

Department of Earth Sciences
University of Cambridge



PART IB EARTH SCIENCES A COURSE GUIDE 2017-18

Contents

1. Course Content and Themes	2
2. Geological Mapwork	3
3. Lectures and Reading lists	4
4. Field Courses	5
5. Examinations	6
6. Marking Criteria	7
7. NST Approved Calculators	8
8. Part II Project	9
9. Libraries	10
10. Lab Safety and conduct	11
11. Feedback processes	12
12. Earth Sciences and Disability	13
13. Careers following a degree in Earth Sciences	14
14. Plagiarism Statement	15

1. Course Content and Themes

The IB Earth Sciences A course concentrates on the Earth processes that form and deform sedimentary rocks. The course covers the description and diagnosis of sedimentary rocks and of their physical, chemical and biological components. The relevant processes fall into two groups:

- processes ultimately driven by the external energy source of the sun. These are the Earth surface processes of the atmosphere, hydrosphere and biosphere. They are covered in the course sections on the hydrosphere, sedimentology and palaeontology.
- processes mainly driven by the internal energy source of the Earth's heat, that is those of the lithosphere, asthenosphere, and deeper. The IB Earth Sciences B course deals with igneous and metamorphic processes. The Earth Sciences A course covers tectonic and structural processes, particularly as they affect the formation and deformation of sedimentary rocks and basins.

Whereas, the IA Earth Sciences course took a holistic view of the Earth, the IB Earth Sciences A course is necessarily more reductionist, tackling the fundamentals of each topic. This approach gives you the rigorous grounding that you need to continue to Part II Earth Sciences or to complement other subjects that you study within NST. However, to help maintain the coherence of the course, it has two ongoing themes in addition to the inter-relationships of its primary subject matter:

- Development of skills relevant to field work will be emphasized. This theme is in preparation for the Easter field trip and particularly of the independent project that many of you will do next summer.
- The regional geology of southwest England will be referred to where appropriate. Lecture or practical examples from this area will link directly to next Easter's field trip.

You will notice some differences in presentation and style of the IB courses as compared with IA Earth Sciences. These differences reflect the transition from closely guided work in IA to the more independent learning required of you in Part II. The course will increasingly highlight scientific debates, yet to be resolved, rather than attempt to give a simplified, if neat, explanation. You will need to read around the course more to understand these debates. Some reading of primary literature in journals will be necessary when you research your mapping project.

2. Geological Mapwork

- Initial instruction will be given in lecture 2, mainly with reference to a short booklet that supplements the one handed out in Part IA Earth Sciences.
- There will be a component of map and cross-section work in practicals 1-8, then at intervals in the rest of the year's course. You will need a few coloured pencils, a ruler and a protractor for mapwork, as well as pencils and pens. It is useful to bring these routinely to IB Earth Sciences A practicals.
- For additional practice, you will be given a booklet of eight map exercises, to be attempted in your own time. We suggest that you finish four exercises in each of the first two terms. Your supervisor may encourage you to do these maps as supervision work.
- Note that mapwork forms the basis of the shorter of the two practical exam papers.

3. Lectures and Reading Lists

The Lecture lists for Part IB Earth Sciences A, plus timetables can be found on the website at <https://www.esc.cam.ac.uk/teaching/earth-sciences-course/part-iba>. In addition, you can access the main university timetable at <https://2017-18.timetable.cam.ac.uk/>.

Reading lists will be available on Moodle, and lecture notes and other course documentation will be added Moodle throughout the year. The hosting site is at <https://www.vle.cam.ac.uk/>. Please speak to Helen Dingwall or Mitha Madhu if you require access although everyone should have access to the course pages from the beginning of Michaelmas Term.

4. Field Courses

Southwest England: 3rd to 13th April 2018. There will be two parties. One party spends the first week in Dorset (Weymouth), then moves to Cornwall (Bude then Falmouth) on Sunday 8th April 2018. The other party does the reverse (Falmouth then Bude then Weymouth). We strongly advise students taking a second year earth sciences course to attend the whole field trip but a decision to attend in part must be made beforehand. However, 'A-only' students should at least come to Dorset and Bude and 'B-only' students at least to Bude and Falmouth. If you opt to do the whole trip and then drop out part way through, you will be liable for additional costs in the order of £250 towards accommodation and transport.

Isle of Skye: Friday 22 June 2018, for those who did not go on the IA mapping course, or Monday 25 June 2018, for those who did, course ends on Saturday 7 July 2018.

5. Examinations

- There are two theory papers, each of three hours duration, which count towards 60% of the exam. Each paper is divided into two sections of five questions. You have to do two questions from each section.
- The sections approximately comprise: -
 - 1A Structures, Sedimentary Basins
 - 1B Tectonics and Geodynamics, Ocean Circulation and Chemistry
 - 2A Stratigraphy and Siliclastic Sediments, Chemical and Biogenic Sediments
 - 2B Evolutionary Palaeobiology, micropalaeontology, Vertebrate Evolution
- Note that past papers prior to 2015 are called *Geological Sciences A* and that the content of these sections was different in past papers from 2007 and earlier.
- There are two practical papers. Paper 1 (3 hours) has four questions covering the rest of the course. Paper 2 (1½ hours) examines geological mapwork and structural geometry. All practical questions are compulsory. The practical exam counts for about 40% of the total marks.
- The exam marking is done by a panel of three examiners, not necessarily staff who have taught the course in that year. Given the 60/40 ratio of theory to practical marks, each theory paper is scored out of 30% of the total marks, practical paper 1 is scored out of 26.7% and practical paper 2 out of 13.3%. No marks are awarded for missed questions. The raw total mark out of 100% is used to rank candidates by order-of-merit. The raw marks are then scaled ('norm-referenced') such that approximately 60% of candidates get a mark of 60 or above. The minimum marks for a pass, third, 2.2, 2.1 and first are 40, 50, 60 and 70 respectively. In a small subject cohort like IB Earth Sciences, there is some flexibility in these percentages and therefore in where examiners choose class borderlines. The examiners carefully scrutinise the marks of candidates close to borderlines, to ensure that you are awarded the subject class deserved by your exam performance.
- You are then given a *subject rank percentile* (SRP) according to your ranking in IB Earth Sciences A. If r is your ranking (1 = top) and c is the class size, then your SRP is $100 \times (c+1-r)/c$. So, if the class size is 50, then the person ranked top gets an SRP of 100, the second person 98, and so on down to the bottom person who gets 2. The SRP is used below in assigning your overall NST class.
- The first estimate of your overall NST class is the median of your three subject classes. There is a table of all possible outcomes at www.natsci.tripos.cam.ac.uk/exams/marks-ib. A second measure is the arithmetic mean of your SRPs; candidates with an average percentile rank of $\geq 80\%$ will be given a first, those between 80% and 40% a 2.1 and those between 40% and 20% a 2.2. Where the two methods produce different outcomes, you are placed in the higher of the two resulting classes.
- Your College Director of Studies receives a breakdown of your marks into a theory and practical score for each subject.

6. Marking Criteria for answers in Earth Sciences written papers

%	Class	Criteria
90-100	1	Brilliant answer. Exceptional understanding of subject and relevant literature. Outstanding critical analysis, full of insight Excellent organized, expressed and illustrated
80-89		Excellent understanding of subject. Answer goes well beyond lectures. Effective critical analysis and grasp of relevant literature Well organized, expressed and illustrated.
70-79		Very good understanding of course material. Sound evidence of outside reading. Some critical analysis. Well organized, expressed and illustrated.
60-69	2.1	Sound to good understanding of course material. Limited use of extra-course material. May contain minor factual errors or omissions. Well organized, coherent and adequately illustrated.
50-59	2.2	Based entirely on course material. Lacks some detail in content. Contains significant factual errors or omissions. Some deficiencies in organization, style or illustration.
40-49	3	Based imperfectly on course material. Contains numerous factual errors or omissions Answer has merit but lacks a sound structure. Concepts poorly expressed and illustrated..
30-39	Fail	Inadequate content, some maybe irrelevant. Poorly organized, expressed and illustrated
20-29		An attempt at the question, but lacking most relevant content.
10-19		An answer with only isolated glimpses of relevant content.
0-9		A nearly worthless or irrelevant answer.
<i>Expectations of appropriate 'critical analysis' and 'relevant literature' will vary from year to year of the Tripos</i>		

7. NST Approved Calculators

For Natural Sciences Tripos examinations Parts IA, IB, II and III (where a calculator is allowed), you will be permitted to use only the standard University calculator CASIO fx 115 (any version), CASIO fx 570 (any version) or CASIO fx 991 (any version). Each such calculator must be marked in the approved fashion.

Standard University calculators, marked in the approved fashion, will be on sale at the beginning of Full Michaelmas Term 2017 at £20 for the fx991ES plus from the Department of Chemistry, Part IA Laboratory preparation room or from the Main Stores in the Bragg Building at the Cavendish for £19.50. You are strongly advised to purchase a calculator at the beginning of term.

Students already possessing a CASIO fx 115 (any version) or CASIO fx 570 (any version) or Casio fx991 (any version) will be able to have it marked appropriately, at no cost in the Department of Chemistry, Part IA Laboratory. Calculators meeting these criteria can be marked in term time from Thursday 5 October right up to the beginning of the exam period, not just in the Michaelmas term.

8. Part II Project

- Those of you who go on to take Part II Earth Sciences have to do a mapping project next summer. You will need to begin thinking about this project in the Michaelmas Term and have made a decision on your area by the middle of the Lent Term.
- An information booklet on planning the project will be issued early in the Michaelmas Term.
- A number of University funds have closing dates early in the Lent Term. If you want to apply for funds, you must have chosen an area by then.
- You will be assigned a supervisor in the second half of the Lent Term based on your area, although there is a list of experts in certain areas in the guide book and it is advisable to have talked to people about the suitability of your ideas early on in the planning process.
- Safety Induction. **Planning your mapping Project safety 1.00-2.00pm, Thursday 22 Feb 2018** for any IB's thinking of continuing to Part II.
- Marlin Fieldwork Safety and **First Aid Training for Part II Mapping Projects, 1.30-5.00pm, Thursday 14 June 2018.**

9. Libraries

Your College library should have all the standard textbooks from your reading lists. If not, ask them to order them. You may need the support of your Director of Studies or supervisor.

The Department of Earth Sciences library is also open for your use during normal working hours, space permitting. **There will be three introductory sessions to the library facilities held at lunchtime in the library on 17, 18 and 19 October 2017 between 1.00 and 2.00pm.** You will need to sign up for these sessions in the library early in the Michaelmas Term. Then we hope that you will feel welcome in the Library and will start to make use of the extensive resources there.

- Make yourself known to the Librarian (Sarah Humbert) when you start to use the library. She will guide you to what you need.
- You will need your University Card to borrow from the library.
- The Departmental Library provides copies of all your key texts available on short loan. You will find them in the Library Office. Once you have registered with the Library staff we are more than happy for you to borrow up to five books at any one time from the Library. Be warned that fines for late return of short loans are high: £1 per hour late.
- The library also has a large geological map collection, which you will need when you come to plan your independent project.
- The Library has a suite of computers that are available for your use once registration for a department computer account has been completed. This registration process will take place during the introductory sessions on the **17, 18 and 19 October.**
- There are three 'visitor' terminals which are intended primarily for searching the online catalogue. If you wish to book the Library laptop for group use (only in the Library) please contact the Librarian in the first instance at libraryhelp@esc.cam.ac.uk.

10. Laboratory Safety and Conduct

General safety

- Food or drink must **not** be consumed in any laboratory with the exception of water in a capped bottle.
- All bags, coats and cycle helmets are to be kept off the benches.
- To allow unobstructed passage around laboratories all students' personal possessions must be stowed under the benches or in the cubby holes provided.
- If the fire alarm sounds, you will hear a very loud continuously ringing bell. On the instructions of the demonstrator in charge of the class, you must leave the building and assemble on the lawn by the Department of Archaeology & Anthropology. Do not stop to collect personal belongings and do not re-enter the building until the fire brigade has given the all-clear.

Equipment and practical material

- Keep a minimum number of possessions on the bench tops, and try to keep them in order so that the risk of knocking samples onto the floor is minimised.
- Bench lamps **must** be lifted by their bases, not by the arms. Lifting by the arms can damage the pivoting mechanism.
- You will be instructed in the use of microscopes, and these instructions must be followed. Do not drag microscopes across the bench top; move them by safe lifting. Dragging the microscopes causes severe vibration, which leads to the optics becoming misaligned.
- When using microscopes and computers, check your seating position to ensure that you are at the correct height and, to avoid eye strain, look across the lab to allow your eyes to change focus every 20 minutes or so.
- Glass microscope slides must be treated with care. They are easily broken; some are irreplaceable, and all are expensive to replace.
- Handle ALL specimens with care. Many, especially the palaeontological material, are of museum display quality and are irreplaceable. *Do not mark or scratch them* unless you are specifically told you may do so.
- Ensure that all specimens, microscope slides, etc. are returned to the correct tray or drawer after use, and that any microscopes and bench lights are turned off before you leave the lab.

11. Feedback Processes

- Your most productive route for criticisms of the course is through the current lecturer or demonstrators. This particularly applies to day-to-day hitches, which can then be rectified immediately.
- You will have the individual opportunity to comment on the courses through the on-line questionnaires after each course component. Please use this opportunity. Your responses do significantly affect our planning of the following years' course.
- The Teaching Liaison Committee has a representative from each of the courses taught in Earth Sciences, and meets about once a term. These meetings concentrate on broader problems of the structure, content and operation of courses.
- If none of these routes seems satisfactory, please feel free to contact the Earth Sciences A Course Coordinator, Alex Piotrowski (Room S411, 33473, amp58@cam.ac.uk), the Teaching Support Manager, Helen Dingwall (Room N14, 68330, hpd20@cam.ac.uk) or the Director of Teaching, Richard Harrison (Room M25, 33380, rjh40@esc.cam.ac.uk).

12. Earth Sciences and Disability

Having done IA Earth Sciences, you will know that we aim to make our courses accessible to all students as far as possible. You should have received help or advice about any disability that might have a substantial and long-term adverse effect on your ability to follow the course or take the examinations; for instance, dyslexia or colour blindness.

If there is any new information about any relevant disability that we should know, please inform your Tutor, your College Director of Studies or Supervisor in Earth Sciences and the Teaching Administrator, Helen Dingwall hpd20@cam.ac.uk soon as possible. They will discuss with the course organisers the appropriate ways in which you can be helped to get the most out of this year's teaching.

13. Careers following a Degree in Earth Sciences

There are a wide range of careers open to Earth Scientists, and a shortage of well-qualified applicants. As a Cambridge graduate you would be highly sought after, because you have a better basic science and maths training than geologists from most universities, and because the Cambridge Earth Sciences Department is known to be one of the best in the world.

There is a misconception that almost all careers in Earth Sciences are in the petroleum industry. In fact, less than half of geologists work in this field. The full range of job areas is as follows:

- *Petroleum exploration & production*: finding new oil & gas fields and CO₂ storage sites.
- *Energy and mineral extraction*: exploring for coal, metallic and industrial minerals.
- *Hydrogeology*: finding and maintaining subsurface water supply.
- *Geotechnics*: detailing rock & soil strength for engineering projects.
- *Environmental geology & geochemistry*: natural and industrial risk assessment, nuclear waste disposal.
- *School teaching*: teaching science in schools.
- *University research & teaching*: degree-level teaching and research.
- *Museums and libraries*: managing collections of geological material.
- *Publishing*: commissioning and editing geological books and journals.
- *Science in society*: science research and policy in public sector institutes.
- *Finance and consulting*: assessing natural resource investment for banks etc.

Earth Scientists are very well qualified for careers outside geology. Earth Sciences graduates have particularly good problem-solving abilities and a wide range of transferable skills. These qualities are valued by most employers. Earth Scientists are therefore highly competitive in the job market, even where specific geological skills are not required.

Salaries for Earth Scientists vary widely between professions. The salaries for UK jobs advertised for 'geologist' average £45,000. The petroleum and mining industries pay higher-than-average salaries, with US pay being the benchmark: starting salaries of £60,000 and pay after 10 years of £90,000. Salaries in the finance sector are even higher than in the petroleum sector.

The Sedgwick Club hold career-oriented talks to which you will be very welcome. There will be a careers evening on **Tuesday 21 November, 5.00-7.00pm** in the common room, with the first half hour for first years only. Please come along.

14. Department of Earth Sciences: Plagiarism Statement

(This is a shortened and more subject-specific version of the University statement at <http://www.admin.cam.ac.uk/univ/plagiarism/students/statement.html>)

Definition and scope

Plagiarism is defined as submitting as one's own work, irrespective of intent to deceive, that which derives in part or in its entirety from the work of others without due acknowledgement.

Plagiarism is the unacknowledged use of the work of others as if this were your own original work. It is always wrong and a breach of academic integrity, whether in supervision exercises, project reports, exam answers or published papers. The University regards plagiarism as a serious offence. The penalties for plagiarism may be severe and may lead to failure to obtain your degree. The University reserves the right to check any submitted work for plagiarism, and can do so with increasingly sophisticated software.

The golden rule is that there should be no doubt as to which parts of your work are your own original work and which are the rightful intellectual property of someone else.

Plagiarism may be due to copying (using another person's language or ideas as if they are your own) or collusion (where collaboration is concealed to gain unfair advantage).

Methods and media

Methods of plagiarism include:

- Quoting directly another person's language, data or illustrations without clear indication that the authorship is not your own and without due acknowledgement of the source.
- Paraphrasing the critical work of others without due acknowledgement. Changing words or their order does not avoid plagiarism, if you are using someone else's original ideas without acknowledgement.
- Using ideas taken from someone else without reference to the originator.
- Cutting and pasting from the Internet to make a pastiche of online sources.
- Colluding with another person, including another candidate (other than as explicitly permitted for joint project work).
- Submitting as your own work research that has been contributed by others to a joint project.
- Submitting work that has been done in whole or in part by someone else on your behalf (such as commissioning work from a professional agency);
- Submitting work that you have already submitted for a qualification at another institution or for a publication without declaring it and clearly indicating the extent of overlap.
- Deliberately reproducing someone else's work in a written examination.

Plagiarism can occur with respect to all types of sources and in all media:

- not just text, but also figures, photographs, computer code etc,
- not just material published in books and journals, but also downloaded from websites or drawn from other media,
- not just published material but also unpublished works, including lecture handouts and the work of other students.

Avoiding plagiarism

The conventions for avoiding plagiarism in the Earth Sciences are as follows:

- When presenting the views and work of others, cite the source in ways such as ‘...as shown by Jones (1938)’.
- If quoting a secondary source, to which you have not gained access, make this clear in ways such as ‘...Hailstone (1802) as discussed by Marr (1916, p. 176).’
- If quoting text verbatim, use quotation marks or indented text and a citation; e.g. “Many of the great movements above described, appear to have been produced by an action both violent and of short duration.” (Sedgwick 1836).
- If using an exact or redrawn copy of a figure from another work, cite the work in the figure caption; e.g. ‘redrawn from Hughes (1866).’
- If incorporating data into a figure from another source, cite the source in the figure caption; e.g. ‘orientation data taken from Whittington (1938).’
- Collaboration with staff or other students during project research may arise during, for instance, Part II or Part III projects. If there is likely to be any doubt as to who contributed which parts of submitted work, make this clear in the text wherever necessary; e.g. ‘Prof. I.N. McCave supplied the comparative data on contourites in table 3.’
- Wherever a source is cited, the full bibliographic reference – including title, journal, volume and page numbers – must be given at the end of the report or essay, except in an essay done in exam conditions. Candidates are not required to make full citations in written examinations but should reference where appropriate.

Checking for Plagiarism

The University subscribes to Turnitin UK software which provides an electronic means of checking work for originality and is widely used in UK universities. Visit the Departmental website to find the document explaining how Turnitin UK will be used by the Department of Earth Sciences and which explains the implications of submitting your work to the software. Written work will only be checked if a candidate is suspected of plagiarism.

Any graduate student submitting written work suspected of plagiarism may also have their material checked using Turnitin.