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https://www.st-andrews.ac.uk/earth-sciences/geolgy-field-camp/
Find us on Facebook https://www.facebook.com/GeologyFieldCampScotland/
Welcome and Introduction

Scotland is the birthplace of Geology. In the mid 18th Century, James Hutton deduced the existence of Deep Time at Siccar Point and the intrusive nature of granite in Glen Tilt, Charles Lapworth documented mylonites and a mechanism for thrust faulting around Loch Eribol, and George Barrow’s observations through the Angus glens paved the way for the concept of metamorphic facies. These and many other discoveries in Scotland laid the foundations upon which today’s Earth Science is built. Over the next 5 weeks, you will literally walk in their footsteps as you study the rocks of the Scottish Highlands.

We are delighted to welcome you to the University of St Andrews where Geology and its earlier counterparts have been taught for several centuries. In this course, we aim to teach and expose you to the maximum amount of geological diversity possible in five weeks (Fig. 1). The University is ideally located for direct access to world-class geology that literally starts at our doorstep. You will work on the classic metamorphic Buchan and Barrovian sequences in the Grampian Highlands, unravel the complex structure of the Moine Thrust and geological framework of the Caledonian Foreland and examine the emplacement of igneous rocks on the Isle of Mull and Iona in the Inner Hebrides, concluding with an independent synthesis, based on your observations and data, of the 3-billion-year geodynamic evolution of the Scottish Caledonides.

This document provides background information about the course and associated logistics. Upon arrival, you will be given a field guide and a quick reference “Field Geology Methods” handbook. If you have questions, please contact us at: geologyfieldcamp@st-andrews.ac.uk

Figure 1. Generalised geology of Scotland. Locations: 1-St Andrews, 2-Edinburgh, 3-Glasgow, 4-Aberdeen, 5-Cullen, 6-Inverness, 7-Ullapool, 8-Durness, 9-Isle of Mull.
Course Philosophy
Fieldwork and mapping are fundamental to the Earth and Environmental Sciences and form the foundation upon which to base the spatial and temporal frameworks of geological reconstructions. They are central to many geoscientific studies and constitute an essential component of your training. Over the five weeks of the course you will develop skills in the techniques of fieldwork including systematic observation and data collection, accurate recording of that information, critical thinking and independent testing of hypotheses.

Emphasis is placed on building self-confidence and learning to trust your interpretations of geological features and history of a given terrane based on your observations and ideas. Brief, daily lectures will introduce you to the day’s geology and discussions are held every evening (termed ‘surgeries’) to ensure your techniques are correct, observations are sound and that you are progressing in your understanding. All questions are worth asking. All uncertainties are worth addressing. Our learning environment encourages interactive dialogue and constructive criticism. This is key in ensuring that you have a satisfying experience, gain new and deeper knowledge and, importantly, that we all have fun doing so.

Course Objective and Learning Outcomes
On completion of this course you will have the ability to:
- identify geological relationships and interpret them in the context of complex structural settings
- visualise and interpret the 3-D and 4-D relationships that define the geology of a given region
- create and test hypotheses and undertake problem solving using field-based data
- systematically describe and identify minerals, rocks and geological structures
- systematically collect, record, assess and compile data in a field notebook
- develop map reading, spatial awareness and compass/GPS skills
- work in groups to refine communication and cooperation skills
- hone time management and organisational skills
- construct geological maps and cross sections
- gain self-confidence to work independently

Assessment and grading
Your mark will be determined on work that you complete for each assignment; each piece of work will be weighted equally unless noted otherwise. You will receive guidance on what is expected for each assignment and feedback will usually be given within 7 days of your submitted work. In general, the main criteria we consider when assessing your work include but are not limited to:
- maintaining a neat, organised and systematically kept field notebook that contains detailed observations and clear sketches, accurate descriptions of rocks and geological features, and high quality end-of-day summaries that include evidence of critical thinking
- the systematic collection and representation of data on field maps and the correct transferral of this information onto office maps and, if required, a final map; all data must be plotted accurately and the maps, when completed, must make geological sense
- cross-sections must capture the key geological features and structures within a given area and show understanding of the 3-D relationships of those structures/features
- there must be evidence of an overall understanding and coherent interpretation of the geology and the processes by which that geology was produced

St Andrews use a grade-point-scale – % mark system that differs from that you are likely used to. Below is a guide as to how your marks would translate into those of your home institution, although the actual conversion will depend on the specific policies and practices of your institution.

<table>
<thead>
<tr>
<th>Grade Point = translated mark (St Andrews %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19-20 = A+ (100-80%)</td>
</tr>
<tr>
<td>17-18 = A (79-70%)</td>
</tr>
<tr>
<td>15-16 = A- (69-66%)</td>
</tr>
<tr>
<td>13-14 = B+ (65-63%)</td>
</tr>
<tr>
<td>11-12 = B (62-60%)</td>
</tr>
<tr>
<td>10-11 = B- (59-56%)</td>
</tr>
<tr>
<td>7-9 = C (55-43%)</td>
</tr>
<tr>
<td>5-6 = D (42-36%)</td>
</tr>
<tr>
<td>≤4 = Fail (≤36%)</td>
</tr>
</tbody>
</table>
Itinerary
The brief itinerary below summarises the course; note it is subject to change dependent on contingencies (weather, accommodation availability, etc.).

<table>
<thead>
<tr>
<th>Days 1-9 St Andrews</th>
<th>clothes washers</th>
<th>food (MYO-make your own B-breakfast, L-lunch, D-dinner)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matriculation and orientation; Introduction to the geology of Scotland</td>
<td>✓</td>
<td>dinner reserved for 1st night</td>
</tr>
<tr>
<td>Assignment 1: Mapping, logging sedimentary rocks (Fife coastline)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Preparation for the Scottish Highlands</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td><strong>Days 10-15 Aberdeen-Cullen-Inverness</strong></td>
<td>✓</td>
<td>MYO B-L-D</td>
</tr>
<tr>
<td>Introduction to Highlands geology (Dunkeld and folded folds)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Assignment 2: Highland Boundary Fault (Donnottar – Garron Point)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Metamorphism: Barrovian and Buchan zones (Garron Point – Aberdeen; Tarlair – Portsoy)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Sauk sequence and Knockan Craig</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td><strong>Days 17-25 Durness-Ullapool</strong></td>
<td>✓</td>
<td>MYO B-L-D</td>
</tr>
<tr>
<td>Assignment 3: mapping of the Moine fold-and-thrust belt and Lewisian gneiss ‘basement’ terrane (NW Highlands)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Geo-tour: 3 billion years of Earth history</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td><strong>Days 26-34 Isle of Mull-St Andrews</strong></td>
<td>✓</td>
<td>MYO B-L-D</td>
</tr>
<tr>
<td>Assignment 4: igneous and metamorphic mapping; Ross-of-Mull Field Conference (Isle of Mull)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Glencoe - Ben Nevis - Siccar Point</td>
<td>✓</td>
<td>dinner reserved for last night</td>
</tr>
</tbody>
</table>

Standards of behaviour
Once accepted on the course you will be a registered student at the University of St Andrews. As such, you are bound by the regulations of the University (see https://www.st-andrews.ac.uk/students/rules/) and are expected to conduct yourself accordingly. Please note that any deviation from this standard will result in swift disciplinary action, which could lead to your expulsion from the course.

Across Britain, numerous areas are designated as SSSI’s (Sites of Special Scientific Interest) and have a protected status that allows scientific study following certain guidelines but also restricts certain behaviour; we will inform you about these at the appropriate time. Scotland also has a ‘Right-to-Roam’, which allows largely unhindered walking and hiking anywhere in the country. This is made possible by everyone following appropriate guidelines: be polite, respect landowner’s property, do not leave rubbish anywhere (carry it with you at all times and dispose of properly), close gates, don’t damage or climb over fences or harass livestock, etc. For more information, see the Field Geology Code we provide.

Logistics
All transport, accommodation and subsistence expenses whilst on the course are included in your fee. In order to ensure all goes-to-plan as smoothly as possible, please take note of the following information:

- **Accommodation.** In St Andrews you will have a room in one of the University’s halls of residence. Away from St Andrews, we will use Youth Hostels and will assign you into a group of between 4 - 8 people (the typical number of beds per room). We will arrange as much as possible for single-sex rooms and such requests will take priority. Bedding is provided (you do not need a sleeping bag) and laundry facilities are available at most Hostels.

- **Transport.** Transport is via 15-seater minibus; seat belts must be fastened at all times. Your baggage will be transported in a separate vehicle to ensure comfortable seating for everyone.

- **Subsistence.** All accommodations have cooking facilities to prepare your breakfast, lunch and dinner. For efficiency, we will organise cooking groups taking into account dietary needs (vegetarian, vegan, etc.). Food shopping will be done by either click-n-collect or delivery and food ordering must be organised at least 24-hours in advance. If you have food allergies (celiac, peanuts, etc.) you must inform us as soon as possible; preferably, upon acceptance onto the course.
Safety in the Field

Safety is our number one concern at all times. You will be given Field Geology Code and risk assessment forms that outline the potential risks of fieldwork and the safety measures put in place to avoid or guard against those. You will need to sign and return these forms before you can undertake any fieldwork.

**Staff must be informed about any existing or potential medical issues prior to the start of the course** (note that all such information will be held in strictest confidence). Please be aware that we are not permitted to provide medication hence you need to carry whatever medication you might require (e.g. inhalers, epipens, antihistamine, diabetic drugs).

You will be assigned safety equipment consisting of a hard hat, high visibility vest and goggles (to be used when hammering) and these must be worn at all times. For safety, you will also need to carry extra warm clothing and always have your waterproofs (see the checklist at the end of this document to help plan your field gear). As a reminder, general risks/hazards to be aware of include:

- failure to pack adequate equipment (maps, compass, clothing, etc.)
- steep/unstable slopes, rock overhangs and fast-flowing rivers (use common sense)
- hammering without goggles (n.b.: using chisels is not allowed)
- wild or domesticated animals (do not disturb them)
- severe changeable weather (have appropriate clothing and footwear)

Site-specific risks/hazards to be aware of include:

- Do not expose yourself to risks inherent in caving, rock climbing or along steep, exposed slopes.
- Do not work in active quarries and ask owners for permission to enter disused properties.
- Road sections require lookouts wearing high-visibility clothing to warn approaching traffic.
- Cross streams only at appropriate fords or bridges.
- Watch out for boggy areas, including along the margins of lochs (lakes).
- Coastal areas have all the hazards of upland areas compounded by changing and variable tides and waves; be aware that headlands and coves can become cut off at high tide and coastlines can have slippery rocks and boulders; do not go swimming.

*Safety wisdom: if you feel frightened, then don’t do it!*

In case of an emergency dial or text: 999 or 112. Ask for Mountain Rescue if you are in an isolated area away from roads and be ready to give a **CHALET** report:

- **Casualties.** Number of casualties and, if possible, their age; and the type of injury (e.g. broken leg, head injury, seizures)
- **Hazards.** What hazards could there be to rescuers (e.g. cliff face, rock fall, dangerous animals)
- **Access.** Describe the terrain, especially any distinguishing features. Also, describe weather conditions at the incident site, particularly if you are in cloud or mist.
- **Location.** Use your field map or GPS to provide your position and description of your location.
- **Equipment.** What equipment is at the scene (e.g. torches [flashlight], group shelter, survival bags)
- **Type of incident.** Explain what caused the accident (falling off a cliff, car crash, etc.)

Responsibilities

The course leader will be appointed by the School and will be in charge of all participants to ensure that:

- safety briefings are given with adequate time for you to prepare, including checking your field gear
- all staff have a list of the names, addresses and phone numbers of your next-of-kin
- you acknowledge receiving any additional safety advice (by signature or a witness)

As a participant of the field course, your responsibilities include:

- taking safety advice seriously
- not endangering yourself or others by indiscipline or abuse of drugs/alcohol
- following instructions of the staff including the rigorous keeping of appointments
- informing the leader prior to the trip of any injuries, illnesses or disabilities that may present a risk
- reporting any injury, illness or harassment immediately
- obtaining and wearing appropriate field clothing and footwear as advised
- signing and returning all requested documents
- providing up-to-date details about next-of-kin in case of accidents
Contact Information
For general questions use the email below. If you prefer to speak to a human being, then feel free to call the number shown for the School of Earth and Environmental Sciences. If no one answers, leave a message and we will get back to you as soon as possible.

- Email: geologyfieldcamp@st-andrews.ac.uk
- School of Earth and Environmental Sciences: Phone: +44 (0)1334 463940  email: earthsci@st-andrews.ac.uk

Suggested Reading
The brief reading list below provides useful background information that will help prepare you for the course and complement your learning experience.

General background information

Fieldwork-focused texts
Daily field gear
The Scots have a saying: “four seasons in a day”. Weather conditions can vary dramatically over short periods of time and, even though you will be here during the Scottish summer, temperatures can still drop below freezing with wind chill. This requires you to pack extra layers, always have rain gear, wear appropriate sturdy footwear and carry extra food and water. Use the list below as a guide:

<table>
<thead>
<tr>
<th>What we will provide</th>
<th>personal items</th>
<th>field gear</th>
</tr>
</thead>
<tbody>
<tr>
<td>hard hat*</td>
<td>ruck sack/day pack</td>
<td>A5 hard-back notebook</td>
</tr>
<tr>
<td>high visibility vest*</td>
<td>sturdy footwear (ankle support)</td>
<td>map board, plastic bag</td>
</tr>
<tr>
<td>goggles*</td>
<td>waterproof jacket and trousers</td>
<td>hand lens</td>
</tr>
<tr>
<td>compass-clinometer*</td>
<td>warm hat and sun hat</td>
<td>acid bottle</td>
</tr>
<tr>
<td>Group 1st-aid kit*</td>
<td>extra layers (fleece, etc.)</td>
<td>pocket knife</td>
</tr>
<tr>
<td>hand lens</td>
<td>gloves and scarf</td>
<td>rock hammer</td>
</tr>
<tr>
<td>A5 field notebook</td>
<td>headlamp or torch (flashlight)</td>
<td>mechanical pencils</td>
</tr>
<tr>
<td>acid bottle</td>
<td>water bottle/camel pack (2-3 ltrs)</td>
<td>coloured pencils</td>
</tr>
<tr>
<td>grain size card</td>
<td>food and snacks</td>
<td>map pens (0.1, 0.3mm)</td>
</tr>
<tr>
<td>plastic bag for map board</td>
<td>matches or a lighter</td>
<td>pencil sharpener</td>
</tr>
<tr>
<td>Field Handbook Guide</td>
<td>insect repellent</td>
<td>erasers</td>
</tr>
<tr>
<td></td>
<td>sunglasses, sunblock, lip balm</td>
<td>permanent marker</td>
</tr>
<tr>
<td>*return at end of course</td>
<td>toilet paper</td>
<td>survival bag</td>
</tr>
<tr>
<td></td>
<td>emergency contact information</td>
<td></td>
</tr>
</tbody>
</table>

Personal baggage/luggage and clothing
Please limit your luggage to 1 daypack and 1 suitcase/backpack because space will be limited in our travel vans. There are stores/shops nearby and laundry facilities at almost all our accommodations hence you will be able to obtain personal items and do laundry throughout the trip. As a guide, pack your personal toiletries (including a towel), 2 or 3 changes of clothing (e.g. socks, trousers, warm undergarments, shirts, sneakers) and several jackets/fleeces (it is better to have layers than to have 1 heavy jacket); consider packing a swimsuit because it can get pleasant enough for a swim in one or two of our locations. There are pharmacies and outdoor clothing shops near to most of our accommodations so you can always buy something you have forgotten, lost or damaged. Note that we will have some long drives thus make certain to pack (good!) music for the vans!