



Central Wales RIGS Group Site Record

SECTION A

General	Central Wales
Site Name: Dol-y-Coed	File Number: Site_CWRIGS_2
RIGS Number: 412	Surveyed by: W.R. Fitches
Grid Reference: SN 8675 4715	Date of visit: 7th May 2005
RIGS Category: Scientific	Date Registered: 6th July 2007
Earth Science Category: Ordovician (Llandeilian) Igneous	Owner: Unknown Planning Authority: Powys County Council
Unitary Authority: Powys County Council	Documentation prepared by: W.R. Fitches
Site Nature: EW Stream Section	Documentation last revised: 9th April 2007
OS 1:50,000 Sheet: 147	Photographic record: Attached
OS 125,000 Explorer Sheet: 187	
BGS 1:50,000 Sheet: E179	
<p>RIGS Statement of Interest: This easily accessible RIGS provides an example of either basalt lava extruded from a mid Ordovician volcano or a small intrusion emplaced into sedimentary rocks at that time. According to Davis et al. (1983), this is pillow lava, comprising bulbous masses formed by basalt flowing into water. On the 2005 map of the British Geological Survey, however, the locality is shown as dolerite, a rock that was injected into older rocks. One interest of the site, therefore, is the origin of the rocks. The rocks contain clearly visible phenocrysts (large crystals) of feldspar and spherical gas bubbles (vesicles) now filled with minerals (amygdales). The site is included in one of the itineraries described in the Powys geological guide (Mackie, 1993).</p>	

Geological setting: The Lower Palaeozoic rocks of Wales were deposited in a small sea, the Welsh Basin, during the time interval of 520 to 410 million years ago. This marine basin and the Midland Platform on its SE side were situated on the north western margin of Avalonia, a tectonic plate that became joined to the Baltica plate in the late Ordovician (e.g., Woodcock, 2000). Throughout the Ordovician and Silurian periods, the Iapetus Ocean separating Avalonia and Baltica from Laurentia (N. America and Scotland) was narrowing as a result of plate subduction, and by late Silurian and early Devonian times, about 415 to 390 million years ago, the continents were colliding with each other. That collision resulted in the uplift and draining of the Welsh Basin during the Caledonian (or Acadian) tectonic event. The rocks that had accumulated in the basin were folded, cleaved and faulted during this event.

Volcanic and intrusive igneous rocks are widely represented in the Welsh Basin but are largely confined to the Ordovician Period, some 490 to 450 million years ago, and are exposed mainly in North Wales and Pembrokeshire. The igneous activity was probably associated with the southward subduction and melting of the crust of the Iapetus Ocean beneath Wales and other parts of Avalonia. Subduction of oceanic crust ceased just before the end of the Caradoc, ending the main phases of igneous activity in and around the Welsh Basin. Within the volcanic interval, several individual volcanic island complexes were developed, of which the Llanwrtyd and Builth inliers preserve some of the best known (Davies et al., 1983; Mackie, 1993; Schofield et al., 2004). The Llanvirn to Caradoc sequence includes the complete history of the complex and its associated faunas, from initial shelf siltstones, through the development of two local volcanic cones, to their erosion and subsidence to deep-water black mudstones.

The rocks at this RIGS are igneous rocks assigned to the Builth Volcanic Group, belonging to the Llanvirn-Caradoc series of the Ordovician Period. These rocks were erupted or intruded 470-460 million years ago. They are dark grey-green and comprise mainly microscopic feldspars and dark minerals (now altered by low grade metamorphism) that indicate a basic composition. Weathered surfaces reveal square-shaped feldspar phenocrysts 1-2 mm across. Spherical vesicles of similar size are largely filled by dark green chlorite and white calcite. Of particular significance is the structure of these rocks. They are strongly jointed, so original characteristics are largely obscured. Davis et al. (1983), however, claimed that pillow shapes are discernible in places, which would point to lava being erupted under water or flowing into the sea. Mackie (1993) seemed not to be wholly convinced of their presence and the present surveyor also remains doubtful. Schofield et al. (2004) make no comment but their 1:50,000 geological map depicts a dolerite intrusion at this locality. Distinction between a lava flow and an intrusive sheet in this area of mediocre exposure remains a challenge.

Network context of the site:

The RIGS of igneous importance in Central Wales are assigned to one or more of the following Networks.

1. Stratigraphic period (Ordovician, Silurian).
2. Plate-tectonic setting.
3. Intrusive or extrusive.
4. Intrusive structural and textural features (e.g., columnar jointing, igneous layering).
5. Extrusive structural and textural features (e.g., pillow lavas, trachytic texture)
6. Acid, intermediate or basic.
7. Sedimentary rock derived from igneous rocks (volcanogenic sediment).

The rocks here are of mid Ordovician age (Network 1); they offer geochemical and isotopic information about the plate-tectonic setting of Wales at this time (2); they are intrusive or extrusive (3); and are of basic composition (6).

References:

BEVINS, R E. 1999 . Introduction to Wales and adjacent areas. In STEPHENSON, D. and 6 co-editors. *Caledonian Igneous Rocks of Great Britain*. Geological Conservation Review Series, 17. Joint Nature Conservation Committee, Peterborough, 233-242.

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DAVIES, J H., HOLROYD, J., LUMLEY, R G. & OWEN-ROBERTS, D. 1983. *Geology of Powys in Outcrop*. Merioneth Field Study Press, Dolgellau, 163pp.

DAVIES, J R., FLETCHER, C J N., WATERS, R N., WILSON, D., WOODHALL, D. G. & ZALASIEWICZ, J A. 1997. *Geology of the country around Llanilar and Rhayader*, British Geological Survey, The Stationery Office, London.

MACKIE, A H. 1993. The Ordovician and Llandovery in the Llanwrtyd Wells to Llyn Brianne area. In WOODCOCK, N.H. & BASSETT, M.G. (eds). *Geological Excursions in Powys, Central Wales*, University of Wales Press, National Museum of Wales, 259-279.

SCHOFFIELD, D I., DAVIES, J R., WATERS, R A., WILBY, P R., WILLIAMS, M. & WILSON, D. 2004. Geology of the Builth Wells district – a brief explanation of the geological map. *Sheet Explanation of the British Geological Survey*. 1:50 000

Sheet 196 Builth Wells (England and Wales). 35pp.

WOODCOCK, N H. 2000. Introduction to the Silurian. In ALDRIDGE, R.J., SIVETER, D.J., SIVETER, D.J., LANE, P.D, PALMER, D. & WOODCOCK, N.H. *British Silurian Stratigraphy*. Geological Conservation Review Series, 19. Joint Nature Conservation Committee, Peterborough, 3-22.

PRACTICAL CONSIDERATIONS:

Accessibility: The RIGS is situated 1.2 km west of Llanwrtyd Wells in the NE bank of the River Irfon and is reached from the mountain road to Tregaron. Roadside parking is available for 2-3 cars or 1-2 minibuses. The rock exposures are beside a riverside path about 100 m southeast of the footbridge.

Safety: The rocks are slippery, especially after rainfall. The river is fast-flowing and can be deep after rainfall.

Conservation status: There are no other known conservation designations in the area covered by this RIGS.

OWNERSHIP/PLANNING CONTROL:

Owner: Unknown.

Planning Authority: Powys County Council.

Planning status/constraints and opportunities: There are no known plans to develop or modify the area covered by this RIGS. Appropriate management and enhancement of the geological interest should be facilitated by the present conservation status of the site.

CONDITION, USE & MANAGEMENT:

Present use: The riverside path is used for recreational purposes.

Site condition: The rock exposure is mediocre, being partly covered by algae and often by mud.

Potential threats: There are no perceived threats to this site.

Site management: At present, no special management is required.

SITE DEVELOPMENT:

Potential use (general): The geology at this site is primarily of research interest and is too complex to merit any public awareness initiative.

Potential use (educational): Of itself, the site is of limited interest. However, it is included in a geological field guide of Powys, as part of an itinerary from Llanwrtyd to Llyn Brianne (Mackie, 1993). The guide is used as a basis for undergraduate and postgraduate field courses.

Dole-y-Coed Park, Llanwrtyd
RIGS 412
CWPIgn 11

O.S. 1:50,000 Sheet 147: Elan Valley & Builth Well
Grid Reference SN 867471
W.R. Fitches 7.05.2005

Photo Name/Number	Caption
Llanwrtyd Basalt 1	Outcrop in NE bank of River Irfon
Llanwrtyd Basalt 2	Vesicular and layered basalt
Llanwrtyd Basalt 3	Vesicles, amygdales and phenocrysts
Llanwrtyd Basalt 4	Vesicles, amygdales and phenocrysts; possible pillow margin; chlorite(?) and quartz in fractures
Llanwrtyd Basalt 5	Vesicles, amygdales and phenocrysts
Llanwrtyd Basalt 6	Drill hole
Llanwrtyd Basalt 7	Outcrop view
Llanwrtyd Basalt 8	Outcrop view
Llanwrtyd Basalt 9	Chlorite(?) and quartz in fractures
Llanwrtyd Basalt 10	Possible pillow
Llanwrtyd Basalt 11	Vesicles, amygdales and phenocrysts
Llanwrtyd Basalt 12	Vesicles, amygdales and phenocrysts
Llanwrtyd Basalt Pan 1	Outcrop in NE bank of River Irfon, viewed towards NW; footbridge in background
Llanwrtyd Basalt Pan 2	Outcrop in NE bank of River Irfon, viewed from SW bank



Outcrop in NE bank of River Irfon



Vesicular and layered basalt



Vesicles, amygdales and phenocrysts



Vesicles, amygdales and phenocrysts; possible pillow margin; chlorite(?) and quartz in fractures



Vesicles, amygdales and phenocrysts



Drill hole



Outcrop view



Outcrop view



Chlorite(?) and quartz in fractures



Possible pillow



Vesicles, amygdales and phenocrysts



Vesicles, amygdales and phenocrysts



Outcrop in NE bank of River Irfon, viewed towards NW;
footbridge in background



Outcrop in NE bank of River Irfon, viewed from SW bank