

Index	Page
1 Introduction	3
2 Foreword from the Head of Department	4
3 A General Introduction to Postgraduate Studies:	
3.1 Supervision	5
3.2 Probation	5
3.3 The requirements for a PhD	5
4 The Responsibilities of the Supervisor	6
5 The Responsibilities of the Department	7
6 The Responsibilities of the Departmental Graduate Education Committee	7
7 The Responsibilities of the Graduate Student	8
8 The Graduate Student Training Programme:	
8.1 The Plant Sciences Training Programme:	9
8.1.1 Health and Safety	9
8.1.2 Technical Matters	10
8.1.3 Graduate Training	10
8.1.4 Communication Skills	11
8.2 Other Opportunities for Training	11
9 Financial Support to attend Specific Meetings	12
10 Frank Smart Studentship	12
11 The means by which your Progress will be reviewed:	
11.1 Allocation of a Second Supervisor	13
11.2 Allocation of a member of the Graduate Education Committee	13
11.3 Personal Progress Log	13
11.4 Preparation of Project Proposal	13
11.5 Supervisor's Termly Assessments	14
11.6 First Year Seminar	14
11.7 First Year Report	14
11.8 Second Year Poster	14
11.9 Third Year Plan.....	14
11.10 Third Year Seminar	15
11.11 Departmental Research Day	15
11.12 Timetable for Graduate Student Activities in Academic Year 2010-11	15
11.13 Advice on the preparation of your First Year Report	17

11.14	Advice on the preparation of your Second Year Poster	18
11.15	Advice on the preparation of your First Year and Third Year Seminars	19
12	Advice on the preparation of your Dissertation:	
12.1	Introduction	20
12.2	The Timetable	21
12.3	Content and Organisation	21
12.4	Selection of Material	22
12.5	Emphasis	22
12.6	Clear Planning	22
12.7	Writing Style	23
12.8	Spelling	23
12.9	Use of Capitals	23
12.10	Hyphens	23
12.11	Quotation Marks	24
12.12	Equations	24
12.13	Layout of Thesis	24
12.14	Introduction	25
12.15	Materials and Methods	25
12.16	Results	26
12.17	Discussion	27
12.18	References	27
12.19	Appendix	27
13	The Examination and Viva	27
14	Teaching	28
15	A Final Word	28
16	Appendices	
16.1	Appendix I: Joint Statement of the Research Council's..... Training Requirements for Research Students	29
	16.1.1 Introduction	29
	16.1.2 Joint Research Council's Skills Training Requirement...	29
16.2	Appendix II: Credit Allocations for Transferable Skills Training Activities	31
16.3	Appendix III: Assessment Criteria for First Year Seminars	35
16.4	Appendix IV: Assessment Criteria for Second Year Posters.....	36
16.5	Appendix V: Assessment Criteria for Third Year Seminars	37

1 INTRODUCTION

Welcome! This handbook is part of the induction material you are receiving at the start of your studies in the Department of Plant Sciences. In addition, you will be receiving an **Induction Pack including Health and Safety Information**, a memorandum to Graduate Students from the Board of Graduate Studies, including your postgraduate log.

This handbook contains important information and is in two parts. The first part covers the Departmental Policy on Graduate Students and consists of:

- Foreword from the Head of Department
- A general introduction to Postgraduate studies
- The responsibilities of the Supervisor
- The responsibilities of the Department
- The responsibilities of the Graduate Student

The second part covers the practical and logistic aspects of working in the Department and consists of:

- The training programme we will provide for you
- The means by which your progress will be reviewed
- Advice on preparing your First Year Seminar
- Advice on preparing your First Year Report
- Advice on the preparation of your Second Year Poster
- Advice on preparing your Third Year Plan
- Advice on preparing your Third Year Seminar
- Advice on the preparation of your Dissertation

Most administrative tasks you will need to undertake will be through your CamSis/CamGrad account.

Please read this document carefully and refer to it throughout your time here. Information is also displayed on the Departmental website. Your funding body may also provide useful training information and you must ensure that you abide by their terms and conditions throughout your sponsorship period.

Enjoy your time here and do the very best you can!



Dr Alex A R Webb
Chair, Graduate Education Committee
October 2011

2 FOREWORD FROM THE HEAD OF DEPARTMENT

Welcome to the Department of Plant Science - your academic home for the next three or four years. We aim to give you a rewarding and informative experience and to train you so that, by the time you write your thesis, you can plan and execute an internationally competitive research project. You will acquire skills that will equip you for a career in research if that is your plan. They will also be invaluable if your career is not directly in research.

Plant science is increasingly recognised as central to new technologies that will allow sustainable production of food for a growing population, to understanding of climate change and its consequences and for development of biofuels. It is also part of a revolution in biology that is providing new insights into living systems at many different levels. Biology and in particular plant biology is the leading scientific discipline of the 21st century.

For much of the time you will be so immersed in details of your project and world hunger, climate change and winning a Nobel prize will be far away from your thinking. However we are reminded constantly by government and others that research must have impact – economic, environmental or social – and I would encourage you to make sure that you do not lose sight of the “big picture”.

Nor should you lose sight of the need for research to be multidisciplinary. Look for ways to enrich your project with approaches from outside plant science, particularly those based on physics, chemistry or maths. Probably the best way to achieve this essential multidisciplinary approach is to talk about research and science as much as possible with anyone who will listen. Move around the tea room and interact with students, postdocs and supervisors who are doing something completely different from you. Take advantage of your college and talk to other scientists there. You will be honing communication skills that are essential for modern scientists and, who knows, you might either pick up or give out useful new ideas.

I look forward to hearing about your research as it happens and I wish you well.

Prof. Sir David Baulcombe
Head of Department of Plant Sciences, Regius Professor of Botany, Royal Society
Research Professor

October 2011

3 A GENERAL INTRODUCTION TO POSTGRADUATE STUDIES

This document sets out the arrangements for graduate work in the Department, defining the responsibilities of the Student, the Supervisor, the Department and the support systems we have in place to facilitate the transition from the more structured undergraduate studies to independent research work.

3.1 Supervision

Each of you has a Supervisor who will be your mentor and you will be part of their research group. You will also be assigned a Second Supervisor who will be in a related area of research and whose prime responsibility will be to follow your overall progress. In addition you will be assigned a member of the Departmental Graduate Education Committee. Should you have any worries then seek their advice either individually or collectively. Do so sooner rather than later.

3.2 Probation

The University requires nine terms' residence before you can submit for a PhD. In exceptional cases, where you have appreciable research experience, this can be shortened to six terms. It is essential that you realise that you are admitted as a probationary Graduate Student. To pass your probation, you have to pass the hurdle of the First Year Report.

The First Year Report is a concise account of your first year's work. Two copies of your report and two copies of your Personal Progress Log must be submitted by the first week in June of your first year (for October starters), the first week in January of your first year (for April starters) and the first week in October of your first year (for January starters). It will be examined by your Second Supervisor and by a member of the Graduate Education Committee who will give you a short viva on your understanding of the contents of your report and related topics. Please ensure that you take along your Laboratory Notebook and a copy of your First Year Report to the viva. The Graduate Education Committee will then decide whether to recommend to your Supervisor and the Head of Department that you should continue for the PhD degree.

Most students pass this hurdle. It is retained primarily to ensure that no-one who is unsuitable for graduate study wastes any more of their time and Departmental resources on a course of study. If your first year report were considered to be unsatisfactory, you may be asked to re-submit a revised report before the end of the fourth term. Alternatively, you will not be allowed to continue with the PhD programme, in which case the work you have done may be considered either for an MPhil, a Certificate in Postgraduate Studies or a Certificate of Diligent Study.

3.3 The requirements for a PhD

The examination for a PhD involves two tests. First, the written account of your research must be approved. The criteria used by the two Examiners (one internal and one external to the University) are as follows:

“Before recommending the award of the PhD degree the Examiners should satisfy themselves that the dissertation is clearly written, that it takes due account of previously published work on the subject, and that it represents a significant contribution to learning,

for example, through the discovery of new knowledge, the connection of previously unrelated facts, the development of new theory, or the revision of older views.”

In addition, you must pass an oral examination in which “The Examiners should jointly examine the student on the subject of the dissertation and the general field of knowledge within which it falls”. It must be emphasised that the Examiners write separate reports on the dissertation and a joint report on the oral and that all have to be satisfactory for the degree to be awarded. There is evidence from recent Examiners’ reports that some candidates are faring badly in their oral examination because they have not read widely enough or attended seminars by speakers outside their area of specialisation. A PhD is not just a compilation of results on a single topic; it also requires an intellectual mastery of the subject and a clear understanding of the context of the work.

When you come to write your thesis, your knowledge and understanding of the general field of your research must be sufficiently complete, critical and authoritative to allow you to talk on more or less equal terms with your Examiners. In addition, you must have a clear knowledge of related fields. This means that throughout your time as a Graduate Student you must read intensively and widely. You should discuss your work with colleagues in your own research group, and in other laboratories. You are expected to attend all Departmental Seminars, not only those in your own field but also the more general lectures in the programme of Seminars in Plant Sciences. Graduate Students are expected to contribute to the general intellectual life of the Department.

4 THE RESPONSIBILITIES OF THE SUPERVISOR

Your Supervisor will be closely involved with your research and will help you get the most out of your studies. The Department sets out the following responsibilities for Supervisors:

- The Supervisor will set out a plan or list of what is to be achieved during three years of research
- The Supervisor will have knowledge of the Student’s area of research and will put them in touch with others when the work goes significantly outside of their field
- The Supervisor will arrange regular uninterrupted discussion sessions, ideally at least once a month for laboratory based Students, and once every three months for field based Students, to consider any immediate matters about the research programme
- In addition to the monthly meetings, there will be a more formal meeting every three months together with the second Supervisor if appropriate, to review the Student’s progress and help them plan future work
- The Supervisor will maintain a written confidential file of the Student’s progress
- At the end of each term your supervisor will make a very brief assessment of your progress in writing to the Graduate Education Committee. If any area of progress is deemed unsatisfactory the Supervisor is required to note what actions are to be taken to improve performance.
- The Supervisor will inform the Student if progress is unsatisfactory and arrange suitable action. The Second Supervisor and the Graduate Education Committee may be asked to assist in this process
- The Supervisor will ensure the Student is familiar with laboratory techniques, goes on appropriate training courses, attends seminars and lecture courses, and meets other people working in the same field
- The Supervisor is expected to advise the Student how to prepare papers for publication and to write up the thesis
- The Supervisor will ensure the Student’s intellectual property rights are protected in accordance with University policy.

5 THE RESPONSIBILITIES OF THE DEPARTMENT

The Department is anxious to provide all its Graduate Students with every opportunity for a broad education and a compatible environment in which they may complete a PhD successfully. The Department will aim to provide guidance and, where appropriate, the facilities to allow Graduate Students to develop a number of different skills including:

- Research methodologies and the process of research including quantitative and qualitative methods and data analysis; project planning and management
- The effective use of learning resources including library and information technology
- Personal skills including oral and written communication, time management and team work skills, professional development and the preparation of curriculum vitae and employment applications
- A broad knowledge of the discipline in which the Student is working
- Technical training to enable the Student to undertake their research work effectively and efficiently
- Teaching experience by bringing to the notice of the Student the opportunities within the Department for supervising and/or demonstrating to Undergraduates
- Professional presentations

6 THE RESPONSIBILITIES OF THE DEPARTMENTAL GRADUATE EDUCATION COMMITTEE

Although Supervisors have the prime responsibility for their Graduate Students, the Graduate Education Committee will oversee the progress of all Graduate Students in the Department. The Graduate Education Committee meets at least five times per year, normally one week before each staff meeting and at the end of July/beginning of August to consider the assessments of the first year reports.

The Graduate Education Committee, which is an advisory group for the Head of Department, has the following responsibilities:

Consultation

The Committee will act as a resource and, if necessary, as an intermediary between the Student and Supervisor and can be consulted on any matters of concern. Each Graduate Student will be assigned a Committee member.

Advisory

The Committee will advise Students on training opportunities and Departmental expectation. The Committee members will help Graduate Students promote their interaction with all members of the Department.

Personal

Students with health problems or concerns about their work in the Department may approach members of the Committee. The first person to approach should be the Supervisor and/or Second Supervisor, then if necessary the Graduate Education Committee. The College Tutor is an essential part of pastoral care and should be contacted. If a problem cannot be solved by the above procedure, the matter will be referred to the Head of Department.

Monitoring

The Committee will monitor the Student's progress by means of the First Term Project Proposal, Termly Supervisor's Reports, First Year Seminar, First Year Report, Second Year Poster, Third Year Seminar, and Fourth Year Plan.

The prime responsibility of the Department to its Graduate Students is to provide a friendly, interactive and instructive place in which they may produce excellent PhDs within the time-frame of their funding.

7 THE RESPONSIBILITIES OF THE GRADUATE STUDENT

Just as your Supervisor and the Department have many responsibilities towards you, it is expected that you in turn have equally important responsibilities.

- To follow good working practices as defined by the Head of the Research Group
- To have a defined area of research by the end of the first year and to have mastered the necessary technical skills to carry out the research programme
- To keep a notebook describing accurately and neatly the work that you do, the techniques that you use, the results obtained, and your interpretation of these results. A copy of the document "Keeping a Laboratory Notebook" can be downloaded from www.plantsci.cam.ac.uk
- To have clear topics ready for discussion at meetings arranged with the Supervisor(s)
- To submit work regularly, on time and in a clear and readable form (word processed)
- To take note of guidance from Supervisors
- To inform the Supervisor of any detailed discussions you have had with people from outside your research group
- If there are any problems with your research work, to seek advice from the Supervisor as soon as possible
- To attend all the lectures in the Plant Sciences Seminars series
- To attend lectures, workshops and training courses suggested by your Supervisor
- To attend all the compulsory Departmental training programmes for Graduate Students

Personal Progress Log

You must keep a separate training log, in which you will record all seminars and lectures attended and given, training undertaken, the highlights of your research work, and your notes of the monthly and quarterly discussions with your Supervisor(s). This log will be quite distinct from your laboratory notebook(s) which should contain all the details of your research work. The log book will be part of the first year assessment. The log book can be found in the Graduate School of Life Sciences Welcome Folder, given to you along with this handbook.

Self Care

Things don't always go well. It's important to discuss problems early on, there is no shame in this and it is not a sign of weakness or failure. Your College should be a valuable source of pastoral care. You may wish to contact the University Counselling Service, they offer confidential support. If illness or personal difficulties affect a sustained impact on your progress, then talk to your supervisory team about taking an intermission. This 'stops the clock' ticking on your project for a recovery period. Check the Board of Graduate Studies website for details.

Financial Difficulties

Please discuss financial difficulties with your College Tutor. The Tom ap Rees Fund covers financial hardship and details are available on the University/Departmental website.

UK Border Agency Compliance

Universities are required to keep contact details of non-EU students (i.e. those needing ATAS clearance). The Department will administer this confidentially but it is the student's responsibility to supply the information on request and inform the Departmental Administrator of changes.

8 THE GRADUATE STUDENT TRAINING PROGRAMME / GRADUATE SCHOOL

The Department is committed to training Graduate Students to the highest standards. Much training, for instance in laboratory techniques, will take place in the Research Group but the Department and the University also provides organised training events. The programme of centralised training courses is summarised below. You will see that much of the programme is compulsory and this reflects the Department's determination to ensure the highest standards in training for its postgraduates. Other events will be put on from time to time to meet newly identified needs or to draw people's attention to particular issues. Appendix I is a copy of the Joint Statement of the Research Councils' skills training requirements. Appendix II outlines credit ratings while full course listings can be accessed through the Graduate School website (<http://www.bio.cam.ac.uk/gradschool>). Training and services run outside of the School (including Careers Service) can be accessed through the "Skills Portal" (www.skills.cam.ac.uk).

8.1 The Plant Sciences Training Programme

8.1.1 Health & Safety

All new Graduate Students will be asked to complete a pre-employment health screening form. You will find a copy of this form in the Health & Safety Handbook. The first page should be completed by your Supervisor whom you should ask for guidance as to what hazards you may be exposed to during your time in the Department and the completed form should be sent to the Occupational Health Department at Fenners.

The Department takes safety training particularly seriously. No student will be permitted to do any fieldwork or practical work until all the appropriate safety courses have been completed.

- University Safety Training – two half days provided by the University Safety Adviser's Office. **This is compulsory for all students.**
- Departmental Safety Induction – a half day provided in the Department which explains how Health and Safety Management is operated in the Department. **Attendance is compulsory for all students.**

8.1.2 Technical Matters

- Instrumentation use – attendance at the 12 lectures/demonstrations run by the Cambridge Centre for Molecular Recognition. Compulsory for all students identified by their Supervisor.
- Analytical Microscopy. The Department has some facilities for light microscopy. More advanced instrumentation and training for electron microscopy and confocal light microscopy are available in the Multi-Imaging Centre, Department of Anatomy.
- Sequencing and database use – attendance at the training courses offered by the Council of the School of Biological Sciences Computer Teaching Facility. Compulsory for students identified by their Supervisor.

8.1.3 Graduate Training

In conjunction with your supervisor, you are required to fill out the form in your Progress Log with the Departmental and Faculty Graduate Education Committee courses which you will undertake. You must attend enough of these to gain the annual requirement for training credits. Some of the courses and lectures available are listed below. Others are listed at <http://www.biomed.cam.ac.uk/gradschool> and attendance can be booked electronically. Unless you are ill, you must attend a booked course.

Resources for scientific writing, thesis preparation, scientific communication skills, poster preparation and accessibility advice can be obtained from www.biomed.cam.ac.uk/gradschool/current/courses/comms-links.html

- Statistics – attendance at the Statistics Course offered at the start of the Michaelmas term by the Zoology Department. Compulsory for students identified by their Supervisor.
- Lab Book – Dr. O’Cane (Genetics) runs the “How to keep a lab book” 14.00 – 16.00hrs on Monday 7th November 2011 in the Department of Genetics Part II Classroom. Attendance by all students is strongly advised but spaces are limited. Book early.
- Experimental Design – Dr Tanner will be giving one lecture on the design and analysis of experiments and field work studies at the start of the year. Compulsory for students identified by their Supervisor. This lecture will be at 16.00 hrs on Tuesday 11th October 2011 in the Large Lecture Theatre.
- Analysing data and writing reports, dissertations and papers – Dr Tanner will be giving one lecture entitled “How to write your Dissertation”. This will be held at 16:00 hrs in the Biffen Lecture Theatre (Department of Genetics) on Wednesday 16th November 2011 then repeated (same time and place) on 9th May 2012.
- Scientific writing – A course is offered in the Biochemistry Department and attendance for all students is strongly advised. Spaces are limited so book early.
- Project management – this course runs at regular intervals and attendance is strongly advised for all students. Book through the Graduate School website.

- Making a poster – a course is run by Dr Sargan (Veterinary Medicine). Attendance is strongly advised for all students. Book early through the Graduate School website.
- Additional lectures. Graduate Students may attend any Plant Sciences Part II lectures they feel might be of use or interest to them. All lectures are listed online. Some students might also be asked to attend specific lecture courses in other Departments where the Supervisor thinks it appropriate. Where this is the case, attendance is compulsory.
- Departmental Seminars in Plant Sciences. These take place in term time on Thursdays from 1600-1700 hours. A wide range of topics is presented every year and **attendance is compulsory for all graduate students**.
- Departmental Research Seminars take place throughout the year on Fridays from 13.00-14.00 hrs. **Attendance is compulsory** and all Graduate Students will be asked to present a seminar.
- Specialist lectures and seminars. These are available throughout the University. The Cambridge University Reporter and Notice Boards carry details of these lectures. Details can also be found on the Department's website.

8.1.4 Communication and Additional Skills

- Introduction to Web of Knowledge database (Mimas) – the Department's Librarian offers a training session on using Mimas. All students are expected to know how to use Mimas and **attendance is compulsory** (1 credit).
- Oral and visual presentation – a lecture entitled "Communication Skills" will be given by Dr. David Hanke on the 29th February 2012 at 14:00 hrs in the Large Lecture Theatre. **Attendance is compulsory** if you have not already undertaken this session as an undergraduate.
- Research Laboratory meetings – combine technical information with the need to present your own data in a professional way on a regular basis. **Attendance is compulsory**.
- UK Research Council-funded students should attend the UK Grad/Vitae course. It's fun and worthwhile, particularly if you are considering a career outside research. Details are available from the Graduate School website.
- Graduate Students can also attend specialist computing courses advertised on the Computing Service web site (<http://www.cam.ac.uk/cs/courses>).

8.2 Other opportunities for training

We have included the list of current courses available and their credit rating, as Appendices II and III. Please consult the Graduate School website for updated details (<http://www.biomed.cam.ac.uk/gradschool>).

9 FINANCIAL SUPPORT TO ATTEND SPECIFIC MEETINGS

Attending meetings is an important opportunity to test your ideas, communication skills and start networking. All students should attend a conference during their time here. Joining the Cambridge Philosophical Society may help you financially and an early approach to your College for support is advisable. You must be a member for a year before applying for funds.

The Research Councils provide funding for all of their postgraduate students to attend scientific meetings (Research Training Support Grant). The amount available depends on the Research Council. This money is transferred directly to each research group so if you have a Research Council studentship and wish to attend a conference, you should discuss this with your Supervisor. If you wish to attend an identified conference in some future year, arrangements will have to be made with the Office to set up an account in which the travel grant can be kept. The Department will not provide any additional support.

Students who are funded by other organisations are advised to consult with their Supervisor and College as to possible sources of funding.

10 THE FRANK SMART STUDENTSHIP IN BOTANY

Students entering their second and third year may apply for a Frank Smart Studentship which will be awarded competitively, based on progress made. Applications should be 2 sides of A4 and should clearly set out the aims of the overall PhD project, the achievements to date and plans for the future. It will be unlikely that everyone who applies will receive an award and the sum awarded to each student will be decided by the Managers. Awards are usually in the region of £1,000 and will be made annually (if funds permit) and students who have received one in the second year may apply for another in their third year. All second and third year students who receive an award will be entitled to style themselves 'Frank Smart Student'.

All awards made by the Frank Smart Fund are for support of research activities. The Managers leave to the discretion of each student how the money is spent (e.g. purchasing chemicals or equipment, making field trips, or attending conferences). Computer equipment is an exception. This may only be purchased if essential for the project and must have the prior approval of the Managers. The Managers will request a report on all expenditure each year and may ask for receipts in some cases. The sums awarded may be carried forward from year-to-year but all awards will lapse at the end of a student's third year in the Department.

11 THE MEANS BY WHICH YOUR PROGRESS WILL BE REVIEWED

Your purpose in joining the Department is normally to gain a PhD, but you enter on a probation. The Department and you both need to be confident that you are suited for the work involved in a PhD before you pass the probation. For this reason, there is an assessment of your work at the end of your first year, the First Year Report. Occasionally, some candidates may be asked to submit their first year work for formal evaluation as an MPhil. There is now the widespread recognition that we need to evaluate all aspects of your training and development, so that we provide an appropriate theoretical and practical environment to develop your research training. It is natural that such an evaluation be carried out before you can formally pass your probation.

11.1 Allocation of a Second Supervisor

You will be allocated a Second Supervisor when you are accepted into the Department. The choice will be made after consideration of your subject of research, the contents of your application form and your interview. He or she will not be a member of your Research Group but will be familiar with the general aspects of your research work. Once you arrive in the Department, the Second Supervisor might be changed if another member of staff appears more appropriate. The purpose of the Second Supervisor is to provide you with an additional perspective on your work, to offer a view of your work independent of the sometimes intense Student-Supervisor relationship and to provide a source of back-up support should your main Supervisor be absent or unobtainable. The Second Supervisor will normally be an Academic Staff Member or an Independent Research Fellow. We will ensure that the name of your Second Supervisor is notified to both the Board of Graduate Studies and your College Graduate Tutor.

11.2 Allocation of a member of the Graduate Education Committee

The Graduate Education Committee has the responsibility of overseeing the general progress of Students and for monitoring their progress during the PhD programme. You will be assigned a member of the Committee who, together with your two Supervisors, will be there to help you during your time in Cambridge.

11.3 Personal Progress Log

The Personal Progress Log is the formal record which allows your progress to be recorded, including details of the credits gained via formal training courses offered within the Department or by the Graduate School. The Department provides a structure to your time in Cambridge which should contribute to your academic development, the development of transferable skills and the strengthening of your links with scientists outside your own Research Group.

11.4 Preparation of the Project Proposal

Once you have arrived in the Department and begun to settle into your Research Group one of the first activities you must undertake is the preparation of your Project Proposal. The purpose of this Project Proposal is to accustom you to academic writing, and to provide an important opportunity to clarify your research project and the techniques to be used.

The content of your Project Proposal should be discussed with your First and Second Supervisors. No more than four weeks should be spent on writing it; after this you must begin experimental work/data analysis/modelling. The length of the Proposal should be no more than 6 sides of A4 and should have an abstract of less than half a page. At this stage you should also prepare your risk assessments for your experiments or field activity.

The Proposal should be submitted to the Chair of the Graduate Education Committee via the Graduate Student Administrator (Room 210) by 1st November (for October starters), 1st February (for January starters) or 1st May (for April starters) and be signed by the student and both Supervisors. The report will be assessed by your Graduate Education Committee Supervisor, and you will receive feedback on its quality, and the focus of your project. **It is essential that you address the issues raised in this feedback.** Too often we see the same mistakes repeated in the First Year Report. Make corrections and have them checked by your Supervisor.

11.5 Supervisor's termly assessments

After the end of each term, the Graduate Education Committee will ask for a brief report on your progress from your Supervisor. A report is also logged on CamGrad. In the first year this is to make sure that any Student who, at this early stage, seems "not to be living up to their promise" can be given help to increase the chance that they will successfully complete the First Year Seminar and First Year Report. Each Student will be told in broad terms how their Supervisor views their progress.

11.6 First Year Seminar

The First Year Seminar is a good opportunity for you to present an outline of your research project. You should have a firm summary of your research programme with an emphasis on the background to your project and details of the techniques you intend using in your research. The First Year Seminars are scheduled to take place during **May 2012** and you will be expected to speak for 20 minutes followed by 5 minutes for questions and discussion. The First Year Seminar should be prepared in consultation with both your First and Second Supervisors and should provide you with critically constructive feedback on your research work in preparation for your First Year Report. The Chair of the Graduate Education Committee will send you a reminder during the Easter vacation. **Attendance at First Year Seminars is compulsory.** The Graduate Education Committee will assess your seminar and feedback will be provided. There is a prize for the best seminar.

11.7 First Year Report

The First Year Report is the Department's formal means of assessing your progress and deciding whether you should carry on for a PhD degree. It is an opportunity for an extended piece of writing and a discussion about, and a defence of, your work to date and your plans for the future. It also emphasises just how much experimental work and reading are required to produce even a modest dissertation. The report must be submitted by 1st June 2012 (for October 2011 starters), 1st October 2012 for (January 2012 starters) and 1st January 2013 (for April 2012 starters). A viva will be held by the second Supervisor and the responsible GEC member, a written report will be submitted to the GEC which will specifically recommend continuation for the PhD, or not, as the case may be.

11.8 Second Year Poster

A poster presentation is one of the standard ways of communicating scientific information in a public forum. Here the objective is for you to be able to inform the whole Department (or delegates at a conference) about your work to date; it should contain a substantial amount of data from your second year. The poster session will also allow you to explain the research in person and to receive useful comments and suggestions. It also allows you to demonstrate your presentation and poster preparation skills. The poster session for students about to enter their third year is scheduled to take place as part of Research Day on 5th December 2011. The Graduate Education Committee will assess your poster and provide written feedback for your Postgraduate Log. There is a prize for the best poster.

11.9 Third Year Plan

The purpose is to help you clarify your plans for your final year of research and writing up. The Chairman of the Graduate Education Committee will send you a record sheet at the start of your third year on which your plan should be drawn up. You should discuss your plan with your Supervisor, who will write some comments on the document and it will then

be passed to the Graduate Education Committee for consideration and comment. Copies of the finished sheet will be returned to you, your Supervisor and Second Supervisor with any comments.

11.10 Third Year Seminar

The Third Year Seminar is an important opportunity for you to defend your work in a professional context and to demonstrate your presentation skills. Seminars will be given as part of the ongoing Departmental seminar series which are organised throughout the year in Plant Sciences on Friday lunchtimes (13.00 – 14.00 hrs in the Large Lecture Theatre). You would normally give your seminar in the period during the extended Easter term, although some of you may already have participated in the programme even in your second year. Each session normally has two seminars, each 20 to 25 minutes long, with an opportunity to deal with questions for 5 minutes after you have spoken. They provide you with an opportunity to explain to the full Department how you have advanced scientific knowledge and understanding in your area. You will be participating in what has become a well-established forum within the Department, well-attended by Staff, Post-docs, Graduate Students and Part II Plant Sciences students. This completes the formal component of your training in public speaking, which we hope will launch you into a career with many more of such opportunities. Feedback, in the form of helpful comments on content and style of delivery, will be given by your supervisors and members of the Graduate Education Committee. There is a prize for the best presentation.

11.11 Departmental Research Day

This is an opportunity to hear presentations on selected research from each of the Groups in the Department and hence a good way to keep abreast of other activities. Talks are given by members of staff, Postdoctoral Researchers and Graduate Students. You may be asked by your Supervisor to talk. If you are, accept the opportunity to gain more experience of public speaking. The talk will not be formally assessed but your colleagues may still give you useful feedback. The Departmental Research Day will take place on the 7th December 2011. **Attendance is compulsory for all Graduate Students.**

11.12 Timetable for Graduate Student Activities in Academic Year 2011/2012

The Graduate Education Committee (GEC), after consultation with the teaching staff, have drawn up the following timetable to show you when we expect certain activities to be completed and/or handed into various members of the teaching staff.

Timetable for Graduate Student Activities in Academic Year 2011/2012

3 October 2011	Michaelmas Term begins
3 October 2011	Two copies of First Year Report + Personal Progress Log (January 2011 starters) to be handed in
4 October 2011	Full term begins
4 October 2011	9.30 Registration followed by: 10.00–12.30 University Safety Course for new Graduate Students (<i>Babbage Lecture Theatre</i>)
5 October 2011	12.30–17.00: University Safety Course for new Graduate Students (<i>Mill Lane Lecture Rooms</i>)
6 October 2011	14.00–15.30: Departmental Safety Induction Training Session (<i>Large Lecture Theatre, Department of Plant Sciences</i>)
7 October 2011	11.30–17.00 Compulsory Induction for new Graduate Students (<i>Babbage LT</i>)

7 October 2011	17.00–19.00 Welcome Reception for new Graduate Students (<i>Zoology Museum</i>)
7 October 2011	17.30-18.30 Departmental Reception for new Graduate Students, Postdocs etc. (<i>Tea Room</i>)
11 th October 2011	11.00-11.30 Introductory talk by GEC Chair (<i>Plant Sciences Seminar Room</i>) 11.30-12.30 New Tools for Literature searching (<i>Plant Sciences Seminar Room</i>)
12 th October 2011	16.00 Seminar by Dr Tanner entitled 'Design & analysis of experiments' (SLT)
31 October 2011	Assessment of First Year Reports (January 2011 starters) by Second Supervisor and GEC Supervisor completed.
1 November 2011	First Year Project Proposals to be handed in (October 2011 starters)
7 November 2011	14.00 – 16.00 'How to keep a lab book' Dr O'Cane (<i>Part II Classroom, Dept of Genetics</i>)
16 November 2011	"How to write your Dissertation" Dr Tanner (<i>Biffen Lecture Theatre, Dept of Genetics</i>)
30 November 2011	Third Year Research Plan (October 2009 starters) handed to first Supervisor.
30 November 2011	Fourth Year Research Plan (January 2009 starters) handed to first Supervisor.
2 December 2011	Full Term ends
7 December 2011	Departmental Research Day & Poster Day for Second Year Students (October 2009, January 2010 & April 2010 starters). The Poster Session will begin and Second Year Students should be present to discuss their posters with supervisors and colleagues, after which a drinks reception will follow.
16 December 2011	Michaelmas Term ends
31 December 2011	End of data collection for students in their Third Year (April 2009 starters)
1 January 2012	Two copies of First Year Reports + Personal Progress Log (April 2011 starters) to be handed in.
2 January 2012	Lent Term begins
January 2012	Lent Term Graduate Education Committee Meeting
17 January 2012	Full Term begins
17 January 2011	University Introductory Graduate Safety Course (for January 2012 starters & April/October 2011 starters who missed the course in October 2011)
31 January 2012	Assessment of First Year Reports (April 2011 starters) by Second Supervisor and GEC Supervisor completed.
1 February 2012	First Year Project Proposals to be handed in (January 2012 starters)
29 February 2012	Third Year Research Plan (January 2010 starters) to be handed in.
29 February 2012	Fourth Year Research Plan (April 2009) to be handed in.
29 February 2012	Lecture entitled "Communication Skills" Dr Hanke (<i>Large Lecture Theatre</i>)
16 March 2012	Lent Term ends

23 March 2012	Full Term ends
16 April 2012	Full Term begins
April 2012	Easter Term Graduate Education Committee meeting
23 April 2012	Easter term begins
1 May 2012	First Year Project Proposals to be handed in (April 2012 starters)
9 May 2012	"How to write your Dissertation" Dr Tanner (<i>Biffen Lecture Theatre, Dept of Genetics</i>)
May 2012	First Year Seminars (October 2011, January 2011 & April 2011 starters) (<i>Large Lecture Theatre</i>). Dates to be confirmed
May 2012	Third Year Seminars: (October 2008, January 2009 & April 2009 starters) (<i>Large Lecture Theatre</i>) Dates to be confirmed
31 May 2012	Third Year Research Plan (April 2010 starters) to be handed in.
1 June 2012	Two copies of First Year Reports + Personal Progress Log (October 2011 starters) to be handed in.
18 June 2012	Full Term ends
15 June 2012	Easter Term ends
30 June 2012	End of data collection for students in third year (October 2009 starters).
30 June 2012	Assessment of First Year Reports (October 2011 starters) by Second Supervisor and GEC Supervisor completed.
July 2012	Long Vacation Graduate Education Committee meeting
31 August 2012	Fourth Year Research Plan (October 2009) starters to be handed in.
30 September 2012	End of data collection for students in their Third Year (January 2010 starters)

11.13 Advice on the preparation of your First Year Report

The report should be no more than 9,000 words long and should be a single coherent document and in a form understandable to a plant scientist outside your speciality. The report should be double spaced in a standard font, size 11. You should discuss the report in detail with your Supervisor who will be able to show you good examples from previous students. Your report should state your hypothesis and cover the work that you have done so far. It should certainly include the planned work that you have yet to do to answer the questions you have set yourself. You need to demonstrate in your report that you can work at the level required for a successful and timely submission of a PhD dissertation. The assessors will be looking at your results, how you analyse your data and establish and test hypotheses. The structure of your report should be clear and it should be written succinctly. There is no virtue in padding out a well argued case. Learn to write concisely and succinctly. You should be spending between 2 and 4 weeks preparing the document.

Your report must be written and presented in the style of an appropriate academic journal. Begin with an abstract or summary of the overall aims of the project, and the progress to date. The introduction should then state your hypothesis, specific aims, establishing their importance and placing your approaches in the context of published work and defining your programme for achieving your aim. Do not simply write a review of the literature;

demonstrate your knowledge of current work by using published material to support your own arguments. You should not only know your literature but also criticise it and synthesise your own views from it.

Follow the introduction with a concise description of the methods used. This should be sufficiently informative to allow the work to be repeated in your absence. Use prose suitable for a journal, not a lab protocol. Next present your results; do so as a coherent narrative. Give the aim of each experiment, say roughly what you did, present your results, draw attention to the important features of the results and lead logically to the aim of the next experiment. The results section should not be just a collection of figures and tables.

The discussion should not be a repetition of the results but should evaluate the reliability of your data, establish what it demonstrates, relate your work to that of others and arrive at a conclusion. Finish with one to two pages outlining your research plans for the future. Here, you should support the likely experimental progression and indicate whether any substantial changes to your original aims and approaches may be required. A timeline or Gantt chart to show timings of activities is valuable.

Figures and tables should be set out properly (see the later section in this handbook). Use an informative title that shows the aim of the experiment and add a preamble that explains what you did. Figures and tables should be intelligible without immediate reference to the text.

Your report must be handed in by 1st June 2012 for October starters (see [timetable](#) for other start dates). The Chair of the Graduate Education Committee will write to you about a month before the deadline to remind you that the report is due. You should provide 2 copies by the due date to the Graduate Student Administrator, together with 2 copies of your Personal Progress Log book. You will have a viva voce examination with your Second Supervisor and a member of the Graduate Education Committee during June 2012 who will produce independent reports on the report you have written, plus a joint report on the viva. Please ensure that you take along your Laboratory Notebook and a copy of your First Year Report to the viva. The Examiners' reports will be submitted to the Chair of the Graduate Education Committee, and the GEC will then notify you and your Supervisor of the result. If successful, your Supervisor will then be able to inform the Board of Graduate Studies that you have passed your probation.

11.14 Advice on preparing your Second Year Poster

Part of Research Day on 5th December 2012 will be set aside for the poster display and poster session. You should plan your poster for this date and work with your Supervisor to produce the best poster possible. You should spend a maximum of 2 weeks on your preparation. The Chair of the Graduate Education Committee will write to remind you of the dates about a month before the session.

The Department will provide display boards and will locate them at Research Day. It is normal to produce an AO (80 x 114cm) poster, printed and possibly laminated. You will attend the poster session, where you will be able to explain and defend your poster. The Graduate Education Committee will assess your poster and provide written feedback

Preparing a poster is very different from the continuous prose of your dissertation and the verbal presentation of a seminar. A good poster should be legible, well organised and to the point. Studies have shown that you have only 11 seconds to attract and retain your

audience's attention so your title must be prominent and brief. Many of your audience will absorb only the title so you need to be clear about the message you wish to convey.

You should focus on the hypothesis(es) you are testing and your most important findings. Make a small scale sketch of your poster on an A4 piece of white paper. Emphasise the points you want to stress in your poster. Think in terms of headlines, text, charts, graphs, illustrations, photographs, etc. Incorporate these ideas into your sketch. Once you are satisfied with your initial plan make a rough layout on a white board or in Powerpoint.

Research shows that many people approach visual information in a spatial sequence of *centre – top – bottom – left – right*. On that principle your title should go centre top in large letter. Title, authors and sponsoring institution can extend across the width of the poster. After that the text and diagrams etc should be set up in two wide columns. The use of space is important and you should ensure plenty of clear space on your poster.

Do not try to crowd too much information on to your poster. Concentrate on two or three main points and highlight trends and comparisons with simplified charts and diagrams. Make key points in the legend of the figure or table. Use text cautiously – bullet points often work better than full sentences. Avoid abbreviations and acronyms if possible and try not to overwhelm your audience with too many numbers, words or complicated graphs. If you find you have too much on your poster, the materials and methods section can either be reduced to a smaller print size or you can prepare a separate methods sheet to hand to those who are really interested in your work. A lot of people will either read or study your poster whilst you are away so your message must be clear and simple. Put in a concise conclusions section.

Using PowerPoint and colour laser printing it is possible to produce a very sophisticated poster. Most groups use Biochemistry (Photographic and Printing facility, tel. 33606) or the PANDIS unit on the New Museums site who produce posters from information you provide electronically on disc.

Discuss the format with your Supervisor and look at examples around the Department.

All lettering must be easily read from about 2m. Use a bold or semi bold typeface for headings and labels. Text should also be bold or semi bold. Avoid type with thin strokes as this can reduce readability. A sans serif font is more easily seen at a distance. Text in normal upper and lower case is much more readable than capitals only.

The use of capitals in titles, headings and labels is acceptable.

The posters will be assessed by the GEC and your Supervisor and the results notified to you. **APPENDIX IV** is an example of the form used to assess the posters.

11.15 Advice on preparing your First Year and Third Year Seminars

Some people have no problem speaking in public; others find it a nerve-wracking experience. The secret to success is preparation, presentation and practice. You only have a limited time to convince what may be a sceptical, and sometimes disinterested, audience that your research work is the best thing since sliced bread. Use your time wisely.

As a general rule, have one powerpoint slide for each minute of your presentation. Remember that your audience can see and hear at the same time, so do not put up a slide

and then read what is on the screen. Illustrative material should be used to complement what you are saying. You might find it useful to use your slides as prompts in case you lose your way. We all make the mistake of putting too much information on to a slide or overhead. Detailed experimental results and long columns of numbers should be avoided. Try and summarise your results by means of simple graphs and illustrations. There should be no more than 8 lines of text on a slide. When you have prepared your slides, check the background contrast and that they can be read from the back of the room in which you will be speaking.

Make sure you have good lecture notes written large enough so you can read them in poor lighting. Use your notes as a guide to what you are going to say, do not read verbatim from your notes. Your notes could include stage prompts for changing slides and even when you want the lights on or off.

Start your talk with a clear statement of what your seminar is about and have a summary of the main points you are going to consider. Give a brief overview of the general area of your research and then concentrate on the part of your research about which you are rightly proud and enthusiastic. It would be useful to summarise the experimental methods you have used and then give a succinct account of your results. Make sure you discuss the significance of your findings and a brief illustrative summary should accompany this part of your talk. Another slide should be used to set out your conclusions and the way forward with your research. You should finish up by acknowledging the people who have helped you with your work.

When you speak, do not look down at your notes all the time, try and look confidently at the middle region of the audience. Unless you are confident, try not to move around too much. Waving arms can be a distraction as well as providing emphasis. Make sure you know how the audio-visual system works, how the audio system works and how to operate the pointer. Load your presentation onto the laptop provided; do not bring your own.

Above all make sure you practise your talk, first by yourself to make sure you are within the time limit. Then have a repeat performance with your Supervisor or to your research group. If possible, practise in the lecture theatre where you will be giving your talk. Get a friend to come along to make sure you can be heard in the back row and that your slides can be seen clearly. It is discourteous to other speakers and will disrupt the timetable if you speak longer than your allocated time, so you will be stopped by the chairman. When it comes to questions, give brief answers. If you do not know the answer to a question, say so. Finally, speak with confidence and enthusiasm about the good work you have accomplished.

Seminars will be reviewed by the GEC and your Supervisors, who will provide feedback on your presentation. (See [Appendices III and V](#)).

12 ADVICE ON THE PREPARATION OF YOUR DISSERTATION

12.1 Introduction

Your dissertation is likely to be the longest piece of continuous prose you will ever write. It is important for many reasons, but especially because it is a significant part of the means by which you are assessed for your degree. It is also a scientific publication and will be available for consultation in the University Library, and probably, your Supervisor's office. Your thesis is a permanent record of your work at the start of your career.

The Department requires all graduate students to complete their data collection 6 months before the submission date in their final year. Anyone needing to continue to collect data after this time needs explicit permission from their supervisor and the GEC.

The aim of this section of the Handbook is to assist you in preparing a dissertation you can be proud of. You will want to consider all aspects of the document – content, style, organisation, paper, printing, binding and, not least, the timetable for preparing it. It is important that the dissertation is as good as you can make it, but beware of perfectionism! By the time you complete the dissertation you will have been living with it for at least three years and it may be very difficult to recognise when it is finished. Do not let yourself become too attached to the minutiae of writing up, because your dissertation must be assessed and you must look for employment.

12.2 The Timetable

The University has clear expectations on submission dates. After 9 terms experimental work the University expects the submissions of the dissertation not later than the end of the 10th term. Any date later than that requires permission in advance from the Board of Graduate Studies and the Degree Committee. It will almost always take you longer than you think to write up, so start early. A possible timetable might be as follows:

Introduction	3 weeks
Methods, results and tables	6 weeks
Discussion, references, etc	6 weeks
Consultations with Supervisor	3 weeks
Revisions of drafts	2 weeks
Proof reading, corrections, printing	3 weeks
Binding	1 week
Contingency	<u>2 weeks</u>
	26 weeks

The maximum length of a dissertation is 300 pages, double spaced ca. 80,000 words (not including references), so over 15 writing weeks that is about 5300 words a week or 2-3 pages every day. However, you should aim for around 150 pages. Arrange in advance the points at which your Supervisor will need your drafts. He/she will be able to recommend some well written dissertations and you might like to have a look at them before starting to write. Once you have started to write, spell check as you go along to build up your own dictionary.

12.3 Content and organisation

Often it is not obvious how to organise your research. Whilst in principle you can structure your thesis to integrate data across timescales or approaches, in practice you should probably think how your data would best be presented as research papers, and structure your thesis accordingly. If you are uncertain how much data is required for each chapter, read a related paper showing similar observations to your own. You may be surprised to see how little primary data is actually needed!

The following criteria are used by the examiners in assessing your dissertation. Is it clearly written? Does it take account of previously published work on the subject? Is it a significant contribution to learning and worthy of publication in peer-reviewed journals? It is thus important that your writing convinces the examiners on all three points.

The content of the dissertation is up to you with advice from your Supervisor, but organisation and presentation are important. A poorly written dissertation may not convey your ideas and their place in the subject you have been studying so that the examiners (and future readers) cannot see the significance of your writing. Indeed careless presentation may raise doubts in the reader's mind about the quality of your scientific work.

12.4 Selection of material

You should select your most important research results to answer the hypotheses you have proposed. Qualifications should be kept to a minimum. Exclude irrelevant material but ensure you include:

- Enough experimental detail for someone else to repeat the experiment
- Enough background information to show you understand the techniques
- Enough discussion of the limitations of your work for the reader to assess the reliability of your results

12.5 Emphasis

Make the aims of the dissertation clear in the Introduction and include a brief overview of the document in the first section. If you have a lot of data to present consider a short summary at the start or finish of each chapter. Link these into a final summary in the last chapter, which should also consider developments for the future.

Include clear cross references between all parts of the dissertation and make sure that your discussion and conclusions answer the questions posed in the Introduction.

When presenting your results distinguish your contributions to the methods used and your own data from those of other people. Distinguish your experimental results from your interpretations and conclusions. Keep technical details in the methods section and keep tables/figures in portrait orientation if possible. Do not over-complicate matters with too many subsections and include only relevant references. Provide a glossary at an early stage in the text, preferably before the Introduction.

12.6 Clear Planning

As you begin to plan your dissertation re-read your key references to refresh your memory and to see where your work fits in. If your data contradicts earlier data, try to see if the differences can be reconciled. If this is not possible state the differences clearly. Plan out your most important results, supporting data, themes and conclusions and draw up your conclusions and aims in draft form. This will help you plan the overall structure of the work to display your findings to best advantage. Do not expect to write your chapters in order. It is often easiest to start with the materials and methods section before tackling the tricky results and conclusions.

Double check your data and then recheck them again. You cannot decide on your final conclusions until your data are as sound as you can make them. Whilst you are writing your materials and methods section gather your results together and check them again. This way you can ensure your methods are correlated with your results.

If you do not find awkward gaps, discrepancies or new patterns in your data, check them again! Expect to do a few more experiments to round off your arguments hence the need

to start preparing for writing up in your third year. If you feel you need to start major new experimental work consult your Supervisor carefully. You have deadlines to meet and it may be better to exclude some results in order finish your dissertation on time.

Prune your data. Keep only important and relevant data in the dissertation. That is not to say you should exclude inconvenient results. It is up to you to present the significance of your results to your readers, not bemuse them with a plethora of data. Statistical packages in particular will present you with a mass of data and it is up to you to select those which will feature in your written results.

Persevere with writing. Expect to replan and rephrase throughout your drafts. Do not get bogged down on one sentence, move on and return to difficult sections later. You might find it helpful to speak out loud what you want to convey and write that down. You can refine it later. Keep a list of the references you refer to as you go along.

12.7 Writing style

By the time you come to write your thesis you will have begun to develop your own writing style. Scientific writing can be verbose, pompous and obscure. Write interestingly, concisely and simply. If you can remove a word and still retain the meaning, do so. Sentences should be no more than 3 lines; paragraphs no more than half a page. Do not sprinkle punctuation marks in the text like confetti at a wedding. Avoid jargon. Do not take refuge in the scientific shorthand of the discipline in which you are working. Take the advice of your Supervisor but do not let anyone impose their writing style on you, but make sure you get quick feedback on your first chapter so that your style can develop rapidly.

12.8 Spelling

All spellings should follow *The Concise Oxford Dictionary* (Oxford: Clarendon Press). Foreign words, if generally accepted as part of the English language (e.g. bona fide, prima facie [even viva]) should not be underlined or italicised. Conventions do vary between journals though, e.g. some would print *in vitro*, whereas others would print in vitro. For your thesis, you should adopt the convention of the journal in which you are most likely to publish.

12.9 Use of Capitals

Avoid capital letters as far as possible, but no hard and fast rules can be laid down about them. Accepted common names of organisms, objects or processes should neither be capitalised nor placed in single quotation marks.

12.10 Hyphens

Very briefly, the rules are as follows; the hyphen is normally used with composite adjectives (*light-coloured*) but not to join an adverb to an adjective which it qualifies (*ever increasing*). It is used with the adverbs well, better, best, ill, worse and worst (*well-known, ill-advised*) but is omitted when the composite phrase is used after the verb (*a light-coloured precipitate was obtained* but *the treatment produced a light coloured precipitate*). There are many compound words which hover uneasily between being joined, separate or hyphenated. The only generalisations which are possible are: use as few hyphens as possible, use them to avoid confusing combinations of letters (*anti-icing*) and to clarify meaning (*re-form* – to form again) or clarify pronunciation (*re-emerge*).

12.11 Quotation marks

Modern practice prefers single quotes (' ') to double ones (" "). When one set of quotes occurs within another set, use single quotes for the outer set and double for the inner. Other punctuation marks should normally be placed within the closing quote but this is not an invariable rule and the placement should follow the sense of the text. Thus, if a quotation ends with a question mark this must be placed before the closing quotation mark. If the question mark belongs to the whole sentence and not just to the quotation then it should be placed after the closing quote (compare: *He asked, "What are you doing here?"* and *What do you mean by "I don't like it"?*).

12.12 Equations

All equations should be numbered, e.g. (1), (2), (3) etc. so that they can be referred to more easily (e.g. 'as shown in eqn. (2 . . .)').

12.13 Layout of thesis

Your thesis must be a coherent document without undue repetition or confusion. The order should lead logically to your results. Do not just list your experiments in the order that you did them. You should start by preparing a synopsis of the dissertation, perhaps a list of chapters with the parts to be included in each. Consider your readers when structuring the dissertation and aim to lead them logically through the text.

The basic layout of the thesis is defined by University Regulations and if your thesis does not comply with these it will not be accepted for examination.

- Title page. The title page should give the full title of the thesis, your full name, your college and the Degree you are submitting for. Avoid having too long a title to your thesis.
- Acknowledgements and/or dedications may appear next.
- Contents – give section numbers AND page numbers.
- List of Figures – give page numbers. Remember that you should number the pages on which figures appear in sequence with the text to ease cross-reference.
- List of Tables – give page numbers as above.
- List of any special abbreviations used in the thesis.
- Summary. You must also submit with your dissertation separate three copies of a summary, together with other items listed in section 28 of the Memorandum to Graduate Students. The abstract should indicate as concisely as possible the area of research, the approach adopted, and should summarise the main findings. An abstract should give the essential results and conclusions without details of methods, authorities for names, or other encumbrances. The abstract should contain all keywords, if possible, that might be useful in an information retrieval system. Too often the findings are given in the form of vague generalisations from which the reader cannot judge whether the thesis is likely to be of interest. It is your job to make sure that sufficient specific detail is included to convince the casual browser through Dissertation Abstracts that your findings are interesting and your thesis worth reading. The

summary will be read by the Degree Committee when making the decision about sending your thesis to the examiners.

12.14 Introduction

The Introduction should refer to relevant previously published papers and give the reasons for doing the work to be described. The emphasis is on setting the scene which existed at the start of project so that the purpose of your research is made clear. Published work which is relevant to your results and/or their interpretation should be reserved for the Discussion section. You will need to sub-divide this (and other) sections and it is useful to identify such sub divisions with decimal numbers as follows 1.1; 1.2; 1.3.1; 1.3.2; 1.3.3; 1.4; 1.5 etc.

Here, as elsewhere in the thesis, you will need to make reference to work which has already been published. Although you should consult your Supervisor about the approach you should adopt, it is usually most convenient to use the convention adopted by the journal in which you would like to see your work published. Correct literature citation is important to permit accurate cross-reference (by you as well as by your readers) to papers relevant to the work described in the thesis. It is also important that you ensure that systematic (taxonomic) names are properly given and are complete so that there is no possibility of confusion over the organism(s) used in the work. Names of genera and species are conventionally italicised.

12.15 Materials and methods

This section should refer to previous work which used the same methods, and give a clear indication of any modifications or improvements in technique. Depending on the field it can be easier to write this chapter first; and while you're writing it, watch the following points.

Use numerals, not words, for all dimensions, weights and distances (e.g. 4 g, 3 mm, 25°C) except at the start of a sentence or where successive numbers refer to different things (e.g. *twelve 250 ml flasks*) or where the style demands the use of words. In the text spell out fractions and numbers up to ten (e.g. *five classes, two-thirds full*) except where numbers occur frequently or in groups. The decimal point must always be preceded by a numeral, e.g. 1.234, 0.123.

Avoid numerals at the beginning of a sentence. Numerals and abbreviations for units are always separated by a space (e.g. 5 mM not 5mM).

In general, measurements should be given in SI system metric units, although litre and ml are acceptable. Chemical symbols in the text can often be avoided by spelling out the name of the substance. When a substance is referred to frequently or when listing different chemicals, as in the recipe for a medium, use the chemical symbols. When a complex substance is referred to frequently, the systematic chemical name or full common name should be given at the first mention, as well as the abbreviation ([e.g. zinc ethylene bisdithiocarbamate (zineb), potato dextrose agar (PDA), trichloroacetic acid (TCA)] and at subsequent mentions only the abbreviation need be used. Such abbreviations should be brought together into an explanatory list at the start of the thesis. It is also important to record the sources of your materials; both the company from which you bought the sodium chloride and the individual who kindly gave you that cloned DNA probe.

12.16 Results

Firstly, organise the progression of data as you wish to present it in terms of figures and tables. Then describe this data succinctly, making sure that there is a logical progression and that the reader can marry the observations of the methods used.

You should aim to make all illustrative matter (tables, graphs, line drawings and photographs) self-explanatory, requiring no reference to the text for them to be understood. This means that headings, captions and legends must be carefully composed so that they are succinct and self-contained. This is NOT to say that the Results section should consist only of tables and figures. At the very least you must guide the reader through the data and say what each table and each figure shows.

Tables should be arranged so as to fit the page size in the bound thesis and if possible in the portrait (i.e. 'vertical') orientation. Frequent swivelling of the thesis through 90° to read tabulated data can be an annoyance. Each table should have a self-explanatory title; experimental details can be placed between the title and the tabulated matter and footnotes can be used to explain symbols, convey statistical points or add other explanations. In column headings give the parameters measured, their abbreviations and the units of measurement. Do not use ditto signs; repetitive matter should be placed in headings, not in the body of the table. Make sure you distinguish between a nil result (0 or – in contrast to +) and a missing result (ND for Not Done or Not Determined); do not leave an unexplained blank space in a table.

Figures, including photographs, should have a self-explanatory legend so that the illustration is understandable without reference to the text. Pages carrying illustrations must be numbered in sequence with the text; but the figures themselves must also be numbered e.g. Fig. 3.1, 3.2, then Fig. 4.1, 4.2, etc. for Figs in chapters 3 and 4.

In graphs, use open and closed circles, open and closed squares and open and closed triangles as your preferred symbols. Other symbols are also available, but if you need to look for any more than this for a single graph you should really ask yourself if your data could be presented more simply. If the same entity appears frequently in your graphs, try to use the same symbol for it. There are so many computer programs able to calculate (and draw) lines of best fit these days that there is no possible excuse for presenting a graph which lacks adequate statistical analysis.

You will see a great many graphical illustrations in the papers you read. You should look at these carefully and note not only the information they contain, but how they communicate it. Make sure that axes and graphs are properly labelled and sensibly scaled. Give them a descriptive caption and remember that graphs are usually clearer if they do not fill the page. Once you have adopted a particular format for axis legends, tick marks etc, use it for all graphs. Do not use a multiplicity of formats if you can avoid it.

As far as possible, only report results which you can demonstrate to have a statistically adequate foundation. This means sufficient statistical description to permit objective evaluation of the reproducibility and significance of the results. Good statistical treatment of the results starts before the experiment is carried out, at the design stage. You must carry out a sufficient number of independent experiments with adequate sample sizes (depending upon the particular demands of your topic) to enable the data in your thesis to

12.17 Discussion

There the work described, and the results obtained, can be related to earlier published work and any ideas for further work may be developed. Information from the Introduction should not be repeated, although a brief summary of your findings will help set the scene for your discussion of your work. It is in this section that you make your contribution to knowledge by considering, interpreting and arguing the significance of your own work. This is probably the most difficult part of the thesis to write. Points made in the Discussion section of each chapter should not be repeated in the final Discussion. Instead, the latter

12.18 References

It is better to err on the side of completeness, each citation including the full title of the paper, all authors' names, full journal title and the final as well as the first page number and last. References should be listed in alphabetical order of the names of the first author, or in numerical order of citation (consult your Supervisor). As well as listing your references accurately you must make absolutely certain that all citations in the text are represented in your reference list, and all references in the list are cited in the text. Make sure that every reference is unambiguous in the form in which it appears in the text, e.g. when two authors, or two different groups of authors with the first named author, have published more than one paper in the same year, you will need to use letter suffixes after the year to distinguish them for your readers. It is often easier to adopt an electronic database for collating references, such as Endnote, so that you can automatically set the format in the style of a particular journal.

Carefully check your references by reading the thesis and ticking every reference in the text whilst at the same time ticking the equivalent reference in the Reference List (check that dates and author names tally at the same time). When you have finished reading through the thesis, all references in the text and Reference List should have been ticked and any mismatches will have become apparent.

12.19 Appendix

Calibration curves, any extensive data sets from which graphs may have been constructed and any other information which may be worth keeping but is not included in the main text can be placed in an appendix. You should also include, for binding into the thesis, reprints of papers which you have already published.

13 THE EXAMINATION AND VIVA

When your dissertation is finished you are now permitted to submit two softbound copies to the Board of Graduate Studies. You may need extra copies for yourself and your Supervisor(s). You should also include three copies of an abstract of your dissertation which should be no longer than one page of A4 and with a title of no more than 12 words. The Head of Department, in consultation with your Supervisor, will nominate two examiners. It is usual that one of the examiners is from within the University and one from outside the University. They will read your dissertation and each will write a separate report. They will then arrange to give you a *viva voce* in which they will closely question you about any and all aspects of your work. They will write a joint report on the viva.

The viva is not a Star Chamber Inquisition but an opportunity for the examiners to make sure you fully understand your work and for you to explain, if necessary, any of the more abstruse aspects of your experimental findings. Make sure you re-read your dissertation a day or so before the viva and arrange to have a chat with your Supervisor about what he or she thinks might be some of the points which could be raised by the examiners. If you feel nervous, persuade your Supervisor to give you a mock viva and ask you your worst nightmare questions.

The viva is not a “best suit” or “smart dress” affair but it would probably not be a good idea to turn up in jeans and a tee shirt. Remember that it is you and your dissertation which are on show. Good examiners will make every attempt to put you at ease and when you answer their questions, look them confidently in the eye. Think (briefly) before you answer detailed questions. If in the period between handing in your dissertation and the viva you have second thoughts about some of your conclusions, raise these issues with the examiners. If you genuinely do not know the answer to a particular question, say so and ask the examiner for their opinion. Above all, try and be relaxed and realise that the examiners want you to get your PhD.

14 TEACHING

Graduates play an essential role in our undergraduate teaching programme. Please check with your Supervisor before volunteering. Training courses to help you become an effective supervisor are available.

15 A FINAL WORD

The Department wants you to enjoy the experience of being one of its Graduate Students. Everyone hopes you will find it a rewarding experience and one that will set you on the road to a productive scientific career. All members of the Department will help you if they can but, in the final analysis, it is your efforts that count. Good Luck!

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October 2011

16 APPENDICES

16.1 Appendix I: Joint Statement of the Research Councils on Skills Training Requirements for Research Students

16.1.1 Introduction

The Research Councils play an important role in setting standards and identifying best practice in research training. This document sets out a joint statement of the skills that doctoral research students funded by the Research Councils would be expected to develop during their research training.

These skills may be present on commencement, explicitly taught, or developed during the course of the research. It is expected that different mechanisms will be used to support learning as appropriate, including self-direction, supervisor support and mentoring, departmental support, workshops, conferences, elective training courses, formally assessed courses and informal opportunities.

The Research Councils would also want to re-emphasise their belief that training in research skills and techniques is the key element in the development of a research student, and that PhD students are expected to make a substantial, original contribution to knowledge in their area, normally leading to published work. The development of wider employment-related skills should not detract from that core objective.

The purpose of this statement is to give a common view of the skills and experience of a typical research student thereby providing universities with a clear and consistent message aimed at helping them to ensure that all research training was of the highest standard, across all disciplines. It is not the intention of this document to provide assessment criteria for research training.

It is expected that each Council will have additional requirements specific to their field of interest and will continue to have their own measures for the evaluation of research training within institutions.

16.1.2 Joint Research Council's Skills Training Requirement

(A) Research Skills and Techniques - to be able to demonstrate:

1. the ability to recognise and validate problems and to formulate and test hypotheses
2. original, independent and critical thinking, and the ability to develop theoretical concepts
3. a knowledge of recent advances within one's field and in related areas
4. an understanding of relevant research methodologies and techniques and their appropriate application within one's research field
5. the ability to critically analyse and evaluate one's findings and those of others
6. an ability to summarise, document, report and reflect on progress

(B) Research Environment - to be able to:

1. show a broad understanding of the context, at the national and international level, in which research takes place
2. demonstrate awareness of issues relating to the rights of other researchers, of research subjects, and of others who may be affected by the research, e.g. confidentiality, ethical issues, attribution, copyright, malpractice, ownership of data and the requirements of the Data Protection Act
3. demonstrate appreciation of standards of good research practice in their institution and/or discipline
4. understand relevant health and safety issues and demonstrate responsible working practices
5. understand the processes for funding and evaluation of research
6. justify the principles and experimental techniques used in one's own research
7. understand the process of academic or commercial exploitation of research results

(C) Research Management - to be able to:

1. apply effective project management through the setting of research goals, intermediate milestones and prioritisation of activities
2. design and execute systems for the acquisition and collation of information through the effective use of appropriate resources and equipment
3. identify and access appropriate bibliographical resources, archives, and other sources of relevant information
4. use information technology appropriately for database management, recording and presenting information

(D) Personal Effectiveness - to be able to:

1. demonstrate a willingness and ability to learn and acquire knowledge
2. be creative, innovative and original in one's approach to research
3. demonstrate flexibility and open-mindedness
4. demonstrate self-awareness and the ability to identify own training needs
5. demonstrate self-discipline, motivation, and thoroughness
6. recognise boundaries and draw upon/use sources of support as appropriate
7. show initiative, work independently and be self-reliant

(E) Communication Skills - to be able to:

1. write clearly and in a style appropriate to purpose, e.g. progress reports, published documents, thesis
2. construct coherent arguments and articulate ideas clearly to a range of audiences, formally and informally through a variety of techniques
3. constructively defend research outcomes at seminars and viva examination
4. contribute to promoting the public understanding of one's research field
5. effectively support the learning of others when involved in teaching, mentoring or demonstrating activities

(F) Networking and Teamworking - to be able to:

1. develop and maintain co-operative networks and working relationships with supervisors, colleagues and peers, within the institution and the wider research community
2. understand one's behaviours and impact on others when working in and contributing to the success of formal and informal teams
3. listen, give and receive feedback and respond perceptively to others

G) Career Management - to be able to:

1. appreciate the need for and show commitment to continued professional development
2. take ownership for and manage one's career progression, set realistic and achievable career goals, and identify and develop ways to improve employability
3. demonstrate an insight into the transferable nature of research skills to other work environments and the range of career opportunities within and outside academia
4. present one's skills, personal attributes and experiences through effective CVs, applications and interviews

16.2 Appendix II: Credit Allocations for Transferable Skills Training Activities

Credit Allocations for Transferable Skills Training Activities

Students should consult the following table to determine how many credits they should receive for participation in a particular training activity. Most taught courses are credited **pro-rata**, that is roughly in proportion to how long they last. One credit is awarded for approximately half a day's training. For example attending the one-day Supervising and Small Group Teaching course will earn you two credits. Courses lasting two hours or more will usually be allotted one credit even though the whole morning or afternoon is not spent at the course. Other activities in which the transferable skills element is only a part, such as writing your First Year Report, have fixed credits allotted to them. Attendance at science lectures will also lead to some credit. You should find all the information you need listed below.

If you have taken part in an activity for which you cannot find the credit rating, you should ask your Departmental Graduate Education Committee Chair, if it is a departmentally-based activity, or [ask us](#).

Credits should be entered in your [Log Book](#).

A brief idea is given here of the year in which you might undertake an activity or course and the sorts of skills you might gain. More details about these, with an attempt to cross-reference to the [Research Councils' Skills Training Requirements](#) will be found on many Graduate School course web pages.

Activity	Year	Transferable Skills Developed	Credits
Induction events Safety courses, introductory sessions on libraries,	1	Various	Pro-rata (or may be assigned by

ethics, literature searching, IP, data management, presentation skills etc.			department)
First Year Report and Assessment	1	Scientific report writing. I.T. skills (Word, Excel)	6
Departmental Seminar Presentation	Any	Communication and presentation skills. I.T. skills	4 (maximum per year)
Poster Presentation	Any	Communication, oral, written and illustrative presentation skills, research skills, I.T. skills	4 (maximum per year)
Web-page development	Any	Writing and uploading of web material, understanding platform compatibility, web communication skills	4
Costed PhD Research Proposal (Wellcome 4-Yr students)	1	Project management skills, processes for funding and evaluation of research, scientific writing and communication, career management	6
Presenting at a Journal Club (seminars with fellow research students)	Any	Communication, critical analysis of published data, team working	2 (maximum per year)
Write Scientific paper for submission	Any	Communication, scientific writing skills, professional development	Up to 6 – Supervisor to allocate according to input
Attending external Symposium/Conference	Any	Networking, professional development and career management	2 (maximum per year)
Presentation at external Symposium/Conference	Any	Communication, scientific writing and presentation skills, professional development and career management	4 (maximum per year)
Demonstrating in undergraduate teaching lab	Any	Teaching	Pro-rata maximum 4 per year
Science on Saturday (or other schools or general public targeted activity)	Any	Communication with general public, public understanding of science, presentation skills	3
Serving on Departmental or	Any	Understanding	2

School committee		organization of research/teaching institution, teamwork, personal effectiveness	
Fieldwork	Any	Various	Consult your Dept.
Graduate School Courses			
<p>Numerous Transferable Skills Training courses are available through the Graduate School, of which a small number of examples are given below. All Graduate School courses are credited pro rata. You should consult the individual course booking page for confirmation of the number of credits allotted to a particular course.</p>			
Vitae (UK Grad) residential course or Graduate School equivalent (2, 3, 4 or 5 days)	2/3	Various: personal effectiveness, team work	4,6,8,10
Other Graduate School courses e.g.	Any	Various	Pro-rata
- Supervising and Small Group Teaching		Teaching and assessing students	
- How to write your dissertation		Scientific writing and dissertation planning, career development	
- Project management		Research skills, personal effectiveness and others	
- Keeping a lab notebook		Research skills and environment, communications skills	
Bioinformatics courses	Any	Bioinformatics	Pro-rata
Statistics courses	Any	Statistical techniques	Pro-rata
Other Courses			
Computing courses	Any	I.T. skills	Pro-rata
Home Office licence course	Any	Ethics, animal welfare	1 credit per module
Language courses	Any	Language skills	Pro-rata
Other University-provided courses, including statistics and courses run by Staff Development	Any	Various	Pro-rata
Other appropriate subject-specific science lecture courses (undergraduate or post-graduate level)	Any	Various (Credited for transferable skills training element only)	1 credit per 6 hours
Self-taught courses	Any	Various, e.g. language, computing	Pro-rata

College and other activities			
Undergraduate supervision, or school, teaching	Any	(Small group) teaching	1 credit per class hour, maximum 4 per year
Presentations to mixed non-specialist audience	Any	Public understanding of science, presentation & communication skills	3 (maximum per year)
Serving on College committee, or helping to run University society	Any	Understanding organization of research/teaching institution, teamwork, personal effectiveness	2

16.3 Appendix III: Assessment Criteria for First Year Seminars

DEPARTMENT OF PLANT SCIENCES

First Year Graduate Student Seminar Assessment Form 2012

Please return this form to the Graduate Student Administrator as soon as possible after the Seminars

Name of Student:

Name of Assessor:

Capacity of Assessor: First Supervisor / Second Supervisor / GEC Supervisor / Other

Comments on Seminar

1. Powerpoint Presentation (logical order, slide content, background, consistency, clarity):

2. Delivery (audibility, speed, timing, confidence):

3. Scientific content (interest, information, original data, context, scope of PhD, handling of questions, progress):

General comments and feedback:

16.4 Appendix IV: Assessment Criteria for Second Year Poster

DEPARTMENT OF PLANT SCIENCES

Graduate Student Poster Assessment Form
(Students at the beginning of their third year)

Please return this form to the Chair of the Graduate Education Committee as soon as possible

Name of Student:

Name of Assessor:

Capacity of Assessor: First Supervisor / Second Supervisor / GEC Supervisor

The Poster

1. Comments on scientific content:

Mark out of 10

2. Comments on amount of information:

Mark out of 10

3. Comments on design and layout:

Mark out of 10

4. General remarks:

Total Score

16.5 Appendix V: Assessment Criteria for Third Year Seminars

DEPARTMENT OF PLANT SCIENCES

Third Year Graduate Student Seminar Assessment Form 2012

Please return this form to the Graduate Student Administrator as soon as possible after the seminar

Name of Student:

Name of Assessor:

Capacity of Assessor: First Supervisor / Second Supervisor / GEC Supervisor / Other

Comments on Seminar

1. Powerpoint Presentation (logical order, slide content, background, consistency, clarity):

2. Delivery (audibility, speed, timing, confidence):

3. Scientific content (context, information, original data, interest):

4. Handling of questions:

General comments and feedback: