BIRKBECK, UNIVERSITY OF LONDON:
Department of Earth and Planetary Sciences

BSc Geology Map and Thesis

This booklet gives general guidance on field techniques relevant to undergraduate mapping, together with guidelines on the preparation and presentation of notebooks, field slips, final copy map, cross-sections and the thesis. Every mapping area is different and students should consult their tutors for specific guidance.

PLANNING YOUR FIELDWORK AND WRITE -UP.

The mapping policy at Birkbeck is that we expect students to map in pairs for safety reasons. That means that you will map the same area and you should be in contact with your partner at all times in the field. You can confer in the field regarding the geology, but you must prepare a separate Map and Thesis. Your area will be chosen with the guidance of your tutor. Areas should be well-exposed and easily-accessible. Areas should contain a variety of geology. The area to be covered depends on geological complexity and relief, and will be indicated by your tutor.

The minimum field time set by the Geological Society for an accredited degree in Geology is 60 days (http://www.geolsoc.org.uk/Education-and-Careers/Universities/Degree-Accreditation/First-Degree-Programmes-in-Geoscience/Requirements-for-Accreditation). If you are on a three year degree with three ten day field classes you will need to spend at least 30 days in the field. If you are on a four year degree with four ten day Easter field classes then you can do a minimum of twenty days mapping but we still recommend thirty days as a sensible target if you hope to produce a good map. You can conduct this field work at weekends or during vacations but it is better and more cost effective to put aside two or three weeks at a time in the summer for mapping because it takes time to get into mapping, the days are longer and the weather is warmer.

Although a visit to the area in the summer of the first year may help you decide whether you and your mapping partner are happy with the area, it may be best to delay collection of data until the second year, when you have better grasp of geology. This may not be possible in all cases due to other commitments and it is possible to produce some good work in the summer of the first year. Remember, that it would be best if you can complete the 30 days fieldwork before October of your final academic year. Do not let this module get in the way of finalising within three/four years.

The area you will be expected to map will vary according to the scale mapped at, the quality of exposure and the complexity of the geology. A typical map at a scale of 1:10,000 in a moderately well exposed region would cover 15 square kilometers. The thesis length should be about 8000 words and include maps, diagrams, field photos etc.

Drafting final copies of your maps and cross-sections and generally preparing the presentation of the thesis will take more time than you expect. It is suggested that you should commence drafting final copies of your maps before the start of the Autumn term of your final year while the information is still fresh in your mind.

COURSE REQUIREMENTS

The deadline for thesis submission is the last day of the spring term in your Final Year. This must be strictly adhered to so that marking by can be completed in good time. The map and thesis should be presented un-bound and will be bound by the department. It is advisable for you to keep a copy of your thesis for your own reference prior to the oral examinations etc. Field notebooks, field slips and field logging sheets should also be handed in for examination.

The following items should be handed in at the time of submission:
(a) original field notebooks
(b) original field slips
(c) original logging sheets
(d) any other field data
(e) final copy map, typically at 1 : 10 000 scale including a cross-section and stratigraphic column.
(f) thesis, with appendices containing tables of structural data, stereo nets, palaeocurrent data etc.

The marks awarded for each of these pieces of work will depend on the geological complexity of the area.

A) **FIELD NOTEBOOKS**

It is suggested that you use the large yellow Chartwell Notebooks (2056) which are available from Maz Iqbal (or a comparable notebook). Before going into the field, put your name and address into the notebook as well as details of a reward for return to guard against loss of notebooks.

Marks will be awarded for the following:
1) amount and quality of field observations;
2) an account of your activities in the field (including dates, details of the locations where you examined the geology and areas where no exposure was found);
3) quality of field sketches;
4) the ease with which the examiner can cross-reference between your notebook and field slips;
5) thoughts, ideas and sound scientific reasoning concerning the geology of your area;
6) sketch cross-sections, detailed sketch maps and logs of the succession in your area.

We will also look for text in your notebooks detailing your assessments of the hazards that might be faced by geologists entering the areas studied. Text should also detail how these hazards can be avoided, ensuring your safety. This should take the form of a locality by locality assessment of hazards listed in the "Department of Earth and Planetary Sciences Safety Code" given out when you join the Department. Students are responsible for ensuring that this safety code is studied before entering the field and carried in the field for reference.

General points

Field observations should be made in the field and not added at a later date to your notebook. If comments are added to your notebook at a later date, then this should be labelled clearly so that the examiner can distinguish between your field observations and your interpretations made at a later date.

As a general rule, you do not need to ink-in your notebooks unless on a particular day the rain/perspiration from your hands has made your work illegible.

All orientation data should be recorded neatly in your notebooks. Lay out your data in columns so that they can be easily located and used in cross-section construction and stereographic projection. The central column of the Chartwell notebooks is particularly suited to this purpose.

Use a whole page for your field sketches. Take your time and sit down when making the sketches. Avoid shading where possible and use single solid lines. In many ways good field sketches resemble detailed cartoons of what you can see. Make sure that all of your sketches, including sketch maps/cross-sections are well annotated. Un-annotated field sketches do not give a good impression. A scale, the orientation of the surface sketched and the direction of viewing should all be included on field sketches.

Construct geological cross-sections in your notebooks as you work in the field, as this will save you hours when trying to draw a cross-section across your final copy map. You may find it useful to save the first page of your field notebook for a particular day to construct a cross-section along the line transect along which you may be working. You may find it useful to add information such as way-up, younging directions and bedding-cleavage relationships to your cross-section as you work in the field.

Talk to your notebook, include your thoughts as you speculate about a particular geological problem. At the end of the paragraph state how you intend to solve each problem (i.e. what exposure or view point you wish to visit to collect more information).

The fundamental lithostratigraphical units that you should try to map are known as **formations**. Formations are formally defined by a type section at a type locality which shows them in their typical form, and all other supposed exposures of the same formation came be compared against. Formations can be distinguished from other rock units on the basis of readily observable lithological features. A formation may comprise a single lithology (e.g. crinoidal limestone or biotite-garnet schist) or suite of different lithologies which are closely associated and not mappable individually (e.g. alternating layers of sandstone and mudstone). A formation should be separated from other formations by **contacts** on your maps. It is the mapping of these contacts that is the basis of most geological mapping. Formations that you are able to map in the field may differ from those on published maps. This means that you should give your own names to the formations that you are able to map in the field. You can name your formations after the type locality (e.g. Smith Quarry Limestone) or use descriptive names (e.g. Belemnite Limestone). Also, the nature of the contact between adjacent formations must be described (e.g. tectonic, unconformable, conformable, intrusive etc.). Although many geological contacts are sharp and easily defined, some may be gradational, with the character of the rock changing from that typical of one formation to that typical of another over some distance. It is important to define the base of each formation. In a stratigraphic succession the top of a formation will be defined by the base of the overlying formation. In the case of gradational boundaries, you will have to come up with a consistent way of defining where you place the boundary. Remember to mark the contacts between your formations on your field slips when you see them in the field.

Field strategy

It is important that you work out exactly how you are going to go about doing the mapping. For many people, it can be very useful to have a brief reconnaissance of the mapping area. This should be very brief, with one day often being sufficient to get an idea of the terrain, main rock types present and general strike of the geology.

When you have a very rough idea of what is present within your mapping area, you will need to decide how to go about the mapping. As the bulk of marks will be given for the map and the general descriptions and interpretations of mapped units, the mapping should take up the bulk of your time in the field. It is usually best to start mapping in the region that the geology appears to be best exposed and/or least structurally complex. This will allow you to get a good idea of how the geology of the area looks when it is 'at its best', which will then allow you to have a far better idea of how to interpret the geology of more poorly exposed or structurally complex areas. It is often a good idea to record things that are important as you go, but come back later for more detailed studies (such as sedimentary logging, detailed structural analysis etc.) when you are happy that you have found the best sites for this work. Keep in mind the sort of area you want to cover, and try to keep to a rate of ground coverage that will allow you some time when the basic map is finished to come back for more detailed studies of sites of particular importance such as the contacts between mapping units (Formations) and the type sections where each formation is best exposed. Do not feel restricted to only mapping within an area that will give you a neat, rectangular map, including important geological information is more important than the shape of the map.

Day-to-day procedure

Start each new day in the field on a new page with the day and date. Make a hazard assessment, consider any risks and what steps you should take to minimize the risk. Comment on the weather and any problems/time constraints you may have (e.g. tide times etc.).

Always state in your notebook at the beginning of a particular piece of field work, the geological purpose of the work. You may find it useful to walk across strike, or walk out a particular boundary. Try to give grid references for the observations in your notebook so that the examiner can understand the route you have taken.

For each exposure examined you should do the following:
1) Give the exposure a grid reference and locality number which corresponds to a circled number on your field slips.
2) Describe the lithology and decide which of your formations this belongs to. When you come across any lithology that differs from what you have seen previously, describe it in full detail; do not simply jump to a conclusion of what the rock is.
3) Attempt to explain the occurrence of lithological/structural features within the rocks.
4) Attempt to record the strike and dip of bedding/layering within the rocks. If this cannot be recorded then you must state the reason why. Plot this information on your field slips in the field using the appropriate symbol.
5) Record the orientations of any structural/lithological features within the exposure (e.g. cleavage, fold axis, joints, faults, lineations on faults or bedding surfaces, intersection lineations, cross-bedding, flute casts, phenocrysts, xenoliths, porphyroblasts.
6) State where you are going next and why.

At the end of a piece of work, state the difficulties encountered how successful the traverse was. This will show future geologists what has been achieved and help them to understand the difficulties with mapping a particular area. (This includes weather, no exposure, bogs, wild dogs, etc. Do not be flippant or moan in this bit!).
In the evening after you have finished "inking-in" your field maps, you may wish to write in your notebook a synthesis of the mapping achieved that day. Comments should conclude with a list of things that you may wish to pay special attention to in the future.

B) **FIELD SLIPS**

Copies of the topographic maps of your area, or aerial photos/ Google Earth™ images should be provided at an appropriate scale (usually1 : 10 000) by the Department.

Marks will be given for the following:
1) the amount and accuracy of information recorded;
2) a clear numbering system for your localities that can be easily cross-referenced with your notebook;
3) a good coverage of annotations justifying the features in poorly exposed areas;
4) a good coverage of annotations detailing the geology to be found at each locality;
5) accurately drafted symbols. It is very easy for an examiner to check using a compass clinometer and the readings in the notebook whether symbols have been accurately drafted. You must draw your symbols in the field using a compass clinometer and ink them in accurately;

6) the accuracy of contacts. It is very easy for an examiner to check whether horizontal contacts follow the contours etc. You must draw in your contacts in the field;
7) accurate indication of the positions and extent of outcrops.
8) Note the location and type of hazard to safety that might be encountered by a geologist accessing specific area; cross-reference this to hazard assessments made in your notebooks.

General comments

You can write directly onto the photocopied field slips, or if you wish you can write onto sheets of drafting film taped over your photocopied field slips. If you use drafting film, then it must be securely taped on top of the photocopied map when handed in. You can discuss the pros and cons of these two styles of field slip with your individual tutors.

Never fold your field slips as this will damage the paper and you will lose the detail contained on the map. Field slips should be no smaller than ~A4. Do not cut your field slips into individual kilometre squares because it is then impossible to relate your place of work to the surroundings.

You should provide a key/numbering system to the field slips so that the examiner can easily assemble the field-slips and compare them with the final copy map. This is best accomplished by providing a large scale map in your thesis with the position of individual field slips marked.

One of the biggest problems students encounter during mapping occurs when they do not ink-in their field maps every night, and as a consequence, the map becomes illegible. You must ink-in every night.

Remember that the Quaternary-Recent superficial deposits are as important as the bed-rock, and forms part of the geological succession and so should be mapped in the field. This includes beach sands, river deposits, scree slopes, sand dunes, till, spreads of thick peat etc.

You should provide on a separate piece of paper a key to your field slips. This key should include:
- a stratigraphic column detailing the formations you have mapped;
- the general lithological features of the formations and their thicknesses;
- the nature of contacts between formations;
- details of all the symbols that you have added to your field maps.

Day-to-day procedure

1) Every time an exposure of rock is recognized, carry out the hazard assessments described above before approaching the outcrop. Then, the outline of the outcrop should be marked on the field-slip in pencil. This outline will be "inked-in" in the evening using a green line. This provides a permanent record of the position and extent of each exposure and exactly how much rock is exposed in the area. Where you have a very large area of continuous exposure (such as on a wave-cut platform), record what parts of it you have actually looked at in detail. The exposure will be coloured in using a coloured pencil. Remember:-

Exposure size	**Size of exposure on the field slip at 1:10 000 scale**
$10m^2$	$1mm^2$
Size of a football pitch	10 by 5mm

2) Each exposure that you feel is worth describing will be given a number which will be written on the field-slip within or as close as possible to the outcrop. This number must correspond to a locality number in the field notebook.

3) Orientation data for bedding, layering or any structural features should be drawn directly onto the field-slip in the field, within, or as close as possible to the outcrop using a compass clinometer. Remember that you cannot really have too much data.

4) Brief comments, or small sketches within boxes should be added close to the exposures to give detail concerning the structures, lithologies and stratigraphical relationships. These comments should include details of the vegetation, topography and accessibility of the area and these details can only be given whilst in the field. It is very obvious to an examiner when comments are added at a later date. Abbreviations can be used for lithological descriptions.

5) Whilst in the field, contacts should be extrapolated into the areas between exposures using appropriate dashed lines. This will provide a permanent record of your interpretation of the geology that exists between exposures. This is very difficult to do at a later date. You must mark the contacts between formations in the field. The most common reason why students have problems with their mapping is that they do not mark contacts in the field. Note that geological boundaries should be extrapolated beneath any 'superficial' deposits, even where these have been mapped as separate units.

6) Where contacts are extrapolated across un-exposed ground, comments must be added to the field slips justifying the position of the contact (e.g. break-of slope, change in soil colour, change in the course of a stream etc.). Whilst in the field, any breaks of slope should be marked and labelled and an attempt should be made to correlate the breaks of slopes with known geological features seen in neighbouring exposures.

Inking-in and completion of field-slips

You should ink-in every night. Mapping pens (~0.13 to 0.18 mm Faber-Castell, Rotring technical pens) are expensive but give much better results than fibre-tipped pens. Use good quality coloured pencils and make sure the colours of adjacent formations are of sufficient contrast.

There are three types of line which constitute a field map.

1) *Solid green lines*. These mark the edges of exposures. Attempt to be as accurate as possible when drafting the edges of exposures, marking the correct size and approximately the right shape. Some exposures will be too small for this to be feasible. Use small green circles to mark the positions of these exposures. Because you can always see the edge of an exposure, green lines should never be dashed.

2) *Black lines.* These are used for the contacts between your formations. They should be solid when they occur within green lines and dashed when outside green lines. Topographic features such as breaks of slope should also appear in black. (You may use blue lines in place of black lines if you feel this will improve the clarity of field maps with black contour lines. In fact you may wish to use other colours to highlight other features such as dykes, superficial deposits etc.).

3) *Red lines.* These are used for faults and fold axial traces. They should be solid when they occur within green lines and dashed when outside green lines.

Stratigraphic symbols should appear drawn in black (e.g. bedding symbols, younging symbols). Structural symbols should be drawn in red (e.g. cleavage, joints, lineations. Appropriate symbols are given on a separate sheet.

Mistakes made in ink can be rectified by gently scraping the ink away using a razor blade.

Strong shading should occur within the green lines and lighter shading should occur outside the green-lines. (Those of you working on drafting film will find this difficult and it is one of the cons of this technique. Try colouring on the back of the film whilst pressing down hard onto a sheet of glass). Make sure you have the geology correct before you colour in your map as it is difficult to rub-out. Alternatively, try colouring on second piece of drafting film placed beneath the first.

If you use drafting film then inked-in work will be washed away by rain (this is another con of this technique). Try taping more drafting film over areas that have already been inked in or use one of the sealants contained in aerosol cans available at stationary/graphics shops. Also, some waterproof inks are available for the mapping pens, but then the mapping pens become easily blocked. If you choose a photocopied paper map to write on then this will disintegrate if it gets wet. Try to keep your maps dry!

The point behind all this should be that another geologist should be able to take your field slips and notebooks into the field and use them as field guide to see where and what the geology is, and how to recognize hazards to safety and avoid them.

C) **LOGGING SHEETS**

If possible you should prepare graphic logs of the rocks in your area.

Marks will be given for the following:
1) the amount and quality of information recorded;
2) the ease with which the examiner can understand the geology recorded on the log;
3) The quality of geological interpretations based on the evidence included in the logs.

The scale at which logs are constructed is dependant on the complexity of geology present. To show a feature of 1cm thick to scale as 1mm on the log, it must be at a scale of 1:10, a typical scale to use is 1:25 where a bed of 1m thickness will be represented by 4cm on the log. The coarsest scale you should normally think of using is 1:50 where 1m of rock is represented by 2cm on the log. Logs may be on pre-prepared A4 sized logging sheets, either preparatory ones or ones you have made up yourself, on graph paper or in a note book. It is important that as much data as possible is recorded on your field logs and draw what you see in the field. Information can always be summarised or condensed for final presentation but should never be added later. Remember that the intention of the field notebook and logging sheets is to convey immediately and clearly the evidence upon which your geological interpretations are based. Another geologist should be able to take your logging sheets into the field and confirm you records.

D) **THE THESIS**

The thesis should detail both the observations you have recorded in the field and the interpretations that you base on these observations. This does not mean, however, that it is simply a typed copy of your notebook. It is a distillation of your records placed in a logical sequence and format.

Format

Your thesis should first and foremost be a scientific document and your aim is to be clear and concise. The thesis should be in 1.5 spaced typescript, with a font that is similar in size to this printed page (12pt). Text should appear on only one side of the paper and you should leave a 4 cm margin on the left hand side and 2 cm margin on the right. Every page in the thesis should be numbered. The text of your thesis must not exceed 8000 words in length; this corresponds to about 30 type-written pages of text using a 12pt font. The purpose of the report is to summarise, describe and interpret the observations you made in the field/laboratory. Since there is an 8000 word limit it will not be possible to describe all the features that you have observed and therefore it is necessary to systematise and summarise, and to use diagrams, sketches and photographs to avoid unnecessary descriptions. To some extent the organisation of a report will vary according to the area of study. However, the following table of contents can be used as a general guide.

TABLE OF CONTENTS **Page nos.**

Subject Matter for each section

Declaration. Your thesis must contain a declaration that it is your own work (see note below on plagiarism). A suitable declaration is as follows:

The content of this thesis is the original work of the author and has not previously been submitted for a degree at this or any other University. Other people's work is acknowledged by reference.

Typed name & signature:
Date:
Department:
Birkbeck College, The University of London.

Table of Contents- This should list the layout of your thesis.

List of Figures- These should be numbered sequentially. e.g. Figure 1, Figure 2, Figure 3 etc.

Abstract- This should be no more than one side of 12pt font and should summarise your findings in the area.

1.1 Mapping area. This should describe the location, topography, access and where you stayed. Also, a scaled down a re-drafted version of your final copy map should be presented here on one side of A4, and should be labelled as Figure 1. You might include an annotated Google Earth™ image showing the outline of the area mapped.

1.2 Geological background. This should set your mapping area in a regional context, possibly including a map.

2.1 Summary of Formations and Stratigraphic column. This should be brief and the stratigraphic column arising from your studies should be presented as a Figure.

2.2.1 Observations. An account of your observations including descriptions of field, including type-sections and logs. This should be illustrated with sketches and annotated field photographs.

2.2.2 Interpretation. An account of your interpretations, including variations from the type-section. This should be illustrated with annotated diagrams.
2.6 Sedimentological summary. This is your interpretation of the area and should briefly point out where, if at all, it differs from published accounts.

3.1.1 Observations. An account of your observations with rock descriptions from field work. This should be illustrated with Figures.

3.1.2 Interpretation. An account of your interpretations. This should be illustrated with Figures.

3.3 Metamorphic history. This should summarise your findings on the metamorphism and be illustrated with Figures.

4.1.1 Observations. An account of your observations with descriptions of igneous rocks and contacts in the field. This should be illustrated with Figures.

4.1.2 Interpretation. An account of your interpretation of igneous intrusions or extrusions. This should be illustrated with Figures.

5.1.1 Structural observations. An account of the structures observed in your area, illustrated with figures.

5.1.2 Structural Interpretation. An interpretation of the structures in your area.

5.6 Structural history of the area. This should summarise your findings on the structural geology and be illustrated with Figures indicating the relative timing of compression or extension and a stereo-net.

Chapter 6 Economic Geology. A summary of the economic geology; sources of aggregate, building stone, mineralization or hydrocarbons. Consider slope stability and geological hazards.

Chapter 7 Geological history of the area. This should briefly summarise your findings and discuss this in terms of the regional tectonic setting of your area. Integrate the tectonic, sedimentary, igneous and metamorphic history and place your mapping area within the regional plate tectonic regime. It is often helpful to display histories using sequential cartoons of the geological history. Compare your stratigraphy with any published stratigraphy and state why your results are superior to any previously published descriptions.

References. All cited references should be listed here in full. The list should be in alphabetical order and should conform to the style of the Journal of the Geological Society, London.

Appendices. These should be listed as Appendix 8.1, Appendix 8.2, etc. and should include tables of palaeocurrent measurements or other field data,

Acknowledgements. These should include sources of funding, relatives, pets etc.

Figures

In general, try to illustrate your report as fully as possible. This does not necessarily mean photographs. Re-drawn or scanned copies field sketches, detailed sketch maps, rose diagrams, stereographic projections, graphs, histograms and summary diagrams will improve your report. Remember to include scale and geographical co-ordinates where necessary and always label diagrams as clearly as possible. Good illustrations with informative and concise captions save words in the main text, and are often more helpful to the reader than long descriptions.

Photographs should be carefully chosen to illustrate specific points, not simply to make the report look pretty. It is, however, worth including at least one view of your area to give the examiners some idea of the nature of the terrain in which you were working. If photographs are used they must include a scale and a comprehensive caption. Photographs should be annotated or accompanied by an interpretation sketch picking out the features of geological interest.

Plagiarism

You are reminded that all work submitted as part of the requirements for any examination of the University of London must be expressed in your own words and incorporate your own ideas and judgements. Plagiarism - that is, the presentation of another person's thoughts or words as though they were your own - must be avoided. Direct quotations from the published or unpublished work of others must always be identified as such by being placed inside quotation marks, and a full reference to their source must be provided in the proper form. Remember that a series of short quotations from several different sources, if not clearly identified as such, constitutes plagiarism just as much as does a single un-acknowledged long quotation from a single source. Equally, if you summarise another person's ideas or judgements, you must refer to that person in your text, and include the work referred to in your reference list. Failure to observe these rules may result in allegation of cheating. You should therefore consult your tutor if you are in any doubt about what is permissible. In general, keep quotations from published works to a minimum. The examiner is trying to judge you, not other authors.

E) **FINAL COPY MAP, CROSS-SECTIONS AND STRATIGRAPHIC COLUMN**

The final maps and cross-sections should be constructed after you return from fieldwork and will show your final interpretation of the geology. Although it is permissible to simply re-draw your field maps onto a new set of photocopied sheets, this can look scruffy and the transfer of features between the two maps is often inaccurate.

The best way to make a clean copy map (although more time consuming) is to assemble your field slips in order to either (1) scan them into a computer to be drawn up in a graphics package or (2) trace them and make a hand drawn map.

(1) *Scanning and drafting on a computer.* For this method, scan your field slips on a flatbed scanner and re-draw them in a computer graphics package. This can produce excellent results but may be time-consuming if you are not familiar with the graphics package you use. The department has a number of computers and graphics packages you can use and we also have a large format colour printer for producing the final copy map. These facilities are costly to the department and you should discuss your needs with Steve Hirons or Gerald Roberts before attempting this method.
(2) *Tracing and drafting with and pen and ink.* For this traditional method, stick down your field slips on table, cover them in a large sheet of drafting film and to trace of the features using a various sizes of Rotring/Faber-Castell technical pens. The resulting tracing is then photocopied at your expense to produce a paper copy and colouring is then carried out using coloured pencils. This traditional method is still acceptable but largely superseded by computer graphics packages and GIS.

Both methods produce excellent results. Choose the method which best suits your abilities.

The map should be drawn at a scale of 1:10,000. Some of the features on the field slips will not be needed on the final copy map. You will not need to include the "green line" outlines of exposures, to have different intensities of shading for exposed and unexposed areas of outcrop or to show topographical indicators for the position of geological contacts. The degree of certainty of the mapping will be indicated by the use of solid or dashed geological contacts (you should use these as on the field slips). The map should include a stratigraphic column and key, and sufficient topographic contours to illustrate the landscape. The exact number of topographic contours produced depends on how mountainous your area is and you should consult your tutor for advice. The final map should be folded so that it can fit into an A4 folder.

Features to be shown on the final copy map

The majority of features from your field maps should be transferred to the final copy map with the exception of locality numbers, green lines and comments/annotations. Please indicate where contacts/faults/folds are exposed or inferred by using both solid and dashed lines. Everything on the final copy map should be in black.

The final map should contain:
a) 1 : 10 000 scale bar (or the scale that you used);
b) North Arrow;
b) Stratigraphic column/columns which should be scaled to show the thickness of the formations with gaps at unconformities;
c) the grid system for the area;
d) topographic contours;

e) spot heights;
f) rivers, roads, lakes, the coast etc.;
g) geological contacts, faults, folds, stratigraphic symbols and structural symbols. These symbols should all appear in black and red (see section on field slips);
h) lines indicating the positions of final copy cross-sections.

A similar style should apply to the final copy cross-sections which should be drawn at the same scale as the map, with the vertical and horizontal scales equal. There is no set number of cross-sections required. You should include enough cross-sections to illustrate the geology of your area.

Each of the formations on the map should be given a letter or number in the style of published geological maps. These maps should appear on the stratigraphic column and on final copy cross-sections.

DUTIES OF TUTORS

Your tutor is jointly responsible with you for the selection of a suitable mapping area. If you are mapping in one of the approved areas within the UK your tutor will usually attempt to spend one day in the field with you. If there is a group of students mapping together in other areas or overseas we will try to provide supervision in the field but this cannot be guaranteed. Field supervision will tend to be fairly early on in the mapping, but you will be expected to already have some contacts marked on the map by that point. It is your tutor's job to supply advice, at mutually convenient times, on all aspects of your Mapping and Thesis course unit.

SAFETY

Before going into the field students must read the pamphlet they received at interview, including: "Advice to students on Geological Fieldwork Safety and Behaviour" issued by the Committee of Heads of University Geology Departments, and the School of Earth Sciences safety code" which can also be downloaded from internet at;

http://www.bbk.ac.uk/earthsciences/images/fieldworksafetycodeofpractise.pdf

Students must follow the advice in the field at all times, and refer to these documents both before each period of fieldwork and during the fieldwork. Further information can be obtained from Dr. Andy Beard (02030738024) who is the Departmental Safety Officer.

FURTHER READING

We recommend the book "Geological mapping techniques" which is edited by Angela Coe and published by Wiley-Blackwell. Wiley also publish a series of geological field guides including: Basic Geological Mapping by Lisle, Brabham and Barnes; Sedimentary Rocks in the Field by Maurice Tucker; and The field Description of Igneous Rocks by Dougal Jerram and Nick Petford..

FINAL REMARKS

The work you hand in for this course unit will be closely scrutinised by both the internal and external examiners. It may form the basis for discussions in your oral examination and, therefore, should be one of the best pieces of work that you produce during your degree. If you take a pride in this piece of work and attempt to shine, then this will stand you in good stead in terms of your final degree. Notes on safety occur on the next few pages.

Gerald Roberts and Charlie Bristow

BIRKBECK
DEPARTMENT OF EARTH AND PLANETARY SCIENCES
FIELDWORK RISK ASSESSMENT

You should read the department's code of practice on fieldwork safety before completing this form.
The purpose of this risk assessment is to identify possible causes of harm and measures needed to avoid these - before an accident occurs.
A **hazard** is anything with the potential to cause harm. The **risk** is the likelihood that someone will be harmed by the hazard and the severity of the harm caused. A high risk is one which is very likely to occur and/or may cause death or serious injury/illness. A low risk is extremely unlikely and/or would result in trivial or no injury/illness. A medium risk is in between these two.
By carrying out a risk assessment, you can direct attention and resources where they are most needed to prevent injuries or ill-health. The five steps to carry out a risk assessment are :

1. **Identify the hazards** - find out about the site, the work, where you will be staying, how you will be travelling etc.
2. **Identify who might be harmed and how** - think about risks to yourself and others in your team. People with health problems, disabilities or lacking experience in fieldwork may be at greater risk and need extra protection. Think about harmful effects of your work on the environment and how these can be minimised.
3. **Evaluate the risks and consider how the risk of harm can be reduced** - what arrangements, equipment and training etc. will help to avoid accidents or illness?
4. **Record your findings** - on the risk assessment form below. This assessment should form the basis of safe working practices and local rules. Don't just fill in the form and forget it - make sure everyone in your team knows about the risks and how to avoid them.
5. **Review and revise your assessment where necessary** - you should do this when there are significant changes in materials, equipment, work methods, location or people involved. Assessments should also be reviewed if there are accidents, near-misses or complaints associated with the work.

FIELDWORK RISK ASSESSMENT FORM

TYPE OF FIELDWORK.....……
(e.g. independent student project, research, supervised field trip)
Dates: From.....To.....…...

Location(s) of work.....…….
.....

Address of residential base.....….....
.....

HAZARDS **Physical hazards (e.g. extreme weather; mountains and cliffs, quarries, marshes and quicksand; fresh or seawater)**	**RISK (High, medium, low)**
Biological hazards (e.g. poisonous plants; aggressive animals, soil or water micro organisms; insects)	
Chemical hazards (e.g. pesticides; dusts; contaminated soils; chemicals brought into site)	
Man-made hazards (e.g. electrical equipment; vehicles, insecure buildings; slurry pits; power and pipelines)	
Personal safety (e.g. lone working, attack on person or property)	**RISK (High, medium low)**
Other hazards (specify)	

Steps taken to minimise risks identified above (e.g. procedures; equipment; clothing; skills training; information)

Emergency procedures (e.g. first aid, survival aids, communication)

	(tick boxes)							
Suitable travel arrangements and licensed drivers?	**YES**			**NO**			**N/A**	
Adequate insurance cover	**YES**			**NO**			**N/A**	
Permission to work on site?	**YES**			**NO**			**N/A**	
Necessary training and information received	**YES**			**NO**			**N/A**	
Health and next of kin information given to field trip								
Leader/dept. office	**YES**			**NO**			**N/A**	
Provision for disabilities, health problems?	**YES**			**NO**			**N/A**	

Person completing this assessment :
Name .....Title.....Date.....……
e.g. undergrad; research student; lecturer

Checked by :
Name ..... Title .....Date.....
e.g. supervisor; co-ordinator

Approved by Chairman of Department :
Name..... Date.....