
Craig Mawr RIGS site

NRW RIGS no. 404 [SH 28602 78220] (Craig Fawr)

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RIGS Statement of Interest:

Craig Mawr RIGS site is valuable because it represents a major mafic-ultramafic igneous complex which shows a serpentinised margin exposed by quarrying [SH 2862 7844], relatively well-preserved primary igneous features within the core of the complex in coastal exposures [SH 2861 7843] to [SH 2864 7818], and a foliated margin on the southern edge of the complex (28907826). These exposures are close to the Anglesey coastal path. These larger igneous complexes have variously been interpreted as tectonic slices of oceanic crust, gravity slides of obducted oceanic crust or more simply as igneous intrusions. Differentiating between these geological models is critical to interpreting the Precambrian geological setting of Anglesey, and so the Craig Fawr outcrops need to be preserved for continued education and research.

Geological setting/context: The Precambrian basement rocks of Anglesey and south-west Llyn 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 Llyn 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 $614 \pm 4\text{Ma}$. Third, a belt of schists and metabasites displaying blueschist facies grade of metamorphism lies within the MSFS. The metabasites have yielded ages of 580–590Ma. Fourth, the Sarn Complex in Llyn comprises metagabbros and granite rocks which occur to the south-east of the Llyn 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 $615 \pm 2\text{Ma}$ 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 $614 \pm 2\text{Ma}$, 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 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 Llyn is considerably less deformed and metamorphosed than the underlying basement, although this distinction is not everywhere obvious.

Network context of the site: To select RIGS to demonstrate the Precambrian evolution of Anglesey and Llyn, four 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 mineralogical, sedimentary, structural or other change across an outcrop, several representative sites have been chosen. 4. Precambrian igneous sections. This network includes four main subsets: a) mafic rocks that were erupted during deposition of Precambrian sediments, as volcanic ashes or as lava flows, b) mafic and ultramafic rocks that were intruded whilst these sediments were wet, c) the products of alteration of these mafic and ultramafic igneous rocks as the surrounding wet sediments were buried, intensely deformed, and dewatered by metamorphism, and d) felsic to intermediate rocks that were erupted as volcanic ashes or formed major to minor intrusions, following regional deformation and metamorphism. Precambrian rocks may also have suffered later phases of deformation, along major shear or thrust zones. Craig Fawr belongs to Network 4 (RIGS Precambrian igneous sections; see above) and has been chosen to illustrate subset c, expressed by a major mafic and ultramafic intrusive complex in which the relatively resistant core is well preserved, whilst the margins show serpentinisation and more intense tectonic foliation.

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Site geometry: Site boundary