Mystery Isle
Plan a geological survey of a fascinating island

Ask your pupils to imagine that they have been taken to a small island for two weeks to map the geology, and to work out its geological history. They have used the first day to “get their eyes in” and have visited just one bay, which seems to have some very varied geology. Photographs of this area are shown below. (Pupils will need enlarged versions of these scenes).

Photo 1. General view of the bay and the castle, looking North West

Photo 2.The foreshore, looking East

Photo 3. Detail of the rocks on the foreshore, looking North East

Photo 4. Students examine the rocks a little higher up

Photo 5.The crag on which the castle is sited

Photo 6. Detail of the rocks in the crag

Photo 7. Coastal geomorphological features.

Remind pupils of the main principles of stratigraphy, which they should bear in mind as they plan to explore the geology, i.e.
Principle of Superposition of Strata
Principle of Original Horizontality
Principle of Lateral Continuity
Law of Cross-Cutting Relationships
Law of Included Fragments
Remind them that they are looking for lines of enquiry to follow up later, and that any conclusions drawn from their first day must be regarded as tentative.

Ask pupils:

- From the evidence in the photographs, which rocks appear to be: sedimentary, metamorphic, igneous?
- How could field observations confirm such first impressions?
- What geological structures, resulting from Earth movements, appear to be present?
- Assuming that there has been no thrust faulting, what is the likely order of formation of each group of rocks?
- What field measurements might be made to discover more about the origin and age of each group of rocks?
- What geomorphological observations might be made to work out the most recent events in the geological history of this part of the island?

Pupils could be encouraged to make scaled diagrams of some of the features, to help them focus on the detail.

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The back up

Title: Mystery Isle

Subtitle: Plan a geological survey of a fascinating island

Topic: Pupils' are asked to use their first day on an island to "get their eyes in" and to plan for further investigations.

Age range of pupils: 16 years and above

Time needed to complete activity: 30 minutes

Pupil learning outcomes: Pupils can:

- apply the main principles of geology to a new situation;
- interpret geological evidence from photographs;
- explain the problems of using initial information to form firm conclusions about the geology.

Context: This activity could be used as a revision exercise after a general course in rocks and structures. The technique could also feature in planning for an actual field course, using appropriate photographs of the chosen area.
Suggested observations which might be drawn from the photos, to be tested later in the field include:

- *Photo 1: Linear features from the foreground to the far shore are igneous dykes. The walls of the gully in the foreground appear to be either massive-bedded sedimentary rocks or igneous rocks (they are in fact andesites). Sampling and hand-lens examination of any of the rocks on the island would be used to confirm initial impressions. Cross-cutting relationship of the dykes with the other rocks would enable the relative ages of each to be determined. Measurements of the strike of the dykes might indicate principle stress directions at the time of intrusion.*
- *Photo 2: The rocks appear to be foliated grey slates with more massive bands, either of originally coarser clastic rocks or limestones, i.e. now a metamorphic sequence. The foliation and fold axes appear to run NE to SW, i.e. a Caledonian trend, to be measured accurately in the field.*
- *Photo 4: Unconformity between apparently vertical slates and a very coarse breccia or conglomerate. The Law of Included Fragments would suggest an analysis of the dates and types of rocks in the deposit.*
- *Photo 6; The Principle of Original Horizontality is broken by the cross-bedding, which could prompt measurements of the fore-set directions to establish palaeocurrent directions.*

- *Photos 5 and 7 show erosion surfaces and high-level caves below the castle crag, suggesting that the crag is in fact a "dead cliff" with a raised wave-cut platform below it.*
- *There is a suggestion of a higher erosion surface in Photos 1, 2 and 7, indicating an earlier pulse of uplift.*
- *There is no direct evidence of faulting in the photographs, but the linear nature of the bay in Photo 1 might alert pupils to the possibility of fault control.*

Following up the activity:
- Use the exercise in Earthlearningidea activity *Questions for any rock face 10: sequencing* (see Links)
- Ideally, organise a similar field visit!

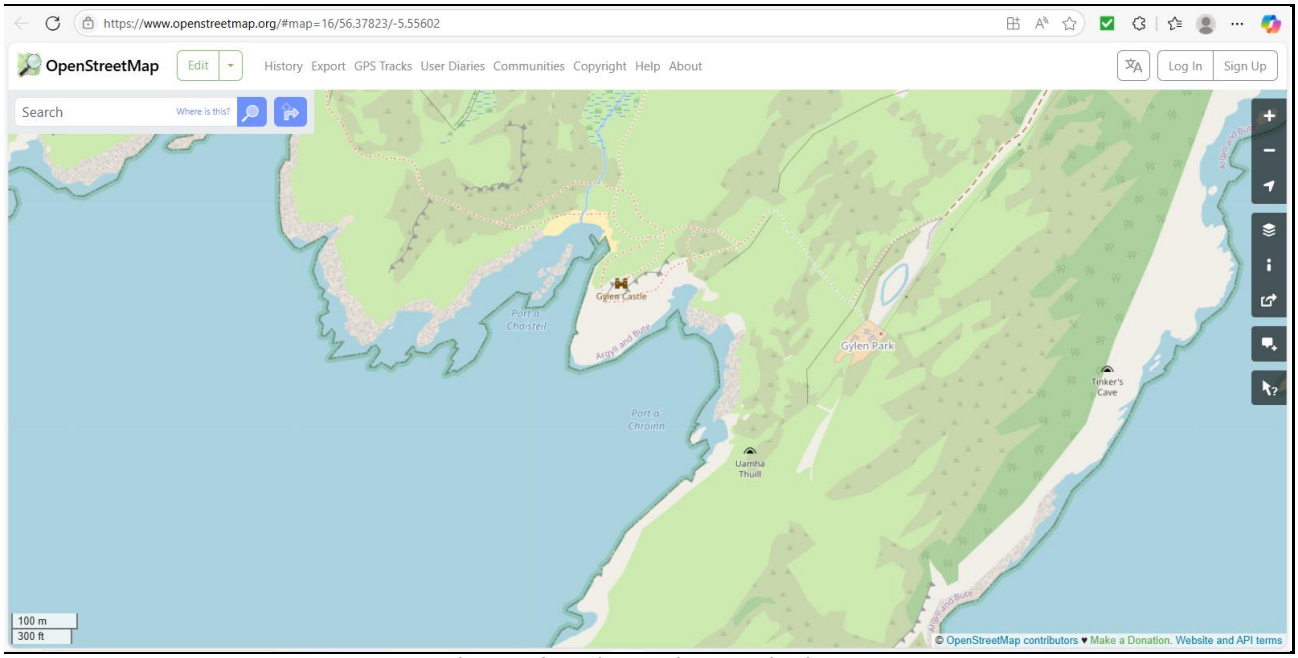
Underlying principles:
Application of the principles of geology is the fundamental method used by geoscientists to sequence rocks and rock events.

Thinking skill development:
- The principles of geology are patterns applied to sequences (construction)
- How the principles should (and should not) be applied causes cognitive conflict
- Discussion of the application of the principles involves metacognition and bridging to the case in hand.

Resource list: Enlarged photographs from pages 1 and 2 plus map below.
This activity features aspects of the Isle of Kerrera, Firth of Lorne, West Scotland.
A British Geological Survey map of the area may be viewed at BGS Geology Viewer (BETA) and scrolling to Grid Reference 1805 7265 (NM805 265) for the castle. Hovering the cursor brings up names of the main rock formations.

Useful links:
https://www.earthlearningidea.com/PDF/Laying_down_the_principles.pdf
https://www.earthlearningidea.com/PDF/238_Questions_rock_face_sequencing.pdf
OpenStreetMap

Source: Written by Peter Kennett of the Earthlearningidea team. Photos by Peter Kennett



Location map for Gylen Castle area, Isle of Kerrera
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