Porth-y-Corwgl RIGS site

NRW RIGS no. 233 [SH 48258 92738]

GeoMôn Global Geopark original webpage

RIGS Statement of Interest:

Porth-y-Corwgl RIGS site is of regional importance as one of the best-exposed faults on Anglesey, which was considered by Greenly, (1919) to be the eastern extension of the Carmel Head Thrust. This faulted junction between the Ordovician (Llandeilo) sediments to the south and the Precambrian New Harbour Group rocks to the north represents a time difference of more than 100million years between the rocks to the north and those to the south. Much of the interest at this site lies in the opposing, polarized theories as to the type of fault which exists here and its relationship, or otherwise, to the Carmel Head Thrust plane on the opposite side of the island. The Ordovician rocks comprise conglomeratic slates and grits that have suffered a single deformation, whereas those in the Precambrian to the north of the fault show complex metamorphic changes in the phyllites (schists which retain some sedimentary features) and spilites (pillow lavas). These exposures raise an important question, are they the lateral equivalent of the Carmel Head Thrust as described by Greenly, or are they a reverse fault formed later than the Carmel Head Thrust as described by Barber et.al. (1981). Greenly based his theory on the discrepancy of age on either side of the fault but, this is now considered to be part of a diachronous transgression (gradual change in sedimentation through time). However, Barber et.al. claim the Porth -y- Corwgl fault occurred later than the Carmel Head Thrust and it is similar to some 40 other high-dipping faults in the area which would displace the Carmel Head thrust in this area down on its north side. Bates (1974) and Greenly (1919) note that the low angle dip at Carmel Head is not typical and suggest that Porth-y-Corwgl is merely the Carmel Head Thrust in an unusually steeply-dipping section. This controversy ensures the importance of this site for research for some time to come.

Geological setting/context: The Precambrian basement rocks of Anglesey and south-west Ll■n 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 Ll■n 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 ± 4Ma. 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 580–590Ma. Fourth, the Sarn Complex in Ll■n comprises metagabbros and granite rocks which occur to the south-east of the Ll■n 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 ± 2Ma 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 volcaniclastic rocks, dated at 614 ± 2Ma, 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 established for the island. This Precambrian basement later formed the north-west margin of the Lower Palaeozoic Basin, the initiation of which was contemporaneous with Arfon Group

volcanism. The timing of the inferred fault displacements has also been the subject of debate. Investigations on Ll■n have demonstrated that assembly of the basement terranes 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 Ll■n is considerably less deformed and metamorphosed than the underlying basement, although this distinction is not everywhere obvious. To select RIGS to demonstrate the Precambrian evolution of Anglesey and Ll■n, 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. Current research suggests that some of these fossils may be Cambrian or even Ordovician in age, but 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 Ll■n. 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.

Network context of the site: Porth-y-Corwgl Fault is a critical component of a network of six RIGS which demonstrate folding, faulting and sedimentary structures in Precambrian strata. They belong to Network 1b (above). Porth-y-Corwgl comprises two geological periods, the Precambrian and the Ordovician separated by a major fault.

References:

BARBER, A. J., MAX, M. D., & BRUCK, P. M. (1981). Field meeting in southeast Ireland, Proceedings of the Geologists’ Association, 92, 269–291.

BATES, D. E. B. (1974). The structure of the Lower Palaeozoic rocks of Anglesey, with reference to faulting. Geological Journal 9, 39–60.

BATES, D. E. B. & DAVIES, J. R. (1981). The Geology of Anglesey. Geologists’ Association Guide No. 40.

GREENLY, E. (1919). The geology of Anglesey. Memoirs of the Geological Survey of Great Britain. HMSO, London, 980pp. (2 vols)

GREENLY, E. (1920). 1:50,000 (and 1 inch to 1 mile) Geological Map of Anglesey. Geological Survey of Great Britain, Special Sheet No. 92 and (93 with parts of 94, 105 and 106).

SHACKLETON R. M. (1975). Precambrian rocks of North Wales . In WOOD, A, (ed). The Pre-Cambrian and Lower Palaeozoic rocks of Wales. University of Wales Press, Cardiff, 1–22.