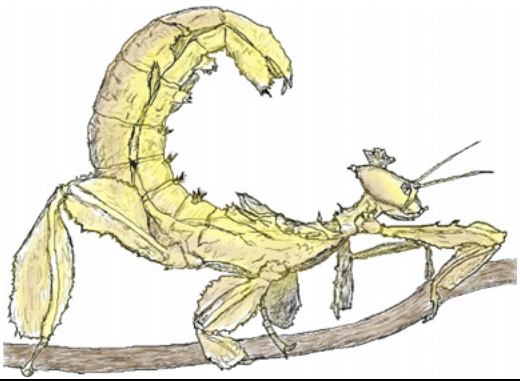
NEWSLETTER

Primary Science and Technology

Support for Science & Technology Coordinators FREE to members

In this issue:



CLEAPSS

School Science Service number 25 spring 2003

NEWSLETTER

Calling the Helpline

Plants in the school grounds

Q. *The National Curriculum asks children to 'find out about different kinds of plants and animals in the local environment'. Our playground is just tarmac and the nearest countryside is a bus ride away! How can we be expected to teach our children about the environment?*

A. We understand the problem - but first, it is worth taking a closer look at your school site. Although it might seem that school buildings and playgrounds are barren places devoid of wildlife, a number of plants will usually be found colonising them. Some plants and animals are amazingly tough and will invade any nook or crevice on buildings in the same way that they colonise cliffs and rock platforms. These colonisers are very interesting because they are adapted to survive some very testing conditions.

Another call to our ***Helpline*** and our response.

Both natural cliffs and buildings:

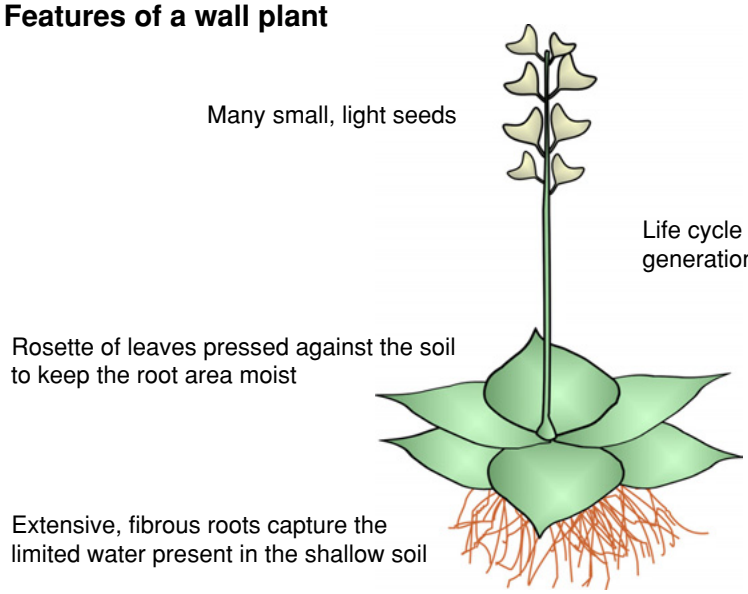
- dry out very quickly after rain,
- have very shallow soil for plants to root in, and any that does exist is easily washed or blown away,
- are exposed to the full force of the wind and high light levels,
- may be quite alkaline if they contain lime in the soil, mortar or concrete,
- are often quite a distance from other environments.

Crevices in natural and constructed rock platforms share many of these problems, although they may have more soil and less exposure to wind and high light levels.

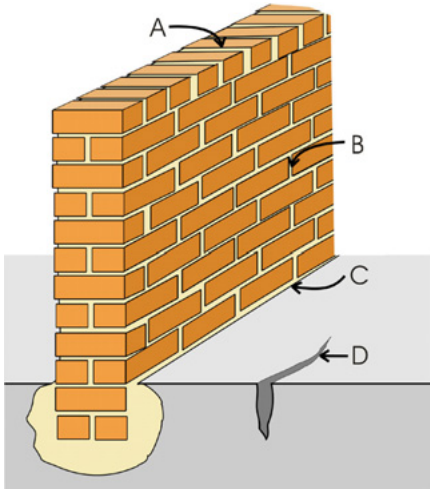
Plants found on buildings will therefore:

- have small or light seeds to enable them to be carried on the wind or by birds,
- produce huge numbers of seeds to compensate for the low chances of survival,
- germinate, grow, flower and set seed very quickly, while conditions are good,
- have shallow (fibrous) roots that make best use of what little soil there is,
- have ways of reducing water loss or surviving drought, for example, by having a rosette of leaves.

Features of a wall plant



Even on a single wall, different plants may colonise different places.



A. Dry, exposed but holds a little water - likely to be colonised first by lichens (organisms that combine the characteristics of fungi and algae) and mosses.

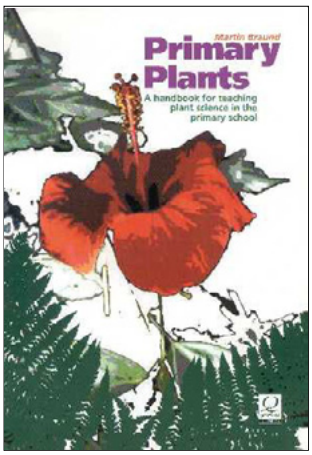
B. Very dry and exposed - only lichens survive at first. If the mortar is eventually broken down by the action of frost and wind, larger plants, including some ferns and flowering plants, begin to colonise the resulting gaps.

C. Often moist enough for quite large plants to survive, eg, Willow herb, Fat hen and Shepherd's purse.

D. Crevices may support similar types of plants as in C but can hold more water.

It is not necessary to identify the plants that you find (although a picture key such as *The Concise British Flora in Colour* [Keble Martin, 1965, Ebury Press and Michael Joseph] will be a big help). It is more important to see how plants manage to reach and survive these difficult conditions. If a tub of topsoil is left undisturbed for some time, a comparison can be made between the plants that grow there and those that are found on walls and buildings. So perhaps there are more opportunities for environmental work around your school than you think?

Book Review



Since few adults seem to find plants exciting, it is not surprising that teachers have difficulty in making the subject interesting for their pupils. This book is intended to remedy this by providing broad background information about the life of plants. It also includes numerous teaching ideas, suggestions for cross-curriculum links and a number of photocopiable pupil worksheets. Although there is little that cannot be found elsewhere, this blend of factual information, ideas for practical work and teaching suggestions (complete with National Curriculum and QCA cross-referencing) make this book worthy of consideration for inclusion in the staff room library.

The text is illustrated by line diagrams and black & white pictures, supplemented by a CD-ROM containing more than 200 colour photographs. Although this collection has the potential of being a useful classroom resource, the editing and file compression applied to the images greatly reduces their value. Nevertheless, if you are struggling to find information and ideas about plants for use in the classroom, this book could prove useful.

Primary Plants
Martin Braund
ISBN 1-84190-038-9
168 page book and a CD-ROM;
£22.99 + £3.00 post & packing

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Measuring the Speed of Sound

The article on sound & hearing in the last PST prompted a teacher and his class to investigate how they could measure the speed of sound. Here is an edited version of the article that they sent in. Congratulations to class 5S and Marcelo Staricoff of Westbury Park School in Bristol!

"We have just received the latest copy of the CLEAPSS newsletter and we were very interested to read your double-page spread on sound. We are a Year 5 class in Bristol, Westbury Park School, and have been studying sound since September.

We had quite an unusual lesson to finish the topic off! This is what happened…

Our teacher, Mr Staricoff [Mr S.], announced that he wanted to try out an idea, even though he had never tried it before, had no idea if it was possible to do, or knew what the outcome would be! As he was a scientist in a previous life we thought that it was worth listening to him for a bit longer.

To our amazement he announced his intention - for ***us*** to *measure* the speed of sound!!! All we knew about the speed of sound was that it travelled at about 340 metres per second. Trying to measure it seemed a bit optimistic, but who were we to argue; we were hooked and set about planning our investigation.

We quizzed Mr S. and managed to extract some hints of how we might tackle this seemingly impossible task. In small groups, we designed our own versions and created a poster of our ideas. We then presented our ideas to the rest of the class, which helped us to come up with an agreed plan of action, which we carried out...

- Mr S. reset two stopwatches and started them at **exactly** the same time. He gave one each to children A and B.
- We then measured the furthest distance we could in our school, using a trundle wheel. This was 114 metres. Children A and B were positioned, with their stopwatches still running, at either end of this measured distance.

- Mr S. joined child A and blew a whistle loudly.
- Child A and B both stopped their watches when **they** heard the sound.
- We returned to the classroom feeling a huge sense of excitement and anticipation. Would there be a difference between the two times?

Our Results

To our total amazement we found that there was a difference between the two stopwatch readings!!! A quick subtraction showed that this was 1.04 seconds.

But what did all this mean? It was time to do some more maths…

As the speed of sound is thought to be around 340 metres per second, Mr S. asked us to calculate how long it would take for sound to travel 114 metres. We knew it would be about one third of a second, but in our groups we calculated it accurately.

340 metres in one second;
114 metres in ? seconds;

$$? = \frac{114}{340}$$

? = 0.34 of a second to two decimal places.

The expected time and our measured time were so close, only 0.7 of a second difference [1.04 - 0.34], we could hardly believe it! We were amazed; we had come so close to the real thing! We started to discuss the meaning of all we had done, but were not expecting Mr S's next question: **Why were we 0.7 of a second out?**

As a whole class, we came up with some ideas, in what turned out to be quite an interesting philosophical discussion.

- The stopwatches may not have been started at **exactly** the same time.
- The sound waves may have been blocked by buildings and trees in the way.
- The experiment relied on child A and B's hearing. We should repeat it with other children, which would also help to obtain an average and more scientifically valid data.
- The length of the whistle sound could be another variable to investigate.
- The real measurement of the speed of sound must have used very accurate instruments.

We really enjoyed ourselves and felt that we had experienced a little bit of real science. We went home very excited, with a great sense of achievement. We thoroughly recommend the whole thing and we would really like to hear how other schools' tests turn out! Are there any other ways of doing the measurement?"

From a teacher's point of view, it was probably the most rewarding science I have ever experienced. Working all together towards a common goal, overcoming problems as we went along and achieving a result that made so much sense was fantastic. The investigation has now become a regular topic of conversation amongst children, parents and our link scientist; as a school we have formed a link with a working scientist from the University of Bristol, organised through the Clifton Scientific Trust. We plan to invite him to share and contribute when we use different children to repeat our measurements. We also need to think of something equally exciting for our next topic 'Gases Around Us' - any ideas?

Mr Staricoff and pupils of 5S

We might quibble that, in presenting the results, it would have been better to calculate the actual speed of sound measured by the pupils (110 metres per second) - not quite as close to the 'real thing' as the pupils thought! Nevertheless, we are impressed by the work carried out.

We list below all the comments that class 5S pupils made about their investigation. We hope that the science activities in other schools also have such a positive effect! We'd love to hear about them.

- I never thought we could do such a thing, let alone do real science. [Jack]
- It was very exciting, much better than any old science lesson. [Joe]
- It was the best thing in school. [Alex]
- It was so interesting. I never thought it was possible. [Dudley]
- WOW! [Angel]
- I thought it was fun and amazing. [Alice]
- It was great doing it as a whole class. [Richard]
- It was absolutely amazing and we came quite close. This was real science. [James]
- I never thought we could measure something so big - science is really cool. [Chris]
- Everyone in the class was so excited when we worked out the result. [Lewis]
- I was surprised when I heard what we would do, but it turned out so well. [Rachel]
- I was excited when Mr S. announced it. [Lily]
- It was great fun to do. [Ella]
- It was great, it felt so good doing real science, great fun too. I really wanted to be a scientist, but now I want to even more. [Vinothan]
- It was such a fun day - I can't wait to try it again. [Sarah]
- I have always wanted to be a scientist and now I know what it is like, it is brilliant. [Louis]
- The experiment was absolutely amazing. I came home as a scientist. Thank you. [Larry]
- It was very interesting to do real science, at first I was very surprised. It was amazing we were less than a second out! [Michael]
- I thought it was a really good day; at home my Mum and Dad didn't believe me. [Georgia]
- I thought the calculations were amazing - it couldn't get better than this, it was so amazing. I felt really proud of our class. [Paloma]
- I can't wait until we do something as amazing as that again - I don't think we'll beat the excitement. [Bianca]
- I thought the day was great because we had a different experience and we did a proper experiment which they don't even do on TV. I never thought we would manage to measure the speed of sound, but we did. [Tom]
- We first thought Mr S. had brain damage, but at the end I went home and felt so proud of myself as a scientist - it was fun, the best day yet. [Kate]
- It was very exciting measuring the speed of sound because children hardly get the opportunity. [Matt]
- The afternoon was very different and I thought I was very lucky because most people wouldn't be able to do this. It was amazing. [Georgie]
- It was great fun. I thought it wouldn't work but it turned out so well. [Rosie]
- I never thought that we would be able to measure the speed of sound especially not at Primary school. [Rachael]
- I never thought we could measure it - the day could not have been better. I think I would like to be a real scientist. It was very exciting to be doing real science. [Natasha]

Let's make music!

In this (and the next) *PST*, we provide suggestions for yet more d-i-y constructions to help in teaching aspects of Sc4 Physical Processes: *Light and sound*.

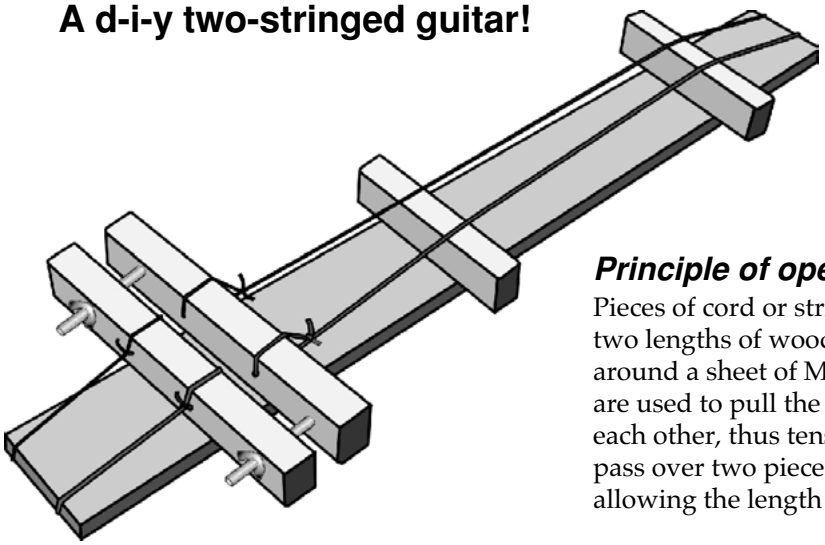
The National Curriculum for Key Stage 2 states that pupils should be taught: "that sounds are made when objects vibrate...; how to change the pitch and loudness of sounds...".

Musical instruments are very rewarding for children to investigate. D-i-y versions are cheap and simple and enable the effect of different variables on the pitch, volume and tone of musical notes to be studied without expensive accidents.

Stringed instruments

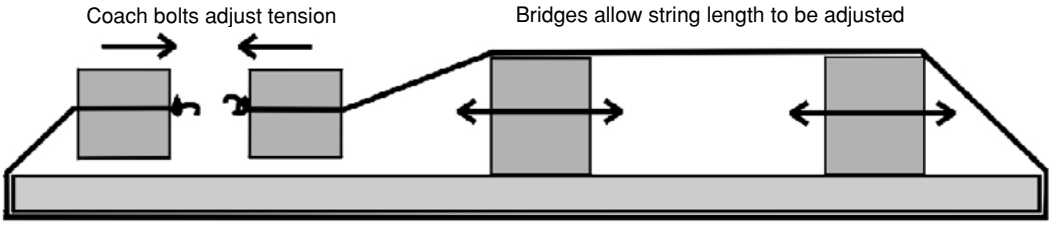
There are many designs for a simple, stringed instrument. The major problem is that strings need to be under tension if they are to produce a clear note - something that is not easy to achieve safely. Here are instructions for a version that addresses this difficulty.

A d-i-y two-stringed guitar!



Principle of operation

Pieces of cord or string are tied at their ends to two lengths of wood. The strings are wrapped around a sheet of MDF or plywood. Coach bolts are used to pull the two pieces of wood towards each other, thus tensioning the strings. The strings pass over two pieces of wood that act as bridges, allowing the length of plucked string to be varied.



Materials required

For the base

- A piece of MDF or plywood at least 500 mm long, 50 mm wide and 10 mm thick.

For the tensioner

- 2 coach (or carriage) bolts complete with wing nuts and washers. Bolts 75 mm long and 5 mm diameter work well, but thicker types are equally satisfactory. These bolts are widely available from d-i-y stores.
- 2 pieces of timber, each at least 60 mm longer than the width of the base. The exact cross section is not critical, but should be between 15 mm x 15 mm and 20 mm x 30 mm (it need not be square!).

For the bridges

- 2 pieces of timber, each at least as long as the width of the base. One dimension of the cross section must be 5-10 mm greater than that of the tensioner bars.

For the strings

- Strong cords of different diameters, such as nylon fishing line or baler twine, long enough to pass completely round the baseboard with 100 mm to spare.

Method of construction

- Clamp the two pieces of tensioner wood together and drill holes as shown below.

The holes marked 'A' must be large enough to ensure that the carriage bolts fit loosely. The holes marked 'B' are for the strings to pass through.

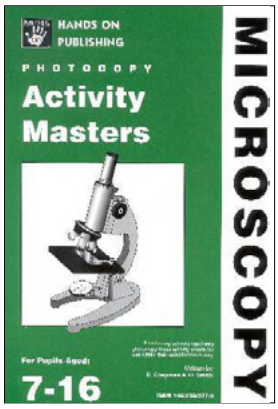
- Push the carriage bolts through the 'A' holes, fit a washer over each one and engage the wing nuts *very loosely*.
- Thread the end of a string through one of the 'B' holes in one of the tensioner bars and tie it securely. Repeat with the other string.
- Place the tensioner and strings in position on and around the base board (as illustrated).
- Thread the other end of each string through the 'B' holes in the second tensioner bar and pull them tight before tying them securely in place.
- Insert the bridges and tighten the nuts on the bolts until the plucked strings emit clear notes.

Using the instrument

Use the 'string stretcher' to study the effect of altering the length of a plucked string, its tension, the material from which it is made and the force used to pluck it. It is possible to feel the vibrations in a plucked string or a small piece of paper, folded over a string, may be shaken off when the string is plucked. The baseboard can be placed on different surfaces (floors, cupboards, walls, boxes etc) in order to investigate their effect on the notes produced. The strings can be tensioned so that they resonate in sympathy with notes, such as those made by a tuning fork.

Microscopy Warning!

Primary schools may have a copy of *Microscopy Photocopy Activity Masters*, from Hands-On Publishing. Some suppliers gave copies away with inexpensive microscopes. Although the materials state that they are for use with pupils aged 7-16, we feel that several of the activities are more suited for work in secondary schools.

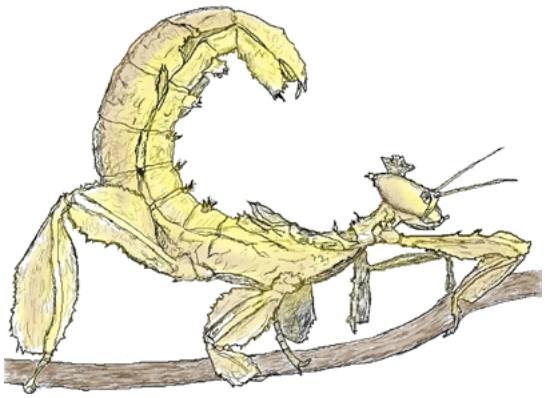


Note, however, that Investigation 4, *Examining Bacteria*, is downright dangerous (*and* unworkable with the microscopes in primary schools)! We cannot imagine teachers wishing to carry out the activity as described (allowing meat to rot in water to produce a bacterial broth!) but anyone tempted to have a go would be well advised to think again.

Hands-On Publishing will supply an addendum sheet to any school that contacts them (Tel: 01732 773399).

NEW GUIDES N ES NEW GUIDE UIDES NEW GU

Our latest publication to help schools keep and study various types of animals is L227, *Stick Insects*.



This provides background information about these fascinating insects and tells teachers how to look after a number of the species that are quite easily kept in schools. Information is included about sources of supply, suggestions for activities to perform with the animals, and details of various resources including books and a video. Warnings are also given about the types of stick insects that may nip or scratch unwary fingers!

FREE GUIDES

If you need help with items ***not*** covered by an existing guide, please call our ***Helpline*** (see below for our contact details). We can give you up-to-date information on equipment, animals & plants, dataloggers and all other resources for primary science and technology.

New item

L5p Safe use of household and other chemicals Substances for use by pupils and by teachers only. Safety advice and ideas. 9/99

L18 Glues and Adhesives Guidance on what to use. 5/00

L24b Microscopes and magnifiers for years 3 to 7 A range from viewers to 'real' microscopes; beware unsuitable 'bargains'. 9/98

L42 Plants for classrooms Robust and useful plants for the classroom and species to study in the school grounds. 3/89

L46 Storage for primary science Information on shelving, trolleys, stacking boxes etc. 9/93

L52 Small mammals All you need to know to keep small mammals safely and humanely. 4/94

L71 Incubating & Hatching Eggs A complete guide to this exciting work. 3/97

L86p Electrical safety All you need to know about electricity and its use in primary schools. 9/95

L110 Materials & Components for Technology What to buy and the best sources. 3/97

L112 Batteries and L-Vunits Using batteries safely, disposable *vs* rechargeable types or low-voltage units. 07/01

L120p Earth science: Key Stages 1&2 Gives information, resources and ideas for activities. 12/92

L122p Simple electric circuits with bulbs and batteries What you need and how to connect components in various ways. 4/96

L123 Teaching weather at Key Stages 1 & 2 Information on equipment and learning materials for teaching this topic. 4/94

L124 Aquaria in primary schools: electrical safety Guidance to ensure a safe set-up. 1/99

L127 Starting photography An introduction to photograms, blueprints & pinhole cameras. 4/96

L157p Measuring temperature Buying and using all types for practical activities. 07/01

L161 Magnets for primary schools Information, ideas for practical work & details of sources. 4/95

L173 Construction kits Over 180 products; relative sizes of models, what to buy for different pupil age ranges and various tasks. 5/93

L181 Cold water aquaria Safety, setting up, maintenance, feeding and sources, for tadpoles, other amphibians and gold fish. 10/90

L190 Studying microorganisms in primary schools Which microbes to use, safe & exciting investigations, general information. 5/97

L197 Giant African land snails Where to obtain them, how to keep them and what to observe. 3/92

L198 Earth in space Ideas on teaching this topic practically. Also sources of equipment. 7/99

L201 Giant millipedes Where to buy and how to look after these unusual animals. 12/92

L203 Control Technology Advice and equipment. 10/93

L204 Science for primary-aged pupils with motor difficulties Information to help in teaching these pupils in normal classrooms. 5/94

L206 Tadpoles Rearing tadpoles of frogs and toads to adults to ensure a high success rate. 9/94

L213 Science with minibeasts: Snails Information and ideas for practical activities. 9/95

L216p Inspecting Safety in Science: a guide for Ofsted inspectors in primary schools Helps you challenge unwarranted demands by an Ofsted inspector ! 9/96

L221 Developing & using environmental areas Help with creating wildlife areas in school grounds and then using them. 12/98

L224 Model health & safety policy in primary science A model for schools to customise that provides guidance on health & safety, including risk assessment. 12/98

L226 Carnivorous plants How to grow and investigate these fascinating plants. 11/01

L227 Stick Insects Guidance on keeping and using these fascinating animals. New; see page 7

PS18 Science policies for primary schools A short guidance note on their production, including a model policy for adapting. 9/96

PS22 Health & Safety in Primary Science & Technology A leaflet discussing essential aspects of health & safety, aimed at new or trainee teachers. 8/01

PS55 Bringing pets & other animals into schools. Guidance on all the issues to consider. 4/02

PS60 Datalogging & control equipment for primary schools. What's available and what to buy. 11/02

E230 Circ-Kit *Download this file from our web site* to help in teaching about electrical circuits. 3/02

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If you would like publications to be sent electronically, e-mail your request and indicate that you would prefer this format. If you do e-mail us, **please include the name and post code of your school** so that we can check your membership.

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