

Presentations

ESEF Cymru

Earth Science Education Forum – Cymru (ESEF-Cymru)

“Delivering Earth science education – developing new partnerships and identifying new funding sources in science”

National Museum of Wales, Cardiff
4.30pm - 7.00pm, 9 October 2007

Presentations by

Professor Dianne Edwards
(Cardiff University)

“Delivering Earth science education in partnership with the National Botanic Gardens for Wales”

Dr Jana Horák & Heather Jackson

(Amgueddfa Cymru - National Museum Wales)

“Working from the inside - delivering Earth science education materials through Science & Technologies Facilities Council funding”

Professor Dianne Edwards introduced the wide range of facilities available at the National Botanic Gardens for Wales, showing images of the layout and how visitors can make the most of the resources as well as background information about the project, the potential of the site, aspirations and her vision for the future.

The National Botanic Garden of Wales has its seventh birthday this year. It is first national botanic garden to be created in the new millennium. This year is our seventh birthday. It is already the most visited garden in Wales and was voted number 1 wonder of Wales by the Western Mail. The site covers approximately 600 acres; the main visitors area covers 80 acres.

The National Botanic Garden of Wales exists to develop a viable world-class national botanic garden dedicated to the research and conservation of biodiversity and its sustainable utilisation, to lifelong learning and to the enjoyment of the visitor and are helping to conserve some of the rarest plants in the world. The Garden is a registered charity which exists without regular funding from any governmental organisation. There is an entrance fee.

The areas that are of particular interest to geologists are the Broadwalk, Rock Garden (Rock of Ages), Wallace Garden which houses specimens of fossils and shows the film “National History of Wales”, art gallery which houses a temporary exhibition of rock images by Richard Weston, and the Progression of plants which includes dinosaur footprints and a model of a giant dragonfly as well as the plants.

The Broadwalk is 220-metres long. It begins at the `Circle of Decision` fountain, shaped like the cross section of an ammonite, and leads, via a rill, to the upper fountain, the Mirror Pool, to the west of the Great Glasshouse. The water is supplied from a borehole. To either side of the Broadwalk are herbaceous borders criss-crossed by paths. The design of the Broadwalk was inspired by an aerial view of the Towy Valley river flood plain four miles away.

The Broadwalk includes a geological walk through Wales:

1- The oldest rocks (at the car park end of the Broadwalk) are Precambrian, Coedana Granite from Anglesey. They are igneous rocks very close to the end of the Precambrian period. They are six to seven hundred million years old. Because they formed from molten magma deep in the Earth`s crust there are no fossils. The earliest fossils of this age in Wales come from near Carmarthen.

2- The next rocks are Cambrian, slates from Penrhyn. They are metamorphic rocks i.e. fine-grained rocks that formed from mud on a deep ocean floor and were then deformed under high pressure and temperature. They rarely contain any fossils. They are 520 million years old.

3- Ordovician rocks are 465 million years old. This was a time of major volcanic activity in Wales. The rocks are Rhyolite, dark green in colour, from Haverfordwest.

4- Silurian rocks are 430million years old. The examples are from the Aberystwyth area. They are dark grey siltstones, or Aberystwyth Grits, deposited during storms in deep water. There are few fossils. Rocks of a similar age in the Llandovery area contain shell-like fossils and were deposited in shallow water off shore.

5- The Devonian rocks are 390 million years old. They are red and grey sandstones from the Old Red Sandstone at Brecon. These are continental deposits and contain some of the earliest land plants. At this stage Wales was on the southern margin of a giant continent straddling the equator.

6- The Lower Carboniferous rocks are 335 million years old. They are limestones – rocks produced in warm tropical seas often incorporating reefs and lots of shells later fossilised. Land would have been across Mid Wales and the rocks here come from north and south of the landmass.

7- The Upper Carboniferous rocks are from Abercarn in Gwent. They are 302 million years old. They are coarse sandstone with abundant plant debris (black marks) swept in by rivers from the vegetation on the flood plains and from the swamps that produced the coal.

The Progression of plants along the edge of the walled garden shows the chronology of plant evolution over 400 million years. The progression begins at the pond which is surrounded by mosses and liverworts, followed by:

- Ferns and club mosses (Devonian) and a cast of arthropod footprints.

- Tree ferns, horsetails and a model of a giant dragonfly with a wing span of more than a metre (Carboniferous).
- Conifers, cycads and dinosaur footprints (Permian to Mesozoic)
- Flowering plants including magnolia and bay tree.

The layout reinforces the visual image of many millions of years of green plants, with colour only being obvious with the introduction of flowering plants.

The systematic arrangement of plants in the formal gardens is designed to convey the similarities and relationships between plants – a DNA fingerprint of their evolutionary relationships. The most primitive are planted nearest the centre of the garden, each section signifies a family. Wherever possible Welsh examples have been chosen.

The science building has laboratories and classrooms for visiting groups, while the land around it has potential for development. This is where Dianne would like to see her vision for a recreation of the Welsh habitats be developed. The area would have geological specimens and their associated flora arranged in chronological order, including glaciation, arctic alpine, limestone pavement (e.g. Great Orme), farmland, shingle and coastland (e.g. Pembrokeshire Coast), early forest, pine, broadleaf, upland oak and herbaceous layers, lowland oak and so forth. Along with the development of the story of the habitat would be the story of the development of farming with examples of an Iron Age Round House, Roman settlements and Medieval homes. The artefacts of agriculture could form part of an exhibition. The vision is possible, but funding is needed. Proposals are being developed and funding sources approached.

More than 100,000 children have visited the Garden (and that is with only one education officer) just think how many more children (and adults) could enjoy the gardens and the educational experience and what else could be achieved with further funding and more staff.

For further information about the gardens see <http://www.gardenofwales.org.uk> .

Contact:

The National Botanic Garden of Wales

Llanarthne

Carmarthenshire

SA32 8HG

Tel: 01558 668768

Email: info@gardenofwales.org.uk

Fax: 01558 668933

Education Dept Tel: 01558 667150

Jana Horák introduced the '*Down to Earth*' project (2007-2009), giving background on the rationale, the aims and targets. The project is supported through Science & Technologies Facilities Council funding (formerly PPARC) with the Faulkes Telescope Team (Dept. of Physics & Astronomy, Cardiff University) Lead by Dr Paul Roche (<http://faulkes-telescope.com/information/team>) and the Department of Learning/ Department of Geology, Amgueddfa Cymru (National Museum of Wales).

Earth Science at KS3 (11-14) and KS4 (14-16) is often taught by non-geologists, (usually within the science curriculum) who lack confidence in teaching the Earth science content and are particularly concerned about using specimens and undertaking fieldwork. The '*Down to Earth*' Project addresses these issues by:

- Giving supported access to specimens
- Providing clear, accurate information
- Stimulating interest in geological specimens

The Outreach Collection at the National Museum of Wales was established in 1948 and is one of the oldest school Museum loan services in the UK (est. 1948). The collection, now housed at Nantgarw Collection Centre, provides specimens to schools across Wales in all Museum disciplines and reaches 137,500 students in 200 schools a year. However, changes in the curriculum, lack of funding and the lack of an Education Officer to maintain the geological collections, has resulted in the collection have resulted in the collections becoming out-dated and of little use to KS3 or KS4. They are sufficient for the needs of KS1 and KS2, but at KS3 and KS4 pupils require more impressive specimens & focussed information.

The '*Down to Earth*' Project aims to develop loan boxes of geological specimens under three meteorite-related themes and produce support materials for teachers, supported by INSET training for Teachers and lectures to schools by project staff. All information will be:

- Available via a free CD sent to schools and free access to a website
- Bilingual (Welsh/English) and formatted for the visually impaired

The users gain:

- Access to high quality resources, not otherwise be available to schools
- Access to resources where Museum/Science Centre visits are logistically difficult
- The first Welsh medium astronomy material for KS3 and KS4
- A model by which resources for other parts of the Earth science-related curriculum can be developed
- Confidence in using geological specimens.

Earth science and the partners in the project gain:

- Access to Earth science teachers in Wales to identify their needs
- Access network of physics teachers in Wales (stronger than Earth sciences teachers' network)
- From the experience of the Faulkes Telescope Project team
- Increased awareness of Earth science and its potential
- An opportunity for further practice of the Museum standard of care to specimens, display methods, and presentation techniques
- Support for specimens through the NMW Outreach Collection on a permanent basis.

Heather Jackson brought one of the loan boxes for us to see (the meteorite box) and explained how the loan system would work, who would use it and what the resource would include. Teacher and students notes and worksheets (with links to the curriculum) were made available.

Initially there will be 12 boxes, 4 for each of the 3 themes:

- Meteorites
- Planetary Geology
- Meteorites and Extinctions

There are 225 Secondary Schools in Wales, with 215,000 pupils between the ages of 11-18. The aim is for each box to be loaned 4-5 times a year (60 loans maximum), with a target audience of 200 for each loan. This should impact on 12,000 pupils per year.

The '*Meteorites*' box contains 10 specimens, including:

- Chondrite
- Carbonaceous chondrite
- Achondrite
- Iron Octahedrite (whole and etched)
- Pallasite
- Tektites

Curriculum content for activities in '*Meteorites*' covers (KS3 and KS4):

- Identification and interpretation of meteorites (Scientific enquiry)
- Triangulation of meteorite position (Maths)
- Newspaper article '*The Shooting Star*' (Literacy / Science in Society KS3)
- Making an Impact! (Energy calculations)
- Creating Craters (Scientific enquiry, Physical processes)

The '*Planetary Geology*' box specimens include:

- Chondrite
- Iron meteorite
- Achondrite
- Haematite (Mars)
- Olivine basalt (Moon)
- Anorthosite (Moon)
- Rippled sandstone (Earth)
- Replica Lunar soil
- Replica Martian soil

Curriculum content for activities in '*Planetary Geology*' covers (KS3 and KS4):

- Soil formation on Earth, Moon & Mars (Geography, The Earth and Beyond)
- Volcanoes on Earth, Moon & Mars (Geography, Maths, Scientific Enquiry)
- Water on Mars (Geography, Materials and their Properties)
- Life in Space. Life from Space? (Life processes and Living things)

The '*Meteorites and Extinctions*' box specimens include:

- Chondrite
- Achondrite
- Iron meteorite
- Iguanodon vertebra
- Spinosaurus tooth
- Ichthyosaur vertebra
- Ammonite

Curriculum content for activities in '*Meteorites and Extinctions*' covers (KS3 and KS4):

- Killer Crater! (Nature of Science KS3, Life Processes and living things KS3)
- Death by numbers (Maths)

Support material for teachers is being developed to accompany each box. The material will include:

- Teacher notes
- Introductory PowerPoint presentation
- Outline curriculum content
- Differentiated worksheets for pupils (KS3, KS3 and KS4, KS4)
- Worksheet answers
- Suggestions for additional activities

Attendees were then invited to handle the specimens and view draft copies of support material for the '*Meteorites*' box.

The Chair thanked the attendees, the speakers for their presentations and Jana and Horák Paula Knapman for their help in organising the meeting.

End

Cally Oldershaw

10 October 2007

Email earthsciencesgroup@bopenworld.com Website www.esef.org.uk