

Science & Technology Equipment News

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STS National Support Services in
Science, Technology and Safety

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SCOTTISH SCHOOLS EQUIPMENT RESEARCH CENTRE

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This Newsletter continues our look, begun in issue 12, at various sources and forms of energy. 'Energy' is very much an abstract concept and not concrete i.e. it is not "a thing". There are even those that argue that it has no place in 5-14 Environmental Studies! It is understandably one aspect of the 5-14 Guidelines which may cause no little concern to both primary and secondary teachers alike. What we hope to show here is that there is no need to get bogged down - especially not in the semantics. Nor should we be too concerned to define 'energy'. The children should instead be encouraged to both test and then develop their own implicit understanding of just one or two big ideas. For example that energy is associated with work. It cannot be created or destroyed (usually, but of course Uncle Albert - Einstein - had other big ideas). It can only be transformed (changed from one kind to another). The ideas for inexpensive practical activities and investigations which are merely outlined below, should provide ample scope to explore these ideas in enjoyable, yet meaningful, ways.

Buzz-off!

Our first couple of suggested activities use solar cells. Solar cells are fairly topical because of recent publicity surrounding the *Mir* space station. In the first activity all that is needed to add to a solar cell is a 3V buzzer (see Items, 838, 839, 840 and 790 back page and Figure 1, below).

The system will work and the buzzer made to sound on any fairly bright day - it doesn't require direct sunlight. Could we make some kind of a burglar alarm using this system? Would the cell provide a suitable output when lit by an electric light bulb? Tip - it won't under a fluorescent tube but try ordinary, tungsten filament lamps (eg 60, 100 or 150 W - take care - the higher powered lamps may get very hot an observation which - depending on the age of the pupils - may itself raise other interesting questions).

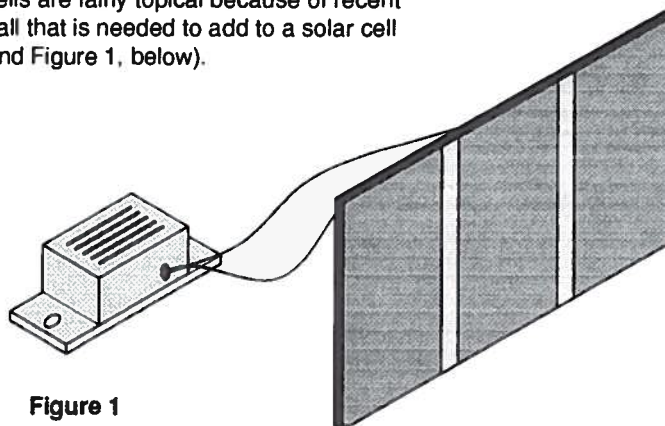


Figure 1

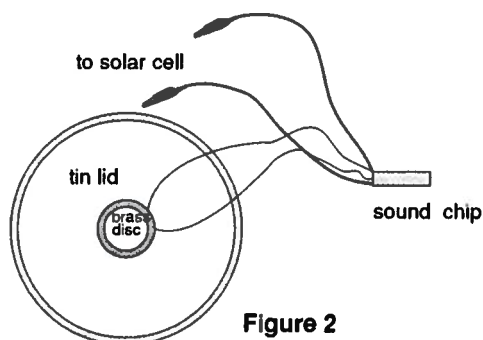


Figure 2

The second activity converts solar or light energy into sound in a slightly more sophisticated way (Figure 2 opposite). This investigation needs somewhat more complex components and makes use of a sound module. This was first described by us in Newsletter 4, Winter 1994. Again like the simple buzzer, this can be driven by a single solar cell. Of course the sound will not fill the classroom. Some form of amplification is needed. No doubt your intrepid investigators will ask about building an amplifier and the use of *Hi-Fi* speakers. However, the simpler approach of sticking a sound module to the bottom of a tin can will amplify the sound somewhat. On second thoughts, perhaps they should be encouraged to look for other ways to enhance (?) the music.

Our *sound module* (Item 846) is supplied ready to use. In essence it is a miniature integrated circuit capable of playing notes in sequences or tunes (a *Music Chip*). Providing that it has a suitable power source it can cause a small brass disc to vibrate and thus play you a tune. The sketch above (Figure 2) shows the brass disc taped to the lid of a catering size coffee tin. This amplifies the vibrations and thus increases the sound level. It works quite well, but note the difference when the disc is taped to the bottom of a tin. Because the system is so portable, the children can try many different surfaces to help amplify the sound. N.B. To restart the module once a tune has been played, it is necessary to first switch off then switch on again. This can be done by removing the red lead from the cell, then replacing it. Perhaps a proper 'on-off' switch could be incorporated into the circuit. This idea of a circuit should be apparent to pupils who have been exposed to lessons in simple electricity. The solar cell in this instance takes the place of a battery as an energy source (again, see Newsletter 4).

If sound has been discussed before with the class, they may be aware that it travels more easily through a solid medium than through air. This being so, does pressing the module disc against their table increase the volume? Is wood a better sound carrier than metal? Does sound travel through a liquid? If these ideas have not already been met with, such questions may begin interesting investigations into *Forms and Sources of Energy*.

Sound off!

Before the invention of the telephone, messages were often transmitted by direct sounds. Examples are provided by drums, speaking tubes on ships, yodelling in the Alps, and even the dreaded megaphone.

The film *Crocodile Dundee* provided one really interesting such method - remember the 'stick with a hole on a string thing' with which the hero summoned help from his mates? How does that work (whatever it's called) and how might we make, and use, such a device safely?

Some other simple, and possibly well known, ideas for design and make type practical activities are sketched out in Figures 3 and 4 (opposite and below).

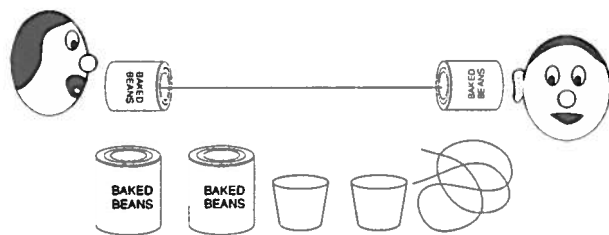


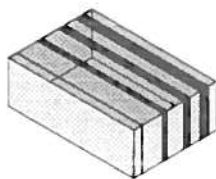
Figure 3 BT (bean tin) telephone

Figure 4 DIY orchestra

Left to right : rubber band guitar
single string instrument
bottle xylophone

What first 'makes' the sound?

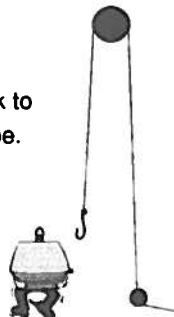
How do you think it travels?



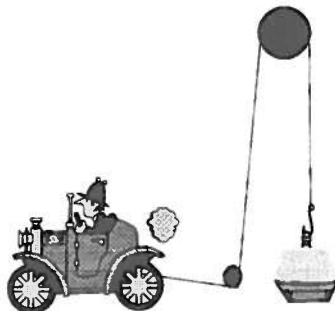
Hot stuff

Heat as a form of energy will be evident to most children from a fire or cooker. But more mundane examples can be found in a torch bulb, a saw blade after sawing wood or metal, a nail head after hitting it with a hammer. Or, how about just rubbing your hands together? The following sketches may appear to have nothing to do with heat - but is this so? They are deliberate caricatures, and thus not everyday examples but they should stimulate questioning along the lines of "Where does the energy come from for the kinds of work depicted?" "Where does it go - all into 'useful' work or does some of it get 'wasted'?". If the whole sequence or just each part were copied (enlarged x2) on to flashcards the pupils can play an energy conversion game.

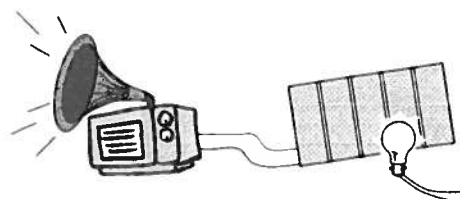
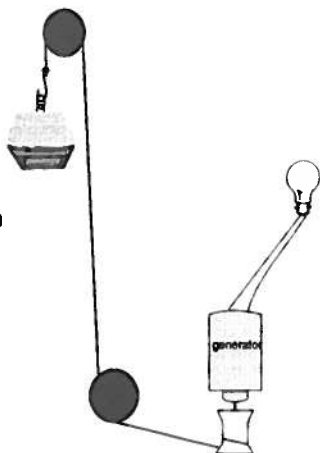
a) A man carries a rock to hook on a pulley rope.



b) He ties the rope to his car and drives forward to lift the rock up to the pulley wheel



c) The rock is allowed to fall and turn another pulley on a generator whose output lights up a bulb.



d) Light from the bulb falls on solar cells and the electricity produced powers a transistor radio.

News and Resources

AMFES extension

"AMFES" stands for "A Microscope For Every School" an initiative of the Royal Microscopical Society (RMS) first reported on in these columns in "News" number 11 (Spring '97). A recent letter from the Society informed us that there are now four RMS-approved models of microscope (see below) and that subject to the availability of funds the Society will now give £20 refunds on up to two instruments per school. The new list of approved models and selected suppliers is as follows:

- ✓ Motic MS-2 from Heron, Hogg, NES Arnold, Primary Learning and Pysers-SGI;
- ✓ Junior Monoscope from Philip Harris;
- ✓ Junior Microscope from Ravencourt, TTS;
- ✓ Zenith PM-1 from e.g. GLS Fairway, Hogg, Optical Vision Ltd. (formerly Technical Optical Equipment).

Base prices before the RMS refund do vary between suppliers so if you are not tied by any purchasing contract then it will pay to shop around. A more detailed list of suppliers, order codes and telephone numbers is available either from us or from the Educational Co-ordinator of the RMS (see below) who is also the person to whom you should send your invoice after purchase. The RMS also offers INSET courses for primary teachers on the educational use of optical microscopes for a number of interesting investigations. Information on these RMS courses is available from :

Dr Juliet Dyson,
RMS Education Co-ordinator,
Moor Gate Farm, Nethergong,
Holmfirth, Huddersfield,
HD7 2UP Tel. 01484 687525

"Be safe!"

It has come to our attention that many teachers of 5-14 Environmental Studies remain unaware of the Scottish Edition of that excellent little Association for Science Education (ASE) publication *Be safe!* The Scottish edition is subtitled (none too pithily):

"Some aspects of health and safety in the Scottish Curriculum Environmental Studies 5-14."

Most of the 12 predecessors to the current Councils purchased the Scottish *Be safe!* in bulk, distributing at least one 'free' copy to each of its primary schools. Unfortunately some did so without any covering letter as to the nature and purpose of that distribution. *Be safe!* is a source of results of general or model risk assessments for primary science and technology. As such, it is meant to be a working document and not one to be just filed away for use as an occasional reference (if that).

It has now emerged in a number of areas that copies have been mislaid or lost or have by other means apparently vaporised. We know that some Councils intend this session to run staff development sessions based on *Be safe!* In some cases the course materials will include a copy of the Scottish edition. Those not involved in such arrangements might like to know that we still have adequate stocks at £4 per copy for 1-5 copies and £3-75 for 6 or more. We can also offer training courses where there is no direct EA provision.

Be even safer!

There is more to health and safety in 5-14 Environmental Studies than teaching safely. It is also possible to use the course to teach *about* health and safety. It is even more than feasible sometimes to teach science and technology *through* health and safety. Careful examination of the National Guidelines will reveal opportunities to adopt all three of these approaches. Such, more integrated, learning and teaching strategies for health and safety are far more common in other EU countries.

Like our sister organisation south of the border (CLEAPSS School Science Service) recently we have been getting more enquiries as to suitable resources for teaching about hazards and risks, not only in science and technology but as relevant to the everyday lives of pupils. We know of some, such as the products of SAFE (the Safety Association for Education) at Greenwich, the Fire Safety videos produced by the Durham brigade and others, risk assessment material for pupils from one English EA, and some relevant ASE materials. There are also some materials now appearing from the mainstream commercial suppliers. We would be pleased to hear from readers - teachers especially - who may have come across, or developed themselves, such learning and teaching materials. If there proves to be sufficient interest we can then publish a list.

Odds and ends

We end with something of a rag-bag (but a trustfully useful one) of news and announcements etc. Firstly, one for the '98 diary - *ASE Scotland Annual Meeting, Irvine, 6-8th March.*

SSERC/STS Resources : In addition to the varied selection of components and materials listed overleaf we still have a number of earlier packs, kits and plans available. Please look back over earlier editions (issue numbers given in square brackets thus []) of *The News* for details and prices of our : *Sundial, nocturnal and solar system masters* [6&7]; *Skeleton* [9]; *Paper Engineering and Buggy Packs* [10].

SSERC/STS In-service : Training in the application of the ASE *Be safe!* booklet (opposite column) is not the only staff development we can offer. Hands-on training can also be made available in any practical aspect of 5-14 science and technology. For details of what is on offer and of our charges (which will often include resources) please contact *Ian Buchanan, Senior Associate, here at STS Support Services.*

'Royal' Resources : Two third party sources, of useful materials and support for 5-14 science, well worth knowing about are *The Royal Observatory* (for some nice stuff on Earth & Space) and *The Royal Botanic Garden* - both located here in Edinburgh (the first at Blackford Hill, EH9 and the second at 20a Inverleith Row, EH3 5LR).

Exploring Space : Dr James More (PT Physics, Glenwood High in Fife) has put together a set of 30 slides of the solar system and beyond with notes for teachers. This will shortly become available from the *Armagh Planetarium, Armagh, BT61 9DB. Tel. (44) 01861 524725* (price to be announced).

'Rude mechanicals' : The more cultured souls out there will recognise the name of this "crew of patches" as a quotation (name that Shakespeare play!). This new Borders outfit is a source of interesting kits, materials and practical INSET for primary technology : *Rude Mechanicals**, *The Schoolhouse, Morebattle, Kelso, TD5 8QG. Tel/fax : 01573 440 537.*

Components & Materials

- | | |
|---|--|
| <p>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</p> <p>621 Miniature motor, 1.5V to 3V, <u>now with 8 tooth pinion</u>. The open body of this motor makes it ideal for showing how such a motor is constructed. 25p</p> <p>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</p> <p>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 12mm long, pack of 4 40p</p> <p>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 with flashing light supplied with PP3 battery clip. Ideal for model burglar alarms, warning barriers, police car etc. 55p</p> <p>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</p> | <p>788 Crocodile leads, assorted colours, insulated croc. clips at ends, 36 cm long. £1.35</p> <p>835 2 x AA Cell ('battery') holder 15p
 845 2 x C Cell ('battery') holder 20p</p> <p>789 MES (miniature Edison screw) bulbs 3.5 V. 9p
 691 MES battenholders for above. 20p</p> <p>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</p> <p>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</p> <p>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</p> <p>794 Cotton reels (for making buggies, rubber powered tanks etc.) pack of 20. 75p</p> <p>796 Pack of 20 pulleys, 5 of each of 10, 20, 30 and 40 mm diameters. £2.50</p> <p>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, 10 x 6 x 22mm 12p
 825 Forehead temperature strips, liquid-crystal type, 36-40°C (96-104°F), [store in cool cupboard] 50p</p> |
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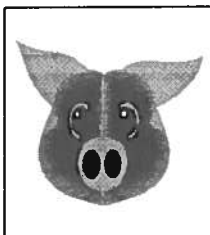
Cash with order only when total value is less than £5 and please add £1 for carriage solely to these small orders (except where an inclusive price is indicated eg kits, etc). For orders totalling more than £5 please do not send payment etc but await delivery and then pay on our advice note or invoice.

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