

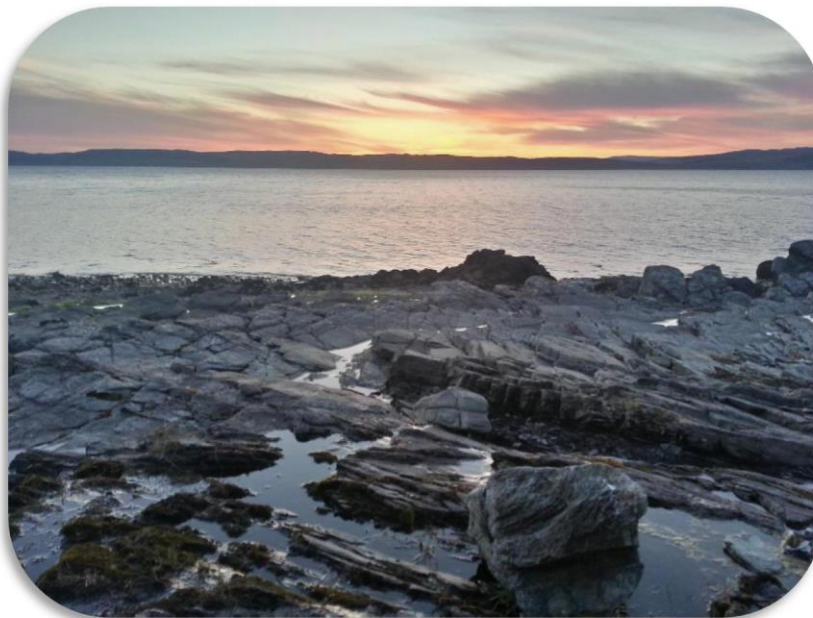
OCR Geology at Lochranza Centre



With rocks that span the last 600 million years of Earth's history and a huge variety of both small and large-scale structures to examine, most of the principles and processes of geology contained within the syllabus can be taught on Arran. Many of these exposures are relatively accessible on foot although transport may be required to visit more distant locations.

Alongside the rich variety of rocks and structures, Arran is also blessed with several world class unique 'must see' sites including Hutton's Unconformity, The Drumadoon Sill, and the Giant Myriapod trail. Sites such as these have helped Arran reach its recent status as a Geopark!

A famous Professor once said that the best Geologist is the person who has observed the most rocks. In this respect students visiting Arran are off to a good start. This variety also enables the Centre to tick a large number of the requirements for the Practical Activity Groups (PAGs). Although this set of tasks is important, we incorporate these syllabus



requirement, along with mathematical skills into general teaching sections.

At the Centre, we can cover large parts of the seven modules required for the A level:

Development of practical skills in geology Foundations in geology

Global tectonics Interpreting the past

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Petrology and economic geology

How do we plan to accomplish this?

- 1)** By teaching or 'reacquainting' students with the knowledge and terminology to describe and interpret rocks.
- 2)** By teaching the students the basic skills to describe, measure and record these observations and measurements.
- 3)** By taking students along routes which give them maximum exposure to a wide variety of rocks and structures, enhancing their learning experience.
- 4)** By letting students apply knowledge and skills through small and large-scale investigations (PAG specific).
- 5)** By using evenings sessions to:
 - a)** Revisit the rocks observed in the field in hand specimens, through thin section & photomicrograph.
 - b)** Plot, Process or interpret data gathered (NB mathematical skills will be applied where appropriate depending on time available & party leader preference).
 - c)** Use evidence gathered to see how Arran's rocks lie within the bigger picture of Basin analysis.

OCR Example for Student Investigations in the Field

Teacher Notes available on request



North Arran Shore Day one

An Investigation into the rocks and their characteristics that make up a famous geological structure



Background

In 1787 James Hutton discovered this site whilst walking around Arran. His observations made at this site altered the way we perceived time. The concept of “Deep time” being introduced.



Equipment Required

A grain size card

1 x10 m tape measures

Hand lens

Compass Clinometer

Fiducial scale

Prior Skill and Knowledge

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Use of a grain size card to investigate the texture of a rock

Use of a Compass Clinometer

Use of a fiducial scale and tape measure

- 1) Using an O.S map and the topographic features around provide a 6-figure grid reference for this location
- 2) Provide a full rock description of both macro and micro features displayed in the two main rocks
- 3) For each of the rock types use a compass clinometer to provide a three-figure reading for the tectonic movement in this area
- 4) Finally make an accurate sketch of the locality showing the relationship of the two rock types to one another

PAG	1	2	3	4	5	6	7	8	9	10	11

Laggan sequence, North Arran Day Two or Corrie as alternative for less walking

An Investigation into a geological sequence that provides evidence for
changing environments through time (PAG 5)

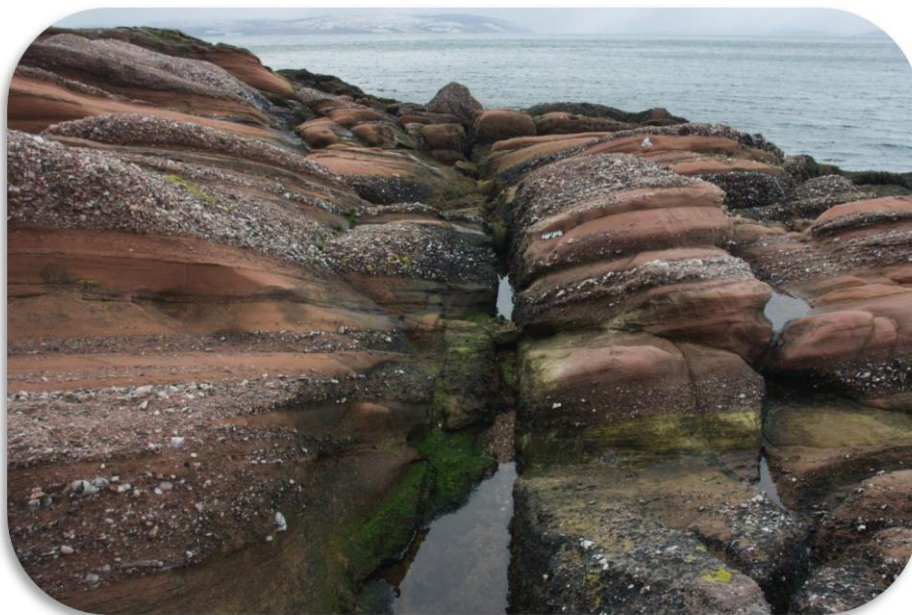


Background

Either between the ferry rock quay and the beer garden in Corrie or on the North Arran walk close to Laggan Cottage can be found a sequence, which provides evidence for a series of changing environments.

Equipment Required

- A compass clinometer
- A grain size card
- 1 x10 m tape measures
- A hand lens
- Dropper bottle of 0.5m HCL
- A graphic log sheet & clipboard.
- Aid memoir to fossils and sedimentary rocks
- Fiducial Scale



Prior Skill and Knowledge

Use of a grain size card to investigate the texture of a rock

Use of a compass clinometer

Plotting a log sheet

Familiarization with some local fossils groups found

Prior familiarization with some sedimentary structures

Written Instructions

- 1) Locate the site using a 6-figure grid reference
- 2) Measure the total distance horizontally to the top of the sequence as indicated by your instructor
- 3) Having established the total distance covered in metres, then walk from the base upwards and identify the different layers of rock along this section. In particular a) identify the particle size of the rock b) Identify the thickness of this rock c) Identify and note any sedimentary structures which may provide evidence of environment
- 4) Some of the layers both at this locality and elsewhere on the section will demonstrate signs of life. When you find these, sketch the fossil and try and assign it to an invertebrate group i.e. Cnidarian, Bryozoan, Brachiopoda, Molluscs, Echinoderm, Arthropoda. Use the aid memoir to help
- 5) Use the log sheet provided to fill in these details as you move up the section
- 6) Provide an angle of dip and dip direction for 2 of the layers visited
- 7) On returning to the classroom apply some simple trigonometry to work out the true thickness of the layers.
- 8) Using the symbols provided and your corrected thicknesses, plot up a neat stratigraphic log using the true thicknesses

PAG	1	2	3	4	5	6	7	8	9	10	11

The Shoreline near Tormore Day Three

An Investigation into a geological sequence that provides evidence for changing sedimentary environments through time (PAG 4)



Background

The rocks in this sequence belong to the Permian period. Evidence from this outcrop in the form of sedimentary structures allows you to interpret the environment of deposition

Equipment Required

- A compass clinometer
- A grain size card
- 1 x10 m tape measures
- A hand lens
- Dropper bottle of 0.5m HCL
- A graphic log sheet & clipboard.
- Aid memoir to sedimentary rocks



Prior Skill and Knowledge

Use of a grain size card to investigate the texture of a rock

Use of a compass clinometer

Plotting a log sheet

Prior familiarization with some sedimentary structures

Written Instructions

- 1) Locate the site using a 6-figure grid reference
- 2) Measure the total distance vertically to the top of the sequence as indicated by your instructor
- 3) Having established the total vertical distance, assign a scale to your log
- 4) Identify the different layers moving from bottom to top by virtue of different grain size and lithology
- 5) Measure the thickness and particle size of each unit, note any other unique features to the layer
- 6) During the course of the log you will find 3 structures which are indicators of the environment. Record each accurately in the form of a sketch
- 7) Use a compass clinometer on one of the layers to gain a 3-figure measurement of the tectonic nature of the area.

PAG	1	2	3	4	5	6	7	8	9	10	11

Boguillie/North side of North Glen Sannox Day Four.

An Investigation into the contact between two rocks, and the changes that can be observed as a result of this this type of contact (Suitable for PAG 3)



Background

The North end of Arran was subjected to the emplacement of a large structure some 60 million years ago. A boundary between it and the local country rock exists at this locality. The aim of this investigation is to find it and to observe and record any changes

Equipment Required

A grain size card

1 x10 m tape measures

Hand lens

Fiducial scale



Prior Skill and Knowledge

Use of a grain size card to investigate the texture of a rock

An introduction to igneous rocks, composition and texture

- 8) Walk North from the car park until you come to a bridge in the road spanning a small stream. Provide a 6-figure grid reference for this
- 9) Go down into the stream on the North East side of the bridge and identify the rock present
- 10) Use a key to identify the mineral groups present
- 11) For each of the mineral groups present, record the percentage coverage and an average size.
- 12) Walk up the stream until you find a change in rock type. Draw a field sketch of this boundary. Look for evidence of relative dating
- 13) Make appropriate sketches to support your evidence
- 14) Describe the rock both above and below this boundary
- 15) Use a set of hand specimens in the lab in the evening to see if any correlation exists between mineral particle size and distance to the contact
- 16) Whilst in the lab devise a simple sampling method and measure sufficient particle sizes for each mineral group in order to work out both the mean and mode for each mineral, plot these on a graph against distance from the contact
- 17) Use a statistical method to work out if a correlation exists between crystal size and the distance to the contact

PAG	1	2	3	4	5	6	7	8	9	10	11

An Investigation into the Geochronology of an Area. (PAG 6)



Background

In a small area on the shore North of the Sannox picnic area outcrops a group of rocks which have been affected by a number of different events over time. Our investigation will reveal the order and environment of their emplacement.

Equipment Required

A grain size card

1 x10 m tape measures

Hand lens

Fiducial scale

Compass Clinometer

Prior Skill and Knowledge

Familiarization of igneous, sedimentary and metamorphic rocks

Introduction.

It is important to walk around the area first for 10 or more minutes to identify the different lithologies and the boundaries between them

- 1) Locate this area by way of a Grid Reference using local features
- 2) Provide both macro and micro observations of the rocks outcropping in the area.
- 3) Use a compass clinometer to provide relevant two and three-dimensional data relating to rock structure
- 4) Identify geological structures in the field using a field sketch
- 5) Use a fiducial scale to increase accuracy
- 6) Use a selected sampling method on the coarser clastic material to gather data which could later be used for paleo-current analysis

7) Draw a base map either during or at the end of the exercise and beside it draws up a table oldest to youngest outlining the order and environment of emplacement for each rock type

PAG	1	2	3	4	5	6	7	8	9	10	11

Glen Sannox Mineral vein

Orogenic Processes



Background.

Up until the second World war, a mineral was mined in this valley for export.

- 1) Students to locate the mineral vein using GR
- 2) Students to identify the mineral and the rock that it is found in
- 3) Students to sketch the outcrop of the mineral vein
- 4) Students to sample the distribution of the vein mineral



PAG	1	2	3	4	5	6	7	8	9	10	11

½ day Independent Fieldwork based investigation of sediments/sedimentary rocks, Igneous or metamorphic rocks.



Students to come up with an area to investigate, plan how to do it. Students to gather and evaluate data and present it orally

PAG	1	2	3	4	5	6	7	8	9	10	11	12

Research, integrating the student’s fieldwork during the visit into the basin model i.e. Using the information concerning the Devonian, Carboniferous and Permian rocks and producing an academic poster about the evolution of the Midland Valley

PAG	1	2	3	4	5	6	7	8	9	10	11	12

1.2.2 (a) Location of a geological feature in the field using traditional navigation and basic field survey skills without the use of GPS

1.2.2 (b) Identification of geological structures in the field, recording observations as field sketches

1.2.2 (c) Use of a compass clinometer to measure two and three-dimensional geological data across a range of scales such as dip and strike of

Planar surfaces, or the apparent dip of fold limbs exposed on a hillside or cliff section

1.2.2 (d) Construction of graphic logs using appropriate scale and symbol sets for unfamiliar geological sequences and exposures

1.2.2 (e) Use of sampling techniques in fieldwork

1.2.2 (h) Production of full rock descriptions of macro and micro features from conserved hand samples and unfamiliar field exposures

1.2.2 (I) Use of methods to increase accuracy of measurements, such as timing over multiple observations, or use of fiducial scale (in photograph/field sketch)