Department with a view to improving procedures for work placement and the experience for students. The Panel **recommends** that the Department should consider how it might better promote placement opportunities to students. The Panel also **recommends** that the Department continues to seek feedback from students during, and on return from, placements with the view to making it as positive and experience as possible.

5.2 *Lecturing Styles*

The Review Panel noted that the Department was moving increasingly to the use of PowerPoint presentations to enhance the effectiveness of delivery and explored this aspect in the meeting with undergraduate students. Students generally received the move to PowerPoint as a positive development but there was a need to achieve a balance in terms of speed of delivery, the inclusion of special effects and animation without losing the benefits of improved clarity of information and comprehension by students. It was noted that lecturers had collected feedback from students on the use of PowerPoint and changes had been implemented as a result, such as providing a handout with key aspects of the presentation but which required students to complete other aspects themselves. The Panel **recommends** that the Department should continue to seek feedback on presentation methods in lectures with a view to enhancing the effectiveness of student learning.

5.3 *Teaching of Pharmacology*

The undergraduate students who met with the Panel were very positive about, and appreciated the lecturing style of, academic staff within the Chemistry Department, which in their view adopted a logical and problem-solving approach. However, Level 3 and 4 students studying Chemistry with Medicinal Chemistry were much less positive about the lecturing style of pharmacology staff in the Faculty of Biomedical and Life Sciences. Chemistry staff had made the students aware of different teaching and learning approaches and lecturing styles, and whilst the students understood this, the difficulties encountered by students had not necessarily been overcome. Feedback had been provided at the staff/student liaison committee and the Head of the Chemistry with Medicinal Chemistry course had been proactive in raising issues with pharmacology staff. However, an added problem for the Head of the course and students was that pharmacology staff changed from one year to the next. The students also commented on different approaches to assessment in pharmacology where essay-style questions were used; this was not an approach adopted by Chemistry so students had little prior experience of this style of examination. The Panel recognises that teaching and assessment approaches vary between Faculties but **recommends** that students should be given an adequate introduction to Pharmacology courses including a full explanation of the approach to teaching and assessment by both Department/Divisions. The Panel also **recommends** that Chemistry and Pharmacology staff discuss how best to address the issue of different styles of teaching and assessment.

5.4 *Laboratory Work*

- 5.4.1 The Panel explored with all the groups with whom it met how laboratory sessions operated in practice. It was noted that at Level 1, where student numbers were in the region of 500 in Chemistry 1 and 230 in General Chemistry 1, there was approximately one demonstrator to 20-25 students. Academic staff with responsibility for the experiments were also present in the laboratory. Level 1 students indicated that they could spend quite a bit of time queuing, waiting to see a demonstrator either for assistance or to get an experiment marked before moving onto the next one. Students

also wanted feedback on how an experiment had been written up. There appeared to be some variation in practice as to whether or not academic staff or demonstrators spent time demonstrating at the start of a laboratory session. Students commented that they would find a demonstration helpful before starting a session. In response to a query, they also commented that they would find it helpful to have an early tutorial on how to write up experiments. The academic staff and demonstrators recognised the need to keep students motivated during laboratory sessions so that they were not a negative student experience.

- 5.4.2 The students recognised that they were partly responsible for queues building up and that good time management on their part (such as starting early, returning to another laboratory session to finish off experiments, not backing-up experiments to be marked, etc) could reduce queuing. As noted previously, marking took place during laboratory time and could amount to approximately one third of the time in a laboratory session. The practice at Strathclyde was for marking to be done outwith the laboratory session
- 5.4.3 The Review Panel **recommends** that the Department should review its teaching practices within laboratories with a view to maximising the time that academic staff and demonstrators are available to support students. This might include running pre-lab demonstrations, offering an early tutorial on how to write up experiments, marking laboratory reports outwith laboratory time, adopting a more proactive approach to students' time management. The review should apply mainly to the Level 1 laboratories but might also benefit other levels.

6 Learning Resources

6.1 Human Resources

- 6.1.1 The Panel was aware that the Department had just completed a major restructuring which had resulted in a reduction in senior academic staff and the loss of five technical staff. It was predicted that by 2004, staff numbers should stabilise at circa 33 which the Head of Department considered to be a realistic figure and in line with comparable departments in the UK. The Panel had some concerns that academic staff might be overly committed given the Department's ambition to achieve a 5 rating in the next RAE whilst seeking to maintain a proactive approach to the recruitment and retention of students to chemistry. A workload model was in operation within the Department which took cognisance of teaching, research and administrative contributions.
- 6.1.2 In discussion, the Panel was told that the distribution of teaching was determined by the Head of Department and was normally distributed on the basis of appropriateness for the specific course and taking into account overall workloads. Although the Review Panel had only received information on the teaching element of the workload model, the Head of Department advised that all staff could see their own workload score and those of others in an anonymised format to aid transparency in the allocation of duties. The Panel was informed in the meeting with key staff that they did look for opportunities to reduce the burden on staff and cited the recent review of Physical Chemistry as one such example. This review had led to a reduction in staff teaching time by offering a single core Level 3 module in Physical Chemistry rather than offering two different streams, one being Chemistry and one for Chemistry with Medicinal Chemistry.
- 6.1.3 The Department was also aware of the future challenges faced given the age profile of both academic and technical staff. With respect to the latter, it was noted that current staff numbers were considered just sufficient to maintain an adequate standard of service and this has been achieved through the reallocation of technicians between research and teaching. However, absence through illness or other reasons did put pressure on the level of service. The Head of Department reported that it had not been

past practice for technical support to be included within applications for research grants but this was now a standard requirement.

- 6.1.4 In the meeting with probationary staff, the Panel was pleased to note that they all felt well supported and that academic staff were proactive in providing guidance and advice. For some, this had involved a member of academic staff sitting in on a lecture and providing feedback. All had done some teaching of varying quantities and to differing class sizes. All considered their futures to be in academia and most recognised the challenges ahead in terms of the recruitment and retention of students, the workloads of academic staff and the need to strike a balance between 'pleasure and pain'.
- 6.1.5 Of the probationary staff who met with the Panel, three have been in the Department from three months to nine months one member had yet to start her probationary period but had been in the Department since 1998 as a research fellow. It was noted that Human Resources should have contacted three out of four of the probationary staff regarding the new lecturer programme but nothing had been received by any of them. The Panel **recommends** that the Human Resources Department review its procedures to ensure that new members of academic staff who have to fulfil the probationary period receive information about the New Lecturer Programme timeously.
- 6.1.6 The majority of postgraduate research students within the Department were employed as postgraduate demonstrators within teaching laboratories. The Panel was informed that training was provided by the Teaching and Learning Service, by the Department and through the Physical Sciences Graduate School. It was expected that most research students would undertake some demonstrating. The demonstrators who met with the Review Panel considered that they had received sufficient training to undertake their duties. In addition, demonstrators had the opportunity to complete the experiments in advance of the laboratory session with students. It was noted that demonstrators were allocated an even number of hours across different years of research study, approximating to 40 hours in the first year. It was the demonstrators' opinion that beyond Level 1 demonstrating was less hectic and demonstrators had more time to spend with students however they could be more demanding. By Level 4 they spent more time with students on key skills development.

6.2 *Physical Resources*

- 6.2.1 The Panel had noted from the SER and annual course monitoring reports (ACMR) comments on the fabric of the Joseph Black main lecture theatre and on the lack of availability within the Chemistry Department of accommodation of suitable size for small group tutorials. However, the main concern of the Department was the state of the teaching laboratories which were considered to be in need of refurbishment, particularly the Raphael laboratory. The major requirement was the provision of adequate fume hoods/cupboards. In the meeting with key staff the Review Panel was told that the current state of the teaching laboratories was having a serious impact on the quality of provision and on the quality of the student experience. The main issues raised by academic staff were:
- a) the need to provide a safe working environment for students and staff;
 - b) the inability to train students to the standards expected by industry;
 - c) the restriction on what could be taught in a practical environment; and
 - d) the need to provide students with a good quality laboratory environment to support the Department's activity to retain students in Chemistry.
 - e) students were entering the Department from some secondary schools that were better equipped than the University.

- 6.2.2 The Panel undertook a tour of the teaching laboratories. The external subject specialists, Professors O'Hagan and Pethrick, concurred with the view that the current provision of fume-hoods/cupboards was unsatisfactory and with the concerns expressed by academic staff.
- 6.2.3 It was noted that the last substantial investment in the refurbishment of laboratories was in 1992 but at that time there was only a partial upgrading of teaching laboratories. The recent Faculty Review of Chemistry had also identified that the 'laboratories are overcrowded and need investment'. Since the Faculty Review, the Department had established a Working Group on Laboratory Refurbishment and an initial report from that group had identified that approximately £5.2m would be required to provide the target number of fume hoods/cupboards per student across four key laboratories, including the Raphael laboratory. The Panel highlighted the difficulties posed by the current position and the need for investment in the teaching laboratory to the Dean of Physical Sciences. The Review Panel strongly **recommends** that there should be an investment in the teaching laboratories to ensure the adequate provision of fume-hoods/cupboards to provide a safe working environment for students and staff and so that the syllabus is not constrained by the lack of such provision. The Panel also recognises that the upgrading of teaching laboratories is a more general issue and consequently **recommends** that the University establish a mechanism for funding the periodic upgrading of teaching laboratories.

6.3 *Equipment Budget*

The Panel was advised that the Department had a very limited equipment budget and in recent years had only been able to maintain basic equipment levels and stock. The Department had lately attained sponsorship from industrial laboratories to undertake practical experiments but this sponsorship could be withdrawn at short notice (which had happened earlier in the current academic session). It was reported that the equipment used for Environmental Chemistry was more aged and the Department had got round this problem partly by taking students out to industry. Academic staff recognised the need to strike a balance between students' understanding basic concepts on older pieces of equipment and having access to more up-to-date electronic equipment which did everything for them. Professor Sewell reported that he was a member of the University's Finance Committee and he regularly drew to its attention the need to increase equipment budgets for these reasons.

6.4 *IT Provision*

The Department currently had two computer clusters for teaching, with approximately 25 PCs to a cluster. The Panel was told that a third cluster was to be installed in the Chemistry Branch Library, which would be available for thesis writing and for electronic journal access. The Head and Deputy Head of Department considered this level of provision would be sufficient for Honours teaching although it was recognised that there were certain times of the year when the clusters were heavily used. Key staff told the Panel that they would have welcomed doubling the level of provision.

7 **Student Progression and Support**

7.1 *Student Recruitment and Retention*

- 7.1.1 The Review Panel was pleased to note that the Chemistry Department at Glasgow was bucking the national trend in keeping its student numbers at a relatively steady state. Academic staff were very aware of the need for proactive recruitment to and retention of students in Chemistry. The Panel noted that the Department was pro-active in its liaison with schools and was involved in the Pre-University Summer School. Whilst the number of UCAS applicants to Chemistry had decreased slightly in recent years, the

Department benefited from the operation of a faculty entry system in recruiting students who had initially applied to study subjects other than Chemistry, such as Biological Sciences. The Panel was told of the positive decision to use its best teachers at Levels 1 and 2 in order to make the subject as interesting and attractive as possible with a view to attracting students to switch to studying Chemistry to Honours level. The Department was aware that provision of good laboratory facilities was also a key point in making Chemistry provision as attractive as possible to students (see section 6.2 above). The Review Panel recognised the high standard of support provided for students as evidenced through the comments of the undergraduate students and through the provision of additional tutorial support particularly at Level 1.

- 7.1.2 Staff were also aware of, and responsive to, the wide range of students who studied Chemistry, particularly at Level 1. This included students studying General Chemistry 1 who required this subject to study biological or other sciences rather than through personal choice, which posed an additional challenge as students on this course tended to be less motivated. It was noted that there was currently little progression from General Chemistry 1 to Chemistry 2 as the normal progression route was from Chemistry 1. Students who wished to progress to Chemistry 2 from General Chemistry 1 had to attain a B whereas progression from Chemistry 1 required only a D. The Department recognised that there were differences in teaching style from Level 1 to Level 2 and that it might be necessary to increase support for students on entry to Level 2. In addition, the coverage of material in General Chemistry 1 was less than in Chemistry 1 and the Department was hoping to address this shortfall by developing a distance learning module which could be taken over the summer prior to entry to Level 2 for those student who wished to move up from General Chemistry 1 or the new Science Fundamentals 1 course.
- 7.1.3 The Review Panel explored in the meeting with key staff and in the meeting with the Head and Deputy Head of Department if a recruitment strategy existed. The Panel was told that it was hoped to increase the numbers entering Level 3 from the current position of *circa*.70 students per annum to between 90 and 100 students. It was hoped that the increased numbers would be into the BSc programmes. The Panel considered that there was also a need for the Department to improve student retention from Levels 1 to 2 (eg by having more appealing course titles) and from Levels 2 to 3. The Panel **recommends** that the Department should develop a recruitment and retention strategy which identifies targets for future student numbers. The Plan should also address the matter of improving retention from Levels 1, 2 and 3.

7.2 *Student Handbooks*

The Panel found the student course handbooks to be well presented and informative. However, the Environmental Chemistry handbooks tended to contain less detail on course content and would benefit from the consistency of approach adopted by mainstream Chemistry courses. The Panel **recommends** that the Environmental Chemistry course handbook should be reviewed so that the level of course information is consistent with that provided for other Chemistry courses. See also comment under 4.4.2 in relation to the inclusion of fuller information on assessment requirements.

7.3 *Accreditation by the Royal Society of Chemistry (RSC)*

At the time of the visit, the Department had just received informal feedback from the RSC on its bid for accreditation of degree programmes mentioned in paragraphs A.4 and A.5. The Head and Deputy Head of Department had learnt that while all programmes had been

recognised² by the RSC, the MSci programmes had not been accredited³ at this time. However recommendations had been given by the RSC as to how to modify the programmes to bring them into line with the RSC's guidelines. The Department agreed with the recommendations and was in the process of modifying the MSci programmes as recommended and the Department fully expected that some of its MSci programmes would be accredited early in 2004. The Department was continuing its correspondence with the RSC on this matter.

8 Maintenance and Enhancement of Quality and Standards

8.1 *Annual Course Monitoring Reports*

Annual course monitoring reports were included as part of the supporting documentation for the review. The quality of the best reports was impressive but the quality of a small number of reports was variable and the Department's quality management process would be considerably strengthened if all reports matched the standards of the best. It was noted that there was variability in the level of thoroughness with which the reports were completed in that some were minimal in the level of comment provided whereas others were fuller and more reflective. From the minutes of the Teaching Committee it did not appear that the Annual Course Monitoring Reports were considered at a meeting of this Committee or that formal feedback was provided to Course Directors on issues raised within the reports which were within the responsibility of the Department. The Panel **recommends** that there should be a sharing of good practice on the completion of Annual Course Monitoring Reports so that all reports matched the standards of the best and the reports should be considered together at a meeting of the Teaching Committee. In addition, for those aspects within the responsibility of the Department, feedback should be provided to Course Directors as a matter of course.

8.2 *Review of Curricula*

The Review Panel was pleased to note that the curriculum at all levels was kept under frequent review. In the meeting with key staff, the Panel was informed that all modules comprised elements of Organic, Inorganic and Physical Chemistry and that a review of these elements would involve a horizontal as well as a vertical review. This had recently been conducted for Physical Chemistry and there would be a similar review in the near future for Inorganic Chemistry. As mentioned previously the review of General Chemistry 1 was imminent to address the issue of the relatively poor mathematical ability of the students entering this course. The Department had also developed mathematical self-study exercises and the provision of additional voluntary tutorials had been organised for students having difficulties with their coursework.

² The RSC recognises a wide range of degrees based on chemical science as satisfying the academic requirements for Associate Member of the Royal Society of Chemistry (AMRSC) which, depending on fulfilment of experiential criteria, can lead to the categories of Member (MRSC) or Fellow (FRSC).

³ The RSC accredits degree courses in chemistry of a high standard in terms of both their intellectual challenge and the competence they are designed to impart to graduates. The Chartered Chemist designation (CChem) recognises the experienced practising chemist who has demonstrated an in-depth knowledge of chemistry, significant personal achievements based upon chemistry, professionalism in the workplace and a commitment to maintaining technical expertise through continuing professional development.

8.3 *Analysis of Performance in Class and Degree Examinations*

The Review Panel was interested to note the departmental practise of analysing student performance in class and degree examinations as an indicator of the effectiveness of teaching. Student performance was analysed for question uptake and for average marks achieved; the analyses were considered in course reviews and used as a basis of discussion between the relevant academic and the appropriate Section Head and/or Head of Department.

C. **Summary of Recommendations**

The recommendations interspersed in the preceding report and summarised below. The recommendations have been cross-referenced to the paragraphs in the text of the report to which they refer.

Range of Provision

- C.1 The Review Panel **recommends** that the Department should seriously consider withdrawing the MSc in Environmental and Analytical Chemistry. Should the Department decide not to withdraw the programme then it must become compliant with the requirements of a Masters degree within the Scottish Credit and Qualifications Framework. (*Paragraph 1.2*)

Action: Head of Department in conjunction with the Head of the Environmental, Agricultural and Analytical Chemistry section

Aims and Intended Learning Outcomes

- C.2 The Review Panel **recommends** that the Department, in conjunction with support from the Teaching and Learning Service, further develop programme aims and intended learning objectives for the range of programmes offered by the Department. (*Paragraph 2*)

Action: Head of Department in conjunction with the Director of the Teaching and Learning Service

The Curricula

- C.3 The Panel **recommends** that the Department should:

- (i) develop a strategy to integrate mathematics in an applied context with a view to overcoming student concerns about their mathematical abilities
- (ii) discuss possible strategies with the Teaching and Learning Service and the Mathematics Department;
- (iii) explore working with the Faculty Effective Learning Advisor in supporting student learning in the early years with a view to setting mathematics in context and enhancing student comprehension and confidence in mathematical aspects of the curriculum. (*Paragraph 3.1.3*)

**Action: Head of Department
The Director of Teaching and Learning
Faculty Effective Learning Advisor**

- C.4 The Panel **recommends** that the Department should continue to implement an applied approach to the teaching of the curriculum and should give consideration to extending this approach to Chemical Physics or to making it more explicit. (*Paragraph 3.2*)

Action: Head of Department

Assessment

- C.5 The Panel **recommends** that the Department should consider the introduction of a marking scheme for the assessment of fourth year projects and should seek guidance from other parts of the University (e.g., Teaching and Learning Service, Faculty of Engineering etc.) and from other Chemistry departments on possible models with a view to increasing the standardisation of marking across projects. (*Paragraph 4.1*)

Action: Head of Department

- C.6 The Panel **recommends** that the Department gives consideration to student peer assessment of teamwork and should invite the Teaching and Learning Service to provide guidance on how this might be implemented. (*Paragraph 4.2.2*)

**Action: Head of Department in conjunction with the
Director of the Teaching and Learning Service**

- C.7 The Panel **recommends** that academic staff should give more guidance to postgraduate demonstrators on how to deal with students who perform poorly in laboratory experiments. (*Paragraph 4.3.1*)

Action: Head of Department

- C.8 The Panel **recommends** that the Department should report to the Vice Principal (Learning & Teaching)/Clerk of Senate any real concerns encountered as a result of the implementation of the Standards section of the Code of Assessment so that these might be addressed by the Assessment Working Group. (*Paragraph 4.4.1*)

Action: Head of Department

- C.9 The Panel **recommends** that fuller details should be provided within student handbooks on the descriptors for attainment of intended learning outcomes so that students are aware of the definitions of the different levels of performance at non-honours and at honours levels. (*Paragraph 4.4.2*)

Action: Head of Department

Learning and Teaching

- C.10 The Panel **recommends** that the Department should consider how it might better promote placement opportunities to students. The Panel also **recommends** that the Department continues to seek feedback from students during, and on return from, placements with the view to making it as positive and experience as possible. (*Paragraph 5.1.3*)

Action: Head of Department

- C.11 The Panel **recommends** that the Department should continue to seek feedback on presentation methods in lectures with a view to enhancing the effectiveness of student learning. (*Paragraph 5.2*)

Action: Head of Department

- C.12 The Panel recognises that teaching and assessment approaches vary between Faculties but **recommends** that students should be given an adequate introduction to Pharmacology courses including a full explanation of the approach to teaching and assessment by both Department/Divisions. The Panel also **recommends** that Chemistry and Pharmacology staff discuss how best to address the issue of different styles of teaching and assessment. (*Paragraph 5.3*)

**Action: Head of Department
Director of IBLS Undergraduate School**

C.13 The Review Panel **recommends** that the Department should review its teaching practices within laboratories with a view to maximising the time that academic staff and demonstrators are available to support students. This might include running pre-lab demonstrations, offering an early tutorial on how to write up experiments, marking laboratory reports outwith laboratory time, adopting a more proactive approach to students' time management. The review should apply mainly to the Level 1 laboratories but might also benefit other levels. (*Paragraph 5.4.3*)

Action: Head of Department

Learning Resources

C.14 The Panel **recommends** that the Human Resources Department review its procedures to ensure that new members of academic staff who have to fulfil the probationary period receive information about the New Lecturer Programme timeously. (*Paragraph 6.1.5*)

Action: Director of Human Resources

C.15 The Review Panel strongly **recommends** that there should be an investment in the teaching laboratories to ensure the adequate provision of fume-hoods/cupboards to provide a safe working environment for students and staff and so that the syllabus is not constrained by the lack of such provision. The Panel also **recommends** that the University establish a mechanism for funding the periodic upgrading of teaching laboratories. (*Paragraph 6.2.3*)

**Action: Dean of the Faculty of Physical Sciences
University Management Group**

Student Progression and Support

C.16 The Panel **recommends** that the Department should develop a recruitment and retention strategy which identifies targets for future student numbers. The Plan should also address the matter of improving retention from Levels 1, 2 and 3. (*Paragraph 7.1.3*)

Action: Head of Department

C.17 The Panel **recommends** that the Environmental Chemistry course handbook should be reviewed so that the level of course information is consistent with that provided for other Chemistry courses. See also comment under 4.4.2 in relation to the inclusion of fuller information on assessment requirements. (*Paragraph 7.2*)

Action: Head of Department

Maintenance and Enhancement of Quality and Standards

C.18 The Panel **recommends** that there should be a sharing of good practice on the completion of Annual Course Monitoring Reports so that all reports matched the standards of the best and the reports should be considered together at a meeting of the Teaching Committee. In addition, for those aspects within the responsibility of the Department, feedback should be provided to Course Directors as a matter of course. (*Paragraph 8.1*)

Action: Head of Department

Prepared by: Janet Anderton, Senate Office]

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