

GEOL 10030: Field Geology Level 1

MODULE COORDINATOR: Prof. Stephen Daly
ADDITIONAL LECTURERS: Prof. Frank McDermott

CREDITS: 5	MODULE LEVEL: 1	SEMESTER: II
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PRE-REQUISITES/PRIOR LEARNING:

While this is an introductory level module a prior basic knowledge of rock types is strongly recommended. GEOL 10020 provides this and is a good complementary module for students with no prior knowledge.

ADDITIONAL INFORMATION:

A female member of academic staff or a female teaching assistant (graduate student) is present during the residential part of the module. Students are accommodated in shared (6-bed, dorm-style) rooms for four nights at Ballintoy Youth Hostel, Ballintoy, Co. Antrim, Northern Ireland. Hence a UK visa may be required by some students. Please note that there is a small additional charge for this module as a contribution to the costs of transport and accommodation.

OVERVIEW OF MODULE:

This is an intensive, mainly field-based and residential, course, which takes place mainly in one week within the Spring Break covering the following topics: Topographic and geological maps, basic principles of navigation; plate tectonics and the geological history of Ireland; sedimentary, igneous and metamorphic processes; Irish mineral, hydrocarbon and coal resources; Geology and landscape features; building materials and quarrying. Seminars and tests taking place in the evenings are an integral part of the module.

LEARNING OUTCOMES:

On completion of this module students should be able to:

1. Read and interpret topographic and geological maps;
2. Visualize the geological structure in three dimensions;
3. Recognize and identify selected rock types and minerals and understand their mode of formation, economic importance and practical application;
4. Understand selected aspects of the geological history of Ireland;
5. Understand the evolution of the Irish landscape

ASSESSMENT:

Continuous Assessment: 30%
(*Assessment of field work*)

Journal: 20%
(*Field notebook*)

Class Tests: 30%
(*Tests on field work concepts*)

Attendance: 20%
(*Attendance at lectures, seminars and field work*)

LECTURES:

Lecture 1: Introduction and logistics. (Prof. J.S. Daly)

Location of the field area; safety and adequate field clothing; topics to be covered on the class; methods of assessment; collection of personal and health data; distribution of safety information.

Lecture 2: Geological Maps and grid references. (Prof. J.S. Daly)

Different styles of geological map; concepts of geological time and stratigraphy; geological timescale; lithology and stratigraphy on maps. Grid references; map scales and precision. How treasure hunts can go wrong. Practical map exercise on Geological Survey maps of eastern and northern Ireland designed to locate places relevant to the class and to answer specific questions about the geology and to encourage the use of grid references and an awareness of scale.

Lecture 3: Geological History of Ireland I. (*Prof. J.S. Daly*)

Plate tectonics for 3200 million years, supercontinents, rifting and orogeny. The oldest (c. 1790 million years) rocks in Ireland. The formation and break-up of the Rodinia Supercontinent (from 1 billion years ago) and the evidence in Ireland. Stratigraphy as a record of environmental change and crustal evolution. Neoproterozoic glaciation. The opening and closing of Iapetus – the Grampian Orogeny and the suturing of “Ireland” during oblique Caledonian collision. Magmatism and heat after orogeny – how we can explain granites.

Lecture 4: Geological History of Ireland II. (*Prof. J.S. Daly*)

Devonian palaeogeography, palaeobiology and climate; evidence for changing sea level – the Carboniferous flood; Carboniferous coals and base metal ores. Variscan orogeny and the assembly of the Pangea Supercontinent. Triassic deserts and the Corrib Gasfield. Jurassic sea level, abortive rifting and hydrocarbons. Cretaceous climate and sea level. Early Cenozoic mantle plume and rifting. Quaternary glaciation. The tectonic (and climatic) future.

Lecture 5: The compass clinometer. (*Prof. J.S. Daly and Prof. P.F. McDermott*)

Maps, projections and magnets. Magnetic declination and navigation. Dip and strike and how to measure them. Indoor mapping and measuring (practical) exercise with the compass clinometer.

FIELD CLASS:**Day 1: Portrairie.** (*Prof. J.S. Daly and Prof. P.F. McDermott*)

- Loc 101 Sandstone: measure dip and strike of bedding, foliation; way-up, folds. Angular unconformity with overlying glacial till; measure azimuth of glacial striae.
Loc 102 Limestone, fossils, thin beds, tectonic and slump folds.

Day 2: Portrush. (*Prof. J.S. Daly and Prof. P.F. McDermott*)

- Loc 103 Triangulation exercise, Ballintoy village.
Loc 104 Portrush sill - coarse dolerite; texture and mineralogy.
Loc 105 Neptunist locality – contact between Portrush sill and Liassic shale Ammonites, bivalves (?), belemnites, Liassic shale.
Loc 106 White Rocks beach. Chalk: sedimentary structures and fossils
Loc 107 Hotel carpark, White Rocks. Columnar jointing, interbasaltic horizon, vesicles, gas escape pipes.
Loc 108 Road section, White Rocks –Stratigraphic relationship between younger basalt and older chalk; intrusive dykes.
Loc 109 Larrybane Quarry - Chalk, fossils, flint, joints. Measure dip and strike of joints, joint spacing, quarry dimensions to calculate quarried volume and size of blocks.

Day 3: Ballycastle North Star Bay. (*Prof. J.S. Daly and Prof. P.F. McDermott*)

- Loc 110 Coal outcrops, plant fossils, sedimentology.
Loc 111 Marine bands; bivalves, sandstone channel.
Loc 112 North Star Dyke – dolerite intruding sandstone.
Loc 113 Murlough Bay dolerite-chalk contact.
Loc 114 Red Triassic mud/ sst on rough track.
Loc 115 Carbonate sandstone on main track.
Loc 116 Carbonate sandstone at shore; measure dip and strike.
Loc 117 Dalradian – lithology, foliation, quartz veins, folds, metamorphic grade.

Day 4a: Giants Causeway. (*Prof. J.S. Daly and Prof. P.F. McDermott*)

- Loc 118 Giant’s Causeway; stratigraphy, columnar jointing; spheroidal weathering.
Loc 119 Giant’s Organ.
Loc 120 Interbasaltic layer; dolerite dykes.

Day 4b: Ballintoy Harbour mapping exercise. (*Prof. J.S. Daly and Prof. P.F. McDermott*)

- Loc 121 Mapping and interpreting the normal faulted contact between basalt and stratigraphically underlying chalk.

Day 5: Cushendall. (*Prof. J.S. Daly and Prof. P.F. McDermott*)

- Loc 122 Sedimentary environment of sandstones; provenance of conglomerate clasts, way-up, channels, dip and strike of layering.