
Cerig Moelion RIGS Site

NRW RIGS no. 361 [SH 26742 77196]

NRW RIGS no. 293 [SH 26742 77196] (Cerrig Moelion (Cae'r Sais))

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RIGS Statement of Interest:

Cerig Moelion RIGS Site preserves one of the best, and certainly the most accessible, exposures of meta-gabbro and serpentinite in Wales. The interest lies in its excellent exposures of rare Monian ultramafic rocks. These altered dunites, harzburgites and picrites are important, not only for their great rarity value but also their significance as possible remnants of ancient ocean floor caught up within the Monian subduction complex. Detailed work on the petrography and petrogenesis of these rocks has led to an important and, at present, unresolved dispute whether they do, in fact, represent true ophiolites (suites of ultrabasic rocks consisting of basalts, gabbros and peridotites associated with mud-rich sediments (pelagic) emplaced in the continent during plate collisions). This is the best site for viewing the plutonic, metamorphosed igneous rocks that lie within the New Harbour Group.

Geological setting/context: The Precambrian basement rocks of Anglesey and south-west Llŷn can be divided into several discrete groups, all of which were juxtaposed along a series of steep, brittle and/or ductile faults and shear zones (e.g. Dinorwic and Aber-Dinlle faults; Berw, Central Anglesey and Llŷn shear zones) collectively referred to as the Menai Strait Fault System (MSFS). First, the Monian Supergroup consists of a thick sequence of polydeformed metasediments and meta-igneous rocks, comprising the South Stack, New Harbour and Gwna groups, the latter representing the type example of a large-scale submarine debris flow or mélange said by some researchers to be of Lower Cambrian age. Ongoing research, however, may suggest a much older date for the Gwna Group with possible Cambrian ages being put forward for the South Stack metasediments. Second, the Coedana Complex of central Anglesey comprises high-grade metasediments, amphibolites and gneisses, and low-grade, thermally metamorphosed hornfelses adjacent to a granite (Coedana Granite), which has recently yielded a late Precambrian zircon age of 614 ± 4 Ma. Third, a belt of schists and metabasites displaying blueschist facies grade of metamorphism lies within the MSFS. The metabasites exhibit a strong mid-ocean ridge basalt signature and have yielded ages of 580–590 Ma. Fourth, the Sarn Complex in Llŷn comprises metagabbros and granite rocks which occur to the south-east of the Llŷn Shear Zone (LSZ), a continuation of the MSFS, which separates these igneous rocks from low-grade Monian mélange to the north-west. A late Precambrian zircon magmatic age of 615 ± 2 Ma has been obtained from a metagabbro of the LSZ. Fifth, on the mainland of north-west Wales, the Arfon Group comprises a thick sequence of tuffs and volcanoclastic rocks, dated at 614 ± 2 Ma, which are conformably overlain by late Lower Cambrian siltstones. Correlatives of the Arfon Group may occur as isolated outliers on Anglesey and, if proven, would provide an important potential lithostratigraphical link across the MSFS. The stratigraphical correlation between the various units has proved highly controversial. The recent recognition of mylonitic rocks, for example in the LSZ, emphasises the presence of tectonic contacts and indicates that each component may represent a so-called 'suspect terrane' which was transported laterally into position along the major faults and shear zones. Ongoing unpublished research suggests, that Anglesey's Precambrian rocks accumulated in accretionary prisms, providing a tectonic sequence rather than a stratigraphic sequence which was formerly accepted. This new research would reverse the accepted stratigraphic order of the bedded succession, the South Stack Group, the New Harbour Group and the Gwna Group established for the island by Robert Shackleton. This Precambrian basement later formed the north-west margin of the Lower Palaeozoic Basin, the initiation of which was contemporaneous with Arfon basement terranes and was completed at least by early Ordovician times since an unconformable Arenig overstep sequence has been identified at several localities such as Wig Bach, Parwyd and Mountain Cottage Quarry. The Arenig sequence of Anglesey and Llŷn is considerably less deformed and metamorphosed than the underlying basement, although this distinction is not everywhere obvious.

Network context of the site: Cerig Moelion is a critical component of a network of RIGS which represent the various types of Precambrian rocks on Anglesey recognised from Greenly's map (1919) and called for this exercise, reference sections. In the small quarry, alongside the minor road, at the eastern side of the site dark green to black serpentinite is exposed which contains pseudomorphs of the minerals olivine and pyroxene, now altered to serpentine and chlorite. In other parts of the site, the serpentine has been replaced by dolomite to produce ophicalcite. The western part of the site comprises pale-green metagabbro, well-exposed in an old quarry face. The gabbro occurs as lenticular bodies within the serpentinite. There has been much debate as to whether the rocks were originally intrusive into the New Harbour Group sediments or were thrust into their present position. Other suggestions include their representation as disruptive igneous rocks that slid into their present position under gravity (Phillips, 1989) or that they occur as intrusions at the outer rise of a subducting plate (Windley, 1978). Their high chromium content gives rise to their likely origin as oceanic crust and most probably of mantle origin. To select RIGS to demonstrate the Precambrian evolution of Anglesey and Llŷn, three separate networks were devised. These are: 1. Precambrian stratigraphy and structures. This network includes two sub-sets: a) Precambrian sedimentary structures; and b) tectonic structures, such as folds and faults, which may have occurred during a tectonic event in Precambrian times or later, for example, during the Caledonian Orogeny; 2. Precambrian palaeontology which includes any life-form and trace fossil, such as stromatolites, sponge spicules, worm burrows and bioturbated metasediments. Some current research suggests that some of these fossils may be Cambrian or even Ordovician in age, although other geologists dispute this. As these life-forms were previously held to be Precambrian in age, they have been included in this category; and 3. Precambrian reference sections. These aim to represent all important Precambrian rock types found in Anglesey and Llŷn. They include the major mapped units of Greenly (1920). The aim is to provide the best and most accessible exposure of the rock type. These can be considered as RIGS 'type sections'. Where there is a relevant metamorphic, mineralogical, sedimentary, structural or other change across an outcrop, several representative sites have been chosen. In this study, Cerig Moelion RIGS belongs to Network 3; a Precambrian series of rare rock types of possible mantle origin.

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