6. Additional Resources

- Rock boxes
- The North Pennines Game
- Rock and mineral dials
- Other resources

6. Additional Resources

The North Pennines Game

The aim of this game is to help students build up a background knowledge of the North Pennines, to develop a spatial awareness of the area and to generally instil a 'sense of place'. Games are available on loan from the North Pennines AONB office and multiple games can be borrowed if they are to be used for a whole-class activity

Rock Boxes

The Rock Boxes are a selection of rocks, minerals and fossils from the North Pennines AONB and UNESCO Geopark. Each of the rocks and minerals were collected from the Geopark and many can be used as part of suggested activities either prior to fieldwork or as part of some follow-up activities. The fossils are detailed plastercast replicas of the fossils found in the Geopark. Fossils should not be collected from within the Geopark. The boxes can be borrowed from the AONB office in Stanhope.

Also included in the Rock Boxes are:

- A laminated glossary of rock and mineral terms
- A laminated Rock Dial
- A laminated Mineral Dial
- Copies of the North Pennines AONB Parnership's 'Identification guide: Flowers and grasses of upland hay meadows'.
- Leaflets on aspects of the area's geology.

OTHER RESOURCES

Powerpoint presentations

A series of Powerpoint presentations have been produced that can be used in conjunction with this education pack and are available electronically on the education pack CD.

Geological leaflets

A range of geological leaflets have been produced by the North Pennines AONB Partnership and are available in most Tourist Information Centres and from the AONB office.

Further information for earth science education

General

North Pennines AONB Partnership, Weardale Business Centre, The Old Co-op Building, 1 Martin Street, Stanhope, County Durham, DL13 2UY.

Tel: 01388 528801
Email: info@northpenninesaonb.org.uk

Science Learning Centre
Science Learning Centre North East, Front Street, Pity Me, Durham, DH1 5BZ.

Tel: 0191 3706200
http://www.sciencelearningcentres.org.uk/

Earth Sciences at Durham University
Department of Earth Sciences, Durham University, Science Labs, Durham, DH1 3LE
Tel: 0191 3342300

E-mail: earth.sciences@durham.ac.uk

Earth Science Teachers' Association (ESTA)
The aim of the Association is to advance education by encouraging and supporting the teaching of Earth sciences at all levels, whether as a single subject such as Geology, or as part of Science or Geography or other courses. Various activities and guidance offered for classroom and field based Earth science and geographical exercises.

http://www.jesei.org

Geographical Association (GA)
The GA supports primary and secondary teachers through teaching and activity design.

http://www.geography.org.uk/

Teaching Earth Science links

The Joint Earth Science Education Initiative provides Earth science teaching ideas for biology, chemistry and physics teachers
http://www.jesei.org

The Earth Science On-site project, undertaken by UKRIGS, provides high quality online field activity guides for former aggregates sites
http://www.ukrigs.org.uk/html/esos.php

General geology links

Interactive geology toolkit developed for the BBC series - British Isles: A Natural History (requires Macromedia Flash)
http://www.open2.net/naturalhistory/toolkit.html

Short animations illustrating a wide range of geological processes, developed to accompany the textbook "Earth: Portrait of a Planet" by Stephen Marshak (requires Macromedia Flash)
http://www.wwnorton.com./earth/earth

Plate Tectonics links

US Geological Survey – "This Dynamic Earth"
http://pubs.usgs.gov/publications/text/dynamic.html

US Geological Survey – "This Dynamic Planet" poster
http://pubs.usgs.gov/pdf/planet.html

Good summaries of history and scientific framework of Plate Tectonics, with downloadable movies
http://www.ucmp.berkeley.edu/geology/tectonics.html

Earthquake depths exercise - Images:
http://quake.geo.berkeley.edu/anss/maps/cnss-depth.html

Continental reconstructions, including movies
http://www.scotese.com/

Rice University Plate Tectonics exercise. Posters downloadable in various formats and sizes, with teacher's guide, suggested class activities and other materials
http://zephyr.rice.edu/plateboundary/home.html

Geomorphology images including many of plate boundary features
http://visibleearth.nasa.gov/

Links to useful seismological programs, demonstrating the dynamic nature of Earth's seismicity, at Leicester University
http://www.le.ac.uk/geology/pdt/programs.html

Resources specifically linked to UK curriculum (These are the Plate Tectonics pages of a much larger, mainly geography based website, which also includes satellite images that would be useful for Plate Tectonic teaching)
http://www.georesources.co.uk/tectonicg.htm

Links to UK information gateways

PSIgate is a free service that offers access to high quality Web resources in the physical sciences, including Earth sciences.
http://www.psigate.ac.uk

GEsource is a free information resource for Geography and the Environment, aimed primarily at staff, students and researchers in the HE and FE communities
http://www.gesource.ac.uk

Links to other science education-related websites

The Science, Engineering, Technology and Mathematics Network (SETNET) is a UK-wide charity that promotes Science Technology Engineering and Mathematics (STEM) awareness, especially among young people. Their website includes links to resources, local SETPOINTS, STEM events and news.
http://www.setnet.org.uk

ESEU/SESEF workshops for Scotland are registered with the National Register of CPD providers
http://www.cpdregister.org.uk

Links to Earth science education worldwide

International Geoscience Education Organisation
http://www.geoscied.org

Global National Network of Geoparks
http://www.unesco.org/science/earth/geoparks.shtml

Glossary of Rock and Mineral Terms

Teacher Resource Sheet

Rocks

Rocks: The Earth, and indeed the moon and planets are built from the material we call rocks. Rocks are aggregates of minerals and enables the geological past to be unravelled. It is from 'reading the rocks' that so much can be learnt about the past climates and geography, and about the past and present conditions that prevail within the interior of our planet.

Reaction with Acid: The use of dilute HCl acid in the field is common practise by geologists to help identify specific rock types. The acid reacts (fizzes) with carbonates such as limestone and in rocks which are not limestones but contain a high percentage of carbonate such as some shales.

Colour: As with minerals colour can be a useful criteria for rock recognition but some caution is also needed. Sedimentary rocks are particularly variable but typically limestones are a creamy colour or dark grey, sandstones are either red or brown and shales are dark grey to black. Igneous rocks tend to illustrate a transition in colour

Metamorphic rocks are highly variable and depends on what the original rock was before metamorphism occurred.

Texture: Texture of a rock refers to the shape, arrangement, size and distribution of the minerals/ grains in a rock. Rocks tend to be crystalline with interlocking crystals; granular with individual grains; or smooth where the grains are so small you are unable to see them.

Hardness: Hardness for rocks is lees specifically defined and largely depends on the minerals that make up the rock. In general sedimentary rocks tend to be softer than igneous and metamorphic rocks. However, harder rocks can be more brittle.

Fossils: Fossils are the remains of animals or plants that are preserved in the rocks. It is very unusual for complete organisms to be preserved and fossils usually only represent the hard parts such as bone, shells or tests of animals and the leaves, seeds or woody parts of plants.Fosils are found most abundantly in sedimentary rocks and are particularly common in limestones and some shales.

Minerals

Minerals: The rocks which form earth and other planets are made up of minerals. Minerals are solid substances composed of atoms having a regular and orded arrangement. They are the 'building blocks' of all rocks.

Hardness: hardness is the resistance of a mineral to scratching or abrasion. The 'Mohs" scale of hardness is used where 10 different minerals are used in order of hardness, so that each will scratch those lower in the scale thus –

1. Talc (Softest)
2. Gypsum
3. Calcite
4. Flourite
5. Apatite
6. Orthoclase
7. Quartz
8. Topaz
9. Corundum
10. Diamond (hardest)

Hardness is tested either by observing whether or not the minerals of Moh's scale scratch the unknown mineral, or by observing whether objects of known hardness such as a knife blade or fingernail will scratch the unknown. Minerals of hardness 1 fell soapy or greasy; the fingernail has a hardness of of about 2.5; a steel pocket knife blade has a hardness of about 5.5; and minerals of hardness 6 and over will scratch glass.

Specific Gravity (SG): Used in mineralogy to reflect the density of a mineral. The density depends on several factors including the kind of atoms in the structure and how closely they are packed together. Minerals such as quartz has a SG of 2.65 with is compared to Galena with a SG 7.5.

Colour: There is no single cause for colour in minerals. Sometimes it is the direct result of the presence in the structure of a certain chemical element; for example copper minerals are blue or green (e.g. malachite). Colour can be used to identify many different minerals.

Habit: This is the general crystal form of the mineral. Thus baryte commonly forms crystals of tabular habit whereas pyrite form cubic crystals. The crystal habit can be a very useful criteria for recognition of minerals and distinguishing minerals.

Lustre: Lustre is a property of the surface of a mineral. The nature of the reflecting surface of minerals gives rise to a different lustre and intensities. Lustre is always assessed independently of colour. Some examples of Lustre include metallic lustre is the lustre of metals; vitreous lustre is the lustre of broken glass and is common to many minerals; silky lustre is due to the presence of parallel fibres.



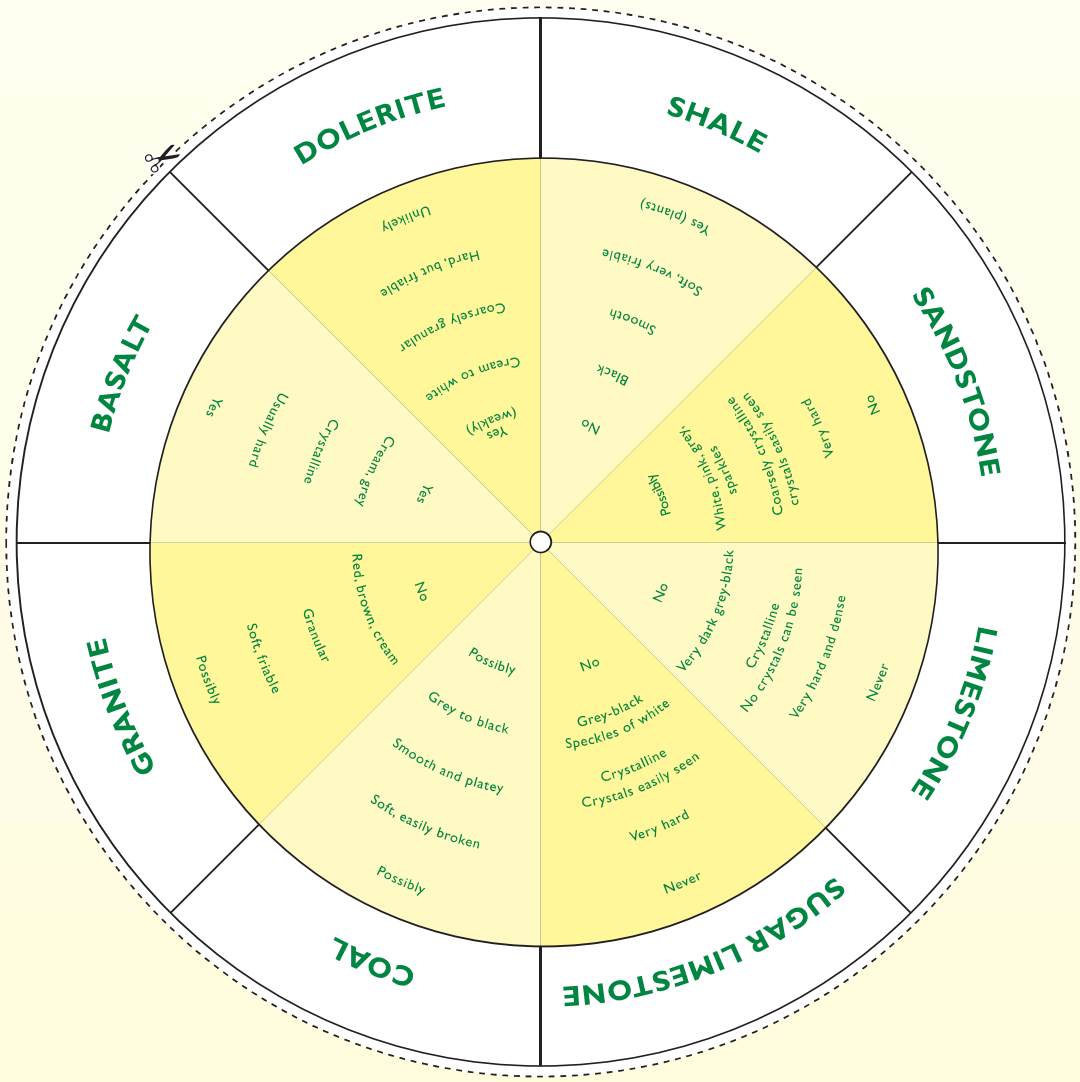


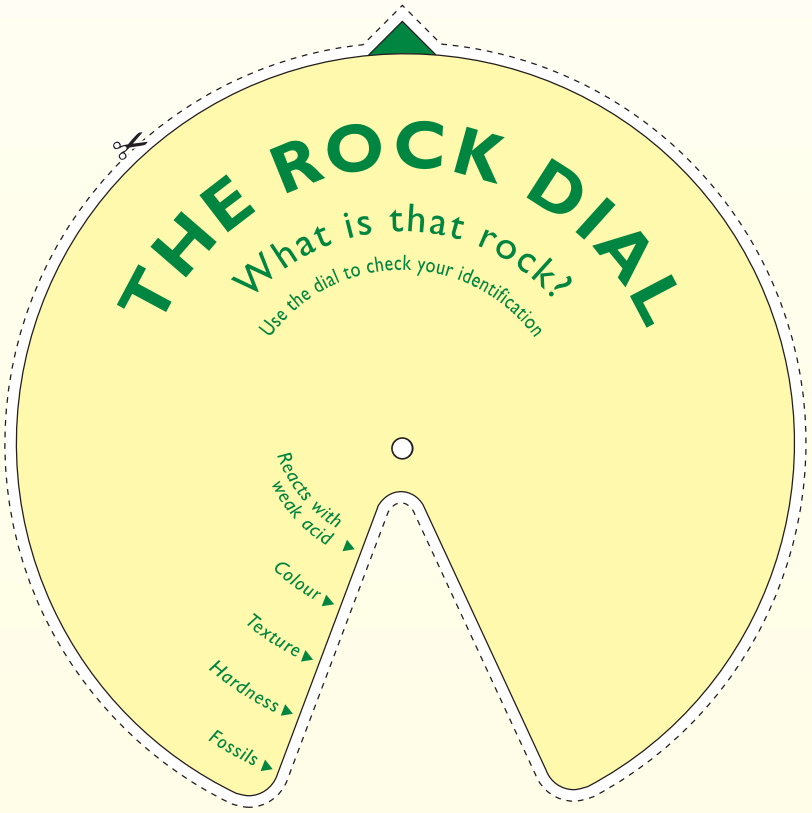
The Rock Dial

Pupil Information Sheet

THE ROCK DIAL

Cut out the dials below and laminate them. Fasten them together with a paper fastener. Use the dial to check your rock facts.





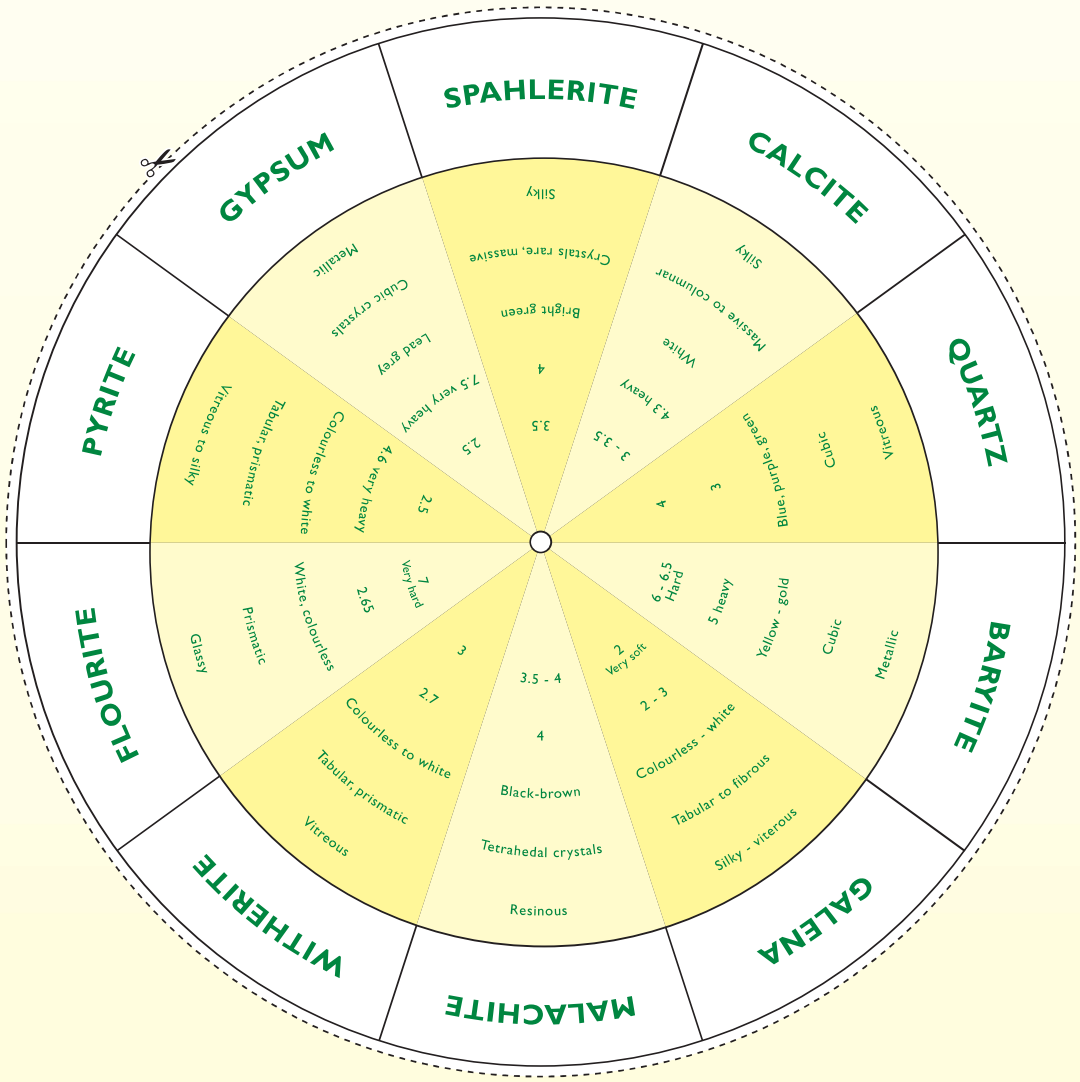
Just point the top of the dial at the rock you want to check!

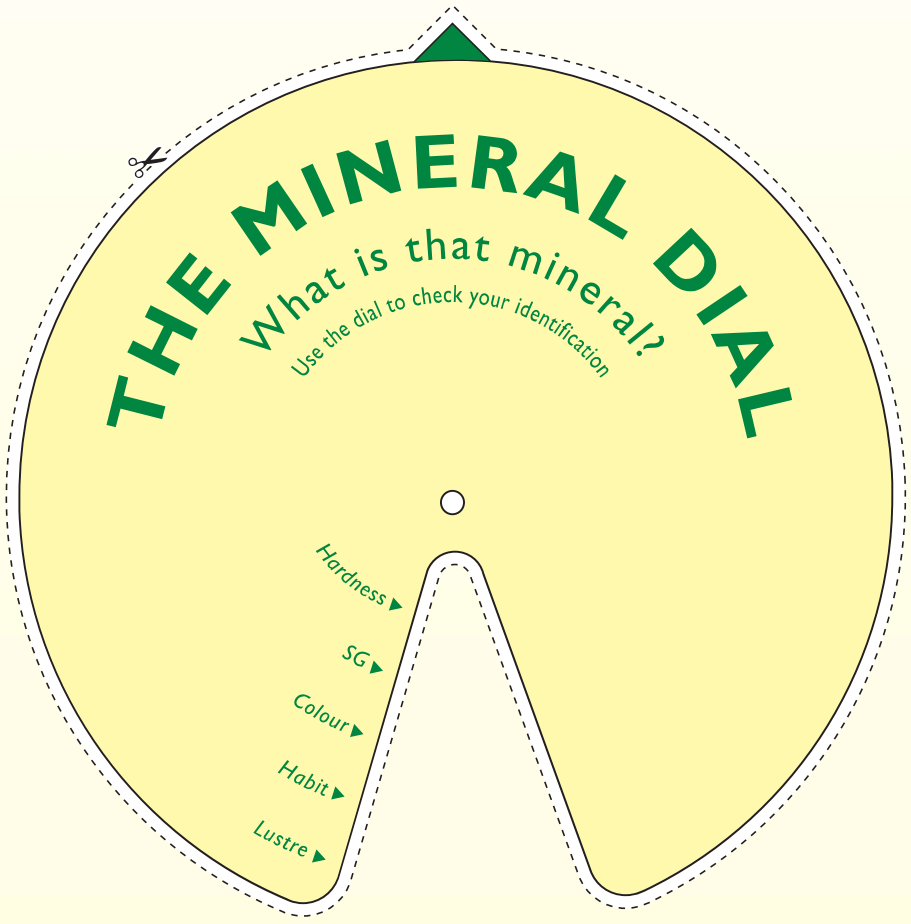
The Mineral Dial

Pupil Information Sheet

THE MINERAL DIAL

Cut out the dials below and laminate them. Fasten them together with a paper fastener. Use the dial to check your mineral facts.





Just point the top of the dial at the mineral you want to check!

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Produced by the North Pennines AONB, Partnership with:

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Stuart Lectures in geology at Durham University and is an internationally recognised geologist having widely published many scientific papers and several books. Stuart has been awarded two Excellence in Teaching Awards from Durham University to signify his commitment and innovative teaching in higher education. He has been further recognised for his work to encourage Earth science education in schools by STEMNET as a Science Ambassador of the Year. Stuart regularly organises courses for teachers and pupils from local schools as part of INSET training and open days.

Ms Jill Essam,
Harehope Quarry Project, Frosterley, County Durham

Jill is a founder member of the Harehope Quarry Project and takes the lead on the delivery of field studies, environmental education and education for sustainable development within the organisation. She has extensive experience of field teaching in geography, geology and ecology and has spent five years in mainsteam secondary education. In her role as a rural community decvelopment worker she has continued to work with schools, both primary and secondary, developing and implementing school / community projects with links to the curriculum. Jill has developed environmental education materials for the University of Newcastle and the Open University and contributed articles to many educational journals.

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