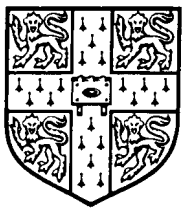
Department of Earth Sciences
University of Cambridge



PART III EARTH SCIENCES
COURSE GUIDE 2019-20

Contents

1. Introduction to the Course

Welcome to Part III Earth Sciences which is an MSc-level course. Having built up the basics over the past three years, the focus now shifts to the application of those principles, and a more critical, interrogative and creative approach to understanding how the planet works. Increasingly, the important insights in Earth Sciences turn up in the territory between the conventional disciplines, and the course is designed to encourage a breadth of research-level experience, even as you focus on your own research project. By the end of the course you will be in a position to take on advanced academic research – or any other occupation requiring analytical ability, intellectual dexterity, writing skills, presentation skills and self-motivation.

There are three principal components to Part III Earth Sciences:

1) The research project. This is the centrepiece of the course, where you address a particular research question over the course of Michaelmas Term, and submit a report demonstrating your ability to generate new observations, data and ideas. Importantly, the success (and grading) of these projects is not measured in absolute results, but the approaches you take in pursuing them. Your project supervisor will be there for general guidance, but it is up to you to drive the work forward, and in the direction you think it should go. The key is to do lots of reading, attend lots of seminars, ask lots of questions.

2) Option courses. The Lent Term option courses are a further step up from Part II lectures, with an increasing focus on current research issues and debates. As such, the topics and content will vary from year to year, as will the structure of any particular course. At least 12 (usually more) four-week option courses are offered each year, from which you will officially take six. Easter Term exams will be individually tailored to a particular option, but they all will be looking for an advanced near-research level of understanding. The key is to do lots of reading, arrange supervisions, ask lots of questions.

3) Seminars and the Easter field trip. The Department hosts a broad range of seminars and seminar series, and you should make it your business to attend as many as possible. This is the best way of tracking the very latest research in your areas of interest, and seeing how it gets done (and presented). The Departmental Seminars (Tuesdays at noon) and Bullard Seminars (Wednesdays at 4pm) are particularly recommended. A short Pt III seminar series at the beginning of Easter Term will address issues and research broadly connected to the Easter field trip. The trip itself – to SE Spain – is in some sense a revision of the whole Pt III course – and one of its highlights. As ever, ask lots of questions, take lots of notes, do lots of reading …

Michael Carpenter (Part III course-coordinator)
mc43@esc.cam.ac.uk

2. Course Format and General Information

Part III - Course Synopses – 2019-20

Michaelmas Term:

Project	=	24 hours per week
Seminars	=	two seminars per week
Poster	=	3–4 preparation days

Optional attendance of Part II Core courses

Lent Term:

Option courses	=	six @ 12-16 hours (two 1.5- or 2-hour sessions per week x 4 weeks)
Seminars	=	two seminars per week
Field Trip	=	Spain: 30 March – 6 April 2020

Optional attendance of Part II Core courses

Easter Term:

Pt III seminars = five-six invited seminars, early May
Student-organised supervisions and revision

MICHAELMAS TERM

Introductory session
Michael Carpenter will give an introductory session at **12.00pm on Monday 14 October in Harker 2** outlining the Part III course, how to get the most out of it, and how it is examined. The meeting will be followed by a buffet lunch with academic staff in the Common Room.

Thin Sections
If essential, the Department will prepare up to ten thin sections of key rocks associated with your project. Samples should be handed in to Reception by **Tuesday 15 October** at the latest, along with a completed thin-section form providing specific requirements. Please draw a line round the rock in felt tip pen to indicate how you wish the rock to be cut**.**

Weekly Seminars
Department Seminar Series, Tuesdays at noon in the Tilley Lecture Theatre.
Bullard Seminar Series, Wednesdays at 4.00 pm in in the Marine/Wolfson Building.
Details are published online on the Department of Earth Sciences seminar page.

Research Project
You are advised to spend around 24 hours per week on your research project in the Michaelmas Term.

The research report must be submitted by 4.00 pm on Tuesday 14 January 2020. Five per cent of the maximum mark available for the report will be subtracted for each day or part of a day that submission is delayed. Only under exceptional circumstances and with advance notification will any exceptions be considered.

You are strongly advised to back up your work at least daily to the server or a memory stick.

If you are doing a lab-based project, you need to fill in a hazard assessment form. Contact the relevant lab supervisor.

The research report must not exceed 7500 words. The original research proposal should be bound in as an appendix.

Draft Versions: You are welcome to submit ongoing drafts of your project via the assignments page on Moodle. These drafts will not be seen by the Examiners at any stage, but could be used for consultation in case of emergency (e.g., illness over the Christmas period or computer failure).

Posters

All Part III students are asked to prepare a poster about their project for public presentation in the Department Common Room on **Wednesday 4 December 2019**. This is a very enjoyable event, and will give you valuable feedback on your ideas and thinking. Although the poster itself is not examined, the exercise of putting it together will help in organizing your thoughts prior to writing your report. It is important not to underestimate the time that this will take. There is only six weeks to the submission deadline at this point.

Note – you should be spending no more than three or four days producing your poster.

*Posters should be set up in the Department Common Room on Friday 30 November (**no later** than Monday 2 December), and taken down on Friday 6 December.* The Departmental Poster evening takes place between **4.00 and 6.00 pm on Wednesday 4 December 2019.** Please put this in your diary.

LENT TERM

Students take six short option courses from a wide ranging choice. These will be chosen from the list published by the department at the beginning of the year and can be combined with up to three NST Interdisciplinary courses, IDP1, IDP2, IDP3.

Before deciding on courses taught outside the Department (IDP1 and IDP3), please consult your Director of Studies as some require specific IA or IB knowledge.

Note: You are welcome to attend any Part II lectures that you might find useful.

Project presentations
Students are required to prepare a short project presentation, consisting of a 10 minute talk, with 5 minutes for questions. The project presentations take place on Wednesday mornings in early lent term. All Part III students should attend and members of the department are also invited. This is not assessed and further details and a timetable will be circulated in mid-December.

Supervisions for option courses
Lecturers may arrange small group supervisions for their Part III courses, but students are encouraged to take advantage of the supervision system more generally. Feel free to approach lecturers for supervisions, or the names of available supervisors. You should be aiming for around two supervisions per option.

Weekly Seminars
Department Seminar Series, Tuesdays at noon in the Tilley Lecture Theatre.
Bullard Seminar Series, Wednesdays at 4.00 pm in the Marine/Wolfson Building.
Details are published online on the Department of Earth Sciences seminar page.

EASTER TERM

Field Trip
Spain, Monday 30 March to Monday 6 April 2020. The cost for the Spain field trip will be £135. The online registration form will be circulated in early December with payment due in the first or second week of December.

Part III Seminars
A series of seminars will be presented in the first two weeks of Easter Term – aimed broadly at issues relating to the Spanish field trip.

Revision sessions
There is no formal requirement for revision sessions for Part III options, however some option leaders run one or two revision sessions in the Easter Term. The timetable for these will be published and circulated at the beginning of Easter Term. Ensure you take advantage of the supervision system for options that do not offer revision sessions.

Weekly Seminars
Department Seminar Series, Tuesdays at noon in the Tilley Lecture Theatre.
Bullard Seminar Series, Wednesdays at 4.00 pm in the Marine/Wolfson Building.
Details are published online on the Department of Earth Sciences seminar page.

3. Part III Options and Timetables

The full Options list for Part III Earth Sciences, plus timetables can be found on Part III Course on Moodle. You can also set up your own personal timetable based on your option choices, using the online University Timetable.
Note: All Options lectures, practicals and seminars take place in Lent Term, with the exception of Nuclear Materials which takes place at the beginning of Michaelmas term.

Reading lists will be available on Moodle, and lecture notes and other course documentation will be added to Moodle throughout the year. Please speak to Helen Averill or Mitha Madhu if you are having any problems with access, although everyone should have access to the course pages from the beginning of Michaelmas Term.

Part III Options 2019-20

1. Continental tectonics and mountains (James Jackson and Alex Copley)
2. Probing lithospheric dynamics through space and time (Nicky White)
4. Records of environmental change in Earth history (Alex Liu)
6. Deep Earth volatile cycles (Sally Gibson)
7. Volcanology: physical mechanisms and petrological processes (Marie Edmond and Andy Woods)
8. Planetary chemistry and evolution (Helen Williams and Olli Shorttle)
9. Magma dynamics (John Rudge and John Maclennan)
10. Chemical weathering (Ed Tipper)
11. Reconstructing climate and ocean physics using the Marine Sedimentary Record (Alex Piotrowski and Andy Woods)
13. Magnetism of Earth and planetary materials (Rich Harrison)
14. Electron microscopy [M8] (Emily Ringe)
15. Nuclear materials [M17] (Ian Farnan)
16. Vertebrate palaeobiology (David Norman and Daniel Field)
17. Natural Hazards (Marie Edmonds, Alex Copley and James Jackson)

IDP1 - Atmospheric chemistry & global change (Pyle/Schmidt, Dept of Chemistry)
IDP2 - Climate change and the carbon cycle: An Earth history perspective (Sasha Turchyn)
IDP3 - Renewable energy: concepts, materials & device physics (Dutton/Rao, Dept. of Physics)

4. Part III Project and Managing Research Time

The Part III project is an opportunity for you to develop your own ways of planning and executing a research project. Whilst individual styles of research vary, there are some common features:

1. Most research projects have a number of components in common, for instance *data gathering, data analysis, learning of techniques, library work, writing, drafting diagrams, 'housekeeping'.*

2. These components do not necessarily have to be done in sequence, but can be overlapped to make best use of time. In particular, it is usually a mistake to delay writing your report until you feel all your data have been fully analysed. Not until you try to explain your results to others will some of the gaps in your analytical reasoning be revealed.

3. Different research tasks require different levels of concentration, allowing less demanding tasks to be done when you might otherwise feel too tired to make progress. For instance, drafting diagrams typically requires less concentration that writing text.

4. Do not expect your research, however well planned, to proceed in a straight line towards your final report. Most ultimately successful projects involve a good number of blind alleys, backtracks, and technical hitches. Learn from these rather than get frustrated by them.

5. Reading a Scientific Paper

Why read this paper?

How you tackle a paper depends largely on your reasons for reading it. Some possible reasons are:

- as background reading for a mapping or research project.
- for abstracting specific data or results for a project.
- as part of a series of related papers to distil into a report or essay.
- for further reading around lectures.

Reading strategies

Adopt a strategy consistent with your reasons for reading the paper. The strategies are ranked in order of speed, and you can start with a rapid strategy and move down the list to a more time-consuming one if the paper warrants it.

- read the abstract only
- *skimming*: as above plus a glance at the figures and any concluding summary.
- *scanning*: as above plus reading the first lines of each section or paragraph, together with appropriate figure captions.
- *reading*: essentially word-by-word.

Summarizing strategies

Choose a strategy for summarizing the essentials of the paper, which is appropriate to your purpose:

- summary notes on a record card or database.
- highlighting or underlining on a photocopy of the paper.
- diagrammatic notes.
- full notes.

Moving on

- The reference list provides a guide to relevant past papers.
- A citation index (e.g. Web of Knowledge, Scopus) lists later papers that cite the one you've read.

6. Examinations

Seminar Paper
The 'Seminar paper' will be divided into two sections. Students answer two questions, one from each section. Section A will consist of a wide range of questions, using the Department and Bullard seminars as thematic guides. Questions for section B will be based broadly on aspects of the Easter field trip and the associated Easter Term seminars. Students are advised to read around a substantial range of seminar topics.

Option Papers
The majority of options will have a 90-minute examination during the main exam period. The exact format of these exams will be made known at the start of the year. Exam formats may include written answers, calculations or the description and discussion of specimens, thin-sections, etc.

Some courses will also run assessed practicals or formal practical examinations related to their course. The division of marks between theory and practical will be made known at the start of the year. The format of the assessed practicals may be a timed exercise at the end of the Lent or beginning of the Easter term, or assessed exercises taken during the course. They may involve specimen description and discussion, calculation, map exercises, writing short reports, or computer based exercises but the exact format of these assessments will be made known at the start of each course.

Viva
The Viva takes place during the last week of Easter term. It is a formal requirement for Part II and Part III, however it is not assessed and is relatively informal. The viva is an opportunity to talk about your mapping project and to discuss with the external examiner details which you may not have included in your report.

Examination codes of conduct
The examination requirements and any practical work associated with each paper shall be announced by the Head of the Department of Earth Sciences not later than the beginning of the Michaelmas Term. The Examiners shall be provided by the Head of the Department of Earth Sciences with assessments of any assessed practicals; in assigning marks for the examination the Examiners shall take account of these assessments.

Project report
The report of a research project shall be on a subject which may be either proposed by the candidate and approved by the Head of the Department of Earth Sciences, or chosen by the candidate from a list of approved subjects announced by the Head of the Department by the beginning of the Lent Term in the academic year immediately preceding the examination. Each candidate shall either obtain the approval of the Head of the Department for the subject proposed or notify the Head of the Department of the subject chosen from the list not later than the division of the Lent Term immediately preceding the examination.

Records of class and fieldwork
The records of classwork and fieldwork shall be submitted to the Examiners through the Teaching Support Manager (Helen Averill) not later than the last day of the written examinations and shall bear the signatures of the teachers under whose direction the work was performed.

Notice about materials which may be taken into practical examinations
Candidates are reminded that no written or printed materials may be taken into the examinations. For appropriate practical examinations mineralogical and palaeontological reference material will be made available; e.g., Deer, Howie & Zussman, Palaeontological Monographs. Candidates are allowed to take in their own copy of DHZ to the practical examination for Petrology options.

Candidates are advised to bring writing and drawing instruments, lens, calculator (see Section 8 for specifications), as appropriate.

EXAM STRUCTURE

Each candidate must enter a Research Project, the Seminar paper and six option papers

Exam component	**Duration (hours)**	**Marks**	**Number of exams**	**Total marks**	**Notes**
Seminar paper	3	6%	1	6%	Two answers; one from each section. Section A: Topics covering a wide range of issues in the Earth Sciences. Section B: Topics based broadly on the Easter field trip and seminars
Option papers	1.5	9% each	6	54%	Six papers from a choice of 15, one for each option course. Some courses have associated assessed practicals
Research project report	-	40%	1	40%	Maximum 7,500 words
Viva	0.5		1		No formal mark. Used primarily to assess student engagement
TOTAL				100%	

7. 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 Excellently 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.
Expectations of appropriate 'critical analysis' and 'relevant literature' will vary from year to year of the Tripos		

8. 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.

Approved calculators for the Natural Sciences Tripos can be purchased from the following locations (Note: these will be marked in the approved fashion:

Department of Chemistry
Department of Physics, Bragg Building, Cavendish Laboratory

Approved calculators bought elsewhere will need to have the approved marking applied by the relevant Department.

You are strongly advised to purchase a calculator at the beginning of term.

9. Working Out of Hours

Working hours for the Downing Site are: 08.45-13.00, and 14.00-17.00 Monday to Friday. Outside these hours (including lunchtimes and evenings) and at all times at weekends, the following conditions apply:

General rules
If working in the Department late at night or at weekends, tell others of the time you intend working to. Time and working restrictions also apply to areas remote from the Department: these are identified in the safety procedures of the individual area. The Head of Section and/or your Supervisor must also be informed of your intention.

Equipment/working in evenings and at weekends

(a) Checks before leaving work at night and at weekends.
It is important to check laboratories before leaving at night:
(i) as much apparatus as possible should be switched off and unplugged
(ii) individual gas appliances should be turned off locally as well as at the main supply.
(iii) doors and windows should be closed.

(b) Equipment running at night and at weekends. The permission of the academic staff member in charge of a facility must be obtained before apparatus is left running overnight. All appropriate procedures laid down in the code of practice for the section must be followed, and a sign must be posted in a prominent position showing instructions for switching off the equipment in case of emergency.

(c) Working in laboratories out of hours is allowed only with the specific prior written permission of the Head of Section. Particular care must be taken when using any equipment, or electrical testing of equipment or buildings, changing any pressure line, and cylinders or prototype experimental work. NOTE: Rock cutting out of hours is strictly forbidden.

Out of hours, the research worker must:
- be accompanied by another person whilst working in the laboratory,
- be fully aware of the safety procedures of the laboratory concerned, and be able to turn off and make safe,
- be fully aware of the emergency exists,
- be fully aware of the location of first aid boxes,
- be fully aware of the location of a telephone in case of an emergency.

(d) Out of hours Chemistry Laboratory use
In addition to all points in part (c) above:
- The use of any of the chemistry facilities requires compliance with the regulations in the respective laboratory.
- There must be no use of HF acid.
- There must be no decanting of acids from large to small containers.
- There must be no movement of dangerous acids around the Department.

10. Department Computing Facilities and Training

The Computing Code of Conduct covers the use of computing equipment by staff and other authorized persons in the Department of Earth Sciences. Please familiarize yourself with the Computing Code of Conduct.

Details of the computing facilities available for student use are as follows:

	Library	**Galson Sciences Lab (N312)**	**Printer Room (S212)**	**Part 1B Lab (S213)**	**Part II Lab (S322)**
HARDWARE					
Windows/Linux PCs	X	X			
Linux PCs, Macs		X			
Windows Only PCs				X	X
Colour Printer (up to A3)	X		X		
Colour Plotter (up to A0 poster size)		X			
Black and White Printer (up to A4)		X			
Scanner	X (Copier plus two scanner 9600×4800)	X (Scanner 9600×4800)	X (Copier)		
SOFTWARE					
MS Office	X	X		X	X
Arc GIS	X	X		X	X
Origin	X	X		X	X
Matlab	X	X		X	X
Mathematica	X	X		X	X
Igor	X	X		X	X
Inkscape(drawing), GIMP(image manipulation, Scribus(poster making)	X	X		X	X
Libre Office, Open Office	X	X		X	X
Standard Linux Applications (including GMT and R)	X	X			

Training in computer skills

At the beginning of your Part II year, you had a course on presentation and computer skills, including report writing, bibliographic skills, computer graphics, stereo-plotting, and map drawing. You will have further developed many of these skills in compiling the report on your Part II mapping project. With the Part III project giving a more specialised flavour to your fourth year, extra training in computer skills needs to be targeted to your individual needs.

For this purpose, the University Computer Service offers a portfolio of courses throughout the year. You are strongly advised to attend relevant courses, either to upgrade your own capabilities in a particular area, or to learn a new skill in an area appropriate to your project. Courses are free to students, but you must book in advance – most courses get booked up days ahead. You can register online via the UIS Training web page, where a full timetable and description of courses is available. You must explicitly cancel your booking in advance if you cannot attend. Most courses assume some prior knowledge of basic computing skills, but no more than you should have from your Part II experience.

The topics likely to be of most interest to Part III students will be:

- Bibiographic software (EndNote)
- Databases
- Desktop Publishing
- Graphics and photo/image processing
- Multimedia
- Presentation software (PowerPoint)
- Programming
- Spreadsheets
- Statistical and mathematical software
- Unix (inc. Linux)
- Web page authoring

As well as these taught courses, there are Self-Teach Courses available for some popular applications. Full details of self-taught courses are listed on the UIS Training web page.

11. Feedback Processes

Feedback processes

If you are concerned specifically about the quality or style of teaching that you are receiving, there are a number of additional avenues for your comments:

- **Comments books** are available in the laboratories, mainly for suggested improvements to the content and format of practical classes. The comments are acted on by the class organiser.
- **Online course questionnaires** are issued via Moodle at the end of each part of the course for you to assess the various components; lectures, practicals and supervisions pertaining to that subject. **Please take the time to fill them in**. They are evaluated by the course coordinator, who suggests improvements to individual lecturers or practical organizers or passes on comments on more strategic issues to the Department's Teaching Committee. Positive and negative feedback are both useful to us in assessing the effectiveness of courses.
- **A student representative** from each NST course taught by the Department sits on the Teaching Liaison Committee along with members of the Teaching Committee. Your representative will be appointed and introduced to your class before the end of the Michaelmas Term. The Teaching Liaison Committee discusses general teaching issues such as re-organisation of whole courses, provision of teaching resources, and co-ordination of University and College teaching. It passes recommendations on to the Teaching Committee, which has the central role in undergraduate teaching matters in the Department.
- **Feedback** on supervisions should be directed primarily through your College system. Concerns about your supervision arrangements should be voiced to your subject Director of Studies (ie in Earth Sciences or possibly Physical Sciences) or to your NST Director of Studies. Your Tutor may be able to advise you, if there are personal as well as academic issues involved. However, issues of supervision content and style are most effectively raised directly with supervisors themselves. Supervisions are meant to be individually tailored, and supervisors expect you to say if you are not getting the best value from them.
- **College questionnaires** provide another route for commenting on the supervision system. The Department will try to resolve major issues concerning supervisions, if College structures have failed to do so. Problems in particular Colleges can be dealt with by the Teaching Liaison Committee, although sensitive issues involving individual supervisors may be best discussed with the Chair of the Teaching Committee.
- If none of these routes seems satisfactory, please feel free to contact the Part III Course Coordinator, Michael Carpenter (Room S109, 33483, mc43@esc.cam.ac.uk), the Teaching Support Manager, Helen Averill (Room N14, 68330, hpd20@cam.ac.uk) or the Director of Teaching, Nick Butterfield (Room E320, 33379, njb1005@cam.ac.uk).

Complaint procedures

If you are unhappy with the experience you have received from the department, faculty, service or staff member, the University has a Student Complaint Procedure for you to use in order to try and resolve the situation. All information regarding the Student Complaint Procedure can be found on the Student Complaints web page**.**

At a local level if any issues arise which need action details should be passed on to the Teaching Support Manager or discussed with your Director of Studies in the department.

Examination review procedure

The University has robust policies in place to ensure that all examination results are accurate. However, something unusual may have taken place in the examination and you may want to check that the examiners were aware of the circumstances and that they have been taken into account. If you have any concerns about examination results you can request a review using the Examination Review Procedure, details of which can be found on the Examination reviews web page.

12. Earth Sciences and Disability

Having studied 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 Support Manager, Helen Averill at 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:

- *Environmental geology & geochemistry*: natural and industrial risk assessment, nuclear waste disposal.
- *Petroleum exploration & production*: finding new oil & gas fields and CO_2 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.
- *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 also be a careers evening on **Tuesday 19 November, 5.00-7.00pm** in the common room. The first half an hour is dedicated to first year students, so please come along from 5.30pm.

14. Transferable skills in the Earth Sciences

Transferable skills are generic skills that can be applied across academic subject boundaries and beyond. Transferable skills contrast with *subject-specific skills*, although the boundary is naturally blurred.

In the Earth Sciences Department, we believe that many transferable skills are best taught, learned, practiced and assessed if they are embedded in subject-specific courses. We monitor the opportunities that our courses provide to acquire transferable skills (Table 1) and ensure that our graduating students are well prepared for further study or work, whether in or beyond Earth Sciences. There are, however, some specific skills courses, listed in Table 2.

Table 1. *Overview of the transferable skills acquired in Earth Sciences*

transferable skills	**some relevant course components**
Intellectual: criticism, analysis, synthesis, problem-solving, evaluation.	lectures, practical classes, small-group supervisions, seminars, field courses
Communication: speaking, listening, reading, writing, presenting (oral/written/graphic), giving and receiving feedback.	supervision written work and discussion, project work and evening presentations on field trips, 3rd year field mapping project, 4th year research project
Organizational: self-assessment, working independently, responsibility, initiative, time-management, career awareness.	weekly supervision work, field work exercises, 3rd year field mapping project, 4th year research project, external speaker lectures
Interpersonal: teamwork, leadership, negotiating, networking, managing people and resources.	teamworking on field course exercises and project work, involvement with student Geology society and outreach work
Research: collecting and recording data, processing, interpreting and presenting data, bibliographic skills.	practical classes, project work on field trips, 3rd year field mapping project, 4th year research project, literature review essays
Numeracy: mathematical, statistical and quantitative analysis, solving numerical problems, error analysis.	exercises in practical classes and small-group supervisions, project work
Computer literacy: word-processing, spreadsheets, graphics packages, geological software, Email, WWW, bibliographic searching, GIS	computer-based practical classes, computer skills course, bibliographic skills sessions
Safety: navigation, assessing risk, urban first aid, wilderness first aid	field mapping exercises, 2nd year risk assessment seminar, 1st and 2nd year first aid course by external provider.

Table 2. *Dedicated transferable skills courses in Earth Sciences*

transferable skills	**hours**	**content**
IA Field safety and first aid	3	basic field safety and first aid
IB Library skills	1	catalogues and literature searching
IB GIS	4	Geographic information systems, ARCGis
IB Risk assessment	1	field risk assessment
IB Field safety and first aid	3	wilderness safety and first aid
II Skills	11	report writing, presentation, drawing programs, reading primary literature, bibliographic skills
Part III exam skills	1	revision and exam skills

15. Department of Earth Sciences: Plagiarism Statement

(This is a shortened and more subject-specific version of the University statement, the full version of which can be found on the University website).

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.