# *The Earth's magnetic field*

***To show the shape of the field*** ***D***

***Place a 15cm bar magnet in the centre of an OHP and two thin strips of wood the same thickness as the magnet on the edges. Place an A4 sheet of glass on top. Now sprinkle iron fillings on to the glass and then tap the glass gently. Next place a 15cm diameter circle on top to represent the earth. You can then show how the inclination varies with latitude.***

***Magnetic Dip (inclination)*** ***A P or D 2 min***

***Students work out the approximate angle of magnetic dip where they are using Magnaprobes (available from Griffin Education) A dip needle (from Pasco Scientific) also demonstrates the angle of inclination.***

***Magnetisation of samples*** ***D***

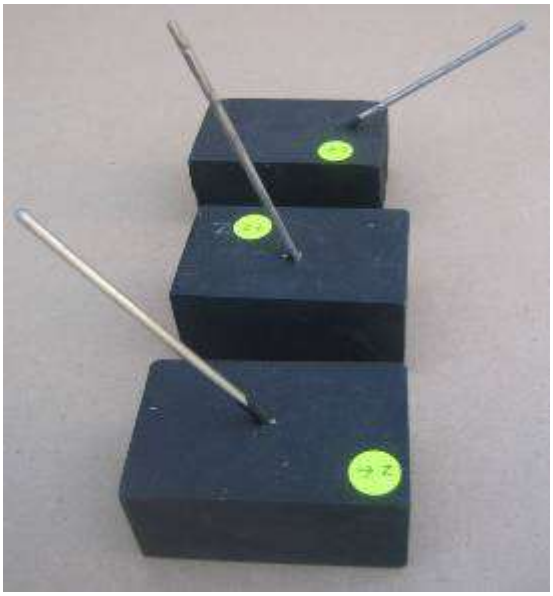
***This is designed to show the inclination of samples collected at different latitudes. Cut a block of wood 15cm by 10cm by 5cm and paint it black to represent basalt. Mark on the block a north arrow. Drill holes through it vertically from top to bottom, horizontally from end to end and at 45° from top to bottom. Imagine you have collected a sample of recent basalt from the equator. Paint a thin rod or needle red for north at one end. Place it horizontally through the block to show the orientation of the magnetic field. Repeat for samples of basalt collected at latitude 35° and at the North Pole.***

***Reversals*** ***D***

***Use the block described above. Place the needle in with North in one direction and then pull it out and replace it with North in the opposite***

*direction emphasising that the poles just change position without swinging round.*

*Working out latitude from magnetic dip* *A P F 30 min*
*The purpose of this activity is to get students to convert magnetic inclination to latitude and to plot this on a map of the world and thus show the changing position of the British Isles. The students are given 10 blocks of wood each representing a piece of basalt or dolerite taken from a different geological period from the British Isles. Each block has a wire which represents the magnetic inclination at that time. Students measure the angle and use a chart to work out the latitude and then plot their data on a map of the world.*



*Variability of the field* *D*
*A 1:50,000 Ordnance Survey map has a diagram showing the direction of the magnetic pole and the true North Pole and the speed of movement of the magnetic pole.*

*Magnetic dip and latitude* *D*
*A circular map of the world is stuck on to thin plywood and a 15cm bar magnet is attached behind it. Plotting compasses or a magnaprobe is used to show the orientation of the magnetic field at different latitudes.*

***To show that basic rocks are magnetic*** **D**

***Coil with 20,000 turns is attached to a microvoltmeter. A piece of dolerite or basalt that will fit is moved into the coil. If it is magnetic it will generate a current, you may need to try several pieces.***

***Idea taken from Keith Moseley***

***Heat and magnetism*** **D**

***To show that iron looses its magnetism when heated make a steel nail magnetic and show that it will pick up pins. Then heat it until red hot. It will no longer pick up pins even when cold provided that the pins themselves are not magnetic. This is used as evidence that the solid part of the core can not be the source of the earth's magnetic field.***

***Origin of the magnetic field*** **D**

***To show how electric currents running in the core can cause the magnetic field and reversals, make a coil from thin coated copper wire wound around a steel bolt. Arrange 12 transparent plotting compasses around the coil on the OHP. Apply 12 volts to the coil and the compasses all become aligned with the magnetic field. If the current direction is changed the polarity of the magnetic field changes and the compasses switch direction.***