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THE LONGFORD , DOWN MASSIF - A NEW GOLD PROVINCE IN THE APPALACHIAN , CALEDONIAN OROGEN

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INTRODUCTION

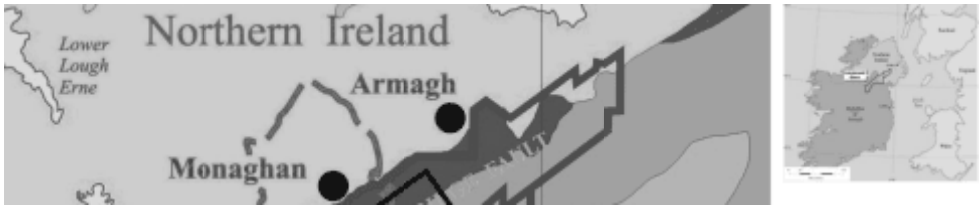
The Longford – Down Massif is a major geological feature stretching from Co. Longford in the Republic of Ireland to Co. Down in Northern Ireland. (Figure 1: The Longford – Down Massif: Regional Geology). It is an inlier of Ordovician and Silurian aged rocks and can be correlated with similar strata in the Southern Uplands of Scotland and the Dunnage Zone of Newfoundland. (Stone et al., 1995). The rocks strike predominantly northeast – southwest and are divided into tracts by strike – slip faults. Of particular significance is the fault zone defining the boundary between the Ordovician and Silurian, the Orlock Bridge Fault. This is a major structural feature that has an inferred lateral displacement in excess of 400 kilometres (Anderson and Oliver, 1986). The pattern of movement of this fault during geological time may have had a major influence on mineral deposition. Within the Longford – Down Massif, numerous minor deposits of lead, zinc, iron and antimony have been worked in the past (Morris, 1984). Gold was initially discovered in old antimony workings in the townlands of Tullybuck and Lisglassan in County Monaghan in 1957 (Morris at al., 1986). Further discoveries of gold mineralisation have recently been demonstrated by Conroy Diamonds and Gold P.l.c. in an area some 20 kilometres by 3 kilometres in extent in Counties Armagh and Monaghan; the Armagh - Monaghan Gold Belt, (Smith, 2001) and elsewhere in the Longford - Down Massif at Slieve Glah in County Cavan. (Figure 1.)

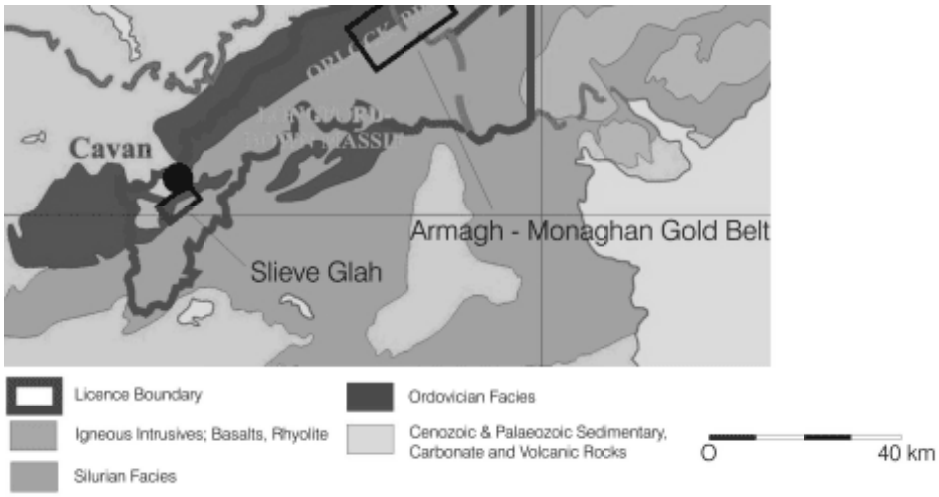
The Armagh – Monaghan Gold Belt lies along the major northeast – southwest trending strike – slip feature known as the Orlock Bridge Fault. The gold belt is underlain by andesitic composition greywackes mainly of Ordovician age and is divided into fault blocks by faults trending approximately north – south. (Steed and Morris, 1997) The association of the Armagh – Monaghan Gold Belt with the intersection between the Orlock Bridge Fault and a major north – south linear feature is seen as an important factor in mineralisation development. Russell, 1979, proposed this linear feature as a "geofracture" named R3.

Within the Armagh – Monaghan Gold Belt gold appears to be associated with:

- Sulphides – arsenopyrite, arsenical pyrite and pyrite.
- Hydraulic fracturing and quartz – feldspar and quartz – carbonate veins mostly penetrating sub – parallel to the foliation.
- A probable magmatic source from which is derived at least part of the mineralising fluids. This is indicated by geochemical studies (Steed and Morris 1997).

Figure 1: The Longford - Down Massif: Regional Geology.





THE APPALACHIAN – CALEDONIAN OROGEN

The Longford – Down Massif forms part of the Caledonian Terrane of north west Europe. This complex extends from Scandinavia (the Scandinavian miogeosyncline) and Greenland (the East Greenland miogeosyncline) and includes most of Scotland and the northern part of Ireland. Prior to the Mesozoic opening of the present Atlantic Ocean, the Caledonian Orogen of Greenland and Western Europe was continuous with the Appalachian Orogen of North America. Newfoundland lies at the north – east termination on the Appalachian Orogen (Williams, 1979), Longford – Down lies near the south –west termination of the Caledonian Orogen. The two major Orogens form a major orogenic belt more than 7,500 kilometres long.

The Appalachian Orogen of Newfoundland is regarded as a "two sided symmetric system" (Williams, 1964). Pre – Cambrian continental platforms (Humber and Avalon zones or terranes of Williams 1964, Williams and Hatcher, 1983) are separated by a younger Palaeozoic mobile belt – the Gander and Dunnage Zones or terranes – which together form the Central Mobile Belt.

A similar symmetry exists in N.W. Europe, with the Longford – Down Massif and the Southern Uplands of Scotland forming part of the enclosed Palaeozoic mobile belt. This mobile belt records the formation, development and destruction of the earlier Palaeozoic Ocean, originally called the "Proto – Atlantic Ocean" (Wilson, 1966) and now referred to as the "Iapetus Ocean" (Harland and Gayer, 1972, Evans and Kerr, 2001).

This 7,500 kilometre long orogenic belt is mirrored in North America by the younger Western Cordillera.

Throughout the Caledonian – Appalachian Orogen, mineralisation has been demonstrated. The work of various geological surveys has summarised gold and base metal mineralisation, e.g. the British Geological Survey in Scotland (Stone et al., 1995) and the Geological Survey of Newfoundland (Evans, 1996). In Ireland, mineralisation in the Longford – Down Massif has been summarised by the Geological Survey of Ireland (Morris, 1984). Verbruggen and Colman, 2001, have also described gold mineralisation in Britain and Ireland. This literature indicates that the Appalachian – Caledonian Orogen is a mineral prospecting play on a global scale.

Conroy Diamonds and Gold P.l.c.'s contribution has been to demonstrate the extent of gold anomalies and deposits in the Armagh - Monaghan Gold Belt and around the Slieve Glah area, in the Longford – Down Massif. The Slieve Glah area may represent a dilation zone, developed some 40m km to the south west of the Armagh – Monaghan Gold Belt, where a significant strike swing occurs on the Orlock Bridge Fault.

GENETIC MODEL

The elements of a genetic model for mineralisation in the Armagh – Monaghan Gold Belt are proposed as follows:

- Structural Elements
  The Orlock Bridge Fault
  ☐ The "R3" Geofracture / Lineament
- Geology and Models for Terrane Origin;
- Source
  ☐ Igneous Intrusives
    - Minor;
    - Thermal Alteration;
    - Granodiorite;
    - Postulated Granodiorite

  ☐ Formation Water

- Permian Red Beds as a leached source of elements.

- Dynamic Elements
  - Groundwater and Leaching;
  - Gold deposition events vs. base metal deposition events;
  - Structural Development
    - Fault and Shear Development
    - Block Exhumation

Structural control is of major importance – on both the large scale and small scale, and the Appalachian – Caledonian Orogen model for terrane origin is seen as critical in placing the Longford – Down Massif situation in a global context. Mineralising fluids appear to result from interaction between igneous intrusive sourced waters and formation waters within the sediment pile. This is indicated by geochemical studies (Steed and Morris, 1997).

CONCLUSION

The Appalachian – Caledonian Orogen is a major crustal feature created by the destruction of a Palaeozoic Ocean in a subducting environment and the reworking of its sediments into the terrane elements we see today. Mineralisation is present throughout the Orogen with particular hotspots in Newfoundland and Scandinavia. The Longford - Down Massif has yielded a few small base metal mines and, until the present round of exploration, one gold occurrence. The work of Conroy Diamonds and Gold P.l.c. has shown the extent of gold deposits and anomalies and hence the potential for further gold discoveries within the Longford - Down Massif.

The Appalachian – Caledonian Orogen is a Palaeozoic feature occupying the eastern USA and NW Europe. The younger Western Cordilleran Orogen in western USA is also a large scale orogenic feature stretching from California to Alaska and hosts major mineral deposits and provinces, e.g. the Mother Lode of California, the Carlin Trend of Nevada. This Orogen, like the Appalachian – Caledonian Orogen, is also the product of a major subduction zone and prospect models developed in the Western Cordillera are probably partially valid in the Appalachian – Caledonian region. Those who seek Carlin Trend look-alikes should perhaps consider the older but highly prospective rocks of the Appalachian – Caledonian Orogen.

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