

LANDFALL AT SLIEVE LEAGUE

The International Appalachian Trail comes to the island of Ireland



Photo 1. View of the quartzite cliffs of Slieve League from Bunglass (Photo by Pohl Thorsten, Wikimedia Commons)

The International Appalachian Trail

The existing International Appalachian Trail (IAT) stretches from the northern terminus of the Appalachian Trail at Mount Katahdin in the US state of Maine, through eastern Canada to the Atlantic coast of Newfoundland. Four million walkers enjoy its benefits each year. Now IAT wishes to share its magic more globally, by following the geological evolution of the Trail's landscape. This recognises that, as originally formed, the Appalachian Mountains were more widely developed than currently seen in North America and that they have become isolated from European and North African segments by the opening of the Atlantic. Now enthusiastic teams in several countries, from Norway to Morocco, are seeking to re-unite these segments through the expansion of IAT. On the island of Ireland we have adopted a North-South cooperative approach to this endeavour.

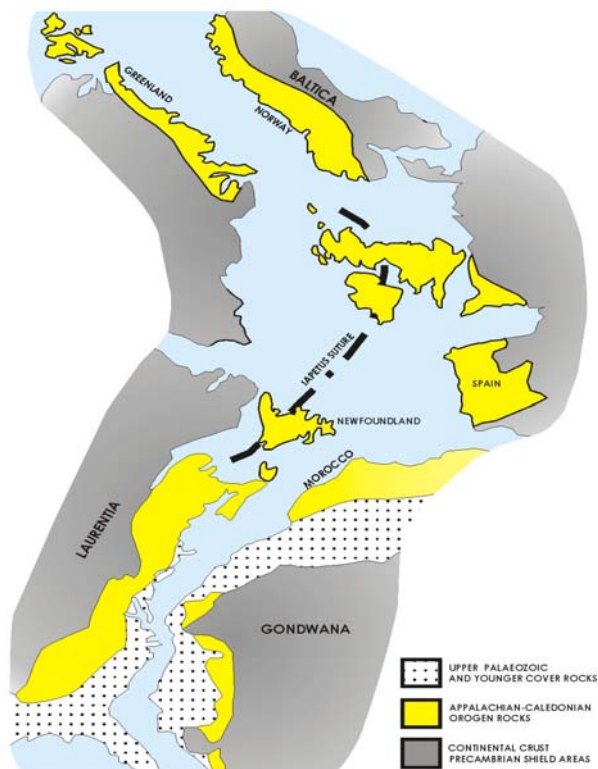
Where better to identify Appalachian Landfall on the island of Ireland than at the majestic cliffs of Slieve League (Sliabh Liag) in the southwest of County Donegal? Rising to a height of almost 600m, the most imposing in this part of Europe, they watch over an area rich in associations which closely link Ireland with Northern Ireland and Scotland (**Photo 1**). The surrounding Slieve League Peninsula has an impressive range of megalithic tombs, some as old as 4,000BC, as well as Christian and more recent ruins. Its blend of spectacular scenery, varied wildlife (both marine and terrestrial), archaeology and history all combine to assure the visitor of a stimulating experience.¹

Dal Riada

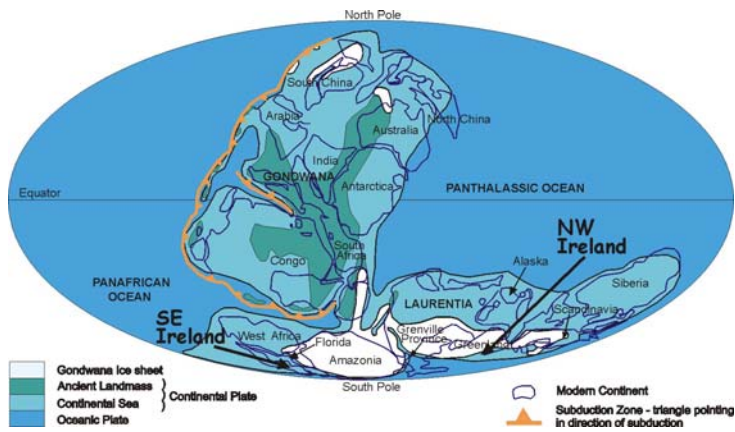
The bedrock here forms part of the Dalradian Supergroup, whose outcrops stretch from the west of Ireland through Northern Ireland to the Highlands of Scotland. That name, Dalradian, is no ordinary

name but was adopted for these rocks by the celebrated geologist, Sir Archibald Geikie (1835-1924), from the name of the Gaelic Kingdom of Dal Riada:²

"In selecting a suitable geographical word, regard should be had to the extension of the rocks through both Scotland and Ireland. It is well known that from the old kingdom of Dalriada, in the north of Ireland, a colony settled in Argyllshire, and gradually acquiring dominion over the whole of Scotland, gave that kingdom its present name. I would therefore propose that the term "Dalradian" might be adopted as an appropriate and useful appellation for the crystalline schists of the north of Ireland and the centre and south-west of Scotland".



Map 1. A reconstruction of Appalachian rock distribution prior to opening of the Atlantic Ocean (Figure 6.1 of Sleeman and others, 2004⁶).



Map 2. A reconstruction of the distribution of continents during the formation of Dalradian rocks (Figure 2.1 of Sleeman and others, 2004⁶).

The Slieve League area is situated in the Donegal Gaeltacht, an area where Irish is used as a community language by a substantial number of local people. This is a powerful linguistic bond that connects Donegal with significant areas of Scotland (and indeed other Celtic regions including Wales). The historical context is also rich and diverse: for example St. Columba, or Colmcille, who was responsible for spreading Christianity to Scotland, lived at one time in nearby Glencolmcille on the Slieve League Peninsula.

The Dalradian rocks are truly spectacular in their diversity and in recording much about the earlier evolution of our planet. They developed long before the opening of the Atlantic Ocean, when North America and northwest Europe were contiguous with each other, and so they can be traced into the bedrock of Newfoundland where they are represented by the Fleur de Lys Supergroup (**Map 1**). These rocks formed on the same margin of an ancient, long-vanished continent called Rodinia which was situated in the Southern Hemisphere.



Photo 2. Dalradian rocks deformed and metamorphosed to layered schist and marble (Photo by Brian Mc Connell, GSI).

We had some different neighbours at that time, including Morocco (which we look forward to partnering in the International Appalachian Trail) and Brazil. Our subsequent global wandering brought our part of the Earth's crust right across the tropics where, for example, the limestones of the Midlands and Old Red Sandstones of the southwest were formed (**Map 2**).

The Dalradian rocks were deposited as a thick sequence of sandstones, limestones and volcanic rocks that have been deformed and metamorphosed in the long subsequent history of plate tectonics (**Photo 2**). In the area of Slieve League the dominant rock type is the Slieve Tooley Quartzite (of which both Slieve League and the neighbouring Slieve Tooley are constructed). It is a fairly pure quartzite formed in the shallow waters of the continental margin of Rodinia. Below the quartzite lies the Glencolumbkille Limestone, a unit of carbonate sediments deposited in the warm seas of Rodinia, now metamorphosed to marble.

It is not surprising that geologists have recently been taking a heightened interest in the kind of rocks that make up Slieve League.³ They preserve evidence of an ancient ice age (approximately 700 million years ago) and so are highly relevant to modern concerns over climate change. The evidence is striking in that the warm, tropical Glencolumbkille Limestone sediments are dramatically overlain by glacial boulder clays (tillites) and sands containing ice-rafted debris (**Photo 3**). There are tell-tale signs in the sediments which allow us to uniquely identify them.

This limestone-tillite-quartzite sedimentary package is a distinctive and widespread feature of Dalradian rocks throughout Ireland and Scotland and even globally in rocks of the same age. This is just one insight into a glacial episode that was truly global in scale. The phases of glaciation comprising these ice ages are referred to as *Snowball Earth*, a time when it seems the spread of ice sheets from polar regions was such that they coalesced in the tropical region. At this time life was still confined to the seas and so it survived there until Earth was "defrosted" through the slow accumulation of warming gases from volcanic eruptions. A fascinating story in itself.⁴

Cold snap

Chilly weather through geological time provides a unifying theme for Ireland, Northern Ireland and Scotland - and I am not trying to upset our tourism agencies when I say this! Much more recently than the Dalradian glaciation, a drop of 5°C in mean annual temperatures led to the renewed and repeated growth of the polar ice cap over the past 70,000 years, and the resulting British-Irish Ice Sheet has



Photo 3. Ice-rafted pebbles in Dalradian glacial deposits (Photo by Brian Mc Connell, GSI).

covered extensive regions of the United Kingdom and Ireland since then. It is believed that marine erosion has played a relatively small part in the shaping of the dramatic Slieve League coastal profile and that the coastal slope is largely a corrie wall shaped by glacial and periglacial action, which was invaded by the sea in Holocene times. There is also a northeast-facing corrie on the other side of Slieve League and the One Man's Pass, a narrow ridge descending east of Slieve League, is an arête between the two. Recent research has shown that ice coverage in the Slieve League area was more complete than previously appreciated - it seems that even its summit was overridden.⁵ This ice sheet was probably 700m high and must have been an impressive sight as it groaned its way across this rugged landscape. Such a weight actually depressed the Earth's surface here, maybe by as much as 200m - a truly Earth-moving experience! The ice sheet also scoured the continental shelf offshore of Donegal's coast. The growth of ice sheets globally had drawn on substantial quantities of seawater so that sealevel fell dramatically and the ice sheet off Donegal was grounded on the seabed. When it melted it left a series of moraine ridges (just like we see onshore across the Midlands). These run north-south along the outer limits of the continental shelf, standing maybe 30m proud of the seabed.

A warm welcome

While Slieve League may have had a chilly past, the visitor today is assured of a warm welcome. Ireland is used to catering for the needs of walkers: in 2009 over 800,000 visitors engaged in walking and spent almost €500 million during their stay. There are several websites (for example, www.ireland.com, www.goireland.com, www.Walk.Donegal.com) dealing with Donegal walks, including Slieve League, and many will provide comprehensive local

information, as well as guidance on how to ensure your visit is safe and enjoyable.

Slieve League can be approached by leaving the R263 at Carrick (An Charraig) and proceeding southwards. Many will be satisfied with viewing it from the cliff-top car park at Bunglass (**Photo 1**). Hill walkers are recommended (for conservation reasons) to take the Pilgrim's Path by following the signposts which start about 2km south of Carrick. This Path has a comfortable gradient but its surface deteriorates on higher ground so only experienced walkers should persist to the summit (where special care is needed because of the dangerous cliffs). Those who summit will experience the exhilaration of the sudden seascapes, bracing breeze and surrounding scenery. Along the route you will mainly see quartzite rock with its pale and dark bedding layers. It is composed of quartz grains, just like on a modern beach, which you will see twinkling when the sun is behind you. If you are vigilant you will see some beds are composed of pebbles, this rock being a conglomerate. Useful geological maps and guides are available to assist you on your visit.⁷

The *Slieve League Cultural Centre* at Teelin (www.sliabhleague.com) arranges guided hill walks and archaeological tours, provides tourist information and houses a Crafts & Arts Gallery and coffee shop. *Oideas Gael* is an Irish language cultural centre in nearby Glencolmcille which organises courses in traditional music and arts, the Irish language, archaeology and hill walking (www.oideas-gael.com).

So where is Ireland's Appalachian Trail?

The relevant organisations in Ireland and Northern Ireland, which comprise IAT-Ireland, are currently evaluating the options for the initial segments of the International Appalachian Trail on the island of Ireland. We expect it will use existing trails in south Donegal, going eastwards from Slieve League via, perhaps, Slí Dhún na nGall and the Bluestacks Way. It will cross into Northern Ireland probably near Lough Erne and then likely follow the well-established Ulster Way. When finally established, IAT-Ireland may be featured on the websites such as www.irishtrails.ie and www.walkni.com, and supporting organisations (listed below) will also have links on their websites. We have many challenges to face but with the enthusiastic commitment of our supporting bodies we are more than equal to the occasion. We will also learn from our sister organisations across Europe and North Africa on how best to achieve our ambition.

Published by the Geological Survey of Ireland on behalf of IAT-Ireland. www.gsi.ie contains additional information and links relating to IAT-Ireland. The text was drafted by Peadar Mc Ardle and Brian McConnell (GSI) and has benefited from comments by members of IAT-Ireland.

Notes:

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