A resource book of activities and information for Science Week 1996

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Science for a better world

A resource book for Science Week 1996

Science for a better world is a resource book of activities and information published by the Australian Science Teachers Association (ASTA). It is designed for teachers and students and provides many terrific activities for use at school and at home. The book can be used during Science Week and throughout the year.

Science Week is an initiative of ASTA, first held in 1985 and run every year since. It aims to focus community attention on science and its importance in the school curriculum, to promote the image of science, to involve students at all levels of schooling, parents, scientists and the rest of the community in a broad range of science-related activities and to promote science as being enjoyable.

The twelfth annual Science Week is from 19 to 23 August 1996. ASTA hopes that teachers will be able to organise a celebration of science during Science Week and that this book will provide useful ideas for the theme - *Science for a better world.*

As well as providing the resource book, ASTA has a Science Week Coordinator in each State and Territory who organises activities and events during Science Week. If you would like more information or would like to help out with organising things in your State/Territory please contact your Science Week Coordinator who is listed on the back of the pull-out Resource List in the centre of this book.

Science Week is one of many programs which ASTA organises to enrich school science education opportunities for teachers in primary and secondary schools and for students. If you would like to find out more about these please contact ASTA or your State/Territory Science Teachers' Association. A free copy of this resource book is one of the benefits of membership and there are many others.

On behalf of ASTA I would like to thank and congratulate the authors and designers of this book *Science for a better world,* the Science Week Coordinators in each State and Territory of Australia and all the teachers in schools who become involved with Science Week activities.

I do hope you find this resource book useful, interesting and enjoyable. Please write to me or ring me to let me know your views and opinions about the resource book or Science Week in general.

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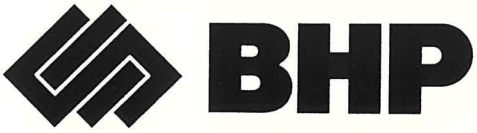

ICI Australia

Science for a better world

Contents

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Text
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Introduction

Science for a better world

Science is playing an important role in helping to achieve the aims of the United Nations' International Year for the Eradication of Poverty in 1996. This book *'Science for a better world'* highlights the essential role that science has to play in improving lifestyle, standard of living and the eradication of poverty.

All children, young people and teachers should find this material relevant at a personal level while also being important from an international and global perspective.

Australian scientists too are playing an essential role in areas such as agriculture, health, solar energy, geology and many others. Not only is their research benefiting people around the world, but in many cases they are working with or co-operating with scientists from other countries for the mutual benefit of both.

One way that Australian scientists work for a better world and the eradication of poverty is through the government body called the Australian Agency for International Development (AusAID). It is responsible for managing Australia's development co-operation programs, as well as for providing advice to the federal government on international development issues. AusAID is an autonomous organisation within the department of Foreign Affairs and Trade which administers many co-operative scientific ventures in developing countries. In the last thirty years life expectancy in developing countries has increased by over a third. At the same time mortality rates of children under five have been halved.

The Australian Centre for International Agriculture Research (ACIAR) is another organisation working towards the eradication of poverty in developing countries. Its work focuses on growing food, keeping food fresh, developing tree plantations, improving soil quality and improving water quality and availability.

Structure of the book

Each chapter in this book is clearly divided into two sections. One section (*Teachers' notes*) provides detailed background information for teachers. The other section (*Student activities*) provides activities of varying complexity with information provided for the students. All pages have been designed to allow for photocopying and distribution to students.

Safety first

All student activities recommended in the **Science for a better world** appear to present minimum hazards. However there is no guarantee expressed or implied that an activity or procedure will cause no injury. Each teacher selecting an activity should test it before using it with a class. Any necessary safety precautions should be added to the material provided to students.

Keep it fresh

Science is playing an important role in controlling pests in agriculture and keeping food fresh after it has been harvested.

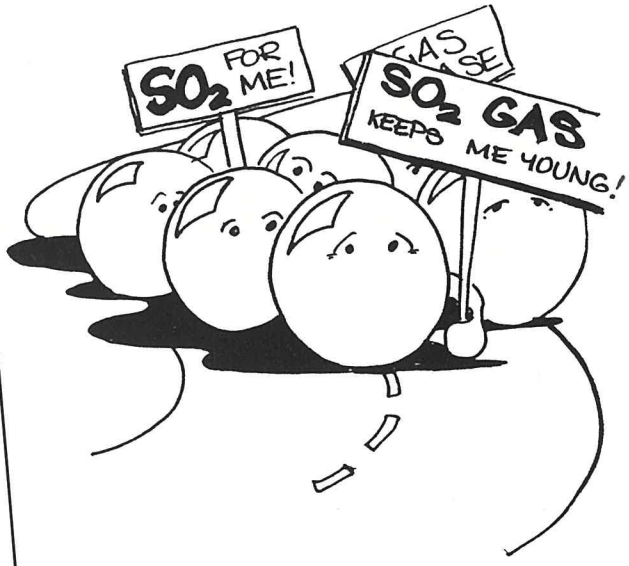
These problems face people in all countries of the world from the richest to the poorest. Australia's scientific research is contributing to reducing poverty in our country and neighbouring countries while at the same time helping our agricultural industries. Much of this research is funded and supervised by the Australian Centre for International Agricultural Research (ACIAR).

Keeping grapes fresh

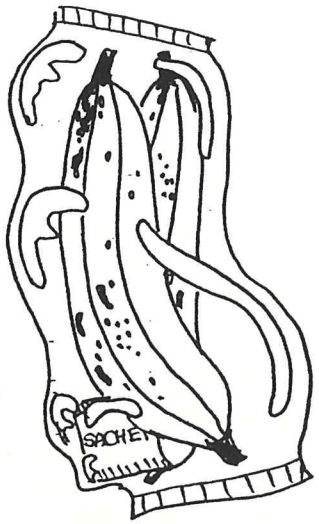
Between 20 and 40% of tropical fruit and vegetables in the ASEAN (Association of South East Asian Nations) region are lost because of disease and the inefficiencies in the way food is traditionally handled.

A process originally used by the USA and Australia to extend the storage life of grapes has been adapted in Thailand. Sulfur dioxide is produced by burning sulfur in gas-tight fumigation rooms or containers, in which fruits are stacked in baskets. This eliminates the oxygen in the container making it impossible for any organism which requires oxygen to survive.

Any projects which prolong the storage life of tropical fruits, and enable them to be exported to overseas markets will benefit many countries in tropical regions.



Giving bananas a hand to stay fresh



Another collaborative scientific research project in Malaysia is aiming to prolong shelf life of the Pisang Mas or Golden Banana. This will benefit their fruit export industry.

Under normal conditions, this fruit has a very short 'shelf-life' after picking, and sales to markets far from the plantations have been virtually non-existent.

Trials were carried out, packing the fruit in clear plastic bags, removing most of the air and adding a sachet of chemical to absorb ethylene gas. The presence of ethylene gas produced by some ripening fruit causes ripening of the other fruit. Its removal reduces ripening and increases storage life. This process kept the bananas green for three weeks at room temperature and for up to six weeks or more at 17°C.

Scientists developed the process to ensure exported fruit remained green for shipping, then ripened normally when removed from the sealed bags.

Beetles – strawberry fields forever

Many Asian and African countries, as well as Fiji, sought to use research work carried out by the CSIRO in Australia and Papua New Guinea to control one of the worlds worst water weeds, *Salvinia molesta*.

This weed was originally introduced to a number of countries as an ornamental plant. It chokes waterways, blocks irrigation and drainage channels, makes fishing and rice-growing impossible, obstructs the passage of boats and hinders access to drinking water for people and animals.

It was found that controlling the plant with herbicides or by physically removing it was almost impossible, as *Salvinia* grows and reproduces so rapidly. It can double its volume in just over two days.

The best way to control the weed was using a beetle named *Cyrtobagous salviniae*. The beetle was introduced to Sri Lanka and proved very successful.

For the beetle to breed successfully, the nitrogen content of the water needs to be high enough to ensure the beetle can multiply rapidly. If growth is too slow, nitrogenous fertiliser can be added to the water around colonies of breeding beetles to speed up the growth of the colony.

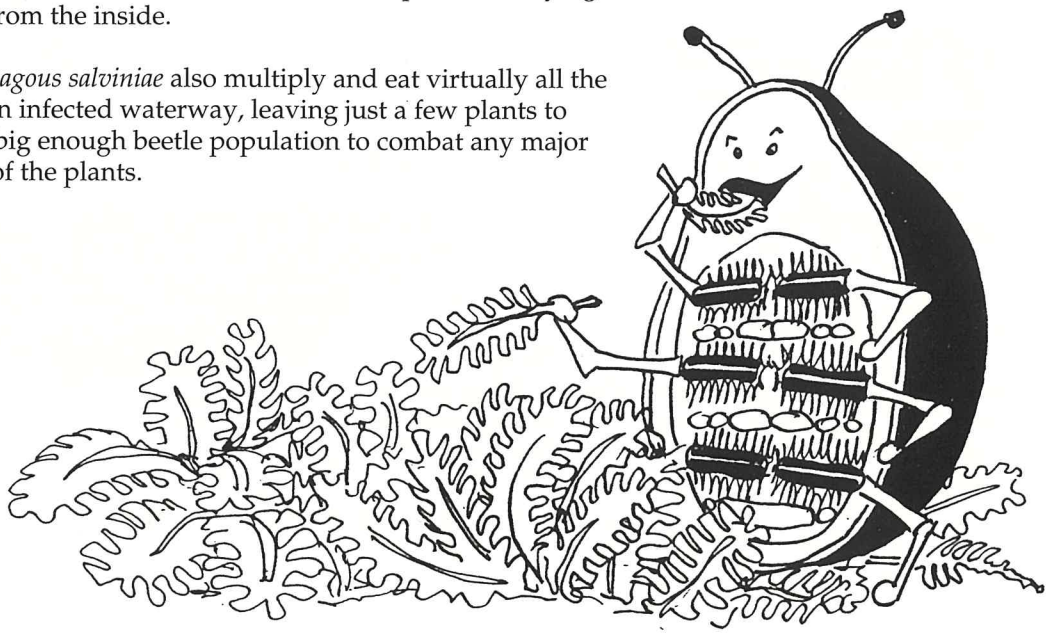
Once the beetles begin to breed and feed on the *Salvinia*, the system sustains itself. The adult beetle feeds on the tips of the *Salvinia* weed, and the larvae tunnel into the plant destroying the plant from the inside.

The *Cyrtobagous salviniae* also multiply and eat virtually all the plants in an infected waterway, leaving just a few plants to support a big enough beetle population to combat any major regrowth of the plants.

Did you know

The dung beetle was introduced into Australia to feed on cattle dung and help reduce the number of flies

?



Pick a bale of high tech cotton

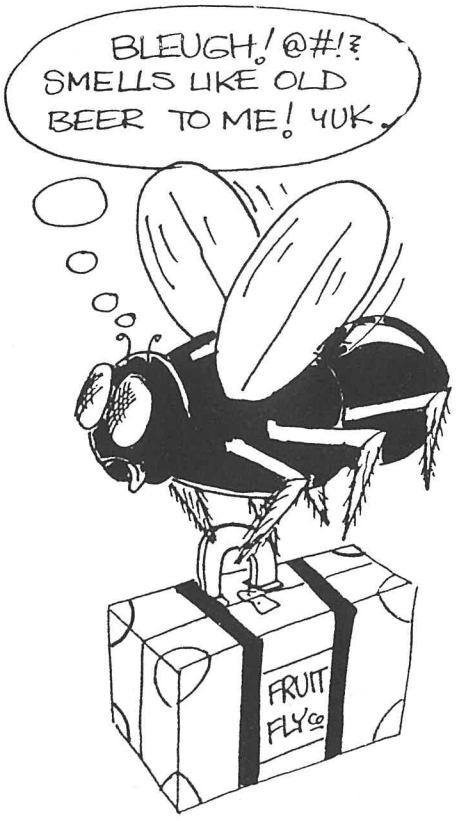
One clever solution to control insect pests in the cotton fields is undergoing major field trials in Australia.

Scientists at the CSIRO have added the genes responsible for making insecticide into cotton plants, so that the plants produce the insecticide in their leaves. This eliminates the need to spray the plants and reduces the amount of potentially hazardous chemicals in the environment.

Did you know

The ancient Egyptians were so good at keeping things fresh that wheat seeds from the Pyramids can still grow

?



Baits

Warm fruit-growing regions are a natural home for many different fruit fly species that damage fruit.

The female flies pierce fruits and lay batches of eggs under the skin of the fruit.

The eggs develop into maggots which feed on the fruit and cause damage. This damage allows bacteria to enter the fruit causing it to rot. The resulting financial losses to growers and exporters can be huge.

Because of the great variation between the different species of flies, no single control method is likely to be effective against them all. However, results from a bait spray developed in another collaborative science project (funded by ACIAR) indicate that the six main pest species found in Malaysian orchards and vegetable gardens can be controlled by this new weapon.

The spray was developed at the Malaysian Agricultural Research and Development Institute from an Australian idea. The principal ingredient of the spray is a yeast by-product from the Guiness Brewery in Kuala Lumpur. It is derived from dead yeast cells.

The spray which is extremely harmful to unwanted insect pests has proved to be harmless to the insects which help the orchards, such as bees. This results in more fruit developing. The big advantages are controlling the pests and increasing the amount of fruit, in a country which is expanding its tropical fruit industry.

Edible coatings

A major scientific research project is under way looking at coating fruit and vegetables with easy-to-apply, cost-effective edible coatings based on a range of widely available simple food ingredients. Coatings on fruit cause a barrier between the fruit and oxygen. As oxygen is needed by the organisms which cause fruit deterioration, excluding oxygen improves the storage life of fruit.

The work is focusing on Australia and Thailand. The ingredients include agar (from seaweed) polysaccharides and gums from plants, gelatine from animals and xanthan from microbes as well as stabilisers, emulsifiers, thickeners and gelling agents.

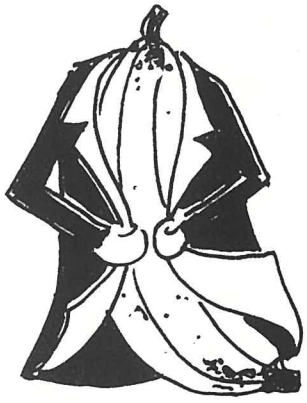
Fruit and vegetables which are dipped in the water soluble coatings get a natural protective layer over them, which is odourless, tasteless and invisible. The effectiveness of these thin layers prolonging shelf life of fruit is being tested.

Success in this project will have significant effects in the way food is handled, stored, transported and marketed.

Did you know

During the processing of white flour, most of the Vitamin E is destroyed. So white bread has 92% less Vitamin E than wholemeal bread

?



Biological control

Another significant research project focuses on the fruit piercing moth (*Othreis fullonia*) and the damage it causes to the fruit industry in Fiji. This pest punctures fruit skins with its sharp-pointed mouth parts (proboscis) and sucks out juice.

The hole made by the moth allows bacteria to enter the fruit causing it to rot. This pest now threatens commercial production of a range of fruits, including citrus.

Certain wasps (*Telenomus* wasps), lay their eggs on the eggs of the fruit piercing moth. The wasp larvae then eat the moth eggs, preventing them from hatching. This reduces the number of moths and the damage they cause. Therefore, if the *Telenomus* wasp is successfully introduced into Fiji, it could save millions of dollars a year in lost export revenue.

For further information: *For ACIAR projects contact the Australian Centre for International Agricultural Research – GPO Box 1571, Canberra 2601. Phone (06) 248 8588. Fax (06) 257 3051. For the genetically modified cotton project contact the CSIRO Division of Plant Industry – GPO Box 1600, Canberra 2601. Phone (06) 246 4911. Fax (06) 246 5000.*

Keep it fresh

Keeping food fresh from the plant to the plate is important so that food and resources are not wasted. This is even more important in countries which do not have as much money as we do. They need to keep food fresh so that they can eat better and earn as much money as they can from the food they grow. If fresh food deteriorates quickly there is very little time to sell it. If it cannot be sold in this short time the grower loses potential income.

Fresh bananas for longer

Find out the best way for you to store bananas without them going off.

What you need

- five green bananas
- plastic bag
- access to refrigerator and/or freezer (optional)
- another piece of fruit

What to do

1. Take five bananas (as green as possible) and store each of them in a different way.
2. You might like to try storing them in the freezer, on different shelves of the fridge, in a plastic bag with the air sucked out or in a bag with other unripe fruit.
3. Make sure you keep a daily record of the state of each of your bananas, commenting on things like looks, feel and smell. You might like to cut a small piece of banana to see how it tastes at key times during the experiment.
4. Explain the differences between the ways you stored the bananas? Why could this be important - especially to people in poor countries?

Banana No.___ Place stored _____

	Look	Feel	Smell	Taste
Day 1				
Day 2				

Discussion

In Malaysia a technique has been developed which greatly increases the freshness of bananas. The fruit is packed in clear plastic bags and much of the air is extracted. A sachet is added that absorbs ethylene gas. (This gas is produced by the bananas and causes them to ripen.) This technique will be a big benefit for the banana industry in Malaysia and will help people on plantations earn more money and improve their lives.

Other Activities: ***A bug vs a pesticide***

Find out *which is a better way of controlling aphids, using friendly insects or a pesticide.*

What to do: *Design an experiment to work out the 'best' way - for you and the environment - to control aphid pests. This is an opportunity for you to be creative and use your imagination. What are some possible ways of killing aphids? If you are having trouble thinking of ideas, you could try squashing them, spraying them with water, spraying them with detergent, spraying them with garlic juice or you may wish to see how many aphids a ladybird can eat. You could also investigate the effects of some chemical sprays on 'friendly' insects.*

Keep it fresh

Did you know

Oxygen is often removed from the silos where Australian wheat is stored to ensure longer safer storage

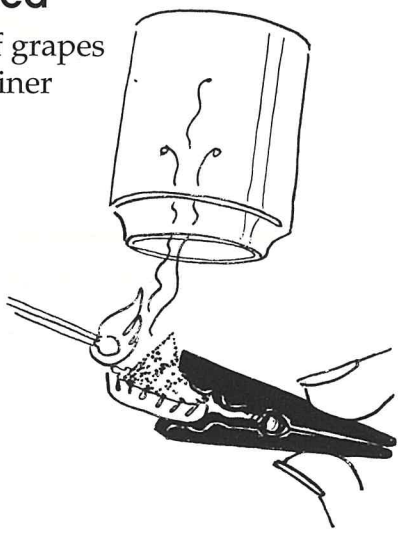
?

Gassing the grapes

Find out how to keep your grapes fresh.

What you need

- large bunch of grapes
- air tight container
- matches
- metal lid
- sulfur
- peg
- fume hood



What to do

1. Divide a bunch of grapes into two equal sized bunches. Make sure the grapes are dry.
2. Place half the grapes in a container which can be made airtight eg a large screw top jar or a large bell jar. Place the other half alongside the container.
3. Put a small amount of sulfur on a metal surface eg a bottle top.

> ***CAUTION: Step four must be done by your teacher as a demonstration in a fume cupboard.***

4. She or he will hold the bottle top with a peg, light the sulfur with matches, a lighter or Bunsen flame and while the sulfur is still burning put it in the container with the grapes and seal the container.
5. Observe both bunches of grapes over the next couple of weeks recording all relevant information. Do not open the container during the experiment until all the 'control' grapes have gone off.
6. Can you improve this method of keeping grapes? Why were some grapes left out of the container? Why did you burn the sulfur? Can you explain any differences in the quality of the two bunches of grapes?

Place grapes stored _____

	Look	Feel	Smell	Taste
Day 1				
Day 2				

Discussion

When the sulfur is burned the oxygen in the container is combined with the sulfur to make sulfur dioxide. The presence of sulfur dioxide and the absence of oxygen prevents harmful bacteria and organisms from growing and damaging the fruit. A technique similar to this has been developed by scientists in Australia and the USA and is being adapted for use in Thailand to help the agricultural industry of that country. It is in ways like this that science is helping reduce poverty around the world.

Other Activities: Beetles - far more useful than a pop group

Find out *why beetles and other insects are becoming more and more important in farming especially in poor countries.*

What to do: *Go to the library, to find out more about useful insects like ladybirds, Telenomus wasps, Cyrtobagous salvinae. A useful book on this subject is Food From Thought by Geoff Sinclair and the Australian Centre for International Agricultural Research: ISBN 1 86320 146 7.*

Keep it fresh

Did you know

When you open some bags of dried fruit you can still smell the sulfur dioxide used to keep them fresh

?

Baiting the bugs

Find out how to trap and kill pest insects without killing the friendly ones.

What you need

- five identical jars
- cardboard
- scissors
- materials to make baits eg. banana, yeast, sugary syrup, bread crumbs, rotting fruit

What to do

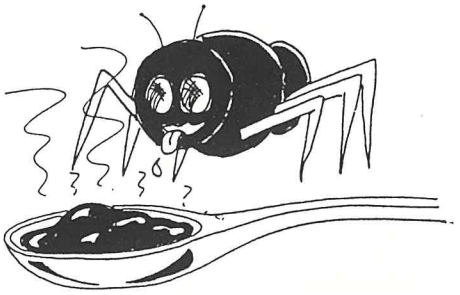
Make five bait jars.

❶ Cut a large hole in the screw top lid of each jar. Tape a cardboard cone into the hole cut in the lid. Cut off the tip of the cone.

❷ Make up four different baits which you think will attract insect pests. Baits could include: mashed banana mixed in with porridge; boiled yeast paste, bread crumbs, beer mixed with bread, cordial mixed with flour. These are just some suggestions. You might like to try something totally different. Write down your recipes so you can repeat the most successful mix. It is best if the mixture forms a moist paste.

❸ Take the lids off the jars and add the mixtures to four of the jars. Leave the fifth jar empty. Label the jars with the mixture you used. Spray the side of the inside of the jars with a long lasting insect spray.

Jar	Small flies	Bees	Ants	Others
Cordial				
Banana				



❹ Place the lids on the jars and put them outside near fruiting trees, vegetables or a fruit market (or other places where fruit and vegetables are stored). All the jars should be grouped together perhaps 500mm apart. Some students may choose to have their jars near a light.

❺ Leave the jars out for 24 hours then identify and count all the insects in each jar. Identify which insects are 'friendly' and which are pests. You may need to ask your teacher for help with this.

Discussion

Scientists are developing a range of special baits which attract and kill only the pest insects. This is much better than spraying with general sprays which kill all the insects including bees which are needed to pollinate the flowers. Most sprays also increase the amount of harmful chemicals in the environment. This bait technique is being developed in Malaysia to protect the orchards and vegetable farms from fruit fly attack. The most successful bait they have developed so far is based on the yeast wastes from the Guiness Brewery in Kuala Lumpur.

Other Activities: A real eggsperience

Find out *how to keep eggs fresher for longer.*

What to do: *Take a dozen eggs. Smear half a dozen eggs with Vaseline or animal fat. Store at room temperature for six months. Compare the look, feel, smell and taste of two of the eggs each month.*

Keep it fresh

Did you know

If you poke your finger into the end of a peeled banana it will split into three pieces? How many petals do you think a banana flower has ?

Protecting the fruit

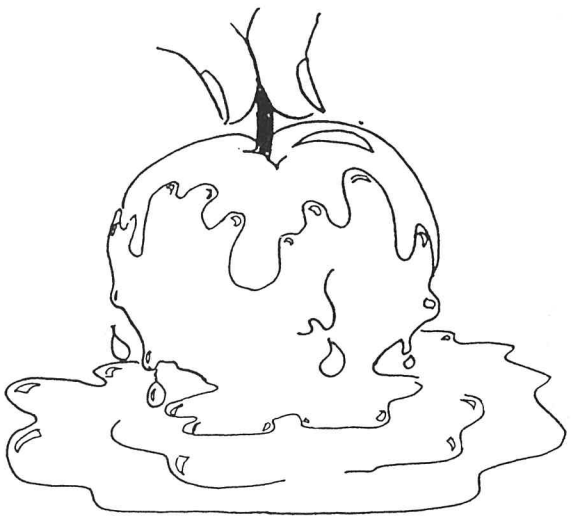
Find out ways of protecting fruit and vegetables from rotting.

What you need

- five different pieces of fruit or vegetables
- gelatine or agar
- container for gelatine or agar

What to do

1. Collect two pieces of five different whole fruit or vegetables. Make sure you have two of each kind.
2. Make up a batch of gelatine (and/or a batch of agar) following the instructions on the packet. You might like to try jelly if you can't get agar or gelatine.
3. Dip one piece of each of the fruit and vegetables in the gelatine or agar.
4. Put the dipped fruit and vegetables alongside the undipped ones.
5. Label them carefully. Every few days record the look and smell of the produce.
6. What happens? Why?
7. Can you think of ways to improve your experiment? How?
8. How do you think dipping fruit and vegetables like this could help people in poor countries?



Discussion

Experiments like this are being carried out by Australian and Thai scientists to work out cheap and easy ways to keep fruit and vegetables fresh. If they are successful it will have a great impact on the way fruit and vegetables are stored, transported and marketed. And it will help the lives of the poor people in Thailand as well as others around the world.

Other activities: Watch it go off

Find out *what makes food go off and how insects speed up the process.*

What to do: *Prick some fruit with a pin in the same way some insect pests pierce the skin of the fruit with their mouth parts (proboscis). Watch over days and weeks where the fruit starts to go off. Try to work out why this is. You might like to collect a range of insects and look at their mouth parts under a microscope or hand lens.*

The 1996 Shell

SCIENCE

Scientific inventions and ideas

Shell Australia, together with the Australian Science Teachers' Association (ASTA), is pleased to announce the 1996 Shell Science Awards.

The 1996 awards will continue the tradition of supporting Australia's young men and women in their understanding of science. The program offers eight year nine and year ten students and two science teachers the opportunity to participate in an interactive science and technology program in Canberra, during the first week of December 1996. The visit will include many exciting events and will culminate with a presentation dinner, where one national winner of the Shell Science Award will be announced. The national winner will receive a trophy and cash prize of $500 towards his or her education.

Shell Science Student Award

Students currently in year nine and year ten are invited to participate in the Shell Science Awards by preparing an entry that illustrates the application of a scientific principle. An entry may be as varied as an invention (scale or full size) or a working model, and must be accompanied by a written report. Entrants may choose to develop their entry by taking part in science competitions, science fairs or science talent search programs conducted by State or Territory Science Teachers' Associations. However, individual students may enter the awards by making a direct entry as outlined on the entry form.

Each State or Territory Science Teachers' Association will select up to three students and forward their written documentation for national finalist selection. This selection will be based on the excellence of the student's project. Both the state and national judging panels will take into account the merit of the applicant's total project in terms of the:

- **clarity of the report** which outlines the reason for the investigation, the investigative processes including any difficulties encountered and modifications necessary, and the design, testing and evaluation of the entry;
- **quality, workability, practicability and sophistication** of the entry;
- **understanding** demonstrated **of the scientific principles** involved in the design and working of the entry, and how that understanding is reflected in the entry;
- **level of complexity** of the science and technology underlying the operation of the entry; and
- **demonstration** of the practicability, sophistication and quality of the entry.

Other selection criteria will include the student's academic and extra-curricular achievements within the area of science and technology, general schooling, and other interests. The student's suitability to represent Australian school students at a prestigious national science and technology event will also be considered.

Shell Science Teacher Award

One teacher from each state may be nominated to be selected as chaperone and educator for the trip. Interested teachers should submit an application form.

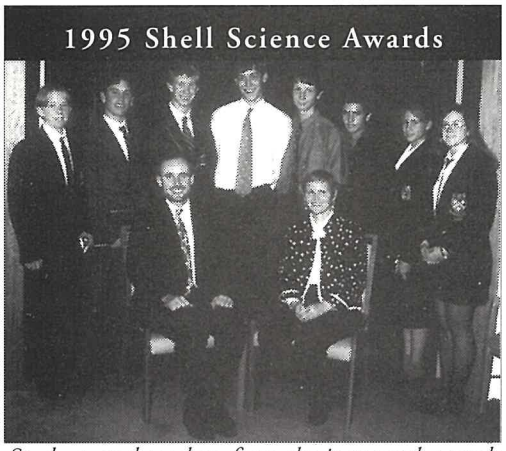
Teacher selection will be based on:

- the range and amount of science teaching experience;
- involvement in extra-curricular student science experiences, particularly those related to student science projects;
- State/Territory Science Teachers' Association and ASTA activities, particularly those related to student activities;
- professional development activities as both recipient and presenter; and
- out-of-school hours supervision of student activities.

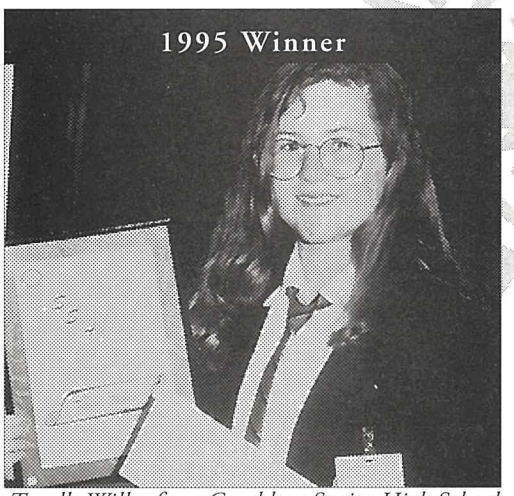
Selection of the 1996 teacher chaperones and the national student finalists will be made by representatives from ASTA and Shell Australia.

AWARDS

National Final Selection Program Canberra



Students and teachers from the inaugural awards are pictured here at the presentation dinner held at Parliament House.



Tenelle Wilks, from Geraldton Senior High School in Western Australia, won the award with her development of a biodegradable plant pot.

Applications

Application forms for students and teachers will be available from the State or Territory Science Teachers' Association. Applications will close Friday 20 September, 1996.

For further information, contact the Education Officer, Australian Science Teachers' Association, GPO Box 2682, Canberra, ACT 2601.

Eight student national finalists and two accompanying teachers will participate in an all inclusive, interactive science and technology experience to be hosted in Canberra, from December 3rd to 8th 1996. The program aims to provide:

- information about leading edge Australian science and technology developments;
- contemporary examples of Australian applied science and technological developments; and
- an indication of the diversity of career paths available in the science and technology fields.

On arrival in Canberra, students and teachers will attend an informal welcome dinner and receive a briefing about the program. Early in the program, the final judging will take place. Each student will be required to make a presentation to their peers of the entry and be interviewed by the national selection panel. On the final evening, the national winner will be announced at a Presentation Dinner to be held at the National Library.

The program will include:

- inspection of science presentations and display galleries at The National Science and Technology Centre;
- visit to the National Film and Sound Archive—the theme being 'Science and Technology at work';
- visit to Telstra Tower; and
- observation of sports medicine facilities at the Australian Institute of Sport.

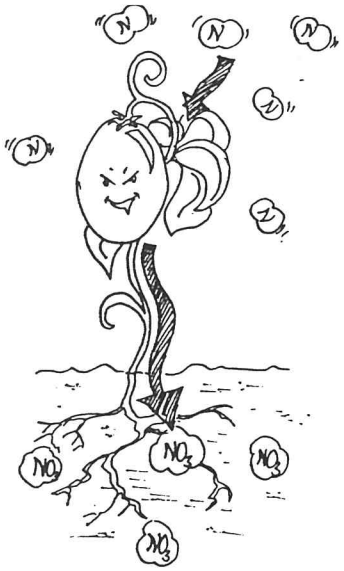
** Please note, the above itinerary is yet to be confirmed.*

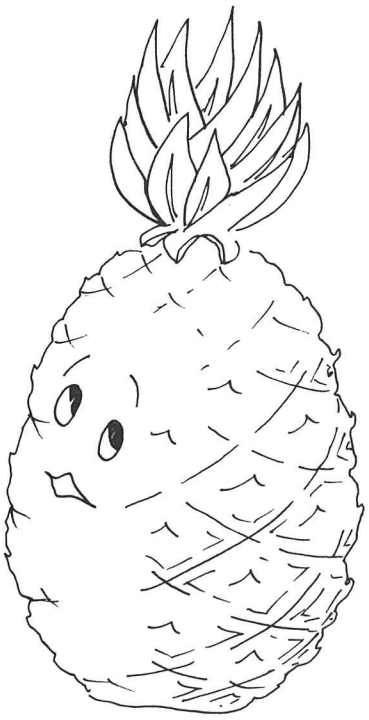
Precious dirt and water

Fertiliser from plants

Soybeans are planted in rotation with rice in Indonesia. The soybeans provide a high protein crop which can also help fertilise the soil by converting nitrogen from the air into a form which can be used by the plants.

Scientists are trying to work out how to increase the quantity of nitrogen soybeans take from the air and put into the soil, making it available to plants. The research is looking at the *Rhizobium* bacteria which are associated with the roots of the plants. Scientists are trying to work out the best strains of the bacteria to use to infect the plant and the best ways to infect the plants under different conditions.





Keeping the dirt on the ground

There are many reports of degradation of land through deforestation and bad cropping practices both in developed and developing countries. Erosion, increased salt levels and loss of nutrients and organic matter in the soil are problems which greatly reduce the productivity of the land.

Research is providing information on different cropping practices, slopes, soil types and rainfall in Malaysia, the Philippines, Thailand and Australia. This work is very important for pineapple growers in Queensland, where pineapples are often grown on steep slopes and the top soil washes away quickly.

Results from these tests in Australia and the three South East Asian countries could greatly improve the way Australian pineapples are grown and the future of the pineapple industry in Australia.

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Did you know

Worldwide topsoil loss is a major problem. Over 25 billion tonnes of valuable top soil are lost every year

?

Growing more food with less water

In three million hectares of orchards on the North China Plains near Beijing, peaches, apples, pears, grapes, hawthorn and walnuts are produced for three hundred million people. But supplies of water for irrigation are dwindling as more water is needed for industry and houses.

A research project is improving the efficiency of water-use in orchards by *Regulated Deficit Irrigation* (RDI), which uses much less water, increases fruit yields and maintains or even improves quality.

Modified furrow and flood-irrigation techniques have also been developed as low capital cost options for the application of RDI to replace the traditional practice of irrigation flooding.

Information is collected on ground water levels and leaf moisture and the success of the new system is seen by a lack of leaf yellowing in the trees receiving reduced water treatments, compared to the yellowing of flood irrigated trees.

A trellis system originating in Tatura, Victoria has been also installed to test high-density planting under commercial conditions. Another part of this project studies the effects of restricting growth of the tree roots and has shown that the practice diminishes tree growth while actually increasing flowering.

If current irrigation practices continue, by the year 2000 about seven billion tonnes of water will be needed annually in the orchards around Beijing. However, if the new irrigation system is adopted, the figure could be cut by one third to one half every year, which would be about five to seven per cent of Beijing's total needs.

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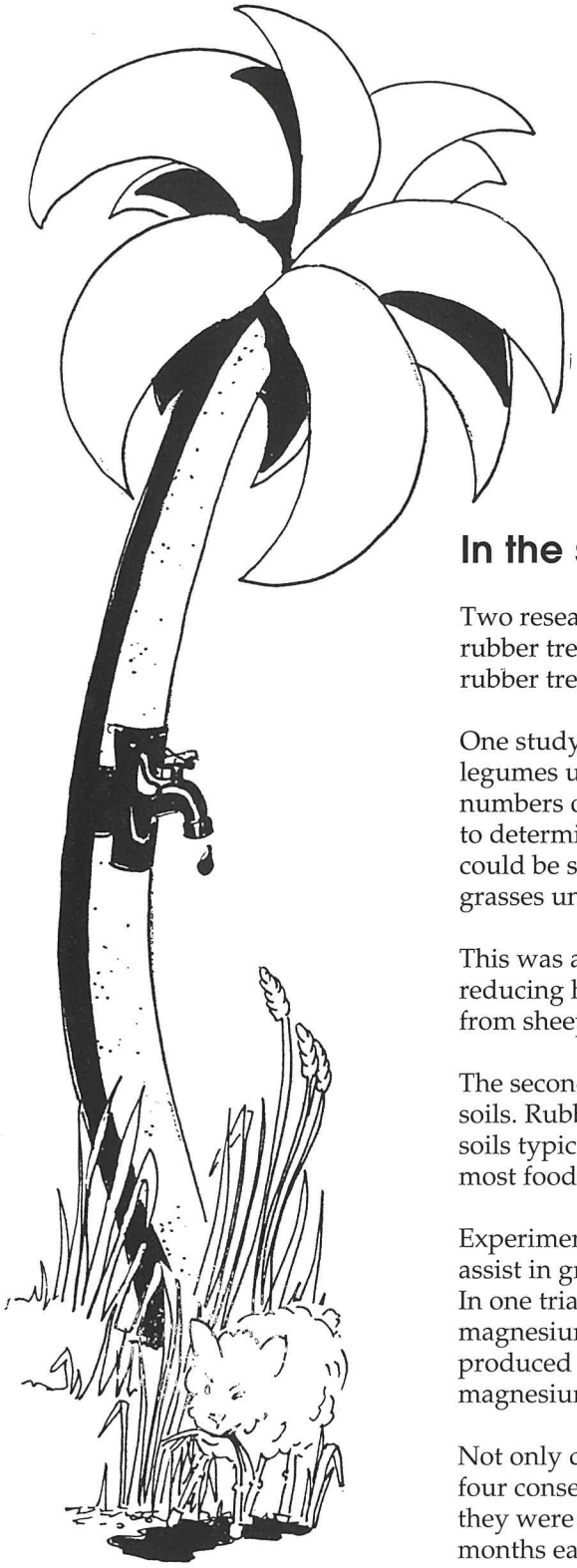
Did you know

Plants can be grown without soil by a process called hydroponics

?



In the shade of rubber trees

Two research projects in Malaysia investigated how rubber tree farmers could obtain an income while the rubber trees were too young to produce rubber.

One study involved growing a variety of grasses and legumes under rubber trees of varying ages. Different numbers of sheep grazed in fenced plots under the trees to determine the maximum number of animals which could be sustained by the different types of legumes and grasses under the immature rubber trees.

This was also a way of keeping weeds under control, reducing herbicide use, as well as providing an income from sheep.

The second of these projects was concerned with acid soils. Rubber trees and oil palms will grow in the acid soils typical of many South East Asian uplands. However, most food crops don't grow well in these soils.

Experiments looked at ways to make the soil less acid to assist in growing food crops which do not like acid soils. In one trial, up to two thousand kilograms of ground magnesium limestone per hectare was applied. The trial produced encouraging results. The addition of the magnesium limestone made the soil less acid.

Not only did farmers get substantially increased yields in four consecutive crops in a peanut–maize rotation, but they were also able to tap the young rubber trees 6–12 months earlier than previously.

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Precious dirt and water

Precious dirt and water

Australia is covered by a thin layer of soil. Without this soil little food could be produced. Australia is a dry country so water has to be used for greatest benefit.

The expertise of Australian scientists is being used in Australia and developing countries to maintain and improve soils and conserve available water. The activities in this section will help you understand how this is being done.

Tomatoes and salt

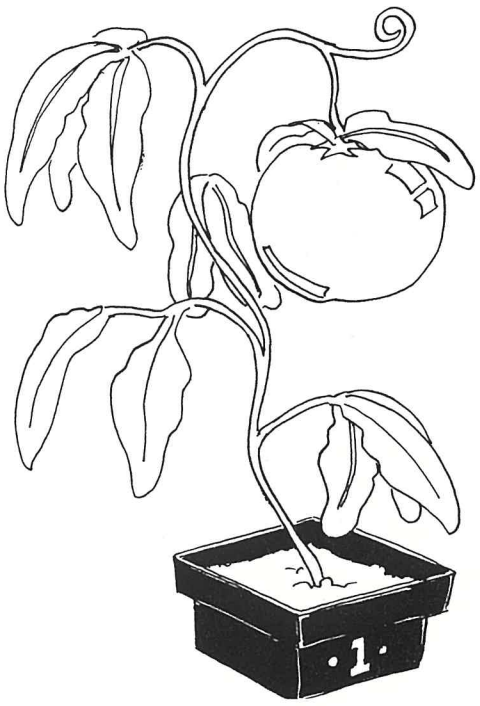
Find out how much salt tomatoes can tolerate.

What you need

- 6 similar tomato plants in identical pots
- salt
- 6 one litre containers
- waterproof pen for labelling

What to do

1. Buy six similar looking tomato plants in identical pots.
2. Label the pots 1 to 6.
3. Label 6 litre containers 1 to 6.
4. Add one litre of water to each container.
5. To container 1 add no salt,
to container 2 add 0.5 of a teaspoon of salt,
to container 3 add 1 teaspoon of salt,
to container 4 add 1.5 teaspoons of salt,
to container 5 add 2 teaspoons of salt, and
to container 6 add 2.5 teaspoons of salt.
6. Mix to ensure all the salt is dissolved.
7. Water the plants each day with 100 mls of water from the appropriate container. **Make sure you use the water from the container with the same number as the pot.**
8. Record the condition of the plants in a table similar to the one below.



	DAY								
Plant No.	1	2	3	4	5	6	7	8	9
No. 1									
No. 2									
No. 3									

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Precious dirt and water

Did you know

Severe wind storms have dumped red dust from Australia in the New Zealand Alps

?

Blowing in the wind

Find out how wind can be a major problem in eroding top soil. (This activity can be messy, so take suitable precautions).

What you need

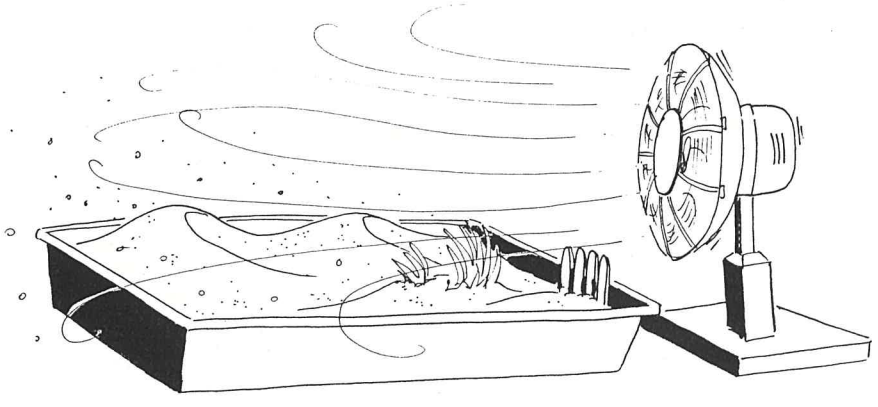
- tray of fine sand
- paddle pop sticks
- tufts of grass
- fan
- large sheet of paper, material or plastic

What to do

1. Set up a sand tray containing fine sand. Put a large sheet below the tray.
2. Put an electric fan near the tray to simulate a strong wind.
3. Leave the fan on for two minutes.
4. Either collect the sand that was blown from the tray or weigh the tray before and after the wind, to work out how much sand was lost in the time.
5. Replace the removed sand, and place wind breaks in the sand eg. tufts of grass, paddle pop stick fences, etc.
6. Turn on the fan for another two minutes to determine the effectiveness of the wind breaks.
7. Modify your wind breaks to improve your results.
8. You could try this again with the fan on different settings or at different distances from the sand tray.
9. Observe any dune formation (this may require a longer period with the fan turned on.)
10. You may like to make an instrument to measure the speed of the wind. Using this instrument and your sand tray, work out the minimum wind speed which will cause damaging wind erosion.
11. How do you think research like this will benefit farmers in poorer countries?

Discussion

Wind erosion can be devastating to cleared land. Understanding the science of wind erosion and wind breaks helps to keep precious soil where it belongs.



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Precious dirt and water

Did you know

There are two different bacteria in yoghurt and we eat millions of both bacteria with every teaspoon ?

Bacteria helping plants

Find out how bacteria help fertilise some plants and the soil around them.

What you need

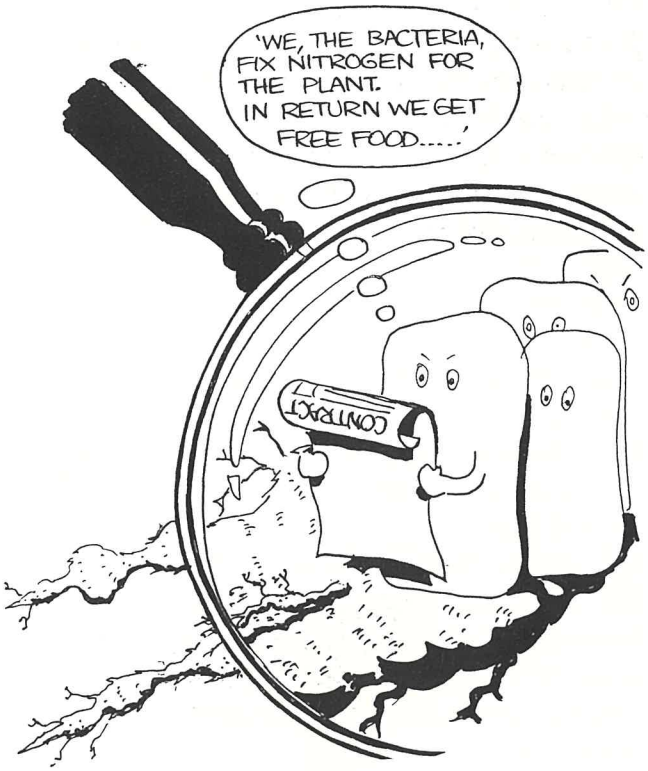
- clover, lucerne, peas, beans or wattle plants.
- stereoscopic or light microscope

What to do

1. With permission, gently pull out of the ground a number of legume plants, being careful not to break their roots. Legume plants include: clover, lucerne, peas, beans and wattle plants.
2. Closely examine the roots for little bumps or root nodules. These nodules contain bacteria which have invaded the root of the plant. The bacteria take nitrogen out of the air and change it into a form which plants can use. In exchange the bacteria are given protection and all the food they need.
3. Scrape a few nodules with your thumbnail or cut them in half. If they are pink they are making leghaemoglobin which is very similar to the substance that makes our blood red. If you have a stereoscopic microscope you could examine the nodules under different magnifications.
4. Design an experiment to determine if plants with nodules or plants without nodules would grow best in poor soil.
5. In a lawn with a mixture of clover and other grasses, the clover will often dominate when the lawn has not been fertilised. After fertilising the other grasses tend to dominate. Why do you think this occurs?
6. How do you think information like this will help farmers in poorer countries?

Discussion

Australian scientists are working in Indonesia doing experiments with legumes. They are trying to work out the best bacteria to use to infect soybeans and the best ways to infect them so that the soil and the plants get the most benefit from the fertiliser made from the bacteria.



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Precious dirt and water

Did you know

A variety of tomato has been bred in England which is frost and cold resistant

?

Australian scientists are working in Malaysia, the Philippines and Thailand to work out ways of preventing soil erosion when farming. They are looking at things like the steepness of the slope, the rainfall and the methods of planting.

Precious dirt

Find out how much dirt is being washed from locations near you.

What you need

- several identical jars
- a rainy day
  (in the absence of a rainy day, soil samples could be collected and water run over them in slightly inclined trays in the classroom. Dirty water samples could then be collected)

What to do

1. The next time it rains heavily collect water samples from as many different sites in nearby creeks and rivers as you can. Very carefully, only if it is safe, and under teacher supervision, collect your samples from the faster flowing areas. Good sites are near housing developments or where there are earth works occurring. Place your samples in identical screw top jars. Make sure each jar is filled to the same level. Label the jars with the location from which the sample was taken.
2. Observe the features of each sample of water eg colour, size of particles etc and record them.
3. Allow your jars to stand overnight.
4. Examine the amount of sediment in the bottom of each jar. Give them a sediment scale of 1 for no sediment to 5 for a very large amount of sediment - record it on your chart.

5. Make a map of the area you sampled recording on it the levels of sediment.
6. Can you work out from your map the main areas where soil is being lost?
7. From the site with the most sediment loss work out exactly how much soil is being removed.

Discussion

Ask your teacher to have a look at your experiment and discuss how much soil is being lost. You will need to know things like the speed of the water and the cross sectional area of the stream to work out the total volume of water which goes down the stream each day. You will also need to know the weight of soil in each jar.

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Precious dirt and water

Did you know

An average person in some Australian cities uses about 400 litres of water per day

?

Precious water

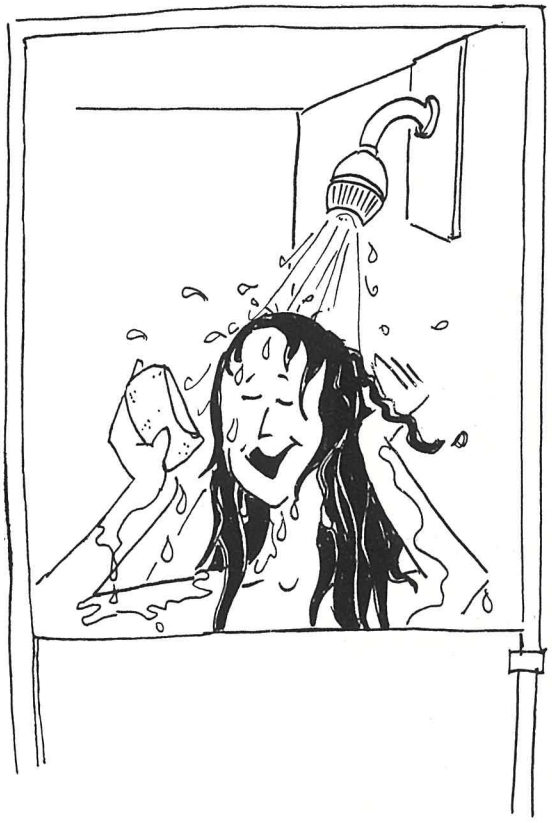
Find out how much water you use.

What you need

- access to your water meter at home
- a litre container for measuring water

What to do

1. Find out where your water meter is and record its reading every day.
2. Work out how much water you use each day.
3. Measure the amount of water used when you flush the toilet and multiply this by the number of times you flush each day.
4. Measure the amount of water used in your shower each minute and multiply this by the number of minutes you spend under the shower each day.
5. Measure the amount of water used in cooking and washing up each meal and snack you have.
6. Measure the amount of water used to water the lawn, water the vegetables and wash the car.
7. Do the same for water usage for each student at school, reading the school's water meter every day. Estimate how much water is used on the school grounds.
8. From your estimations work out how much water is used by people in your city.
9. Can you think of ways to reduce the amount of water you use? Make a list of things that you and your family can do in the future to save water.



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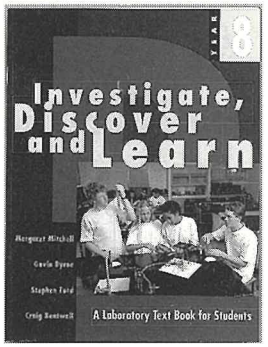
Investigate, Discover and Learn

A Science Laboratory Manual with a Difference!

This is not a boring text book. It is hands-on, immediate, easy to work with and an essential tool for successful laboratory work. A class set of **Investigate, Discover and Learn** will give your students an understanding of what they are doing in the laboratory and why they are doing it.

In each experiment, **Investigate, Discover and Learn**

- tells the student what he/she needs;
- tells the student what is expected of him/her;
- asks what happened;
- asks the student what it means;
- asks the student what can be inferred;
- explains what is known;
- asks 'so what?' (why did we do the experiment?) and
- asks 'Did you know?' (an amazing related fact).



Each experiment is self contained on an attractively designed double page spread. Based on the National Profiles, the relevant strand appears at the foot of every page.

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Solar energy

An Australian improves solar cells

As the world runs short of fossil fuels, we are looking for other ways of meeting our energy needs. While nuclear energy is a possibility, there are some problems and hazards. Many scientists prefer the option of solar energy. The problem in the past has been the inefficiency of solar cells and the huge number needed to produce the required energy.

Professor Martin Green and the Micro-electronics Research Centre at the University of New South Wales in Sydney have developed the world's most efficient solar cell. His solution is to produce more efficient solar cells, so that the production of energy by this means is viable. If research can present solar energy as a viable alternative for the future, it will be a much preferred option to many because it is much safer.

The technology developed by Professor Green and his team will help people the world over improve their quality of life and obtain energy for their personal and industrial needs in a comparatively harmless manner.

Solar energy

Making the most of the sun

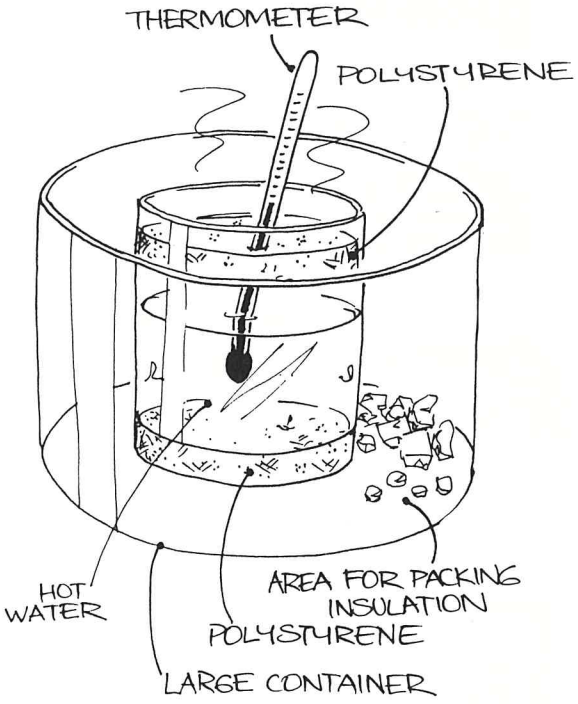
Find out how we can all use energy from the sun during the day to keep our homes warmer in winter.

What you need

- 250ml beaker
- boiling water
- thermometer
- larger container into which the beaker fits comfortably
- polystyrene sheet (fruit packing case is ideal and can be kept for reuse in other experiments).
- a variety of other insulators

What to do

1. Take a 250ml beaker and some polystyrene such as that found in a fruit packing case.
2. Cut a circle of polystyrene to fit into the top of the beaker. Insert a thermometer through the polystyrene. Cut a second identical circle of polystyrene on which to place the beaker. Take a large beaker or bottle or tin into which the 250ml beaker fits comfortably. Place the 250ml beaker inside the larger container.
3. Very carefully, pour 200ml of boiling water into the beaker. Place the polystyrene top and thermometer in the beaker. Take temperature readings every minute for twelve minutes. You could record your results as a line graph.
4. When cool remove the water by pouring it down the sink and place the 250ml beaker back inside the larger container. Pack the area between the beaker and the larger container with pieces of polystyrene. Add 200ml of boiling water to the beaker and take temperature readings every minute for twelve minutes.
5. Repeat the fourth step with a variety of materials which may have insulating properties. You could try any material that you think would be effective. Some ideas are cotton packing, scrunched newspaper, scrunched aluminium foil, soil, or sand. In each case graph your results as a line graph. Write the name of the packing material on each line.
6. List the materials tested from the best insulator to the least effective insulator.



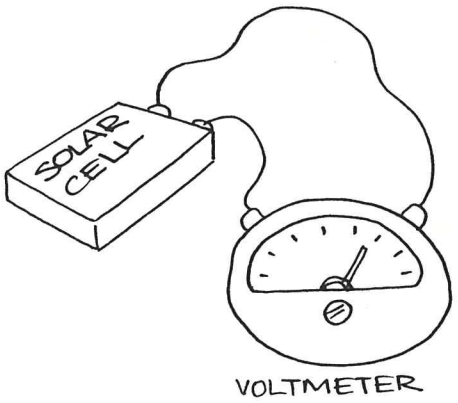
Discussion

Whenever the sun is shining our homes are heated by solar energy. At night the heat energy is lost to the surrounding environment. This heat loss can be greatly reduced by the use of insulators. This saves energy used to heat our homes at night in winter and saves us money as well.

Solar energy

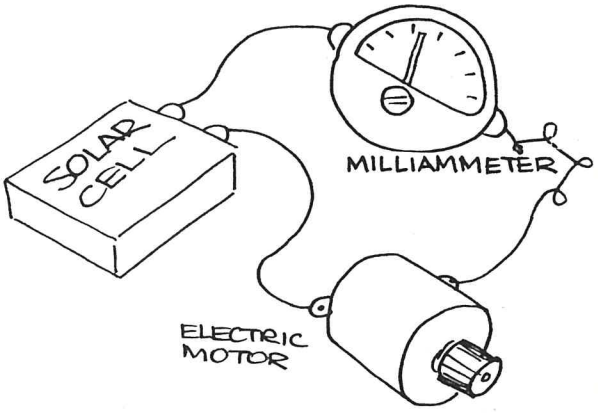
Making a motor work

Find out how you can make a simple motor work using a solar cell. Use a small electric motor such as you would find in a toy.



What you need

- simple solar cell
- sensitive voltmeter
- milliammeter
- connecting leads
- small electric motor



What to do

1. Thoroughly examine a solar cell. A solar cell is a device which converts energy from the sun into electrical energy. We can determine if a solar cell is working by exposing it to light and connecting it to a voltmeter. If a voltage registers between the terminals of the solar cell it is capable of producing electric current.
2. Connect the solar cell to a sensitive voltmeter and then expose it to full sunlight. Note the reading on the voltmeter.
3. Cover half the cell with cardboard and again note the reading on the voltmeter.
4. Cover the entire cell with cardboard and note the reading on the voltmeter.
5. Connect the solar cell to a milliammeter and a tiny electric motor.
6. Place the solar cell in full light (sunlight if possible.)
7. Note the reading on the milliammeter and any change in the electric motor.
8. If the motor did not start, try connecting two solar cells together and repeat the experiment.

Discussion

One of the problems with solar cells in the past has been their inefficiency. It would take huge areas of solar cells to produce enough energy for society's needs. If solar cells are to be a viable alternative for our energy needs in the future, solar cells need to be more efficient. Australia is currently producing solar cells with an improved efficiency as a result of the work being carried out at the University of New South Wales in Sydney by Professor Martin Green.

Other activities: Ice in the sun

Place two identical ice cubes in identical dishes. Place one near a brick wall which is in full sun. Place the other three metres from the wall. Measure the time that it takes each of the ice cubes to melt. Can you explain your result?

Solar energy

Cooking with solar energy

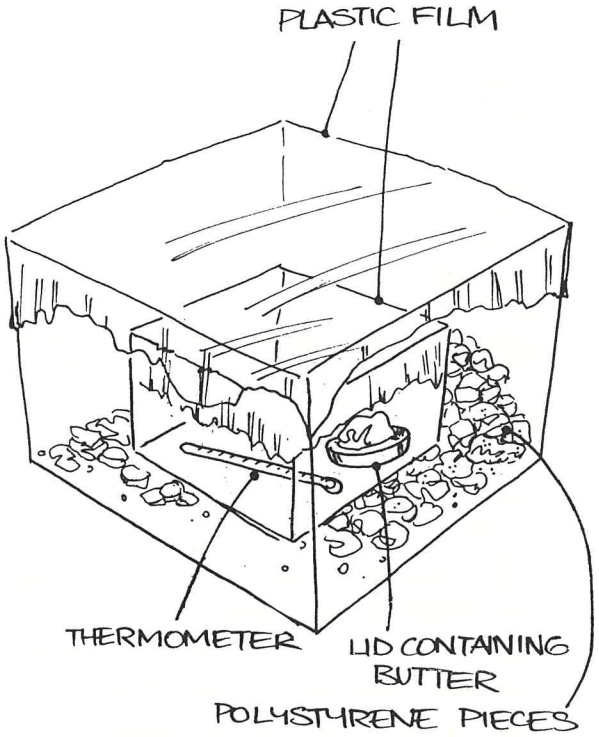
Find out if you can cook using only solar energy from the sun.

What you need

- 2 boxes, one to fit easily into the other
- plastic film
- polystyrene pieces
- 2 jar lids
- butter
- thermometer

What to do

1. Set up the simple solar cooker shown in the diagram. A small box contains a thermometer and a jar lid containing butter. It is covered with a plastic film which is stretched firmly over the top and taped into place. This is placed in a larger box. The area between the two boxes is packed with polystyrene pieces.
2. Place an identical lid containing butter outside the solar cooker. Place both this lid and the solar cooker in complete sunlight. Observe them closely over the next hour to see which butter melts first.
3. If it is a very hot day you could try to cook different types of food in your solar cooker.



Discussion

The efficiency of a solar cooker depends on the amount of sunlight. This is a very simple basic design. It could be greatly improved. Mirrors or aluminium foil could be used as reflectors to concentrate the solar energy and improve the efficiency of the cooker.

Other activities: Focusing solar energy

Place two identical ice cubes in identical dishes. Place both in direct sunlight. Leave one to melt naturally. Concentrate the sun's energy on the other using a magnifying glass. Measure the time that it takes for each of the ice cubes to melt.

Life and health

The children of the world

Building a better world must involve making the world better for children. Every year thousands of children die as a result of malnutrition, disease, famine and war injuries. Australia is one of over one hundred and fifty countries that have signed the World Declaration on the Survival, Protection and Development of Children. As a signatory, Australia, through AusAID, is giving assistance to children in developing countries.

Science – working to improve health

Our planet Earth is feeling the strain of an ever increasing human population. Providing sufficient food for this population is becoming challenging. Through government organisations such as the Australian Agency for International Development (AusAID) and the Australian Centre for International Research (ACIAR) Australia is involved in many scientific research projects to develop appropriate technology which will help more people have adequate food. The countries which are helped most by these research projects are the developing countries some of which are our near neighbours.

Developing countries usually have more health problems and desperately need aid in the form of medicines, facilities, clean water and doctors and nurses to improve health care and standards.

Providing a clean healthy source of water in countries where water is often obtained from polluted river systems, improving the mining of ores to decrease environmental pollution, helping to control population through education, contraception, training doctors and nurses to help fight disease, and using solar energy to provide warmth and hot water are all projects that have helped developing countries improve the hygiene and health of their population.

Australia provides aid to many countries through AusAID. One such country is Vanuatu. While many aid projects target education and agriculture, many also target health. Priority areas in Vanuatu have included improving rural water supplies, a maternal child health care service and an immunisation scheme for children.

Another example is the work done in the Indonesian islands of Lombok and Sumbawa. The highly successful Rural Water Supply and Sanitation Project completed in Central Lombok in 1991 improved the water supply for about 260,000 people. Another project currently underway aims at improving living conditions in both islands.

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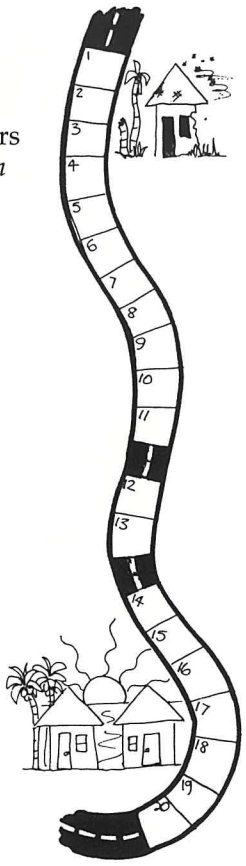
AusAID

Life and health

United Nations priorities

Find one of the priorities for the United Nations in 1996 by solving the following puzzle.

Answer the following clues and write only the letter required on the road. The answers to the questions can all be found on the previous page under the headings *The children of the world* and *Science – working to improve health.*



1. The planet we live on (first letter)
2. Another name for a farming area (first letter)
3. Name of the Australian organisation providing aid to other countries (fourth letter)
4. Helping to train these will improve medical care (first letter)
5. What Australia is giving to poorer countries (second letter)
6. The growing of food crops is called this (fifth letter)
7. The name of our country (first letter)
8. We are in good _____ if we are not sick (fifth letter)
9. Source of water for many poorer countries (second letter)
10. Energy from the sun (first letter)
11. A country with which Australia is working for mutual benefit (third letter)
12. Australian technology is helping to make the use of _____ energy more viable. (second letter)
13. A unit consisting of parents and children. (first letter)
14. Australia makes _____ countries a priority for aid. (first letter)
15. A word for the total number of people in a country. (second letter)
16. Australia is _____ fortunate to have its current lifestyle. (first letter)
17. Medical research is helping to control _____. (fourth letter)
18. This may help population control. (fifth letter)
19. Education in poorer countries can be helped by training more of these (first letter)
20. Another word for personal cleanliness is _____. (second letter)

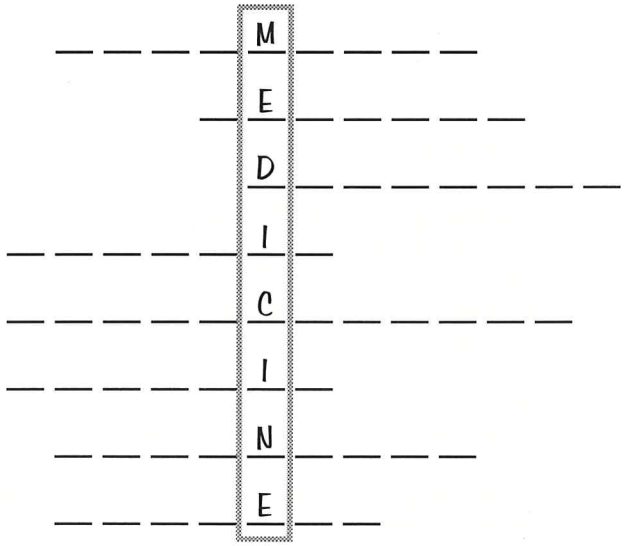
The correct answers are listed at the base of page 38.

What can we do?

One way that Australia can help developing countries is to supply MEDICINE.

Eight diseases which Australia scientists are helping to control are; cholera, diabetes, dysentery, leprosy, malaria, pneumonia, tuberculosis, and typhoid.

Fit these names into the word puzzle opposite.



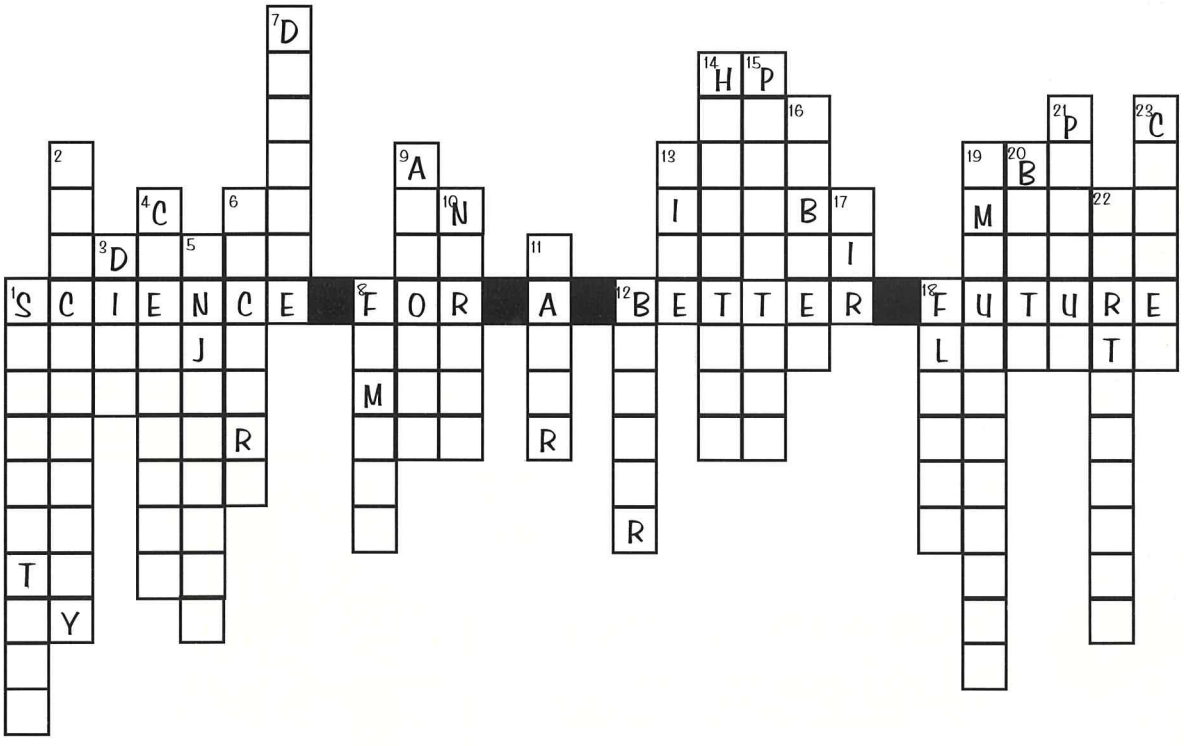
Life and health

Where does science fit in?

Add the answers to the following clues to the word puzzle below.

1. Many of these from Australia and other countries co-operate in research projects.
2. A form of energy often used in homes.
3. What we eat.
4. These cause pollution in many rivers.
5. One form of protecting people from disease.
6. Training more of these would improve health care.
7. Malaria is an example of a _____.
8. This is a severe food shortage.
9. Drinks which contain this have caused problems in many communities.
10. These are often responsible for health care in the absence of doctors.
11. People get sick if they drink this and it's not clean and fresh.
12. The title of this book is *Science for a* _____ *world*.
13. Quality of _____ can be improved in some areas of all countries.
14. The building of these improves health care.
15. _____ spoils the water supplies in many countries.
16. A type of plantation grown in some developing countries.
17. Clean _____ is the right of all life forms.
18. A natural disaster that can increase disease in a community.
19. A medical program to help eliminate TB, whooping cough and tetanus.
20. _____ control helps reduce population growth.
21. When a disease gets out of control it is sometimes referred to as a _____.
22. Used to increase crop yields in agriculture.
23. An illness which can be caused by pollution and lifestyle.

The correct answers are listed at the base of page 39.



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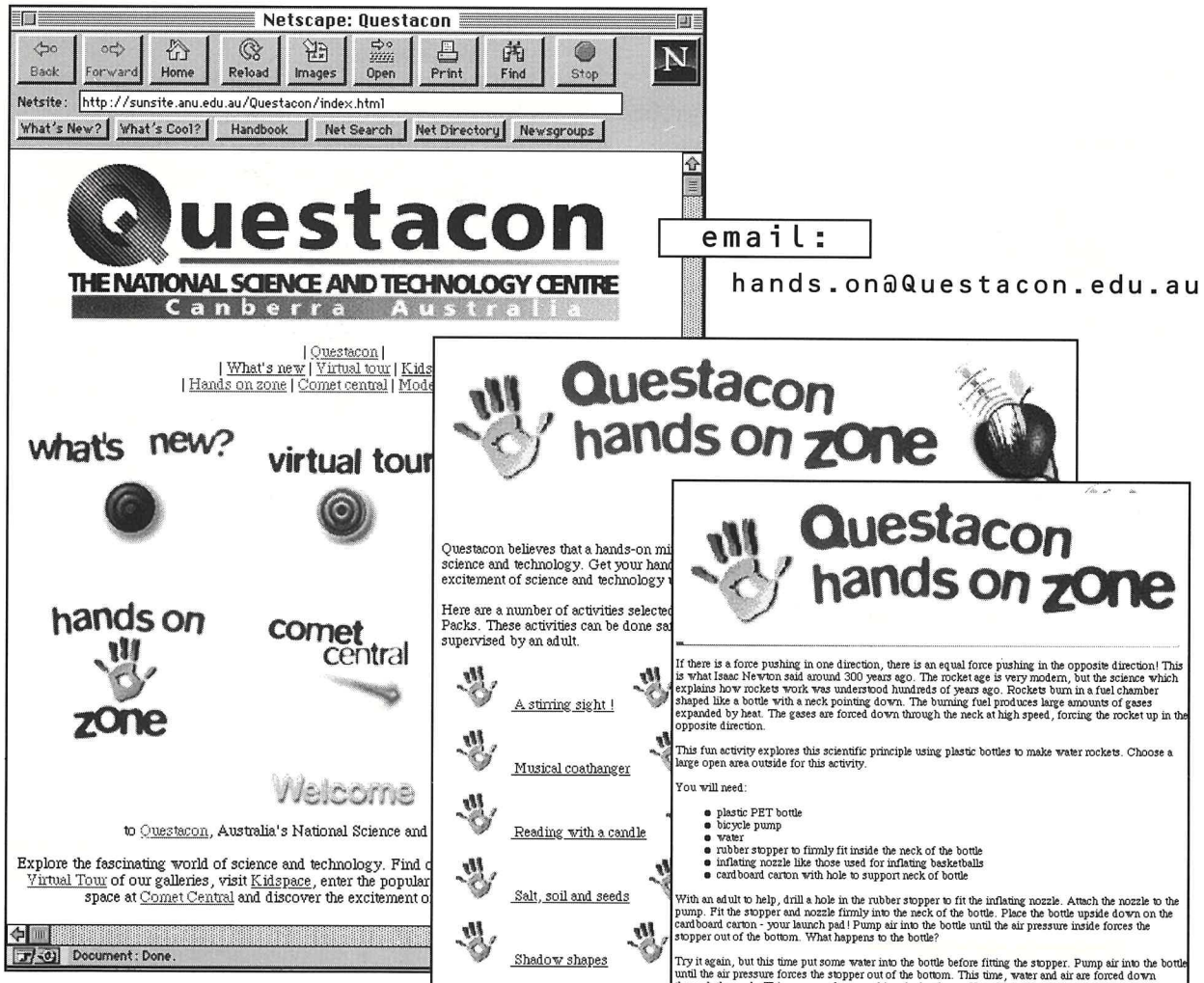

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Tree farming

One of the major topics of debate in Australia in recent years is the cutting down of trees in native forests.

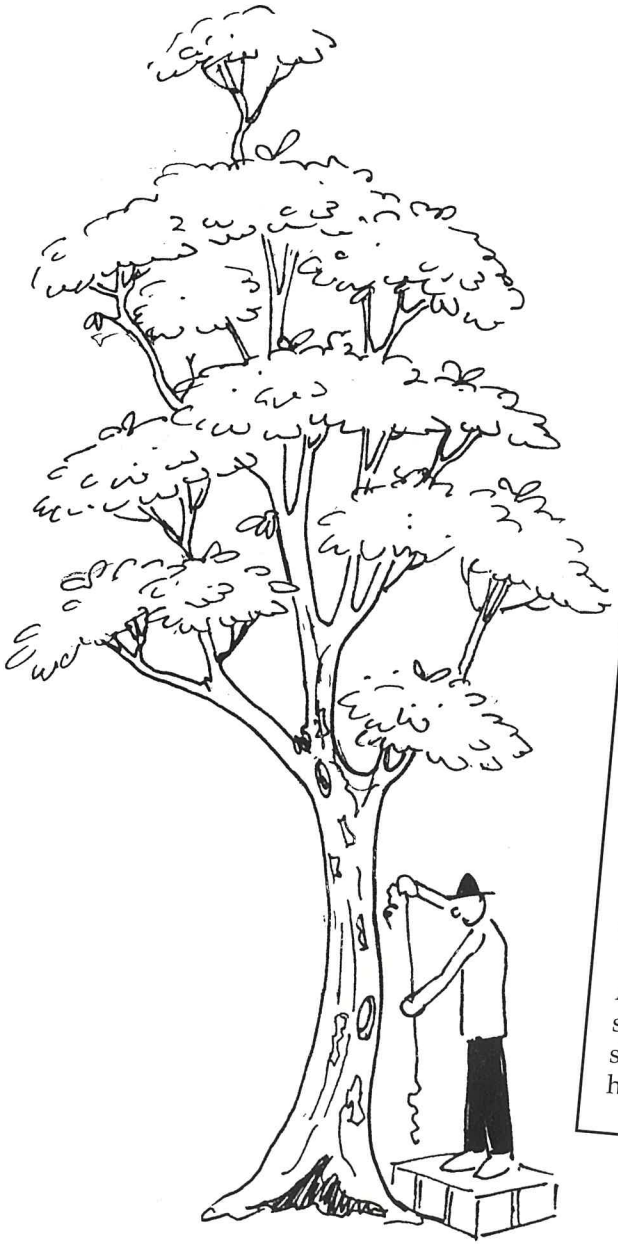
Australian scientists have been involved in many areas of this debate from looking at the biodiversity (the numbers and types of organisms in the forests), to documenting growth rates, to selecting which trees are best to grow in plantations.

This section looks at a few examples of how Australian plants and Australian scientists are helping developing countries to improve their forest plantations and the forest related industries.

Did you know

The tallest trees in the world used to be in Australia. The Australian Mountain Ash tree was recorded at over 150m high! The tallest trees here now are about 100m

?



Where will it grow?

CSIRO scientists are working with scientists in China and Thailand to work out which Australian trees to grow where. They are working not only on climate and soil type but on the different varieties of the same tree species. This information will greatly assist the production of successful plantations and help foresters choose the best varieties to rehabilitate degraded land.

Another project is trying to determine which species of trees and shrubs will grow best on salt affected lands in Australia and Asia and how much water these plants need.

Did you know

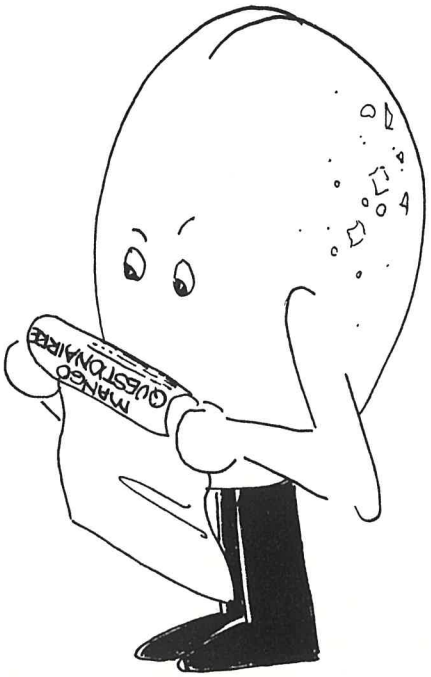
It takes many years for Australian trees to develop hollows. These provide homes for many different kinds of birds, reptiles and mammals

?

More mangoes

In Australia and Thailand, with extensive mango industries, the yield of mangoes varies up to 150% from year to year. One scientific research project aims to work out how environmental factors such as water supply and temperature affect flower formation and how cold temperatures affect the steps in fruit development in Australian and Thai plant varieties.

This study is likely to lead to the use of varieties which are more suited to specific growing regions. This will lead to substantially improved mango production in Australia and Thailand.



Domesticating Australian plants

There are around 1500 species of *Eucalyptus*, *Acacias* and *Casuarinas* in Australia. Until recently, only a very small number had been 'domesticated'.

In 1961, the Australian Tree Seed Centre was founded as the national seed bank for Australia's native tree and shrub species. Every year, it provides some 20 000 samples of seed for research in Australia and overseas. These seed stocks have been crucial to the many forestry projects which aid developing countries and reduce poverty in the region.

Now, more than ever, Australian trees such as the *Macadamia* are being recognised for their qualities and the benefits they can offer developing countries. In many cases, while trialing trees in other countries, Australian foresters learn more about their own native trees.

Did you know

The oldest tree in the world is found in Tasmania and it may be almost 10,000 years old

?

Australian trees abroad

Asian scientists are attracted to particular Australian trees because of their qualities such as drought and salt tolerance. These qualities enable them to grow in infertile and saline soils.

Scientists believe that Australian trees as well as producing good timber for building, and chips for paper pulp, could be used to produce a number of other non-traditional items. For example, leaf oils from *Melaleucas*, *Leptospermums* and some of the *Eucalypts* can be used for flavourings, fragrances and antiseptics. The basic ingredient of some French perfumes is an extract from acacia flowers.

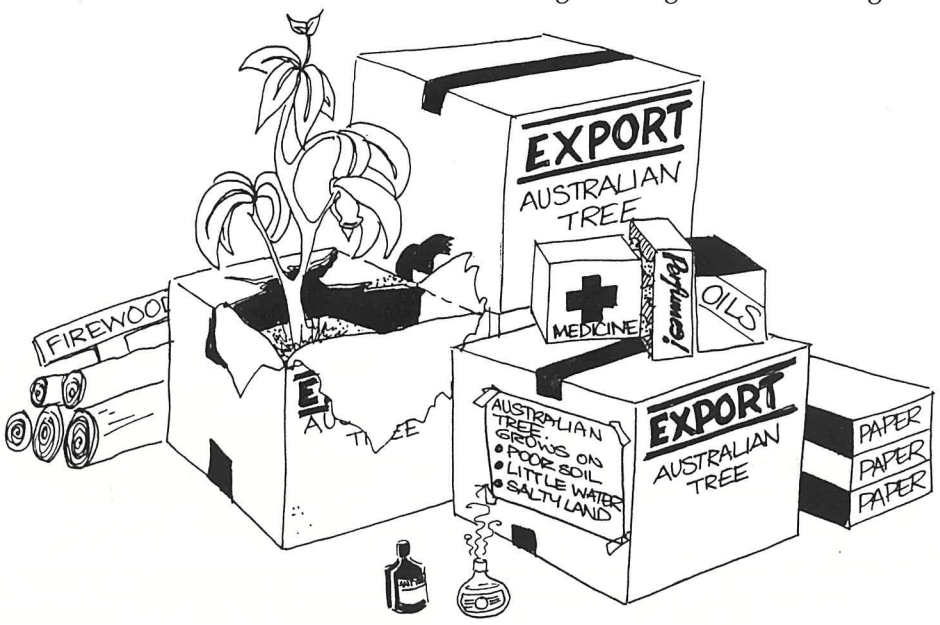
Thailand is particularly interested in Australian trees as it urgently needs timber for firing ceramic and lime kilns, domestic firewood and building.

The knowledge gained by Australian scientists in this project also assists with selection of the most suitable species to plant in different areas in Australia to help stop such degradation as erosion and salination.

The *Macadamia* is another Australian tree which is proving valuable in other countries. A major industry has been established in Hawaii around the nuts produced from this tree which are very tasty, highly nutritious and are easily stored for long periods.

About 200 Australian species have been introduced to China. This new genetic material is vital for breeding research as a basis for more productive plantations in China.

One of China's more interesting forestry projects focuses on *Acacia mearnsii*, better known to Australians as black wattle. As well as producing timber for firewood and housing, the trees are providing the raw material for increasing numbers of tannin factories. These produce 'Mimosa Extract' for use in manufacturing leather goods and wood glues.



For further information: *For ACIAR projects contact the Australian Centre for International Agricultural Research. Phone (06) 248 8588. Fax (06) 257 3051. For the genetically modified cotton project contact the CSIRO Division of Plant Industry. Phone (06) 246 4911. Fax (06) 246 5000.*

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Invitation

You are cordially invited to enter the 1996 Australasian Poster Competition.

Prepare an original, creative A3 poster on the theme:

'Science for a better world'

and your poster could be on display at Questacon —The National Science and Technology Centre in Canberra during the 1996 ASTA Science Week.

Enter in your age group (*your age at the closing date: Friday 7 June*) and remember to put your full name, date of birth, school year and name and address of your school on the back of your poster.

Categories

Primary
- Under 7 years
- 7 years to 8 years
- 9 years to 10 years
- Over 10 years

Secondary
- Under 14 years
- 14 - 15 years

Presented by the Australian Science Teachers Association as part of Science Week activities and proudly sponsored by ICI Australia

Send your entry to the Science Week Co-ordinator in your State or Territory by no later than Friday 7 June 1996

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Osborne Park WA 6916

Additional information may be obtained from:
The Education Officer, Australian Science Teachers Association
GPO Box 2682 Canberra ACT 2601 Telephone: (06) 248 9250

Tree farming

Extracting more than wood from the trees

Australian scientists are working with people in developing countries to help them grow better forest plantations. These forests aim to help the people in many ways.

Many of these plantations use Australian trees because they are fast growing, resistant to drought and help put nutrients back into the soil.

Scientists have come up with clever uses for some of our native trees, extracting much more than just the wood from the trees.

A smelly business

Find out how to make different kinds of perfume.

What you need

- flower petals
- knife
- sealed container
- olive oil

What to do

1. Take approximately 250 g of flower petals. Rose petals are ideal.
2. Chop them finely with a knife, or place in a blender. If you are using a blender you will need to add a little olive oil.
3. Place the chopped petals in a sealable container and cover them with olive oil. Stir the petals and oil.
4. Leave the sealed container in a warm place for a month. Open it regularly to stir the mixture.
5. After a month, heat the mixture until it is as warm as a bath and then strain it through a muslin or fine cotton cloth.
6. Store the perfumed oil in an air tight container.

Discussion

The Chinese have been using the Australian black wattle as raw material for extracting tannin. The tannin is then used in making leather goods and wood glues.

Trees can be used in many different ways increasing their value eg to prevent erosion, to add nutrients to the soil, as wind breaks, as wood for building, as pulp to make paper and as raw material for the extraction of tannins, perfumes, oils and other chemicals.

Tree farming

Oil from koala food

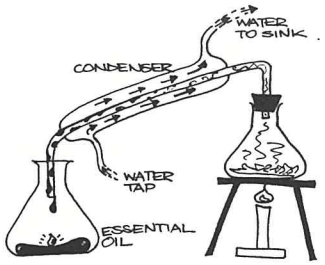
Find out how to extract Eucalyptus oil from koala food.

What you need

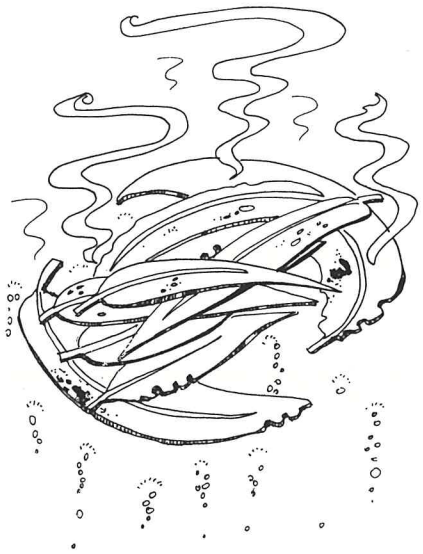
- distillation or quickfit apparatus
- gum leaves (preferably from a species rich in oil such as the peppermint gums)
- Bunsen burner or heat source
- container for boiling water and leaves

What to do

1. Make the equipment with Quickfit, or a few cans and a hose and some water.



2. Place the leaves of one variety of gum tree into a container. Some gum trees provide more oil than others. The peppermint gums are a rich source of oil. Add just enough water to cover the leaves.
3. Heat until boiling and turn down the heat until the liquid just remains boiling.
4. Add water to the condenser to keep it cool.
5. Smell the liquid which you have distilled. Are there two layers to the liquid? How much oil did you extract? How did you know it was *Eucalyptus oil*? Find out what *Eucalyptus oil* can be used for.
6. You might like to distil oils from *Melaleuca* and *Leptospermum* leaves. These can be used for fragrances and antiseptics. If the flowers smell nice you might like to extract the perfume from them.



Discussion

How much oil do you think you would be able to extract from a fully grown tree?

Can you see why scientists are working on ways to improve the growth rate of trees and on making use of substances other than wood from tree plantations?

How will this work help people in developing countries?

Answers for the 'United Nations priorities' puzzle (page 30): *1–earth 2–rural 3–AusAID 4–doctors 5–aid 6–agriculture 7–Australia 8–health 9–river 10–ore 11–Vanuatu 12–solar 13–family 14–poorer 15–population 16–very 17–disease 18–contraception 19–teachers 20–hygiene*

Tree farming

Did you know

Only about 1% of all the plantations of Australian trees are in Australia. Most are overseas ?

Where will it grow?

Find out the best places for different native plants to grow.

What you need

- a local nursery

What to do

1. Take an excursion to a local nursery which has native plants.
2. Make a list of ten native plants.
3. Tick which conditions they like best, on a table like the one below.
4. Write down any other details from the labels of the plants.
5. From this information can you explain which plants would do best:
   - in the cold
   - in the heat
   - in dry areas
   - in wet areas
   - for making power poles

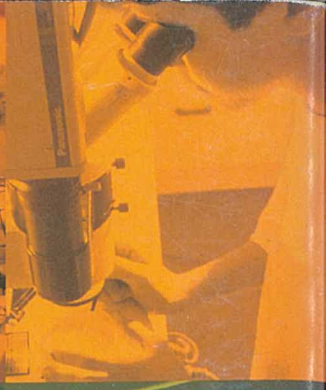
Plant	sun	shade	poor soil	rich soil	acidic soil	alkaline soil	cold climate	no frost	lots of water	little water

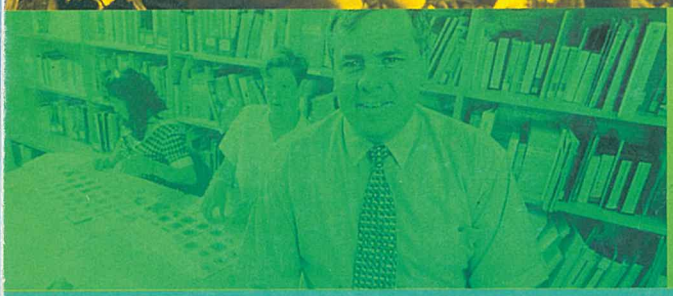
Discussion

Scientists are working on a number of very important experiments to discover which varieties of plants do best in the different weather and soil conditions across Australia and China. This work will help in repairing damaged land and in producing trees. The trees can be used for a variety of reasons such as making paper, building and production of chemicals such as oil and tannin (which is used to make leather products).

Answers for the 'Where does science fit in?' puzzle (page 31): *1–scientists 2–electricity 3–diet 4–chemicals 5–injection 6– doctors 7– disease 8–famine 9–alcohol 10–nurses 11–water 12–better 13–life 14–hospitals 15–pollution 16–rubber 17–air 18–floods 19–immunisation 20–birth 21–plague 22–fertiliser 23–cancer*

BHP SCIENCE AWARDS 1996





The BHP Science Awards are offered to encourage the teaching and studying of science in Australia. There are two separate competitions: The BHP Student Science Awards for primary and secondary school student research projects, and The BHP Science Teacher Awards rewarding teachers who are committed to the pursuit of innovative science programs in primary and secondary schools. BHP offers the Awards programs in conjunction with the CSIRO.

For further information about either of the Awards Programs, please write to BHP Science Awards, GPO Box 86A, Melbourne 3001, or telephone 03 9609 3131. Entries close 30th August 1996.

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