

Guide for PhD Candidates at Cambridge Computer Lab

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1 Introduction

This guide has been written by various PhD students and is based on their experiences and the anecdotal evidence of others. We hope that it will be useful to you in your first year, and beyond. While every PhD is different, there are hurdles and opportunities that arise frequently, and we hope that in this guide we have included some information that you might otherwise spend a lot of effort finding out for yourself.

This guide is available on the web for browsers within the Computer Lab at

http://www.cl.cam.ac.uk/UoCCL/local/phd_guide/

If you would like to contribute to this guide, please contact the current graduate representative on the Computer Science Syndicate, or Lise Gough.

2 The PhD Process (Research: How to Do It)

You might like to read the excellent book *How to Get a PhD* by Phillips and Pugh[4], available in the lab library, and also at the Graduate Union office, among other places.

2.1 You and Your Supervisor

The relationship between you and your supervisor is naturally extremely important, and if it works well you will have found a lifelong friend and colleague. However, do not take too much for granted — you may have to put a lot more time and effort into this relationship than you might expect. Do not leave it to chance, and it can be useful to take every opportunity to get to know your supervisor, both professionally and socially.

The supervisor/student relationship varies greatly from case to case. Some people have relatively little contact with their supervisor, meeting casually around the laboratory, and formally every few months. Others develop a close working relationship as colleagues, and others operate in a more traditional teacher/student role. Certainly, the tendency in the Computer Laboratory is to expect a high degree of independence from PhD students. Some students find this daunting at first and may feel like their supervisor is letting them down. Take your time, don't expect too much or too little, and get to know how your supervisor can realistically help. No one is going to provide you with a PhD on a plate, but your supervisor can make a significant contribution by pointing you in promising directions, giving feedback on your ideas and pointing you to similar research.

When you first meet your supervisor, discuss your mutual expectations of what the relationship is going to involve, including:

- How much independence/guidance you think you want, and how much your supervisor thinks s/he wants to give you.
- How often you are going to meet, and for how long; the actual frequency doesn't matter so much as the regularity (as long as it's *relatively* often - once every six months is definitely inadequate!).
- What sort of preparation will be expected (on both sides) for your meetings.

Be prepared to renegotiate these issues to your mutual satisfaction at different times in the relationship.

If you feel that the relationship is not meeting your needs, *talk to your supervisor about this*. Under no circumstances should you allow yourself to begin avoiding her/him; losing contact, and thereby becoming effectively unsupervised, can lead to all sorts of problems further down the track and may seriously jeopardise your chances of getting a PhD at all.

If for any reason you find your supervisor either genuinely professionally inadequate or fundamentally incompatible with you, despite the best efforts on your own part, you should seek advice from an appropriate person in the lab.

This appropriate person is probably your second supervisor. This is a relatively new phenomenon in the lab, but each first year student chooses (with the help of their supervisor) another person to generally oversee their progress through the PhD. This person will mostly review their progress, but is also available for general advice, including choice of PhD topic and other important matters.

In addition to your supervisor, the following people are here to help:

Andy Hopper	Head of Department	GC10
Caroline Mathews	Chief Secretary and PA to Head of Department	GC08
Margaret Levitt	Departmental Secretary	GC07
Lise Gough	Sec. of Degree Comm., Disability Liaison, Postgrad. Admin.	GC04
Fiona Billingsley	Secretary of Women@CL Group, Undergrad. Admin.	GC04
Glynn Winskel	Research Student Co-ordinator	FS12
Martin Richards	Chairman, Degree Committee	FC11
Nicholas Cutler	Librarian	Library
Carol Speed	Accounts	GC05
Ian Burton-Palmer	Building Services Manager	GW04
Martyn Johnson	Senior Computer Officer (+ networks)	GC09
Graham Titmus	Computer Officer (Windows world)	GE07
Chris Hadley	Computer Officer (esp. printing)	GC14
Ian Grant	Computer Officer (Unix world)	GE01
Robin Fairbairns	Computer Officer (Windows world)	GE01
Jiang He	Computer Officer	GC11
Nick Batterham	Hardware Technician	GC13
Piete Brooks	Computer Officer (Linux world); Departmental Safety Officer	GC16
David Cottingham	Graduate student rep., Computer Science Syndicate	SN04

For further advice on the supervisor/student relationship, see the relevant sections of *How to Get a PhD* [4].

2.2 Research Groups in the Lab

Your research group is likely to be an important part of your research career. Nonetheless it is entirely possible to do a PhD in the lab without much contact with your group, and to even proceed without any “official” group at all. Officially (i.e., as far as BoGS is concerned), the only thing that matters is that you are attached to a supervisor. For a discussion of what life is like without a group, see section 2.2.2.

The lab’s various groups vary in size and structure (the SRG has sub-groups for example) but there is still a degree of common experience that we can describe here.

2.2.1 Being in a research group

Being in a research group is probably most useful because it is home to people with similar research interests. These people will understand at least some of the issues that your work addresses, and may even work alongside you, collaborating on some common project. Though the community feel of a group will vary, it can be a very positive facet of your research experience.

With regular weekly talks, the research group also represents a pretty painless way of keeping abreast of what everyone else is up to. Of course, there will inevitably come the day when someone in the group (perhaps your supervisor, or the group's talk organiser) suggests that you should be the star attraction. This opportunity is definitely one to be embraced with open arms. Intimidating though it may seem, giving a talk will provide you an ideal opportunity to show your work to a small and interested audience. Preparing talks can also prove a useful way of structuring your research in the short to medium term.

2.2.2 Independent students

In general, most of the Lab's research takes place within the context of the various research groups. However, there are a small number of faculty and research students working independently from any group. If you or your supervisor are not part of a large established group, and particularly if your supervisor has no current research grants, then you may find that you are somewhat disadvantaged in terms of access to computing equipment, travel funds and so forth (since these are often supplied by group-based research grants). In addition, the social structure of the Lab tends to be somewhat research group oriented; so you may well feel both socially and professionally isolated. Being outside of a research group may give you fewer opportunities to meet important figures in your field, and reduce the amount of support available to you from peers and mentors.

In general, you are best advised to choose a research topic that allows you to work closely with a research group, and is in an area of "prime research focus" for the Lab. Of course, there are other reasons to come to Cambridge than purely academic ones, and it is possible to survive in the Lab if you are working on something comparatively esoteric with a supervisor who is more "on the fringes" of the Lab's main activities. However, you should be aware that you may feel both resource-deprived and a little isolated or marginalised if you choose to take this course of action.

2.2.3 Broaden your horizons!

Finally, it is important to realise that the groups are not mutually exclusive, that you are free to attend other groups' talks and that doing so is almost certainly good for the breadth of your intellectual horizons. The schedules for the groups' talks are all publicly available on the Web, though subscribing to a few research group mailing

lists is probably the best way of finding out about these. As well as the lab talks and research group seminars, you might like to know what's going on at Microsoft Research and the Engineering Department. The Laboratory has seminars on widely varying topics every Wednesday afternoon. Generally, seminars only take place within the three undergraduate terms.

2.3 Research Traps in Computer Science

There are a few things that make research in computer science different from research in other disciplines. These are a few things worth being aware of:

Don't mistake coding for research While many, if not most, computer science PhDs will necessarily involve a lot of programming, it's easy to fall into the trap of writing code as a PhD-avoidance mechanism. This is when you add unnecessary features to your programs, or fiddle needlessly with minor optimisation tweaks because this seems easier than confronting something that really needs doing. This is a particularly seductive way of avoiding your PhD, because it can superficially resemble real work. Ask yourself "Does writing this program/adding this feature really further my research?"

Be careful about RSI Don't let bad work habits turn you into a cripple. RSI (*Repetitive Strain Injury*, also known as OOS, *Occupational Over-use Syndrome*) is avoidable though only a modicum of self-discipline (good posture, short relaxation breaks, etc), so don't put your health at risk. For a "workplace assessment", contact Pieter Brooks (ext. 34659), who may be able to supply footrests, wrist pads, etc.

Don't be daunted by other people's work Many PhD students come with plans to do research in an area that initially seems full of potential, only to discover that much more work than they had ever thought possible has already been done on this topic. Don't be put off by this — it may be a good sign that you're heading toward an area where you can make a significant contribution. If you take the time to understand what other people have done, it is likely that you will soon begin to think of ways their work can be improved.

Prepare yourself for a lack of structure Compared to the experience of research students in other scientific disciplines (physics, chemistry, the biological sciences), you may find that your research in computer science proceeds with relatively little methodological structure. It can be discouraging to find that your work seems to be a vague, undirected creep towards a goal over a distant horizon. You have to learn not to be envious of others' definiteness,¹ and to impose a structure of your own onto your work.

¹Remember that they may well be deluded!

Be aware of the sink-or-swim philosophy It may appear to you, as it has to others, that the lab has a sink or swim philosophy for its research students, i.e., that you are provided with little support and left to find your own way forward into productive research. There is some support available, (see section 4.7.10), but the lab does have a fairly laid-back attitude to the supervision of research students.

2.4 PhD Timeline

This section takes a look inside the three or four years that constitutes a typical PhD. Every PhD is different, and you may deviate substantially from the ideal presented here. This is not necessarily a problem, as long as you and your supervisor agree you are making progress toward your ultimate goal.

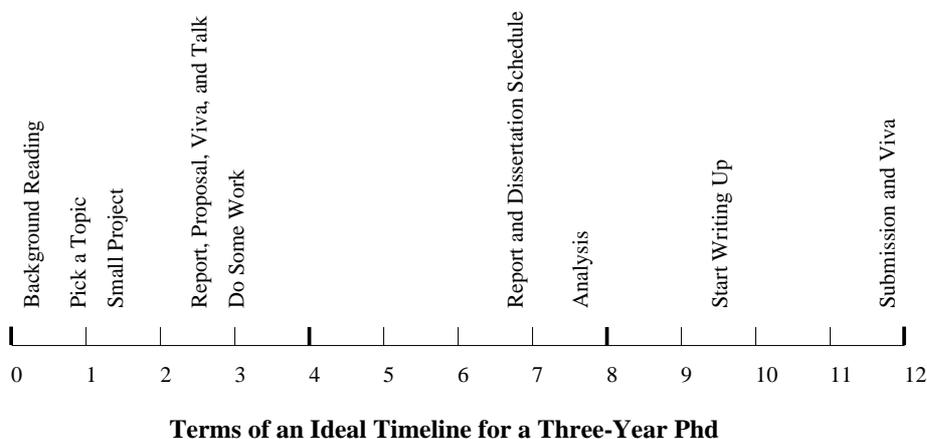


Figure 1: Idealised PhD Timeline

2.4.1 The Progress Report and Research Proposal

At the end of your tenth month as a provisional research student in the Lab, you will be expected to submit a Progress Report and Research Proposal. You will find that there are few guidelines given about these documents, other than that the suggested length is two to four thousand words, and that the former should say what you have done and the latter should say what you are going to do! Your supervisor may have particular preferences regarding the length and format of the report and proposal.

If you are uncertain as to what should go into these documents, a good strategy is to have a look at reports produced by students in previous years. Your supervisor should be able to supply some examples for you to read, as should fellow research students in later years; some students have even put them on the Web. It is worth reading some

research proposals and completed PhD theses early in the first year, to give you an idea of what you should be working towards.

Remember, a research proposal is not a PhD! That is, you don't have to have all your ideas worked out, or even enough concrete ideas to make a thesis. The idea is to define a research area, describe your goals, give an indication that you know how to take the first steps toward achieving these goals, and provide some evidence that the goals are potentially attainable in two years.

2.4.2 The first year interview (Viva)

Once your Progress Report and Research Proposal have been submitted, an informal interview will be organised by your supervisor, involving yourself and two academics, usually your supervisor and one other with similar interests and expertise.

First year students typically feel daunted at the prospect of this interview: in a way this is natural as it is always challenging to talk about ideas you have when you haven't worked out all the details yet. It is important to remember that the interview is basically there for you - to make sure that you have a clear and practical research direction, and are not wasting your own time on work that will not lead to a PhD. Your examiners are well aware that you are still a fledgling researcher, and will not expect you to be an expert in the field yet, although they will expect you to know what you are talking about and to be able to defend your point of view. Be reassured that your supervisor will not have allowed you to submit your Research Proposal if it is of too low a standard, and will have suggested that you do further work. (For this reason, it is worth having a good draft of both documents ready at least a month before the final submission date, to allow yourself time to rewrite them if your supervisor recommends it—staying up all night the day before it is due is best left to the undergraduates).

Although some people have more positive experiences of the first year interview than others (partly depending on the social skills of the examiners concerned!), in general there is little "failure" at this stage; virtually all people who depart the Lab in the first year do so of their own volition, because they realise that a PhD is not for them, and never even reach the interview stage. If you have done enough work to produce an acceptable Progress Report and Research Proposal, you should approach your interview with confidence.

2.4.3 The Second Year Report and Dissertation Schedule

In 2000 the Second Year Report and Dissertation Schedule were added to the PhD Timeline. At the end of the tenth month of your second year you will be expected to submit these, as a single document or two separate ones.

The Report should indicate the progress made in relation to the goals set out in the first-year Research Proposal, including comments on significant changes to the original ideas.

The Schedule should outline the planned content of the dissertation and describe the work to be done during the third year, indicating the times when the draft and final versions of the dissertation should be ready.

2.4.4 Important Dates

For PhD students beginning their course in October, first and second year reports are due by the first Monday of August.

For those starting in January, the deadline is the first Monday of October.

For those starting in April, it is the first Monday of January.

After handing in your first year report and proposal, and subject to it being approved, you will then be registered for the PhD degree course (instead of “not at first registered for any degree”, or the “CPGS”).

2.4.5 When to write up

A Computer Science PhD involves reading, thinking, coding and writing-up, but it dangerous to think of these as separate “phases” of the process. In particular, if you do no writing until the fateful day when you “start to write up”, you will have a daunting task ahead of you. Essentially, you should be writing continually throughout your PhD, be it literature reviews, progress reports, conference or journal papers or simply the odd paragraph here or there that may one day be incorporated in your thesis. Some people feel that there is no point writing much thesis-oriented material in the early stages, because their ideas will change before the final thesis is produced, but there is a tremendous psychological advantage in having a large collection of material already available when you “start” writing-up, even if that material may require a reasonable amount of additional work. Furthermore, having a written record of your early confusions may help you anticipate misunderstandings that your examiners may have of your work, and to phrase your thesis carefully in compensation for this.

In terms of how long it takes to write up, don’t be misled by the quasi-mythic tales that circulate around the lab of people who wrote an entire thesis in a few weeks, or even a couple of months. Typically, you should anticipate that producing your thesis will involve six months of solid writing. Since the writing-up process will often make you realise that you require some extra data, or a few more finalising experiments, “writing-up” should probably commence at least twelve months before you intend to submit, to give you room to manoeuvre. In summary, do not underestimate the time it will take you to write up, which is guaranteed to be far more than you expect. Giving yourself plenty of time to do it will mean that the whole experience is much less unpleasant, and you will still have time for those important non-PhD activities which help to keep you sane!

Sometime in your PhD you might like to ask your supervisor a question along the lines

“If I do X, Y and Z and write about it, will I get a PhD?” Of course, they can’t give an exact yes or no, but if you get a positive kind of response then you might find a huge burden removed from your shoulders, as you will know just what you have to do to finish up.

2.4.6 Structure and goal setting

The degree of externally-imposed structure that you will experience during the course of your PhD will vary somewhat with the style of supervision that you receive and the degree of participation that you are expected to have in your research group. However, in general the Lab imposes very few formal requirements on its students, and does not monitor their progress very closely. Unless you have a particularly proactive supervisor or research group (which is not the norm), you can expect to feel “left to your own devices” to an extent that you may not have anticipated.

Even if you enjoy working independently and managing your own progress, the relative lack of external structure is potentially a great pitfall, particularly if you have a less than ideal amount of contact with your supervisor (see section 2.1). The official milestones of the first year (the progress report, research proposal, interview and presentation) and the second year (the second year report and dissertation schedule) should help to prevent your PhD stretching ahead in a directionless blur. The ability to set goals and deadlines for *yourself*, even if they are quite arbitrary, is extremely important. Obviously, the suggested PhD Timeline (fig. 1) can be of general use, but on a more day-to-day basis, the following suggestions may be helpful:

- **Arbitrary deadlines.** Get into the habit of setting regular, short- and medium-term deadlines for yourself (“I will produce a graph of experimental results Y today”, “I will write a summary of journal paper X by Friday”, “I will add feature Z to my prototype by next month”). Make the tasks realistic, even if they therefore seem trivial (setting yourself too many impossible goals will only leave you stressed, depressed and even less productive), and even give yourself rewards for success if you want to! For larger, medium-term tasks, actually *telling your supervisor* (or even just your fellow students) what you will do, by when, will give you extra motivation to succeed.
- **Progress reports.** Committing yourself to producing regular (monthly, for example) short progress reports for your supervisor (either oral or written) will force you to assess just how much you are achieving, and will help you to catch any “PhD drift” before it becomes serious.
- **Talks.** Volunteering to give a talk to your research group, as well as being good for you, is an easy way to acquire a fixed, external deadline. This can be a good way of forcing yourself to impose some structure on any provisional results that you have, or carry out some more directed experiments to acquire further results.
- **Conference papers.** Conferences are another useful source of external, fixed deadlines; choose a relevant conference and commit yourself to submitting a

paper to it. As well as providing a short term focus for your work, this has the benefit of bringing you independent feedback on your work (the reviewers' comments) and potentially a publication or two as well - not to mention some written material that may eventually be incorporated in your thesis!

2.5 Work Habits

You have three years to get some work done. When you start, it seems like an age. However, after two years, you may be wondering where your time has gone, and how you could possibly finish in one more year! Personal work styles vary tremendously, but it's important to remember that:

- Just because you're at your desk, it doesn't mean you're working.
- Just because you're not at your desk, it doesn't mean you're not working!

A few hours of *effective and focussed* work a day for three years would comfortably see you through a PhD. However, even if you're in your office, it's very easy to get distracted from anything resembling work, and even if you are slaving away, are you working on something relevant to your thesis? Try to recognise your individual PhD-avoidance tactics.

Remember while you're at Cambridge to take the opportunity to "Get A Life" so that you can retain your sanity and improve the image of compsci geeks everywhere. Don't rely on the lab for your social life—get out there and mix in your College and the various university societies.

2.6 Overrunning

Despite your best efforts and the best efforts of your supervisor, you may not finish in three years: you may have suffered some sort of setback (it's not unknown for students to have completed one or two years' work and then be beaten to publication by someone else), have ended up with experiments that take a long time to run, or have spent all your time playing Quake².

If you think you may be in danger of overrunning, you should speak to your supervisor as soon as possible: what happens then is up to you, your supervisor, your funding body, and the department.

Typically, you will apply to the Board of Graduate Studies for leave to submit late and for remission of fees, both of which will typically be granted (the remission of fees bit is important, as otherwise, you would end up having to pay the University Combination Fee). This has to be done well in advance, so you shouldn't delay until the last moment.

²We do not encourage this alternative :-).

Funding is a little more thorny: if you are funded other than by the EPSRC, arrangements will be between you and your funding body—typically, ‘all’ that will happen is that you will have nothing to live on for the period in which you overrun—see section 7.2 on how to cope with this.

This will happen if you are funded by the EPSRC, but it is also important that you do not overrun by more than a year. If you overrun by more than this amount, EPSRC will begin to penalise the department by depriving it of funding for new PhD students to the amount specified on the EPSRC web site³. The penalties incurred aren’t particularly large, but the department is still anxious to avoid them, especially in view of the large amount of contention for EPSRC studentships. Similar arrangements apply for other research councils.

Whilst outside the scope of this guide, you should also note that if you are in danger of overrunning, you should typically also see your College tutor about arrangements: some colleges have hardship funds which you can use, and there are also University-wide funds. Some colleges may even be able to offer you accommodation for a fourth year.

3 Undergraduate and Diploma supervisions

A good way of earning some extra money, and gaining teaching experience if you are planning on an academic career, is to supervise undergraduates and/or Diploma students. Supervisions are intended to supplement lectures, and are an important part of Cambridge’s teaching traditions. Responsibility lies with each College’s Director of Studies to ensure that its undergraduates and Diploma students are adequately supervised for each of their lecture courses. This generally means that each student will receive a few hour-long sessions of extra tuition each week of term, usually in groups of two.

If you didn’t do your first degree at Cambridge, you may find some of the related terminology to be a bit confusing. The undergraduate course is known as the *Tripes*, not because it lasts three years, but for some arcane reason to do with a three-legged stool. The first two years are Parts IA and IB; the final year is Part II. The Diploma course lasts for one year, and is intended as a conversion course for those who already hold a degree in some other discipline. Diploma students attend lectures from all the Parts of the undergraduate course. There is also a Part II (General), which has the same lectures as the Diploma, but is for undergraduates who have completed the first two years of another Tripes, such as Mathematics or Natural Science.

³<http://www.epsrc.ac.uk/>

3.1 Lectures

If you agree to supervise a course, then you can refresh your memory on it by attending the lectures. You can also attend any of the lectures which interest you, perhaps to cover material that wasn't part of your own undergraduate course, or to keep up with new developments. You can find out which lectures are on and when by getting the relevant booklets for each year level, and the overall lecture timetable, from Fiona Billingsley, or the Lab's Reception. These are also available on the Web⁴. As yet, the lab does not regularly schedule lectures aimed specifically at research students, although this has happened in the past, and there is some interest in making it happen again. As a member of the University paying the Composition Fee, you are also entitled to attend lectures given by other departments: see the "Lecture List" issue of the *Cambridge University Reporter*, which is published at the start of October. There is likely to be a reference copy in the Library, as well as your College library, they are available for purchase from newsagents in the Michaelmas term, and the Reporter is also available on the web⁵.

3.2 Supervising

For all courses other than Part II, supervisors are recruited by the Director of Studies in Computer Science for a particular college, who is usually one of the academics in the Lab. Many Directors of Studies share supervisors with each other, in order to make the task of arranging supervisions easier, so you will often find that your group of students is drawn from a number of colleges. In 1998/9, the Lab took over the arrangement of supervisions for Part II courses, and it has become the responsibility of a course's lecturer to find an appropriate group of supervisors. Many of the Part II courses are specialised, and arranging supervisions centrally means that each college gets its fair share of suitable supervisors. The new scheme for supervision of Part II courses is explained in more detail on the Web⁶.

You will normally be expected to make your own arrangements of where and when to see your students; one supervision per 3–4 lectures is usual. You can contact them via e-mail, as all undergraduates have accounts on the Computing Service's hermes facility. You may end up supervising in your own room at home, but if this is inconvenient you may be able to book a supervision room in a College or in the lab, or perhaps find a free space somewhere in the lab (see section 4.7.8). Lecture notes for any courses you are supervising are available free of charge from Student Administration, as are past examination papers (these are also held in the library, and on the Web⁷). The past exam questions are useful when setting work for supervisions; it is reasonable to expect students to complete a few questions and submit them to you at least the day before their supervision, to allow you plenty of time to mark their answers.

⁴<http://www.cl.cam.ac.uk/UoCCL/teaching/>

⁵<http://www.admin.cam.ac.uk/reporter/>

⁶<http://www.cl.cam.ac.uk/UoCCL/teaching/PIISS/svisions.html>

⁷<http://www.cl.cam.ac.uk/tripos/papers.html>

In the 1997/8 academic year, the Lab introduced more formal support for supervisors: lecturers are expected to write a supervision guide for each of their courses, including examples of appropriate questions to set, and notes on how they would expect those questions to be answered. These guides should be available for consultation from Fiona Billingsley. In practice, this has been a little slow to get started, and you may find that a guide is not yet available for the course you are supervising—contact the lecturer to ask! More information about support for supervisors is available from the Lab's Web pages⁸. If you have any problems with the lecture material, for example because an example is unclear or you don't understand how a lecturer is defining his or her terms, you should feel free to email the lecturer for clarification.

Supervising is generally easier for research students who were also undergraduates at Cambridge; if you weren't, you may find that the content of a course does not exactly correspond with what you know about the subject. The courses here may well go into more depth than elsewhere, and almost certainly at greater speed; if you are unsure about what will be covered, it is advisable to check with the lecturer or your prospective Director of Studies before agreeing to supervise the course.

At the end of supervising a course, you will be required to provide a very short report on each student's progress. This can be limited to one or two sentences for most supervisees, with a few other details about effort, progress and interest. All reports are now submitted online via CamCORS⁹, for which you'll need an account. Your college Tutorial Office (supervisions@college.cam.ac.uk) should be able to help you with this, or ask Fiona Billingsley. Payment claims are also made via CamCORS, so filling in the correct number of hours is important. Bear in mind that the number of hours filled in as "given" *excludes* the number "to come" (i.e. those that you are scheduled to give but have not done so when you submit the payment claim).

The Board of Graduate Studies restricts you to six hours of teaching per week, or ten with the permission of your supervisor. Many funding bodies also restrict the number of hours you are allowed to work¹⁰; even if yours does not, it is advisable anyway not to supervise for any more than six hours per week if you ever want to get any of your own work done! Most Directors of Studies are very keen to find supervisors, and will try to get you to take on as much as possible, especially if you are able to supervise a course that not many others can. You can make things a little easier by supervising several groups of students for the same course, meaning that you only have to cover the material once yourself.

If you lose touch with any of your supervisees, or are worried about their progress or their well-being, you should let the student's Director of Studies know.

⁸<http://www.cl.cam.ac.uk/UoCCL/teaching/supervision.html>

⁹<http://www.camcors.cam.ac.uk/>

¹⁰The EPSRC restricts you to six hours a week at present, though this is creatively interpreted by some departments and ignored by others.

3.3 Projects

If you decide that course supervising is just too much work, there are other, (usually) less time-consuming jobs available. One of the alternatives is project supervision, for Part II undergraduates and Diploma students. These are a large part of a student's workload for the year, and involve carrying out a substantial piece of work and writing it up in a dissertation. It is important to note that student projects are marked only on the basis of the dissertation, and *not* the practical work. More information about projects is available in the briefing document handed out to students (the "Pink Book"), which you can get from Fiona Billingsley. It is also available on the Web, along with a collection of other information about projects¹¹. Projects may be related to the research in your group, or an independent piece of work, and you can suggest anything which you think would make a suitable project.

Make sure that you see your project students regularly: it is all too easy to forget to chase them up. Every two weeks during term is a good rate to aim for. Many students can work on their own without much help, but if you lose touch you can never be sure if they are getting along just fine, stuck and afraid to ask, or doing nothing at all. Of course, this is their own responsibility in the end, but a good supervisor should do something about it. Again, if you are worried, contact the student's Director of Studies. Diploma students submit their dissertations after their exams, but Part II students do so before, which means it is important for them to have their dissertations finished early so they can start revising for their finals.

3.4 Money

With both course and project supervisions, you will be expected to keep an honest record of the number of hours you have seen each student, and at the end of each term you must fill in forms to claim your payment. You are also expected to write a short assessment of each student's work for the term. These allow the Director of Studies to keep track of the student's progress. Your reports and claims for payment will be made online, using the CamCORS system¹². Payment is made for each hour you are actually with the student, so you do not get paid for the hours you spend marking their work. The exception to this is time spent proof-reading the final draft of a project student's dissertation, for which you can usually charge. The pay scale is uniform across all colleges, and works to ensure that you get paid about £20 per hour for a single student, increasing slightly for larger groups: hence, you will be paid around £18 for each hour of supervision of a single student, around £11 per hour per student for each supervision of a pair of students and so on.

¹¹<http://www.cl.cam.ac.uk/Teaching/Projects/projects.html>

¹²<http://www.camcors.cam.ac.uk/>

3.5 Demonstrating

Another possibility is demonstrating at practical classes. This usually involves being in attendance while students work at computers, offering assistance if they appear to be having difficulties. If you have knowledge of Windows, you can be a demonstrator for a course which aims to teach Natural Science students how to use popular PC packages (see Chris Northeast about this). Demonstrating pays less (about £9 depending on experience) per hour than supervising, but is less demanding.

“Tickers” are also required for a few Tripos subjects, such as the ML and Java programming courses, and for these subjects you will be expected to mark students’ weekly work. The pay is about £43 for a two-hour session each week; ask Dr Frank King about this.

For more information on supervisions, see Frank King’s guidelines [2].

4 Pragmatics/Administrivia

You are likely to feel overwhelmed by the amount of administrative information which your College and the lab will throw at you in your first few days in Cambridge. This section is an attempt to clarify the practicalities of the lab, such as its relation to the Computing Service (section 4.1) and its structure (section 4.2); where you have to go to obtain everything from thesis binding (you never know, it might happen...) to a cup of tea (section 4.7); how to access Cambridge's libraries (section 4.7.1); and officialdom which you might encounter (section 4.8).

4.1 Shouldn't I Be In The Computer Science Department?

Cambridge University is odd. In many ways. One of the more unusual features is that its Computer Science department is called the Computer Laboratory, due to its historical basis as the "Mathematical Laboratory".

Originally, the University's Computing Service used to be the "other half" of the lab, but that has now been split off and is left in central Cambridge, administering the computers used by the rest of the University and providing other useful services from the Computing Service Reception on the second floor of the Cockcroft building (see 4.7).

The Computer Lab has its own systems on which an account will have been set up for you when you arrive. In addition, you may want to access some of the Computing Service's systems. For more information, obtain a copy of the "Information for New Users" [3] booklet from Reception. Ignore, at least for the moment, the details in this booklet about the Computing Service mail system (`hermes`) since the Lab system will handle that for you. You may wish to obtain a PWF (Personal Workstation Facility) account if you are likely to require occasional access to the PCs and Macs in the "Intel Lab" (and other places in the University) You may want a `pelican` ftp large storage account to archive all those important files which you will eventually create¹³. Again, obtain these accounts and information about them from the Computing Service Reception.

4.2 Who's Who In The Lab

Members of the Computer Laboratory are listed on the web, along with their email addresses, room numbers and phone numbers¹⁴. The structure of the lab can be viewed as a set of research groups under the supervision of the head of department. Within each research group are an assortment of professors, readers, lecturers, research associates, research visitors, research assistants (RAs) and PhD students. The relative proportions of these classes of people varies considerably from group to group.

¹³<http://www.cam.ac.uk/cs/docs/leaflets/g79/>

¹⁴<http://www.cl.cam.ac.uk/DeptInfo/userlist-p.html>

Some of these academic classifications may be unfamiliar to non-Cambridge graduates, so some explanations may be in order:

- The ordering—professors, readers, lecturers, research fellows, senior research associates, research associates, research assistants—reflects the general academic recognition of these posts.
- Lectures can be given by anyone from the rank of professor to (rarely) PhD student.
- Everyone (except College research fellows) is employed by the university. Academic positions (professors, readers, lecturers) are either tenured (most senior academics have tenure), or else typically employed on five-year contracts renewed subject to performance. Research associates (post-docs) and research assistants (post-grads) are employed on fixed-term contracts associated with grant-funded projects. The renewal of these contracts is subject to funding.
- Research visitors are usually funded by sources outside of the lab.
- The phrase “Director of Studies” is less relevant to graduate students (although see section 3 on supervisions) and is a supplementary term which can be applied to any of the above people to indicate that they organise supervisions for a particular College.

4.3 Important People

Apart from your own research group, the people you are most likely to come into contact with are:

- Margaret Levitt, Departmental Secretary, who will be able to answer questions about all manner of things.
- The Student Administrator: Fiona Billingsley, who handles lecture notes, supervision guides, and a hundred and one other things.
- The Graduate Administrator: Lise Gough, who makes sure that you hand in first year reports, deals with the BoGS, and answers many of your questions on graduate student matters.
- The Efficient Reception Staff, who give you COTAG cards (entry cards), room bookings, etc.

4.4 Representation

Representation for graduate students is provided by a single representative on the Computer Science Syndicate. Representatives serve for a calendar year, and are typically

elected in November to serve from January to December: an email circular will be sent around at nomination time. The Syndicate deals with Lab policy decisions, rather than day to day practical issues.

A separate representative is elected to stand on the Staff Student Consultative Committee¹⁵, which deals with day to day concerns like cafeteria prices, complaints about heating, and so on.

4.5 Women@CL

Women@cl is based in the Computer Laboratory. At national level we support women in computing research, with a focus on interdisciplinary research, leadership and enterprise, through a programme of career development activities including regional and national workshops, mentoring and networking. The group organises regular events including lunches and seminars. For further details, see <http://www.cl.cam.ac.uk/women/>.

4.6 Safety

The Laboratory is generally a very safe place to work. However, you should make sure you are aware of the arrangements in place should anything untoward happen.

Fire Make sure that you know what your exit routes are (bear in mind that there are fire doors at the bottom of all the stairwells). Fire alarm call points are the red break-glass panels. Extinguishers are generally sited near these. If the alarm sounds, leave the building, and report to your assembly point. Fire wardens (fluorescent jackets) will be on hand.

First Aid There are a number of first aiders¹⁶ in the Lab. If you require first aid, telephone reception. If you do need to call an ambulance, dial 9 for an outside line, and then 999.

Security If for any reason you need University Security, they can be contacted on internal extension 31818.

4.7 Where To Go For The Essentials In Life

The Lab has a useful web page containing maps of locations in West Cambridge¹⁷.

¹⁵<http://www.cl.cam.ac.uk/Teaching/SSCOM/>

¹⁶<http://www.cl.cam.ac.uk/UoCCL/local/safety/>

¹⁷<http://www.cl.cam.ac.uk/site-maps/site-maps.html>

4.7.1 Libraries

Even though you're a computer scientist, you may not find all of the things you need to read on the net. You may (shock, horror) find that you need to read books or journals. There are many libraries scattered throughout Cambridge, catalogued in all sorts of intriguing and historically interesting ways.

It should be noted that the various libraries around Cambridge may subscribe to digital libraries like the ACM, saving you on membership fees for these organisations. The Computer Laboratory librarian is the person to ask.

Computer Lab Library A slightly eclectic mix of computer science books and journals on a wide range of topics.

Scientific Periodicals Library (SPL) Full of journals and other periodicals.

University Library (UL) A UK copyright library, which means that every book published in the UK should be in here. It has a lot of books, and a tea room famous for intrigue, sexual tension and scones. A computer scientist, however, may be interested in the Lecture Notes in Computer Science (LNCS) series which are not available elsewhere in Cambridge.

Betty & Gordon Moore Library (BGML) One of the dependent libraries of the UL, this is the Department for Applied Mathematics and Theoretical Physics library. It also contains many of the UL's Computer Science titles. Access can be gained 24 hours a day on application at the desk.

Your College Library Mainly useful as a source of undergraduate text books, if you're lucky.

The University Library maintains a searchable catalogue of the contents of the UL, a list of serials (eg. journals), most of which are physically stored in the Scientific Periodicals Library, and a "Union Catalogue" of all College and departmental libraries including the Computer Lab Library. This catalogue can be searched via the web¹⁸, or using SSH¹⁹.

The Computer Lab library maintains its own set of pages on the Web²⁰, along with access points to other online libraries. Searching it or any other departmental library is most easily done via the UL Newton online catalogue, using "apply limits" button to narrow the search. You will typically be allowed to read in other departments' libraries, if they have material you can't obtain elsewhere, but it is courteous to ask the librarian first, typically by email.

If for some reason you don't find what you're looking for in Cambridge, you may order an inter-library loan from the Scientific Periodicals Library.

¹⁸<http://www.lib.cam.ac.uk/>

¹⁹see details at http://newton.lib.cam.ac.uk:7703/help/telnet_help.htm

²⁰<http://www.cl.cam.ac.uk/Library/>

Photocopiers are available in most departmental libraries, the UL, and the SPL, and are operated by means of cash or photocopier cards of several types: if you are unsure, ask the librarian. You should also read and obey the restrictions on copying posted by each photocopier (though also note that they don't apply to certain publications: ACM papers, for example, are freely redistributable under certain conditions).

4.7.2 University Cards

University Cards that contain a photo of the owner and a smart chip were introduced in 2000. These provide access to the UL and SPL and may also be required in your college. You will need a passport-sized photograph of yourself.

As of Michaelmas 2004 a new University card is being issued, which contains an RFID tag. The majority of departments still make use of the TDSI strip that was present on the smart chip version of the card, but is not on the new version. In particular, the Betty & Gordon Moore Library still uses TDSI. To obtain an extra University Card, visit their offices²¹ on Mill Lane.

4.7.3 Leaflets and courses

Lots of wonderful things can be obtained from Computing Service Reception (Austin Building, New Museums Site) and, if it's work-related, they're free!

Computing Service Reception is also where you can obtain (work-related) leaflets, and information about the courses, which the Computing Service provides. Details of these are available on the Web²² and the leaflets in particular could be a useful introduction to Unix, X, etc.

Booklets on the Computer Science tripos and other useful Computer Laboratory related leaflets are available from Fiona Billingsley, or in the racks outside the lecture theatres.

4.7.4 Binding, printing and photocopying

Work for the printshop run by the Computing Service can also be dropped off and collected at reception. Small photocopying jobs can be done personally using the photocopiers in the library (accessed by using the librarian's photocopying card or purchasing a card from the Lab's reception desk), or in the various photocopying rooms scattered throughout the building. Again, photocopying is free if it's work-related. Comb binding can be done using the self-service machine in the library. Printing throughout the Lab is free.

The lab operates an honour system for the usage of personal photocopying, printing, etc. Please be honorable—don't abuse the system.

²¹<http://www.admin.cam.ac.uk/offices/misd/univcard/>

²²<http://www.cam.ac.uk/CS/index.html>

The lab has a number of its own printers distributed around the site. A list of them including location and capabilities is obtainable by typing `lpr -Px` in a Unix shell. One to note is redwood, which can print in colour and on sizes of paper up to A0. Use of redwood is arranged through Chris Hadley.²³

4.7.5 External phone calls

Telephones on the university network, such as the one in your office, can be “barred” to a certain extent. The sorts of calls you can make from various phones vary widely, and it’s probably best to refer to the phone directory for the full details. However, you can make free external calls within Cambridge, by prefixing the number desired with a “9”. 0845 numbers are free as well. If you wish to make a call on a phone which does not permit you sufficient access call Reception on 63500 giving the number you desire and whether the call is personal or work-related.

Personal calls will come back to haunt you in the form of the phone bill which will appear in your lab pigeonhole some time after such calls. Don’t worry too much, though, because the lab’s call charges appear to be less than BT’s. Hence the request to take your 5p phone bill “to accounts” means that you should pay a visit to accounts. In addition, the university network phones all allow you to connect to the various telephone companies’ charge card facilities, so you may prefer to use these to make your personal calls.

4.7.6 Stationery

To get pens, pencils, Post-It notes, folders, binders, drawing pins, cuddly toys, etc, you can either:

- go to the stationery cupboard, in the ground floor central corridor
- go to Stores (having come in through the main entrance, turn left and it’s on your left again)

4.7.7 Recycling

The Lab has recycling facilities for paper, with green bins suitably labelled in each printer area. In addition, many offices have recycling trays, which the occupants should empty into their nearest green bin. Cardboard and glass are recycled through Stores. Aluminium drinks cans can be deposited in the appropriate bin in the cafeteria area.

²³Check out the redwood “home page” at <http://www.cl.cam.ac.uk/info/printers/redwood/redwood.html>

4.7.8 Room bookings

If you are in charge of your research group's meeting/talk schedule, or if you are organising a one-off event like a talk from a visiting speaker, or a demo, then it's probably best to book a room for the purpose. Rooms can be booked only by emailing Reception@cl.cam.ac.uk. Rooms are in short supply and priority will be given to academics and meetings.

You can also book Lab rooms for supervisions (ask at reception to find out which rooms are available for this purpose), though it's generally easier to find an alcove instead. You can sometimes book supervision rooms from the College of the students you are supervising. Also, if you can find a vacant room in the lab at the time of a supervision you can use it, but you must vacate if someone else wishes to use the room for something other than a supervision.

4.7.9 Tea, coffee, biscuits, happy hours

In the old building, in central Cambridge, there used to be a tradition of having coffee in the morning and tea in the afternoon. In the new building, there is no such organised gathering of people, however, in the afternoon, there is usually a tea pot on in the tea room at 4:00 (Monday – Thursday).

Happy hour seems to have become a nice tradition – Friday at 5:00, also in the tea room.

4.7.10 Whinging

At some point in your PhD it's likely that you'll be unhappy about your subject, your officemate making too much noise, your supervisor being away for too long or your existence as a PhD student in general. Don't worry. It happens to (almost) everyone.

What can you do about it? Firstly, remember that your peers in your office, or the other people in your research group are probably experiencing the same worries or have already handled the same situation and found an answer. Talk to them, if you can, and you will probably find a great deal of solace and sympathy, if not necessarily a solution. If that is not practicable, or doesn't work, other people you could talk to are:

- your supervisor, of course;
- the graduate representative on the Computer Science Syndicate;
- Lise Gough, who is always wonderfully supportive to graduate students;
- your graduate tutor and counsellor at College, who can provide alternative sources of assistance. Ask your porters if you don't know who these people are.

See also section 4.8.2 on changing supervisor/group/department/College, and the table in section 2.1 for a list of other helpful people within the lab (including Margaret Levitt, who deals with room changes).

4.8 Official stuff

4.8.1 BoGS

It has a rather unfortunate name, but the Board of Graduate Studies is crucial to your PhD. This is the committee which will have accepted your application to be a PhD student, who will hopefully agree to your confirmation as such a student after your first year, and to whom you will submit your wonderful thesis at about the three-year stage.

BoGS has a large number of forms for current graduate students online²⁴, which you may well find more useful than going down to Mill Lane to get paper versions of!

4.8.2 Changing supervisor, etc.

A number of eventualities may lead to you changing your supervisor and/or research group. The most likely cause of this is that you have found an alternative avenue of research during your first year: something which is more related to the work of another person or group in the lab than that of your current supervisor and group. Such a change is more frequent than you might imagine, but is only really possible in your first year since a later change would seriously disrupt your completion schedule.

The impetus for such a move is likely to come from you and should be discussed with your existing supervisor fully. Also, feel free to discuss the matter with Lise Gough or the head of the department. Advice from your supervisor and others should assist you in finding a new supervisor within the lab, and hence to establish links with a new research group. Your existing supervisor can then inform BoGS that a change of supervisor has been requested and Margaret Levitt will advise on whether a room move is possible.

Changing your department or College is a more major undertaking and rarely happens. Your supervisor could assist if the former eventuality appears necessary, and your graduate tutor at College and the Graduate Union Handbook²⁵ [5] can assist in the latter case.

4.8.3 Transferable Skills

Every student, regardless of year, will be expected to keep a log of activities that could be regarded as transferable skills. Forms are distributed at the beginning of each aca-

²⁴<http://www.admin.cam.ac.uk/offices/gradstud/current/>

²⁵More information on the GU is available at: <http://www.gradunion.cam.ac.uk/>

ademic year. The Lab is expected to submit returns each year and this brings cash into the department that will be used for conference travel and so forth.

Students who submit their forms by the beginning of Michaelmas Term (preferably by the first Monday in August) will have requests for travel or other purchases treated favourably. Those who do not may not receive Lab support!

Examples of transferable skills training which should be included are:

- attendance at lectures or courses, or less formal training, on:
 - health and safety
 - risk assessment
 - first aid
 - writing or presentation skills
 - IT skills
 - intellectual property
 - research and project planning and management
 - generic research methods (including statistics)
 - research ethics
 - literature searching and library skills
 - laboratory demonstrating or supervision of undergraduate students
 - career planning and development
 - languages
- preparation and delivery of presentations within or outside Cambridge
- attendance at conferences and seminars (in Cambridge as well as elsewhere, whether presenting material orally or as a poster, or participating as a listener)
- preparation of posters, reports, papers etc.

Contact the Postgraduate Student Administrator for further details.

5 Technical hints

As well as being academically challenging, the lab can be a technically intimidating environment in which to work, particularly if you are not used to the Unix, X-based world that is prevalent in the lab. On the other hand, if this is an environment with which you are very familiar, it can be equally dangerous; you need to watch out for the tendency to excessive customisation. This section of the handbook should help you avoid pitfalls on both sides of the road to ultimate success.

5.1 General details

The lab's computers vary a great deal, but can generally be classed as Unix machines, running on a variety of different architectures. There are a few machines common to the lab as a whole, eg. `shep` and `ware`, as well as machines dedicated to particular research groups.

As a new research student, you will probably end up sitting front of a PC running Linux or Windows XP.

There are six system administrators; these are the people you should turn to for support when it all goes wrong. Usually this is via an email to `sys-admin@cl.cam.ac.uk`. Though it hardly does them justice, here is a sampling of their areas of expertise. For more information, look to the introductory booklet you will have also received [1], and to the World Wide Web (see below).

Martyn Johnson can help you with DEC machines, ATM, Ethernet, and \LaTeX

Graham Titmus knows about Suns, HPs, X, Ethernet, Windows NT, and Emacs

Piete Brooks is the postmaster, in charge of e-mail and news, and the resident Linux guru.

Chris Hadley manages GNU software, and printers

Robin Fairbairns looks after the NT machines

Ian Grant Linux Kernel, RPMs, etc.

Jiang He Wiring, machine registration, phones

Nick Batterham hardware technician

As a general rule, the system administrators like to do as much business as possible by email. This is a non-intrusive way of working, and also allows business to be forwarded to more appropriate people conveniently.

When you encounter a technical problem, it's best to consult the following sources (in order):

- Google
- Google Groups
- Other students in your group
- The System Administrators

A great deal of information about the IT systems in the lab is available on the Local Systems Information page²⁶. This gives details on all sorts of things. In particular, new students may be interested in the sections on setting up a notebook computer to work on the wireless network, printing from your notebook computer, etc.

There's plenty of scope in the lab for people to do weird and wonderful things to their computer environment. If such is your fancy (though see below for a cautionary tale about excessive customisation), the system administrators tend to like to know the potentially disastrous stuff beforehand, rather than after the disaster has already happened!

If you need to purchase equipment, the Computer Officers are a good source of advice. Remember that you'll need the authorisation of your supervisor to actually spend the money though.

5.2 Basic environment

At the bare minimum, you need to be able to use the lab's computers to log in, read mail and news, and do your basic research work. This will in turn require you to be able to cope with a window manager (`twm` by default), a mail reader (the lab recommends `exmh` under X, or `mh` if you only have access to a text terminal), a news-reader (`xrn`, though in the interests of your sanity, you may prefer to use the terminal-based `trn`), a Unix shell (usually `bash`), and an editor (`emacs` or `vi`). The lab now has a lot of material on the Web, and the Web is a worthwhile resource in its own right, so it's likely that you will also use a Web browser, probably `netscape`.

The Lab Mail Transport Agent is the locally-developed `exim`²⁷, which provides sophisticated mail handling that makes it quite easy to tie the mail system up in knots and receive visits from angry systems administrators. This is not desirable—read the lab's notes on how to set up your `.forward` file before you try to do so.

It is also important that you have definite proficiency with some sort of text processing system. The standard system in use at the lab is \LaTeX ; not only does it have required degree of sophistication, there is plenty of support for it within the lab in terms of a strong user-base (i.e., there are plenty of people around to help).

Finally, you may also (read: will regret it if you don't) want to learn to use version control systems such as CVS. These allow you to store your work in such a way that it is possible to recover old versions of it. This is not so much a backup concern (the lab automatically backs up all of the file system every day), but one of being able to undo a development that has gone astray.

There is documentation on most of these tools and other aspects of the lab environment on the lab's web-pages²⁸, and there are always man pages and knowledgeable users to

²⁶<http://www.cl.cam.ac.uk/localsys/>

²⁷<http://www.exim.org/>

²⁸<http://www.cl.cam.ac.uk/info/>

consult.

Much of the lab's internal communication is done via the medium of the Usenet newsgroups. The groups you should definitely subscribe to are:

`ucam.cl.announce` this is where lab-wide announcements of general relevance are made so this is an important forum to read.

`ucam.cl.<your research group>` each group has its own newsgroup for announcements about talks and other information that it finds important.

You need to feel confident and happy with the computer environment in the lab. If using the computers is a trial, it will be difficult to get the most out of them, and the most out of your research.

5.3 Charging

Traffic coming into the University via the transatlantic link is now charged, initially at 2p/megabyte. Traffic that traversed the link between 1am and 6am is not charged. Charges are now being passed on to departments and colleges.

Traffic coming over the transatlantic link includes traffic from pretty much everywhere except Europe (and sometimes from Europe too), and this has a number of consequences for computer scientists:

- The University runs a web proxy: traffic via the proxy is not currently charged, so use it. See <http://www.cam.ac.uk/WWW/ProxyServer/> for instructions (your browser may come already set to use the proxy, but don't depend on it).
- Don't download large files from the US where a local mirror will do: the University runs its own Linux and GNU program mirror²⁹, accessible via `/rnfs/uxsup/` from Lab machines, there is a sunsite archive in London³⁰ which mirrors practically everything you might possibly want at `/rnfs/sunsite/`, and for everything else, try the UK academic mirror site run by the Universities of Lancaster and Kent at <http://www.mirror.ac.uk/>.
- If you must download large files from the US, do it between 1am and 6am (you can automate this process: ask your local UNIX guru how).

The Computer Lab's charges weren't all that high last year, mainly because people kept to these guidelines.

Hackers who use `traceroute` to check whether charging will be applied to traffic from a particular host are reminded that IP routing is not necessarily symmetric and that JANET IP routing has been known to be significantly asymmetric.

²⁹see <http://www-uxsup.csx.cam.ac.uk/nfs-server/>

³⁰<http://www.sunsite.org.uk/>

5.4 How to customise yourself to death

Upon arriving at the lab you decide that `twm` is not good enough for your sophisticated needs so you switch to `fvwm` with its multiple virtual windows, and you spend a week or so fiddling with its colours, menus, and title-bar buttons.

Then, being an `emacs` hacker, you decide to install and use the latest and greatest packages to read mail and news. With hundreds of customisation variables each, it's a good month before you're entirely happy with the look and feel of both. And then you discover Supercite, and dozens more options.

Moving increasingly far out onto a limb (no-one sits down in front of your terminal anymore because they have no idea what their button presses and keyboard actions are likely to do), you discover the arcane mysteries of the `.forward` file. You decide to filter half of your incoming mail into one folder, automatically copy another subset of mail to a friend, and archive more mail onto your web-pages (did I mention that you're maintaining an extensive set of web-pages by now?). Having lost half of a week's mail and sent bounce messages to all of your electronic correspondents, you finally sit back after another 6 weeks and pronounce yourself happy with your environment.

The above story is not a recommendation of how to proceed!

6 Publishing, conferences and networking

Communicating your research to others in some lasting and referable way is almost as important as doing research in the first place. The main ways of doing this within a PhD are:

- journal articles
- conference (or workshop) papers
- Computer Laboratory technical reports
- and of course, your thesis!

It's also not unknown for PhD students to write book chapters, or write or edit books during their PhD. In particular, some completed PhD theses are published as books or monographs. Another excellent reason to publish is to “stake a claim” on your research results before you write your whole thesis. Technical reports are particularly useful for this purpose, as, while the quality is generally high, the refereeing process is internal, fairly informal and much less daunting (see below).

When you submit an article to a journal or conference, it will be distributed to reviewers who will determine whether the article will be accepted, and who will also provide comments or make suggestions on the article.³¹ As a rule, the review process for journals tends to be more severe. This means that journal articles tend to be of a higher quality than the average conference paper, and hence look better on a CV. However, the review and publishing process for journals can be longer.³²

Computer Lab technical reports are another way to get your work “published”. A document becomes a tech report when it has been approved by a member of the academic staff. Before they will approve your document, they will review it, provide suggestions and feedback, etc. This review process is meant to maintain the high standard for lab tech reports. Tech reports are sent out automatically to a wide external audience, and also appear electronically on the web. Consult the librarian for further information. Technical reports can typically be revised and republished (with a different number) at later dates, for example after you write your thesis.

Conferences (and many workshops) publish proceedings containing the papers presented there. If a conference or workshop paper is accepted, you'll have to go to the conference and talk about it. Typically this is a 25 minute presentation followed by questions. Some conferences will accept papers as a *poster*. This is a lesser grade of paper which sometimes (depending on the conference) appears in the published proceedings, or else in an unpublished (or tech report) supplementary proceedings. You

³¹If nothing else, this is often an excellent source of feedback on your ideas, provided by people who may be more interested in your topic than others in the lab!

³²A few years ago, one formal methods journal had a 3 year ‘lag-time’ between submission and publication!

don't have to give a presentation for a poster paper, but you will have to prepare a poster about your work for the conference, and discuss your work during 'poster sessions'.

One of the most important roles of attending a conference or workshop, (regardless of whether you've got a paper accepted) is that you'll get to meet and talk to (leading and upcoming) people in your field (see also information on internships in Section 8). It's much easier to have an email correspondence with people you've actually met. Other people will be able to provide you with pointers and inspiration for your work, and possibly with jobs after your PhD. Also, often dry academic papers don't explicitly provide you with an understanding of the philosophical issues or underlying motivation of your field. Listening to questions after talks, and discussions during question coffee breaks, will allow you to come to grips with some of these ideas and tensions.

If you get a paper accepted in a conference or workshop, you'll need to get there. See the discussion on funding in Section 7.

6.1 Events not to Miss

The Computer Laboratory runs various open days, and one of the most useful of these is the yearly "industry sponsor days" where the Friends of the Computer Laboratory (various computing companies in Britain) have an opportunity to present their case for recruitment. There is now a special slot for graduate students.

7 Funding After You Arrive

In order to get to Cambridge, you must have already found funding for the three years of your PhD. However, after you arrive, you may well want extra funding for travel, or to complete your PhD should you overrun.

If you do not have sufficient funding for your studies, you should consult with your College about various scholarships that may be available. In addition, the Reporter has one issue a year devoted to scholarships³³. Finally, you can join the laboratory's funding email list (where notices about grants and scholarships are sent)³⁴.

7.1 Travel funding

You may want money to go to conferences, workshops, summer schools, or research visits to associated industrial groups or departments around the world. The main sources of travel grants are (in no particular order!): (possibly) your scholarship, (if it's rich enough) your College, and the lab. It's often easier to get funding from these

³³The 2003-04 issue can be found at: <http://www.admin.cam.ac.uk/reporter/2003-04/special/05/>

³⁴Send an email to: funding-opportunities-request@cl.cam.ac.uk

sources if they know that they are providing a partial contribution for the expenses of a trip.³⁵

For industrial visits (and some summer schools) you may be able to get partial funding from the site (or school) involved.

The Philosophical Society can also provide travel grants for research purposes once you have been a member for one year. The grants aren't huge, but can be useful. Join the Philosophical Society as soon as you can! It's offices are in the Scientific Periodicals Library.

There are also many miscellaneous travel grants. (e.g. the Data Connection Travel Awards) Find out about these by reading newsgroups, checking notice boards in the Lab tea room and your College, and by reading the Cambridge Reporter.

When you do go on a trip, you'll need the Lab to agree to pay for it before going. Go to Accounts and ask for an expenses claim form, which you should fill estimated amounts on. This is then signed by your supervisor (or possibly the Head of Department). You may also need a statement of support from your supervisor detailing why it would be beneficial for you to attend the event. On returning from your travels, you should fill in the reverse of the form with the actual amounts, attach receipts, get it signed again, and take it back to Accounts. The same procedure applies for non-travel expenses (e.g. purchases you make on your own credit card on the Lab's behalf). If in any doubt, talk to Lise Gough or Caroline Matthews.

7.2 Completion funding

It may well be the case that your PhD overruns, i.e. takes more than 3 years to finish. Things may start to become difficult then. Most scholarships stop after 3 years. If you are lucky enough to have College accommodation of some sort, you will probably lose it and be thrown into the grim Cambridge commercial housing market.³⁶

If you have completed a significant amount of the writing up of your thesis you may apply for the exemption of University Composition fees after three years of full-time study. This doesn't happen automatically – you need to write to the BoGS, stating that you are no longer making significant use of University facilities. Once this has been accepted, you only need to find money to house and feed yourself.

The Philosophical Society has some money available for 3 month research completion funding. This money is only available if you've been a member of the society for one year prior to your application; check details and closing dates for applications with the Philosophical Society.

³⁵Sometimes grant bodies will agree to match contributions from other sources. If a few of your sources have that condition, then you may have to engage in delicate negotiation for commitment in principle to partial funding from each of them.

³⁶To add insult to injury, the Lab policy is also to throw you out of your office and into a terminal room over-full with other over-running PhD students.

The only other way of getting enough cash to support yourself is to get a job. If you get a Research Fellowship at a College, then you will get money and accommodation, and be lucky enough to be able to work on whatever you want to (i.e. your thesis!) and you'll also have an official position in the university (and hence keep a desk in the lab). If you get an RA position with a project in the lab, then you'll also get to keep a desk and probably be working on something vaguely related to (if not identical to) work in your thesis.

If you start doing alot of undergraduate supervision, you will keep in touch with the lab and just about be able to support yourself. If you get a job in the Real World, it may be difficult to remember to finish your PhD...

8 Internships

For many students, one of the most valuable things they do during their PhD is to take an internship with a company. Many people who begin PhDs are not looking to become academics, and instead hope to apply their skills in commercial research organisations or other computing firms. It is relatively easy to make good academic contacts at conferences and around the department, but making contacts in industry is harder, and an internship can be a good step on the road to a successful industrial career. Not only do internships help you find a job later, but they can provide a valuable stimulus during your PhD, and they give you an opportunity to run your ideas by a group of people quite different to those at the Laboratory. Finally, they can be great fun, and often you will share the experience with other interns from around the world. More than one student has found the internship experience useful enough to justify taking two of them in a four-year PhD!

Internships are usually for 3 months over the summer, though 6 months during term time is not unheard of. The Board of Graduate Studies and Computer Laboratory tend to be very supportive of internships. *The most important thing is to have the support of your supervisor.* Things will normally go very smoothly if the work you will be doing has some relevance to your PhD.

Students have been known to do internships with Intel, DEC (now HP Compaq), Xerox PARC, Hewlett-Packard, Sun, Microsoft, Bell Labs, SRI International, AT&T and many other firms. Most of these companies have research labs (many in Silicon Valley!) with special summer intern programmes. These have their own application forms and deadlines (usually in about the January or February before the internship will take place); look on the Web site of the company or lab you are interested in. You can also try browsing the Web page which lists the Computer Laboratory's industrial supporters³⁷. Conferences are a good place to make contact with industrial researchers, who may be looking for potential interns: you may find that you can arrange an internship with them informally, or just create a good enough impression to make them remember you when your official application form arrives on their desk. So make it known that you are available!

Most internships are in the summer. However, if your internship is during term time, you will likely have to notify the Board of Graduate Studies and your funding body. Regardless, it is best to talk to the Student Administrator when you are considering taking an internships; otherwise, you may find yourself in an administrative mess!

Acquiring a work visa may pose a problem, but often this is simpler to arrange than one might think. Internships in the United States will usually be under a J-1 or H-1B visa, and in either case you will require the support of the company you are visiting. You might like to get in touch with people who have done internships recently. Most visa regulations are available online, and typically the support of a major company seems sufficient to smooth the path of officialdom.

³⁷<http://www.cl.cam.ac.uk/ext/supporters-club/>

Funding usually comes from the company you are visiting, though for visa reasons you may need to continue to draw your Cambridge stipend (e.g. a USA J-1 visa requires this). If you are funded by EPSRC, their regulations regarding internships are not particularly clear. You should find that they will continue to pay you your grant while you are away, although you may need to contact your college's finance office to ensure that they do not send back the cheque! The extra money earned during an internship can often see you through the few extra months you may require to write up.

Finally, another possibility is to spend several months at another university. If you are interested in doing this, talk it over with your supervisor, your funding agency and others around the Laboratory.

9 Post-PhD

There are four main options after your PhD is finished.

Research Fellowships etc allow you to work on what you please. Research Fellowships and Senior Research Studentships are offered by many Cambridge (and Oxford) Colleges. There are also fellowships offered by the European Union, the Royal Society, NATO, etc tenable at various institutions. Fellowships are highly competitive, and applications are sometimes due more than a year in advance of the starting date. Keep your ears open, and check newspapers, newsgroups, and the Cambridge Reporter.

RAs and Post-Docs i.e., work on a specific research project in a university or industrial lab somewhere. Although you apply for positions working on specific topics, you can choose ones which are interesting, and perhaps bend the topic further to your interests. Maybe you could try to encourage your supervisor or research group to set up an RA tailor-made to what you'd like to do? Keep your ears open, and check newspapers and newsgroups.

Academia i.e., a lecturing position somewhere. You'll have to do (increasingly more) teaching but performance is still largely dependent on your publication record. It's become harder to get an academic position immediately after a PhD, but is still possible. Keep your ears open, and check newspapers and newsgroups.

The Real World i.e., sell your body to the highest bidder, or start a company and make a billion. The 'Milk Round' of employers seeking bright young things hits Cambridge half-way through Michaelmas term. Lots of final-year undergrads go to this, but companies love postgrads too, and you'll probably get more money and a more interesting job. Keep your ears open, aggressively hunt down companies you like and read the newspapers!

If you want help with deciding what to do post-PhD, you might try going to the Cambridge University Careers Service³⁸. Another possibility is going on a residential

³⁸Web page at <http://www.careers.cam.ac.uk/>

course run by the research councils. These graduate summer schools are five hectic days of team building, careers advice, work related case studies and fun. If you don't believe the fun part, speak to anyone who has been on one and they'll strongly recommend you go.

These courses are run on a selection of dates in a variety of places and are free to EPSRC funded students. If you're not EPSRC funded, you can go but you'll have to find around 450 pounds (see Section 7 for ideas on funding). Also, reply quickly when the information comes around, as some of the more popular dates/locations get booked out very quickly.

Finally, the Laboratory has a graduate association called the Cambridge Ring, which organises regular events and provides excellent opportunities for networking and mentoring, not to mention job opportunities. Membership for graduates is free! Talk to Jan Samols, or visit <http://www.camring.ucam.org/>.

10 Glossary

This is a glossary of abbreviations and Lab-specific terms.

ARG The Automated Reasoning Group. A research group looking at theorem provers.

BoGS Board of Graduate Studies, Mill Lane.

CUDN Cambridge University Data Network.

EuroPARC A Xerox research lab on Regent St.

HVG The Hardware Verification Group. An older name for the *ARG*.

Networks and Operating Systems An SRG research group. As it says.

NLP/AI Natural Language Processing/Artificial Intelligence research groups.

Open Media A research group under the *SRG* umbrella. Associated with AT&T.

Opera An SRG research group, looking at systems support for distributed multimedia applications.

Rainbow A research group looking at graphics, mobile computing, HCI and autostereo systems.

Security A research group looking at computer security.

SPL Scientific Periodicals Library

SRG The Systems Research Group. Composed of the Opera, Networks and Operating Systems and Open Media research groups.

SRI Stanford Research Institute, they also have a branch on Mill Lane.

Systems Either refers to *SRG* conglomerate, or the *Networks and Operating Systems* group.

Theory A research group looking at theoretical computer science.

UL University Library (main library).

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- [5] Cambridge University Graduate Union. Handbook and alternative prospectus, 1996. Available from the Graduate Union, Keynes House (next door to Olivetti), or your college MCR.