Science & Technology Equipment News

For Primary Schools and Teachers of S1/S2 courses

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STS National Support Services in Science, Technology and Safety

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In this issue we poke about in some darker, possibly little visited, corners of the 5-14 Guidelines. These are the bits related to materials and their properties. Such studies may lead on at some secondary stage into areas we might recognise either as the science called chemistry or the technology of materials and their uses. Yet again, I'm afraid - despite understandable criticism from some quarters - there may be as many questions posed as answers provided. Good science, like good teaching, is often much more to do with questions than answers. One of my favourite quotes is that reputed to come from an adult delivering judgement on one well, and fondly, remembered teacher at primary :

"She was my best teacher. She taught me everything I don't know"

Contrast that with Alexander Scott - Professor and Poet - on the worst aspects of "Scotch Education" :

"I tellt ye, I tellt ye"

Apologies to the members of the Science Support Network who already have had large helpings of such stuff!

Understanding Earth and Space

Materials from Earth On planet Earth

Understanding People and Place

Aspects of the physical and the built environment.

Ways in which places have affected people and people have used and affected places

- What materials are used in building the walls of our houses ?
- Why are they used ?
- What materials do some peoples in other lands use to build their houses? Why?
- What changes have taken place in building materials used in Scotland ? (Contrast and compare a modern housing project with traditional ['Scots vernacular'] village or town houses)

Sticks and straw, bricks and stones

The old story of the three little pigs and the big bad wolf offers insights to house building in Europe. Nowadays, we build houses for comfort, to keep out the rain and cold rather than wild animals. But what of those countries or regions of the Earth where there is or was still the possibility of contact with animals much more dangerous than wolves. What type of homes do, or did, some tribal peoples often build in such places? Some have homes in tents, others use leaves and vines, yet others mud huts.

Why do some societies not use more permanent, stronger, materials? (See Figure 1).

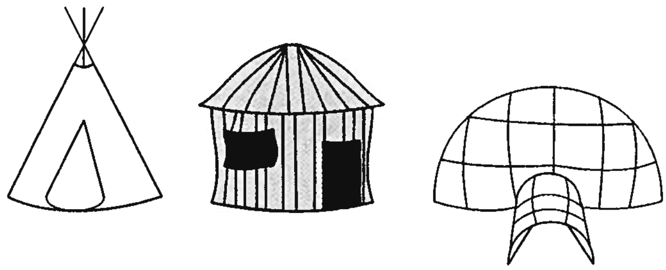

Figure 1 Dwellings of hunter gatherers or nomadic herdspeople

The most common house building materials in Britain are brick, sand and cement. Such materials will be within the ken of most if not all children. But how does the sand from the sand pit help in house building? Where did the sand come from originally? What's in bricks or cement and how are they made?

Why is it when we mix sand with water to build a sand castle it does not retain its shape, yet plaster of Paris powder mixed with water sets into a hard mass?

Stone was once an ubiquitous building material. This is especially true of Scotland where it has gone on being used widely. This has been so, even in the present - now fading - century. When did brick begin to be more common in Scotland and why?

Limestone

Various forms of limestone are found in many parts of Britain although it's not all that common in Scotland. Where it does occur then overlying soils, lochs and lochans, tend to be 'sweeter'. They may well be more fertile than in areas where the rocks are volcanic, such as granite. Why is this?

Limestone is a 'sedimentary' rock made up, in layers, of the shells of creatures that lived many thousands of years ago when much of the land was covered by the sea. As the sea receded, the bodies were compacted and over time the layers of shells formed the harder limestones. Sometimes the stone outcrops at the surface and is then worn by wind and weather into special forms - such as limestone *pavements*.

Where the stone is plentiful, relatively easy to get at and to quarry, it has been much used in building houses or farm buildings. These uses range from rubble or 'dressed' stones in walls to split sections as roof tiles or flagstones.

Although a fairly hard rock, limestone has its weak points. It is affected by acids. There is a simple experiment that can be safely carried out in the classroom to show this effect. Place a small piece of limestone in a saucer and gently allow a few drops of vinegar to land on the surface, the rock will fizz as carbon dioxide is released (the main chemical substance making up the stone being calcium carbonate) . What effect will 'acid' rain have on old limestone buildings?

This could be a time to examine different rocks through a microscope or hand lens and try to guess where they originated.

Uppies an' doonies

Over the past few years scientists have been concerned with the effect acid rain has on crops and forests. But rain has always been slightly acid from the carbon dioxide dissolved within it. The stalagmites and stalactites in limestone caves testify to that. Over many years, the rain falling on outcrops of limestone has found its way through cracks to eat away at the rock. Where there is sufficient space between rock layers a strange phenomenon occurs - the growth of stalactites and stalagmites. This takes place over thousands of years but we can illustrate roughly how these strange shapes are born, over a much shorter time scale. All that is needed is a length of wool, a packet of washing soda (a form of sodium carbonate), two bottles (small soft drink bottles are ideal) and a saucer. See Figure 2.

Dissolve as much of the washing soda as you can, warm water helps (protect your eyes - it's an alkali and quite corrosive - see Section 7 of *Be safe!*). Twist a few strands of wool into a reasonable little 'rope'; dip each end into the solution in the bottles; ensure that the wool rope hangs down between the bottles. Place a saucer beneath the centre of the wool then put the whole assembly in a warm spot. After a few days a wee stalactite and a stalagmite should start to grow. (Note that the chemistry of our demonstration is not quite right, but that's okay at this level).

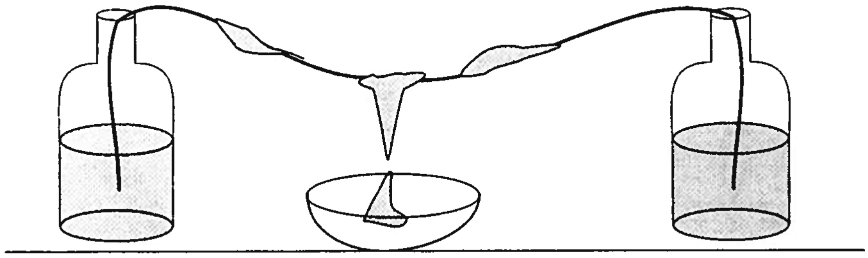

Figure 2 DIY stalagmite and stalactites

Wet footing, dry rot

If rainwater can find its way through rocks on a mountain side what about the bricks in our houses?

Is a brick house better at keeping out damp than one built of sandstone or of wood ? Again a simple experiment may show how water can move in bricks, timber or a piece of sandstone. Figure 3 (below) should be largely self-explanatory. But how can we detect if a material is absorbing water? Which materials do the children think will become damp or allow the water to pass through? One fairly easy method is to weigh the material before placing it in the water, weighing it again after a few hours. Note that it as well to try different kinds of brick. For example, facing bricks and those intended only for internal walls ('commons') may behave differently in their absorption of water.

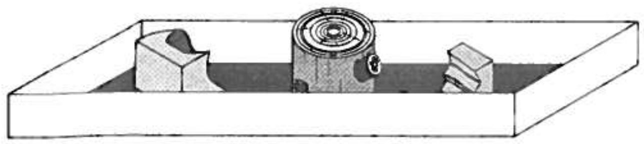

Figure 3 Water absorption - brick, stone and log.

The sketch in Figure 3 is not to scale, but it does show all that is needed - a shallow tray to hold water, a piece of broken common brick a small log of wood and a piece of sandstone. The brick and stone can be had from a builder's merchant, the wood from your own or a pupil's garden. Pieces of brick and sandstone are also materials commonly discarded in the 'secret corners' of many gardens.

Could this dampness come into our homes? If it did then our homes would suffer from rising damp and wet rot in timbers. These can be problems in many older properties. If left unattended, they can lead to that scourge of the home-owner, dry rot. That is another topic - one which will be investigated in a future Newsletter.

Pick the proper course

Why has this rising dampness not afflicted all of our homes (especially this Summer!)? The answer lies in a *damp-proof course* laid between the bricks at the foundation of the building and the start of the first course (row) of the wall proper. What material could we use to put between the rows of brick or stone?

There is a simple experiment to show how a damp-proof course works in our homes. All that is needed is a packet of sugar lumps, an old supermarket plastic bag and a shallow container for water.

Figure 4 below shows what to do. Remember that this investigation should not take long. Indeed if it's left overnight some children may think that bricks dissolve in water. That could then provide opportunities to look at some other substances which do form true solutions.

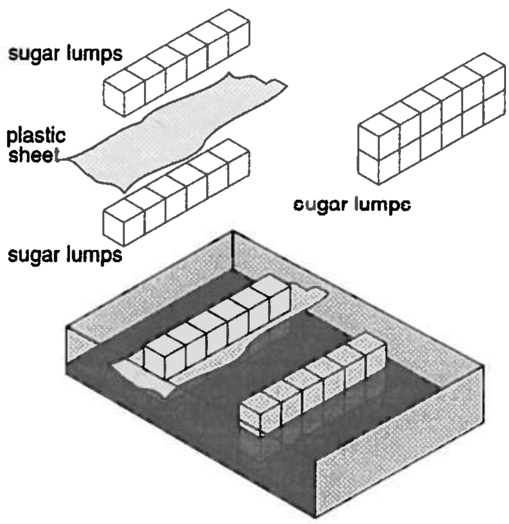

Figure 4 Modelling a damp-proof course

Sand and salt

Our last investigation is on solutions. It is an old favourite but probably one new to many primary children. Again, the apparatus is simple: two egg cups, one filled with sand the other with table salt, and a clear coffee mug or tumbler filled almost to the brim with water (slightly warmed). Key questions to ask :

What do you think will happen when we add the sand? What happens when we add the salt?

Although this is a weel kent demonstration it is still a good idea to try it on your own - if only to discover just how much salt you can dissolve before your cup runneth over. So as to have a fair test etc, try to match the quantities of sand and salt in the egg cups.

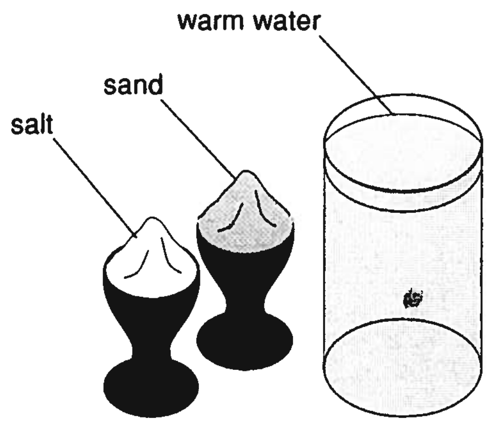

Figure 5 Dissolving and not dissolving

Components & Materials

593 Miniature motor, 1.5V to 3V, 2mm dia. shaft **30p**

614 Miniature motor, 3V to 6V, 2mm dia. shaft. Both motors above can be used for project work but they run at fairly high speeds, some form of gearing will be required. See worm/gear, item 811 **45p**

621 Miniature motor, 1.5V to 3V, now with 8 tooth pinion. The open body of this motor makes it ideal for showing how such a motor is constructed. **25p**

798 Pack of 24 gears, 6 each of 12, 20, 30 or 40 teeth, dia. 15, 22, 32, 40 mm. 12 tooth gear fits motor shaft and 40 tooth gear is push fit in cotton reel **£2.00**

799 Pack of 24 cams, 6 of each of 4 shapes **£1.00**

800 Pack of 100 wheels, 39 mm diameter, assorted colours, 3 mm axle hole **£5.25**

811 Worm and gear, gives a 34 to 1 speed reduction. **35p**

817 Axles 3 mm dia.,nickel plated, round ends. push fit on SSERC plastic wheels, gears and pulleys: 70 mm long, per pack of 4 **40p**

818 As above but 95mm long, pack of 4 **40p**

819 As above but 120mm long, pack of 4 **40p**

820 Worms to fit 2mm electric motor shaft, pack of 5 **£1.00**

821 Reducers 3mm to 2mm enables gears, pulleys and wheels, to be fitted to motor shaft, per 5 **25p**

629 Dual tone buzzer - OUT OF STOCK

710 Sonic switch. Clap your hands, the motor starts, clap again the motor reverses, on the third clap the motor stops. Needs 4 AA cells, not included. **85p**

723 Microswitch miniature, lever operated **40p**

822 Plastic toggle switch, low voltage **40p**

688 Crocodile clips, red, miniature, insulated. **5p**

759 As above but black. **5p**

788 Crocodile leads, assorted colours, insulated croc. clips at ends, 36 cm long. **£1.35**

835 2 x AA Cell ('battery') holder **15p**

845 2 x C Cell ('battery') holder **20p**

789 MES (miniature Edison screw) bulbs 3.5 V. **9p**

691 MES battenholders for above. **20p**

508 LED (light emitting diode) 3 mm, red, per 10. **50p**

761 LED 3 mm, yellow, per 10. **60p**

762 LED 3 mm green, per 10. **60p**

790 3V buzzer. **55p**

846 Sound module with 'melody' chip **£1.00**

838 Solar cell, 100 x 60 mm, 3.75 V per cell, max. **£2.10**

839 Solar motor, body 25 dia.12 mm long with shaft 2 mm dia 6 mm long. **£1.70**

840 Solar pack : one of each solar cell, solar motor propeller (801), and 3 V buzzer - with notes. **£3.75**

836 Motor mounts, plastic, push-fit with self adhesive base pad for SSERC motors 593 & 614,10pk **£1.95p**

801 Propeller, 3 blade, to fit 2 mm shaft. Blade 62 mm long **35p**

792 Propeller kit with hub and blades for ten 3 or 2 bladed propellers. **£3.50**

794 Cotton reels (for making buggies, rubber powered tanks etc.) pack of 20. **75p**

796 Pack of 20 pulleys, 5 of each of 10, 20, 30 and 40 mm diameters. **£2.50**

837 Ring magnet, 40 mm o.d., 22 mm i.d. **35p**

815 Ceramic square magnet, 19 x 19 x 5 mm **15p**

824 Ceramic magnets, poles on face, 25x19x6mm **35p**

823 Ceramic magnets, poles at ends, 10x6x22mm **12p**

825 Forehead temperature strips, liquid-crystal type, 36-40°C (96-104°F), [store in cool cupboard] **50p**

833 Floppy disks, 5 1/4" double density, box of ten **60p**

834 As above but double sided high density, ten **60p**

Cash with order only when total value is less than £5 and please add £1 for carriage solely to these small orders (except where an inclusive price is indicated eg kits, etc). For orders totalling more than £5 please do not send payment etc but await delivery and then pay on our advice note or invoice.

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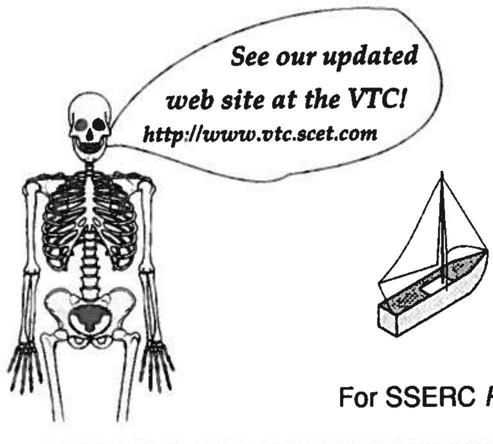
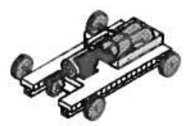
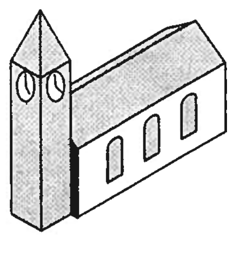


Buggy pack £5 and *Paper Engineering pack* £2. See News No. 10. S*olar cell and motor pack* - see Item 840 in the listing above. Copyright free *Skeleton template* £1.25. For two new kits - see Science & Technology News 15.



Watch out for Issue No.17 (Winter 1998/99) and wide-ranging reviews of resources for 5-14 Science!



For SSERC *Primary Graphics* - see News No. 13.