

1495



UNIVERSITY OF
ABERDEEN

BC4314- Honours Biochemistry
Option 2
Course Handbook 2023-2024



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Course Summary

Biochemistry is profoundly influencing our understanding of human biology and of medicine in a number of ways. This involves the molecular explanation of events occurring during development and in disease. A clear understanding of these biochemical processes opens ways to a rational design of methods for preventing and treating the illness. In this course, the molecular changes involved in cancer, the second highest cause of death in the UK will be explored. This will be complemented by insight into how stem cells, a cell type that is critical for development and function, differ from normal somatic cells. You will build on previous knowledge of biochemistry, molecular and cell biology to further develop your understanding of these important aspects of human development and health.

Course Aims & Learning Outcomes

The subject-specific learning outcomes are such that, at the end of the course, students should be able to:

- use examples to analyse the molecular mechanisms underlying the subversion a of human biochemistry in tumour cells.
- describe the properties of stem cells and how they contribute to development and disease.

Course Teaching Staff

Course Coordinator(s):

Prof Berndt Müller (b.mueller@abdn.ac.uk)

Other Staff:

Dr Shin-ichiro Hiraga (s.hiraga@abdn.ac.uk)

Dr Hajime Murakami (hajime.murakami1@abdn.ac.uk)

Dr Anke Roelofs (a.roelofs@abdn.ac.uk)

Prof Valerie Speirs (valerie.speirs@abdn.ac.uk)

Office hours: Staff will respond to queries during office hours. Office hours will be published separately.

Assessments & Examinations

This course is assessed via a written examination (worth 70% of the overall course grade) in the May exam diet and one piece of continuous assessment (worth 30% of the overall course grade).

The continuous assessment associated with this course is detailed below, with two other pieces of work being associated with your other “Option” course and the “Core” course.

- **Option 2 course continuous assessment: Monday 27th November, 10:00-13:00.**

Continuous assessment

The topic and format of the continuous assessment will be announced in the course introduction and through MyAberdeen.

General Comments on Scientific Writing

Assessment: The continuous assessment for Honours will be assessed by two members of staff, using criteria that will be published in MyAberdeen alongside the submission links for each piece of work. This assessment is not open to negotiation, although if asked, the markers will clarify any points of constructive criticism. Please use the assessment criteria as a guide and read them with care; the notes on scientific writing also give you guidance on what we judge to be important in a well-written piece of work. If you have particular doubts about your ability to write scientifically, either in terms of organising material or in the mechanics of good scientific writing, seek help from a member of staff or the Honours Coordinators during the first term. Do not wait until your first assignment is causing you anxiety.

Avoiding Plagiarism

The definition of Plagiarism is the use, without adequate acknowledgement, of the intellectual work of another person in work submitted for assessment. A student cannot be found to have committed plagiarism where it can be shown that the student has taken all reasonable care to avoid representing the work of others as his or her own.

The instruction given above to write assignments **in your own words** and not to copy whole sentences from articles is crucially important to avoid plagiarism.

The University views this offence extremely seriously; indeed, it can have dire consequences, including the awarding of no higher than a pass degree.

Continuous assessment assignments and your thesis are unless stated otherwise all submitted as electronic copies via MyAberdeen so they can be checked for originality. The programme will detect passages of text copied from other sources, and also if sentences from various text sources were used throughout the text, both indicators of plagiarism. MyAberdeen accepts most common formats, but it is advised that you submit your work as **PDF** files to avoid problems with re-formatting of figures and/or text during the submission process. Any evidence of copying from other sources that is detected in your final submissions will be brought to the attention of the Head of School, who will investigate and determine whether cheating has occurred and take the appropriate action.

Feedback

As for all elements of continuous assessment, you will be given feedback on the Honours classification your work has attained, with the grading on the University Common Grading Scale (CGS). Feedback is normally given within 3 weeks of submission.

Guide to Writing

Students should refer to "A Guide to Scientific Writing" by David Lindsay (Longman Cheshire) for more general guidance on writing. What follows is not a substitute for reading this book but gives general guidance on writing and on how we assess your work.

PLANNING YOUR WRITING

Think

- What do I know already?
- Where will I find the information needed to develop my views on this issue?
- Where can I find more information?
- What are the best examples to illustrate the points that I want to make?
- How many words do I devote to each example?

Prepare

- Read a mix of reviews and use these to identify the major original scientific papers that have resulted in our current understanding of the topic.
- Read these papers and make notes on: research strategy use to analyse the problem, key experimental procedures that generate the data and critical controls that validate the data.
- Devise a set of themes and ideas for your work using the core information from above.
- Organise evidence under the theme headings: remember that arguments pro and contra are equally important.
- Select illustrations (diagrams/schemes) that reflect the themes and ideas.

Plan

- Place themes in a logical order, and have a clear, and planned, introduction and conclusion.
- Start simply and develop towards more complex arguments.
- Do not hop from one theme to another and then back again.
- Identify the links between themes as a mechanism of ensuring continuity.

Execute

- Write short sentences and keep clauses simple.
- Use appropriate tenses.
- Be consistent in the organisation of sections.
- Have diagrams in front of you when writing about them.
- Support statements with evidence, usually a citation; ensure your citation style is consistent

Complete

- Read over what you have written - can you read it out loud without stumbling?
- Have you answered the question?
- Have you done what you said you would do at the start of the assignment?
- Have you checked it carefully for typographical errors?

Class Representatives

We value students' opinions in regard to enhancing the quality of teaching and its delivery; therefore, in conjunction with the Students' Association we support the Class Representative system.

In the School of Medicine, Medical Sciences & Nutrition we operate a system of course representatives, who are elected from within each course. Any student registered within a course that wishes to represent a given group of students can stand for election as a class representative. You will be informed when the elections for class representative will take place.

What will it involve?

It will involve speaking to your fellow students about the course you represent. This can include any comments that they may have. You will attend a Staff-Student Liaison Committee and you should represent the views and concerns of the students within this meeting. As a representative, you will also be able to contribute to the agenda. You will then feedback to the students after this meeting with any actions that are being taken.

Training

Training for class representatives will be run by the Students Association. Training will take place within each half-session. For more information about the Class representative system visit www.ausa.org.uk or email the VP Education & Employability vped@abdn.ac.uk. Class representatives are also eligible to undertake the STAR (Students Taking Active Roles) Award with further information about this co-curricular award being available at: www.abdn.ac.uk/careers.

Problems with Coursework

If students have difficulties with any part of the course that they cannot cope with, alone they should notify the course coordinator immediately. If the problem relates to the subject matter general, advice would be to contact the member of staff who is teaching that part of the course. Students with registered disabilities should contact the medical sciences office, (medsci@abdn.ac.uk) (based in the Polwarth Building, Foresterhill) to ensure that the appropriate facilities have been made available. Otherwise, you are strongly encouraged to contact any of the following as you see appropriate:

- **Course student representatives**
- **Course co-ordinator**
- **Convenor of the Medical Sciences Staff/Student Liaison Committee**
- **Personal Tutor**
- **Medical Sciences Disabilities Co-ordinator (Dr Derryck Shewan)**

All staff are based at Foresterhill and we strongly encourage the use of email or telephone the Medical Sciences Office. You may have a wasted journey travelling to Foresterhill only to find staff unavailable.

If a course has been completed and students are no longer on campus (i.e. work from second half session during the summer vacation), coursework will be kept until the end of Fresher's Week, during the new academic year. After that point, unclaimed student work will be securely destroyed.

Course Reading List

This course does not have recommended textbooks as you are expected to read the primary research literature, so no specific course texts will be recommended. That said, your previous texts from third year would be useful for basic and fundamental knowledge.

Lecture Synopsis

Lectures are split across main topics as shown below.

Tumor viruses and cancer (Prof Berndt Müller)

The identification of the role of viruses in cancer has led to the discovery of oncogenes, and an understanding of the molecular events involved in transformation of normal somatic cells into tumour cells. Here we will look at examples of how infections with the retrovirus HTLV-1 papilloma virus or the papilloma virus HPV leads to tumour formation by interacting with the cell cycle machinery and its control mechanisms.

The features of a cancer cell (Prof Valerie Speirs)

Topics covered will include the relationship between cancer and ageing, the steps required for cell transformation, an overview of the key hallmarks of cancer and how these might be exploited as therapeutic targets.

The cellular machinery that maintains genome integrity (Dr Shin-ichiro Hiraga)

Genetic information is encoded in chromosomal DNA, which is constantly exposed to molecules/chemicals that alter it, causing damage and/or mutations.

Eukaryotic cells have multiple mechanisms to maintain the integrity of their genomes against damage and mutations caused by internal and external sources. Here, we will review the cellular machinery that maintains genome integrity by ensuring the fidelity of chromosomal DNA replication, replication error-correction, and repair of DNA damage using examples from humans and model organisms.

We will look at how the failure of such safeguards mechanisms leads to the generation of cancers.

Stem cell biology and its applications (Dr Anke Roelofs)

These lectures will provide an introduction to stem cells, focussing on key concepts in stem cell biology such as self-renewal and potency. Examples of transgenic models that allow for *in vivo* tracing of stem cells and their progeny will be used to illustrate how these have shaped our understanding of adult stem cells. Focus will also be on telomeres and their role in stem cell maintenance, and emerging concepts of cancer stem cells will be highlighted. Finally, cellular reprogramming technologies that allow for the generation of induced pluripotent stem cells from somatic cells will be discussed.

Practical/Lab/Tutorial Work

This course contains one set of research tutorial sessions and you will also complete another set of corresponding research tutorial exercises in your other Option course.

The research tutorials are teaching exercises at which, supported by a staff member, you will discuss a specialist subject, based upon self-directed reading of the literature. Several papers have been chosen that reflect the development of a particular topic, **and you must have read papers before attending the first research tutorial unless otherwise instructed.** You will be required to develop an understanding of what

constitutes a key and important paper, how the information is derived (techniques and their application), the design of those experiments, an understanding of the crucial data and an appreciation of what in the field is controversial. You are also expected to read outside the prescribed papers and such 'use of extensive original literature' (CGS marking scheme) will be taken as an indicator of a first class student. You will thus build up a set of your own notes on the particular subject area within the research tutorial.

You will be expected to attend two tutorials, each of 1-2 hours, during which some group work may be required.

Preparation:

The time spent with the tutors for each tutorial is very limited (3-4 hours). For this reason, it is important to 'hit the ground running' and go into the first of your two 2-hour sessions fully prepared. It is thus essential that you read the appropriate notes page(s) which follow, and prepare by reading any supporting review recommended by the tutors, as well as the papers listed. This reading of the papers should be thorough, making sure in particular you understand the rationale of the results sections, how all the techniques work that are described and how the results lead to the main conclusions of the paper. If anything is not clear, bring those questions along to the tutorial with you; if you are critical of anything in the papers, bring these discussion points along as well. Remember, the tutors are there to support your learning, not to spoon-feed you with the answers. You should therefore go to the tutorial prepared to ask questions, to think, and to contribute to the group discussion subjects suggested in the tutorial notes (below).

BIOCHEMISTRY 2 RESEARCH TUTORIAL

HOW DOES DERAILMENT OF GENOME STABILITY PATHWAYS CAUSE CANCER?

Tutor: Dr Hajime Murakami

Introduction

Studying inherited mutations in the BRCA1 and BRCA2 proteins has shaped our understanding of the pathological mechanisms that lead to cancer. In this tutorial we will explore the implications of two recent studies addressing how the BRCA proteins ensure genome stability to prevent cancer. The long-held view has been that BRCA proteins specify the mechanism of double-strand repair, directing repair to occur through accurate homology-directed mechanisms. Newer studies highlight a more recently uncovered role for the BRCA proteins, in protecting the nascent DNA at blocked replication forks. We examine the evidence presented in two of these papers and consider what they can teach us about how cancer starts.

You can access the PubMed entry for that paper by clicking on the title of each paper listed below.

Papers to be discussed in the tutorial are:

'Double-strand break repair-independent role for BRCA2 in blocking stalled replication fork degradation by MRE11'

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3261725/>

'Isomerization of BRCA1–BARD1 promotes replication fork protection'

<https://doi.org/10.1038/s41586-019-1363-4>

University Policies

Students are asked to make themselves familiar with the information on key education policies, available [here](#). These policies are relevant to all students and will be useful to you throughout your studies. They contain important information and address issues such as what to do if you are absent, how to raise an appeal or a complaint and how the University will calculate your degree outcome.

These University wide education policies should be read in conjunction with this programme and/or course handbook, in which School specific policies are detailed. These policies are effective immediately, for the 2023/24 academic year. Further information can be found on the [University's Infohub webpage](#) or by visiting the Infohub.

The information included in the institutional area for 2023-24 includes the following:

- Assessment
- Feedback
- Academic Integrity
- Absence
- Student Monitoring/ Class Certificates
- Late Submission of Work
- Student Discipline
- The co-curriculum
- Student Learning Service (SLS)
- Professional and Academic Development
- Graduate Attributes
- Email Use
- MyAberdeen
- Appeals and Complaints

Where to Find the Following Information:

C6/C7- University of Aberdeen Homepage > Students > Academic Life > Monitoring and Progress > Student Monitoring (C6 & C7)

<https://www.abdn.ac.uk/students/academic-life/student-monitoring.php#panel5179>

Absences- To report absences you should use the absence reporting system tool on Student Hub. Once you have successfully completed and sent the absence form you will get an email that your absence request has been accepted. The link below can be used to log onto the Student Hub Website and from there you can record any absences you may have.

Log In - Student Hub (<https://www.abdn.ac.uk/studenthub/loginbdn.ac.uk>)

Submitting an Appeal- University of Aberdeen Homepage > Students > Academic Life > Appeals and Complaints

<https://www.abdn.ac.uk/students/academic-life/appeals-complaints-3380.php#panel2109>

Academic Language & Skills support

For students whose first language is not English, the Language Centre offers support with Academic Writing and Communication Skills.

Academic Writing

- **Responding to a writing task: Focusing on the question**
- **Organising your writing: within & between paragraphs**
- **Using sources to support your writing (including writing in your own words, and citing & referencing conventions)**
- **Using academic language**
- **Critical Thinking**
- **Proofreading & Editing**

Academic Communication Skills

- **Developing skills for effective communication in an academic context**
- **Promoting critical thinking and evaluation**
- **Giving opportunities to develop confidence in communicating in English**
- **Developing interactive competence: contributing and responding to seminar discussions**
- **Useful vocabulary and expressions for taking part in discussions**

More information and how to book a place can be found [here](#).

Medical Sciences Common Grading Scale

Grade	Grade Point	% Mark	Category	Honours Class	Description
A1	22	90-100	Excellent	First	<ul style="list-style-type: none"> • Outstanding ability and critical thought • Evidence of extensive reading • Superior understanding • The best performance that can be expected from a student at this level
A2	21	85-89			
A3	20	80-84			
A4	19	75-79			
A5	18	70-74			
B1	17	67-69	Very Good	Upper Second	<ul style="list-style-type: none"> • Able to argue logically and organise answers well • Shows a thorough grasp of concepts • Good use of examples to illustrate points and justify arguments • Evidence of reading and wide appreciation of subject
B2	16	64-66			
B3	15	60-63			
C1	14	57-59	Good	Lower Second	<ul style="list-style-type: none"> • Repetition of lecture notes without evidence of further appreciation of subject • Lacking illustrative examples and originality • Basic level of understanding
C2	13	54-56			
C3	12	50-53			
D1	11	47-49	Pass	Third	<ul style="list-style-type: none"> • Limited ability to argue logically and organise answers • Failure to develop or illustrate points • The minimum level of performance required for a student to be awarded a pass
D2	10	44-46			
D3	9	40-43			
E1	8	37-39	Fail	Fail	<ul style="list-style-type: none"> • Weak presentation • Tendency to irrelevance • Some attempt at an answer but seriously lacking in content and/or ability to organise thoughts
E2	7	34-36			
E3	6	30-33			
F1	5	26-29	Clear Fail	Not used for Honours	<ul style="list-style-type: none"> • Contains major errors or misconceptions • Poor presentation
F2	4	21-25			
F3	3	16-20			
G1	2	11-15	Clear Fail/Abysmal		<ul style="list-style-type: none"> • Token or no submission
G2	1	1-10			
G3	0	0			

Blue = Live classes delivered in person

Yellow = Assessments

Grey = No scheduled classes for BC4314 on these days

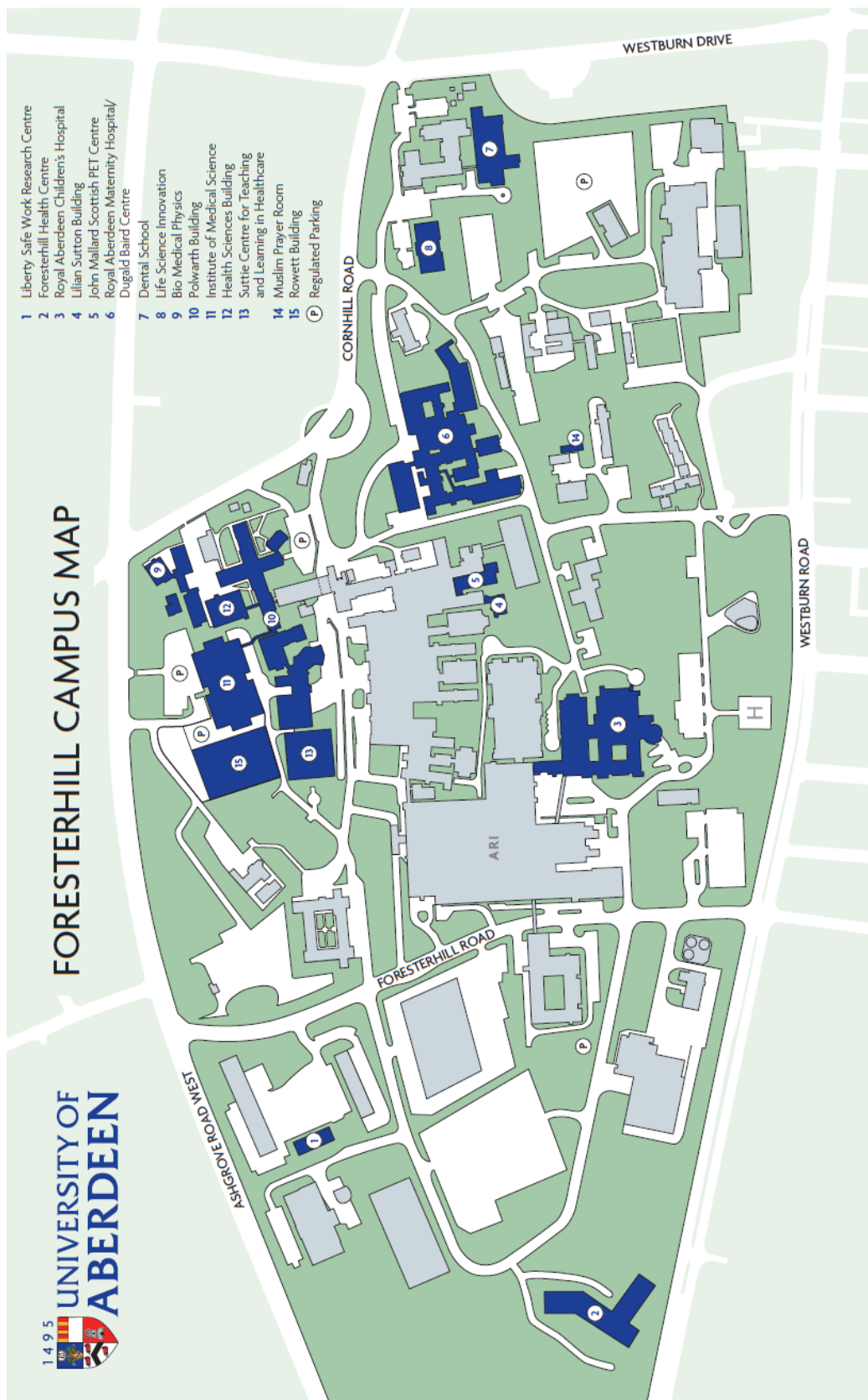
Course Timetable BC4314: 2023-2024

Date	Time	Place	Subject	Session	Staff
Week 13					
Mon 23 Oct	13:00-15:00	2:054	Course Introduction Lectures Tumor viruses and cancer	Lectures	Prof B Müller
Tue 24 Oct					
Wed 25 Oct					
Thu 26 Oct					
Fri 27 Oct					
Week 14					
Mon 30 Oct	13:00-15:00	2:054	Stem cell biology and its applications.	Lectures	Dr A Roelofs
Tue 31 Oct	13:00-15:00	1:039/040	Lectures/Workshop "Tumor viruses and cancer".	Lectures/Workshop	Prof B Müller
Wed 1 Nov					
Thu 2 Nov					
Fri 3 Nov					
Week 15					
Mon 6 Nov	13:00-15:00	2:054	The cellular machinery that maintains genome integrity.	Lectures	Dr S Hiraga
Tue 7 Nov	9:00-11:00	2:054	Biochemistry 2 Research Tutorial part 1	Tutorial	Dr H Murakami
Tue 7 Nov	13:00-15:00	1:039/040	Lectures/Workshop "Stem cell biology and its applications."	Workshop	Dr A Roelofs
Wed 8 Nov					
Thu 9 Nov					
Fri 10 Nov					

Week 16					
Mon 13 Nov	13:00-15:00	2:054	The features of a cancer cell.	Lectures	Prof V Speirs
Tue 14 Nov	09:00-11:00	2:054	Biochemistry 2 Research Tutorial part 2	Tutorial	Dr H Murakami
Tue 14 Nov	13:00-15:00	1:039/040	Lectures/Workshop "The cellular machinery that maintains genome integrity."	Workshop	Dr S Hiraga
Wed 15 Nov					
Thu 16 Nov					
Fri 17 Nov					
Week 17					
Mon 20 Nov					
Tue 21 Nov	13:00-15:00	1:039/040	Lectures/Workshop "The features of a cancer cell".	Lectures/Workshop	Prof V Speirs
Wed 22 Nov					
Thu 23 Nov					
Fri 24 Nov					
Week 18					
Mon 27 Nov	10:00-12:00	Comp Room 2	Continuous Assessment		Prof B Müller Dr H Murakami Course Teaching Staff

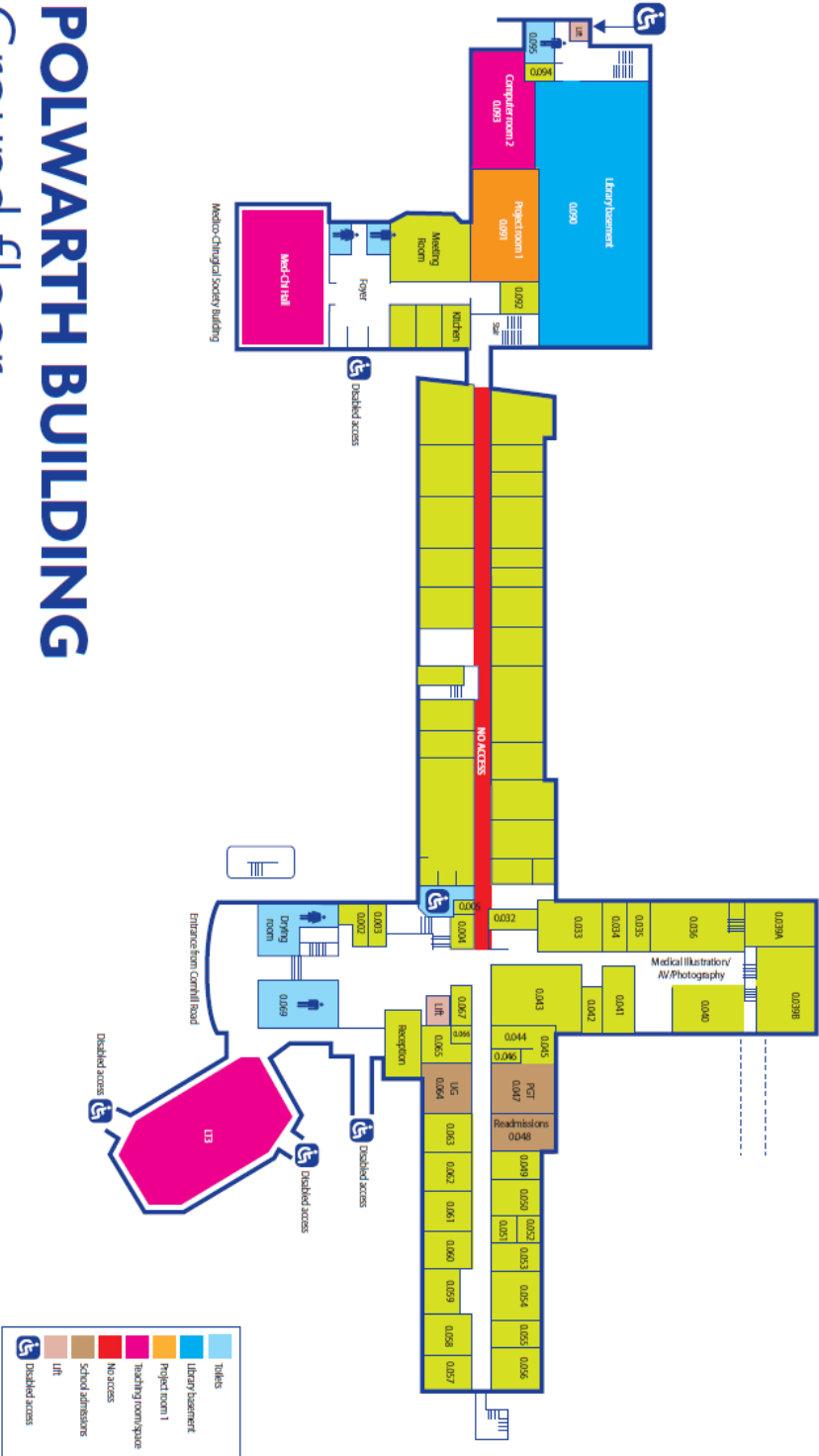
2:054, 1:039/040, Comp Room 2: Polwarth Building

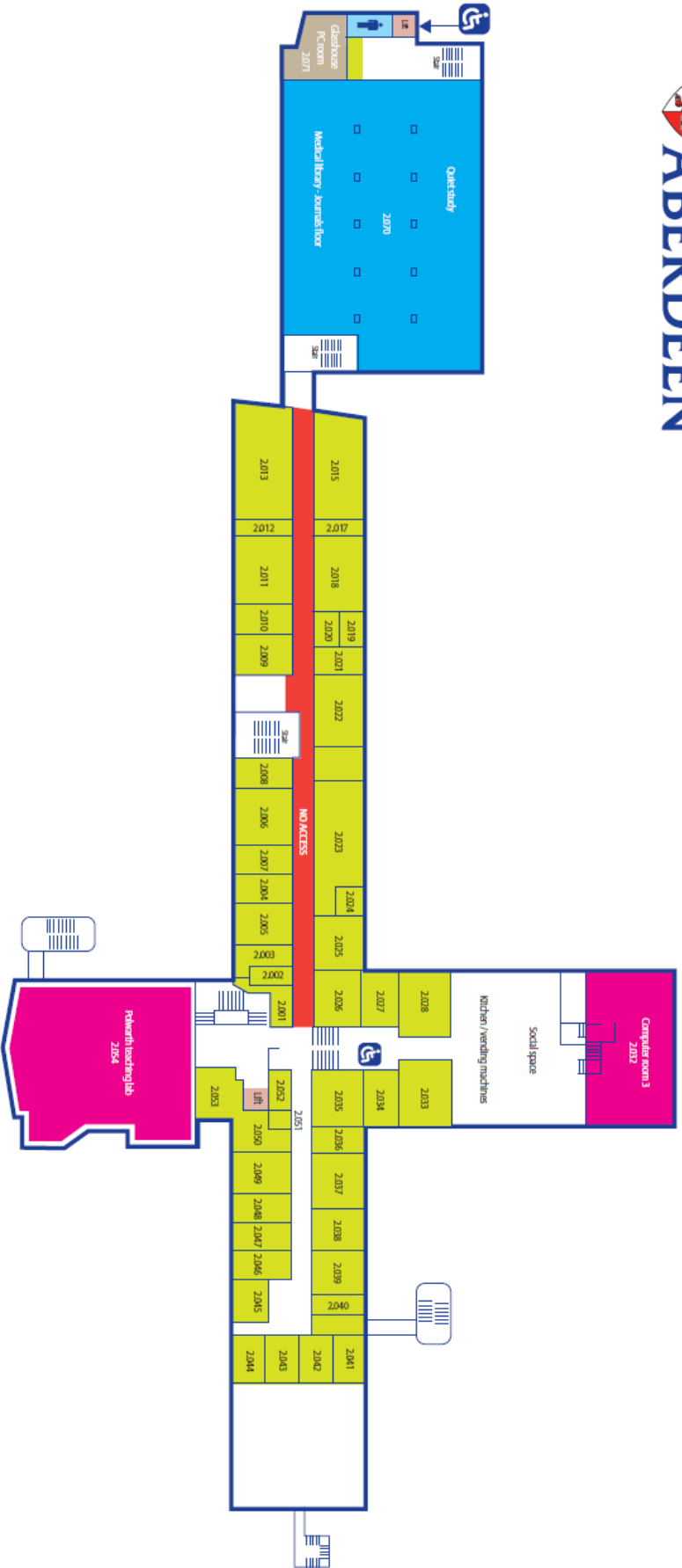
Campus Maps - Foresterhill



POLWARTH BUILDING

Ground floor





POLWARTH BUILDING

Second floor

