Key Dates

Michaelmas

Mon 27th Sept 2021	Course starts
Fri 3rd Dec 2021	Term ends

Lent

Tue 11th Jan 2022	Lent term modules start
Fri 21st Jan 2022	Interim project report submission (Supervisors)
Fri 21st Jan 2022	Interim project report submission (Students)
Mon 7th – Fri 11th Mar 2022	Group mini-projects
Wed 16th March 2022 (noon)	Deadline for mini-project individual reports/poster
Thu 17th Mar 2022	Mini-project assessment
Fri 18th Mar 2022	Term ends

Easter

Fri 8th April 2022	Draft Project Report to your Supervisor
Wed 27th Apr 2022 (noon)	Project Report Submission
Dates tbc	Exams
~1 week after exams	Possible viva voce exams

Research Project

The research Project contributes 30% towards your final degree and we therefore expect a high standard. You will be provided with a list of project titles and supervisors as soon as possible: you are advised to contact the supervisors whose projects interest you to discuss possibilities. You are also permitted to organise your own project if you have identified a supervisor who is willing to host you, providing that the subject is acceptable to the management committee. If you are thinking of organising your own project, please contact Gos Micklem (g.micklem@gen.cam.ac.uk) as soon as possible. Projects commence at the start of term and full details of what we expect are laid out below. For some of you, this will be your first experience of working on a project, and even those who have carried our Part II projects should find that the Part III projects are more intensive and hopefully more rewarding. Remember, experimental science, be it wet or dry, can be exciting and frustrating in equal measure. Don't get too down when, as is inevitable at times, things don't go well and try to enjoy the experience. You will be examined on how well you present and discuss the results of your project work not on the volume of results you generate, so even when ideas don't pan out and you have to go back to square one, do not despair.

Introduction sessions

A few years ago we introduced a set of project introduction sessions in the second half of the Michaelmas term. These will run on three early evenings (probably Thursdays from 17:00-18:30) where 6 or 7 students each present a **5 min** introduction to what the research projects are about and the methods that will be used. A maximum of 4 slides and **NO DATA** are presented in an "elevator pitch" style: i.e. what's it about, why is it important and here's what I plan to do. There will of course be time for a few questions after each presentation. We found these sessions useful since it helps you all keep in touch when you are spread about for your projects and can help make connections between different projects or commonality in methods.

Notes for Supervisors and Students

These notes are particularly relevant where wet lab work will be undertaken but apply also to dry projects.

1. Legal Obligations: the most important responsibility of supervisors is to ensure that projects are carried out in a safe environment. It is also a clear responsibility of the student to work within the relevant safety rules and be mindful of the safety of others in the lab. Before any wet lab work starts, supervisors should discuss safety aspects with students and it is expected that all relevant safety documentation is complete prior to commencing work.

2. Student supervision: supervisors are requested to nominate a **day-to-day or deputy supervisor** from within their group and **to ensure that the deputy receives a copy of these notes.** Please send the name and email address of the day-to-day supervisor to (sysbiol-admin@gen.cam.ac.uk). This ensures that adequate supervision is available at all times. As part of their supervision, it is expected that the student will meet regularly, usually weekly, with their supervisor to discuss progress and future work. Such discussions are facilitated if students have produced a written summary of the preceding week's work.

Supervisors should note that students are expected to integrate into their research group for the duration of the project and, for example, participate in group seminars/journal clubs.

Please remember that students need to achieve a reasonable balance between project work and other components of the course.

Supervisors should bear in mind that projects make up an assessed component of the degree and that they should be designed so as to obtain a reasonable amount of data for the assessed report. Projects that are too ambitious for a two-term undergraduate project (e.g. more akin to 1st year PhD project) may limit the scope the student has to demonstrate their capacity to critically evaluate data.

3. Duration: projects can begin as soon as possible after the start of term and will run until the end of Lent term. Arrangements for each project are highly dependent upon the rules and working practices for each lab/building and it is important students and project supervisors establish how the projects will be managed at the outset. Interactions with day-to-day project supervisors and research groups may be entirely remotely or involve face-to face interaction.

It is important to remember that some students or project supervisors may not be able to undertake face-to-face interactions during the current pandemic and individuals should be respectful of each other's needs at this challenging time.

While projects are generally limited to term time, it is possible for project work to continue past the end of term (Fri 3th Dec) with the agreement of student and supervisor. Supervisors, should not put pressure on students to stay in Cambridge or work remotely beyond the end of term since they may face accommodation or connectivity difficulties. Projects formally recommence on Mon 10th January. Please note that students have course work across both Michaelmas and Lent terms. For instance **it is not possible to carry out project work from 7th to 11th of March inclusive due to an intense assessed team project assignment.** Students are strongly encouraged to commence the write-up of their dissertation before the end of Lent Term and to organise writing so that they can obtain feedback from their supervisor.

4. Project write-up: a maximum of 6000 words – due by **noon on Wednesday 27th April 2022**

5. Budget allocated per project: £250 per project is available to supervisors to cover any incurred costs for 'dry' projects. A budget of up to £500 is available for mixed 'dry/wet' projects and up to £750 for 'wet' projects. Please contact sysbiol-admin@gen.cam.ac.uk for advice and for budget claims.

6. Supervision payment: as agreed by the Senior Tutors Committee, Colleges will pay for a notional total of 9 hours of supervision per term for Part III project supervisors. Claims can be made by the lab head or by the day-to-day supervisor(s) through the CamCORS supervision reporting system at http://www.camcors.cam.ac.uk at the end of each term. **Part III project supervisors are required to write timely reports for *both* Michaelmas and Lent term, to ensure Colleges get supervision reports on the project work of their students. This is important for writing references and in the event of a student having problems in the examinations due to illness or other causes.**

7. Interim Progress Report: ***Supervisors*** and ***students*** should provide a short progress report on the provided form to the Course Coordinator at the end of the Michaelmas Term. This is to ensure that there are no problems that require action on our part. **Please return the completed form by Friday 21st Jan 2022 to sysbiol-admin@gen.cam.ac.uk**

Preparation of Research Project Reports

1. Format and style of presentations, number of copies: project reports should generally conform to the style of a scientific journal i.e. PLoS Biology or *EMBO Journal*, except that they should include:

a) a Table of Contents;
b) a list of *Abbreviations*;
c) a Summary of approximately 250 words; and
d) an Introduction that may be slightly longer than the *EMBO* Journal model, may be divided into subsections, and may include figures or tables.

The different sections should be in the following sequence, with each section starting on a new page, however, we recognise that it is sometimes better for the presentation to describe methods before results: Title/Cover Page; Summary; Table of Contents; List of Abbreviations; Introduction; Results; Discussion; Materials and Methods; Acknowledgements; References.

We recognise that Part III Systems Biology projects cover a wide range of subjects and techniques and may necessitate different approaches to presenting the results. **As long as each of the sections is included there will be no penalties for the order they are presented.**

The dissertation should not exceed 6,000 words. This total excludes: references, figures, figure legends, tables, table headings, abbreviations, acknowledgements and tables of contents. Students who overstep this limit significantly are likely to be penalized. Extensive appendices are not permitted but you may, for example, have supplementary material with code you have written, gene lists, etc. You should not include large amounts of text in the excluded items as a way of circumventing the overall word count. Normally, a good project report would have at least 25 references.

The dissertation should be typed. The text should be in 1.5 spacing or double-spacing, except for the figure legends and the reference list, which should be single-spaced. Arial, or Time New Roman 12 pt, are the recommended fonts. The pages should be serially numbered.

See below for how your complete dissertation should be submitted by the deadline.

2. Declaration: you are strongly advised to read the statements on plagiarism from the University and the Faculty of Biology and at the end of this handbook:

http://www.admin.cam.ac.uk/univ/plagiarism/students/statement.html
https://www.biology.cam.ac.uk/exams/AllExams/plagiarism

The University's regulations: Ordinances, Chapter II Section 17, regulation 6 http://www.admin.cam.ac.uk/univ/so/2010/chapter02-section17.html#heading2-15 require you to abide by the statements on plagiarism and include a signed declaration about the work. The following form of words should be used:

I understand the University's definition of plagiarism. I declare that, in accordance with Discipline regulation 6, this dissertation is entirely my own work except where otherwise stated, either in the form of citation of published work, or acknowledgement of the source of any unpublished material.

You should insert into your dissertation a page containing your name, your College, the title of the dissertation and the above declaration, which you must sign and date, this should be included immediately after the Cover Page (see next section).

You must also include a note on this page explicitly stating if any experiments have been done on your behalf. For example, this might be where an experiment involved the use of complex equipment requiring special training and a postdoctoral researcher did the experiment for you to save time. This is a standard requirement for PhD and similar dissertations.

3. Cover page: see below

4. Help from your supervisor: you are actively encouraged to show an early draft to your supervisor for their comments, and then, if need be, to show your supervisor a near-final version at a later date. Some supervisors may prefer to see drafts section by section, whereas others may prefer to see the work as a whole - please make appropriate arrangements with your supervisor ahead of time. If you do present your draft in sections, remember that you cannot expect to get informed criticism of the Results section unless it is accompanied by at least a rough version (*e.g*. a photocopy of an autoradiograph, or a sketch of a graph) of the data you intend to show plus a draft of the accompanying legend. Please also remember that supervisors have other duties and commitments, and may not necessarily be able to read your work at the drop of a hat.

The role of your supervisor is to advise, but **not** to act as a proof-reader. Use a spell-check programme before you present the draft to them. If you are consistently making the same mistake, don't expect your supervisor to mark **every** instance of this error; if one or two instances are identified, it is up to you to find and correct all the others.

Supervisors will be asked to state how much help they have given with the write-up. This should **not discourage** you from seeking their advice, but please do ensure that you provide them with a decent first draft. If it is full of mistakes or spelling errors, requiring a lot of attention, the supervisor is required to notify the Examiners of this in their report and the Examiners may take it into consideration.

5. Project Assessment: your supervisor will be requested to give a report and offer a mark on your report and on your performance in the laboratory. Your dissertation will also be read separately by an Examiner, who will provide an independent mark.

6. Submission deadlines:

A draft of the project write up should be provided to supervisors by **Friday 8th April 2022**.

The deadline for submission of the final project dissertation is **12.00 noon on Wednesday 27th April 2022.** By this time the dissertation **must** be uploaded to the submission site on Moodle. In case of difficulties a copy can be emailed to the course administrator via sysbiol-admin@gen.cam.ac.uk.

Any leave for extension can only be granted by the University's Examination and Access Mitigation Committee in response to an application made by a student's College Tutor. You are therefore strongly advised to allow a safety margin for technical problems such as computer malfunction that might lead you to overrun the deadline. Contact your College Tutor immediately if it appears that late submission may be inevitable.

Guidance on individual sections

1. General advice: the order in which you write up the various sections is, of course, up to you but we recommend that you think of adopting the following order of priority: *Results, Figures and figure legends; Discussion; Summary; Materials and methods; Introduction; References; the remainde*r. It is often a good idea to have more than one section "on the go" at any one time, so that if you get "writer's block" on, say, the Results section, you can at least be getting on with the more mundane Materials and Methods in the meantime.

2. Cover (title) page: the cover page should only include:

a) your **Name**;

b) the **title of the project,** which need not necessarily be the same as the title under which you started the project

c) the **name of the official supervisor** of your project, and the name of the person who did most of the day-to-day supervision if this is different;

d) a **statement confirming the number of words** contained in the thesis, which must not exceed 6,000 (excluding references, figures, figure legends, tables, table headings, abbreviations, acknowledgements and tables of contents).

3. Summary: this should give a concise account of the problem you studied, what approaches (in outline) you took, and what your major findings were. Avoid superfluous minor details, but do try to make the main points absolutely clear. Aim at a limit of ~250 words, a little more than the *EMBO Journal* normally allows. Be careful that the Summary does not claim that more was achieved than actually was! Examiners are more likely to understand a shortfall in attainment than to respond favourably to exaggerated and unjustified claims. A Summary must be a 'stand-alone' section, fully comprehensible even if the reader doesn't have the rest of the work to hand. Thus, non-standard abbreviations should not be used unless they are defined within the Summary, and references must not be included unless they are also cited in full (authors, year, journal name, volume and pagination) in the text of the Summary.

4. Table of contents: this is a brief index to help readers orient themselves. It should give page numbers and is therefore best prepared when the rest of the dissertation has been completed. A useful convention is to number the first pages - covering the Summary, Table of contents itself, and Abbreviations - as (i), (ii), (iii) etc, and to start the Arabic numerals with the first page of the Introduction. Be careful about consistency in the use of upper and lower case for the titles of subsections, and therefore also in the Table of contents. You will see that in the *EMBO Journal*, the titles of subsections are in lower case.

5. Abbreviations: the list should not include widely accepted abbreviations such as ATP, DNA, RNA, etc. It is also not strictly necessary to include commonly accepted abbreviations such as EDTA, EGTA, Tris, HEPES, etc. On the other hand, do not forget to include abbreviations which, even though they may be in very common use in the particular laboratory where you did your project, are not standard, generally recognised, abbreviations. It is a good idea to consult your supervisor if in doubt and to look at some recent published papers on the same topic.

Abbreviations should ideally be defined twice: once in the abbreviation list, and again at the point they first appear in the text. Please ask yourself whether any abbreviation you use is really necessary. If used only two or three times in the whole dissertation, it is probably better spelled out in full each time.

6. Introduction: when writing the Introduction, and indeed the whole dissertation, bear in mind the readership at which you are aiming. As a general principle you should assume that the reader is: (a) intelligent; (b) has a broad general knowledge of systems/molecular biology; (c) is at least vaguely aware of the problem you have been investigating; but (d) may lack any detailed appreciation of the topic. Thus, the Introduction should **not** be a comprehensive review of the whole field of research in which your project fits. It should cover: the background to the problem you studied; how this relates to other major questions in the field; what was known before you started; why the particular problem was considered to be worth investigating; how you decided to set about it and why you chose that approach. Above all the reader must be left in no doubt as to the aims of your project. Given the constraints of the word-limit, you cannot afford to make this too long; certainly no more than about 20% overall, with perhaps up to about 2 figures or tables.

The Introduction to *EMBO Journal* papers usually ends with a couple of sentences that briefly state what was studied and what was discovered. Remember that the reader will already have read the Summary, so these closing remarks should be no more than a succinct reminder. You may find it useful and reader-friendly to divide your Introduction into sub-sections with separate sub-headings. Likewise, a diagram or two, or a table, can be included if this would be helpful to the reader.

7. Results: it is often best to present the results in chronological order, but this need not necessarily be the case. The overriding consideration is that they should be scientifically logical and, if hindsight indicates that you should have done the experiments in a different sequence, present them in the more logical sequence.

Beware of presenting too many negative results. On the other hand, semi-failures or unexpected results, which caused you to modify the protocol in a way that eventually lead to success, should be shown. As much credit will be awarded for showing logical scientific reasoning in your efforts to overcome technical problems as for getting the perfect result on the very first attempt.

If a given experiment/analysis was repeated a few times, with more or less the same outcome on each occasion, there is no point in showing the results of every such experiment. Just show the "typical" result, but mention in the text that you had obtained essentially the same result in, say, four different experiments (otherwise the sceptical reader may have doubts about whether you did it only once and whether the result is reproducible). Remember that you don't need to show every single result. Sometimes it is appropriate simply to state a result in the text, accompanied by "(data not shown)", provided this isn't used too often (otherwise suspicions are aroused!). Obviously it must **not** be used in respect of a result that is absolutely pivotal to your final conclusions!

Assuming that you have a separate Discussion section you should avoid extensive discussion and speculation within the body of the Results section. On the other hand, do not go to the other extreme of a bald presentation of the results with no "interpretation" whatsoever. In general, the most reader-friendly style is to have a couple of sentences explaining why the results of the experiment you have just described prompted you to try the experiment that you are going to describe next.

If and when the logical sequence of presenting your results takes you in a new direction, it is helpful to have a separate sub-heading. This alerts the reader that you about to go into new territory, which may well be related to what has gone before, but is not simply a continuation or more of the same. Again, a glance at the *EMBO Journal* will show you that in almost every

paper, the Results section is divided by sub-headings and is not presented as a continuous block.

For purely computational projects, by and large you should adhere to the same model when presenting your result, rather than PCR assays you will have modelling simulations or particular pieces of computational/bioinformatics analysis.

Presentation of data All Figures and Tables **must** have a legend. The legend may start with a sentence which is really a title - and thus can be ungrammatical in not having a verb, *e.g.* "The influence of RNA concentration on the efficiency of translation dependent on the poliovirus IRES"; or it can be a statement, *e.g.* "The fidelity of mRNA translation decreases with increasing RNA concentration". What follows the title should be a **brief** description of the experimental conditions/model/computational analysis for the particular experiment, such that when read in conjunction with the Materials and Methods section, the reader is left in no doubt as to what was actually done. The legend should also make quite clear what is being shown – gel photograph, model output, etc

The legend should preferably be placed immediately below - and on the same page as - the figure itself. If a figure occupies a whole page, the legend should be on the facing page opposite. Figures collected together at the end of the report **ARE NOT** a good idea and, with modern word processors or typesetters such as LaTeX, there is no excuse for not embedding Figures and Tables in the results section.

For ***line graphs***, make sure that the **axes are labelled** to show not only what parameter is being varied, but also the units in use. For example, the *x*-axis might be labelled: "Enzyme concentration (µg/ml)", or "Time (min *or* h or days)"; and the *y*-axis might be labelled: "[^{35}S]methionine incorporation (cpm *or* nmol)"; "Product concentration (nM)", and so on. Another reader-friendly virtue is to make the symbols consistent from one graph to another. For example, if you use open circles (o) for the control, and filled (blacked-in) circles for the experimental ("something added") curves in Figure 1, don't switch to blacked-in triangles for the control and open triangles for the experimental in Figure 2 unless there is a compelling reason to do so.

Again there are two ways of "labelling" different plots on the same graph. It can be done entirely within the legend by a succinct description of which symbols refer to what conditions. Or the curves can be labelled on the graph itself, provided this can be done neatly and unambiguously. Again, both methods of identifying each curve can often usefully be used in a single figure. The same principles apply for labelling **histograms**. For **micrographs**, make sure that the scale is indicated (usually by a scale-bar), and that important features are highlighted by labelled arrows.

If you are unfamiliar with any of the various computer drawing or graphics program packages available, hand-drawn graphs and diagrams annotated by hand are perfectly acceptable provided that they are clear and legible.

8. Discussion: what your reader wants here is a very brief recapitulation of your major conclusions and the evidence that supports them. A common mistake is to reiterate, at too great length, points you have already made in the Results section.

You should discuss how your results relate to previously published work, and to the ideas and models currently favoured in the field. Beware of over-interpreting your results, and claiming that you have established more than is in fact the case (see remarks under ‘Summary’ above).

Speculation is permissible, provided it is modest, and provided you make it quite clear to the reader that you are speculating. You may also make suggestions as to how your experiments might be improved and refined. And it is a good idea to explain what further work you would have done if you had had more time. (In this respect a project dissertation **can legitimately differ from a published paper**, since your project had an arbitrary cut-off point, whereas papers are published only when the time and data are ripe.)

9. Materials and methods: a common mistake is to make this section unnecessarily long and detailed. It **must** contain the minimum information necessary for someone (your successor, perhaps) to repeat the experiments or computational analyses. Thus if you followed exactly the supplier's recommendations (*e.g.,* for restriction enzymes, or Qiagen columns), a standard published method, or default settings on a software tool then it suffices to say just this and to cite the reference. However, if you modified the published method or used custom settings in a software tool, you should briefly describe these modifications. When citing published standard methods, it is useful and reader-friendly to drop a hint as to the nature of the method. For example, instead of "Protein concentration was estimated by the method of Jones (1980)", it is better to say "Protein concentration was estimated from the A_{280} as described by Jones (1980)" or “ClustalW was used for protein alignments with the default parameters (Thompson et al 1994)”

Unless you are following a published protocol to the absolute letter, you should list the compositions of the reagents you used, since these do vary slightly between different practitioners. Common mistakes include:

• use of 10ml and 50mM: it should be 10 ml and 50 mM
• use of sec. *or* mins: it should be sec *or* min *or* h (no plurals and no full stops)
• the use of jargon, such as "kinasing the oligos" ("to kinase" is not a recognised verb, and "oligo" is likewise jargon).
If in doubt, leaf through the pages of *EMBO Journal* for appropriate models and examples.

10. References: the style of citation of references in the text, and the presentation of the reference list at the end, should conform either to the Author-Date style exemplified by *EMBO Journal* OR the numerical system used by PLoS journals (i.e. PLoS Biology). Study some papers in that journal to see what is expected.

11. Permissible Variations: it is sometimes better to amalgamate the Results and Discussion sections. It is difficult to make hard and fast rules about when and if this would be an advantage. The deciding factor is whether it would make the dissertation easier to follow. We advise starting out with the intention of having separate Results and Discussion sections. If the first draft shows that the outcome would be more "comfortable" if the two were amalgamated, then you can copy-paste various parts of the Discussion into the appropriate different places of the Results.

In scientific writing, the passive is more conventional than the active voice (e.g. "...the reaction temperature was increased..." rather than "...I increased the reaction temperature..."). However, there is an argument that the active voice provides more information, as it makes clear who did the experiment. Either is acceptable in your dissertation, but in any case you must ensure you are consistent throughout.

University of Cambridge Part III Systems Biology

Research Projects 2021-22: H&S regulations

To be completed for all wet lab projects

Name of student:

Name of supervisor:

Name of day-to-day/deputy supervisor:

Provide a brief description of procedures and GMOs to be used

Student's Declaration:

I have read and understood the relevant safety regulations for my host department relating to laboratory safety, including prior risk assessments, COSHH assessments and the use of Genetically modified organism, that cover the work I will undertake during my Part III project. I undertake to follow the practices explained to me for the safe handling and disposal of any materials. I will not do any experiment until I have been instructed by my supervisor on the use, storage, and disposal of these materials and have returned this form.

Signed:

Date:

Supervisor's Declaration

I agree that this form has been correctly completed, and that full instruction will be given to the student on the safe handling and disposal of the chemicals and GMOs described above.

Signed:

Date:

Please return completed form to sysbiol-admin@gen.cam.ac.uk /Genetics Building/ ***as soon as possible***.