Australian Science in Schools Week

15th–19th October 1984

RESOURCE BOOK

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'WE DIG SCIENCE'
'SCIENCE IS NATURAL'
'SCIENCE IS EXPERIMENTING'
'LET'S DISCOVER SCIENCE'

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A Message from the President of ASTA

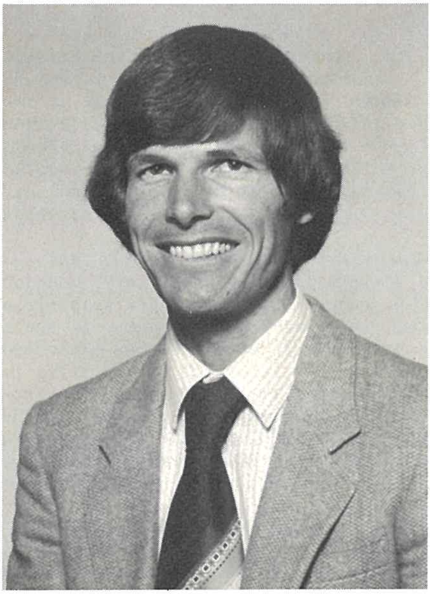
Australian Science in Schools Week is one of the most important and exciting projects that ASTA has undertaken. This one event has the potential to reach and involve students and teachers of science in every primary and secondary school throughout Australia. And, more importantly, it has the challenging task of communicating to all Australians that science should be an integral part of the school curriculum, for it is vital to the well-being and development of our nation.

In recent years, there have been many pressures placed on science in the curriculum - including an insufficient number of trained science teachers (felt most acutely in the physical sciences); the inadequate provision of in-service programs for science teachers during a period of changing needs and new curriculum initiatives; a reduction, in some instances, in the proportion of time spent on science in the curriculum; and the proposals and, in some cases, decisions to make science optional at the very levels of schooling where science should be contributing to a balanced, general education for all students.

If Australian Science in Schools Week conveys to the community that science and its place in the school curriculum is important and that school science is worthy of the support of the Australian community and its representatives in Government then the Week will have achieved its most important goal.

I wish each of you every success in your teaching and I urge you to become involved in and support the activities of Australian Science in Schools Week.

Brenton Honeyman
President, ASTA



Brenton Honeyman President, ASTA

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Preface

Science really is BIG and IMPORTANT. It encompasses so much both internally and in its relationship with other disciplines. Science is also undoubtedly vital in the future of Australia and recently has taken a back seat to other areas of public interest.

This Resource Booklet is a vital catalyst in assisting Australian Science in Schools Week achieve its aim of encouraging the resurgence of interest in science at schools, at home and at play. There is much more to Science than simply 3 periods a week of note transcription from a blackboard and a few recipe experiments. Science and the Laws of biology, chemistry, physics... pervade every living moment of our everyday lives. It is constantly with us, but even as scientists we are often unaware of their presence. The aim of this Resource Booklet is to stimulate the imagination and provide a few directions that can be taken and developed. It is **not** a recipe book to be followed one step unthinkingly after another.

The Resource Booklet is arranged into two sections:

SECTION 1	Activities
SECTION 2	Resource Articles

There is no great distinction between the two sections except that the articles in Section 2 tend to be longer. The order of articles in Section 2 is arranged from hands-on activities through background material to more academic considerations.

Ideas abound. Obviously not all will be partaken. However, if this Booklet inspires you to organise but **one** activity at school during ASISW then it has served part of its purpose. It is important to stress that ASISW is not an event of quantity, but rather of quality. Please concentrate on a few activities and do them well whilst having fun doing them. A quick glance over these activities may produce the thought that they have all been seen before. A **scientific**, exacting glance at each activity will produce imaginative ideas as to what each activity is all about. Select one and **think** about it.

Not all of these activities will take place over the week of 15-19th October 1984. Some activities might begin during ASISW and run onward. Other activities might culminate during ASISW. Not all of the activities will take place at school. ASISW hopes to take Science out of the classroom and into the world and the focus of community attention. Why not ask students to write an article for the local newspaper: "What we are doing during ASISW?" Why not approach local shops and ask if posters and materials can be displayed? Primary Schools - ask your Secondary counterparts for help. Secondary Schools - don't wait, go and offer help. How about organising an Open Day or Open Evening/Afternoon at school. Be **imaginative** and give it a go. Our greatest scientists had to have the courage of their convictions.

The one piece of synchronisation that we ask is that the following activities should be run on the following days. These are the 5 National Activities and we hope will gain wide attention.

Monday 15th October	Balloon Launch Day
Tuesday 16th October	*Land Yacht Day
Wednesday 17th October	*Camera Day
Thursday 18th October	ESP Day
Friday 19th October	Time Capsule Day

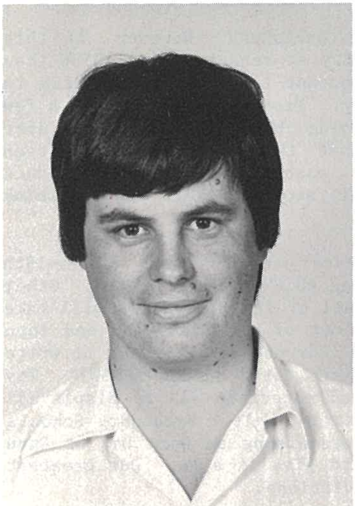
* Described in the Resource Booklet

These activities are chosen because they apply to a wide range of year levels in their organisation. The higher the level, the greater the sophistication. More details will be published in the August issue of the Australian Science Teachers' Journal.

A point of interest. ASISW and the organising committees are always looking for feedback and ideas. If you develop new and original ideas for activities, resource materials or **anything** - send them in with photos and names and addresses. Students will be awarded book prizes for material subsequently used, and all such material will be publicly acknowledged. Why not give it a go and contribute to the success of future Australian Science in Schools Weeks and indeed Australia?

I would like to thank those people throughout Australia who have contributed to this Resource Booklet. Apart from those already acknowledged in the articles I would like to thank for their contributions to Section 1: Gaell Hildebrand (Victoria), Elizabeth Jacobs (Northern Territory), Greg Linstead (W.A.) and Richard Twardy (Tasmania).

Don Hyatt
April 1984



Don Hyatt
National Director, ASISW

CONTENTS

SECTION 1 ACTIVITIES

The activities given here are in no particular order with respect to year level, science discipline or depth of description. You will also find that details of activities are, at best, brief. This is a quite deliberate policy in that it is up to **you** and your **Students** to select from the following list of **Ideas**, the activities that appeal to you the most and think through and develop these activities yourself. Indeed, the list merely provides some suggestions and it might be that you have some special activities of your own, or these suggestions might spawn further directions of investigation. Have a good **Think** about it.

Write a play: 'An ant's view of the botanic gardens.

Nature in the city.

Dispersal of fruits and seeds.

Electrolysis.

Hovercraft.

Earthworms.

Magnetic drag.

Air pressure.

A toy windmill.

A chemical garden

Solar energy

A home-made motor.

The rain cycle.

Sound.

Earth-moving ability of earth worms.

Bouncing and rolling.

Batteries and bulbs.

Electricity from lemons and salt water.

Storing energy in a rubber band/heat

Bark rubbings.

Leaf prints.

Plaster casts of our teeth.

Fossils.

Ink on fish.

Models of insects.

Tiny plants (e.g. moss).

The mysterious diver.

Challenges to ingenuity such as

picking up a coin out of water

without getting wet.

Life cycles.

How an aircraft works: principles of flight.

Engines.

Controls.

Gyroscopes.

Hang-gliding.

Magnetic patterns

Balancing models.

Collecting spider webs.

The Periscope, build a model.

The use of friction in the world.

Reflection of light.

What kind of soil is the best for certain kinds of plants.

Traffic lights.

Magic inks.

Germination.

Properties of magnets.

Finding out about things.

Asking questions about things.

Crystal growing.

A fountain.

How yachts work.

Light and plants.

Hot air balloon.

Electric circuits
in a model house.

Who can get the highest pile of soap froth?

Effervescece of a frizzy drink.

Air pressure phenomena: flags, pingpong ball.

How fire extinguishers work.

How soap works.

How a toilet works.

Why does the body need water?

What happens to you if you touch a live wire?

If you put a nail in a tree will the nail move higher as the tree grows taller? (wheat?).

Posters showing effect on animals of bushfires.

Star maps.

Insectivorous plants.

What is rotting?

How science is not a stamp collection of facts or a game of getting the right answers.

Various waveforms.

Marble collisions.

How everything on earth is recycled eventually by natural processes.

Some pendulum phenomena.

Projector microscopes (uso's/ crystals).

Ink and finger prints.

Marble rolling on corrugated cardboard.

Make your own breathalyzer.

Redo the speed of light using the old methods of rotating mirrors.

The biggest camera in the world.

Burying a container of contemporary objects in estuary sediments - Geological prognosis.

Solar barbecue

Electroscope

Scientific anomalies - raisins in fizzy drink.

Articles on famous scientists.

Resurrecting the original papers of historic prominence.

The parallel between a scientist's curiosity and that of a young child's.

Polarizing phenomena.

Balloon in a bottle.

Swirling tea leaves.

Visual illusions

Temperatures in the household: bathwater, tea, coffee.

Which is heavier: 300 ml cream or 300 ml milk?

Immiscible liquids of different densities.

The returning rolling tin

Magnetic suspensions and swingers.

Paper spinners.

The habits of snails.

Gladwrap over a plant.

Parachutes

Liquids in a container.

Photograph display.

The physics of Australia II

Chemistry in the 1 hr photography developing business.

Heliostat messages over long distances.

Halley's comet

Natural laws of nature working around the home: (thick) glass decorations fracturing in the sunlight, insulation, suntans, photochromic glasses, iceblock phenomena....

Modern discoveries e.g.: Pluto is a 'double planet'.

Siphons.

What makes apples go brown?

Why does glass break when washing up sometimes?

Why does lightning interfere with radios?

Why does turning a light on during day time make hardly any difference?

Pressure connected test tubes.

Coloured layers with different densities

Why do suntans fade after a while?

Why is new grass so green?

How do photocopiers work?

Why do certain small lights leave a broken trail as you sweep your gaze past them in the dark?

What are "Corbie grubs", and do they become anything else?

What makes those little house flies go around in 'circles' underneath the lights?

Why do plastic pegs outside on the line slowly decay?

Why do weeds grow so quickly?

Where do blowflies go at night?

Why do rubbish tins smell so much?

What makes a tomato turn red?

How do photographs get put in a newspaper?

Why do your hands, or anything else moving, appear to flutter as you go past a TV screen?

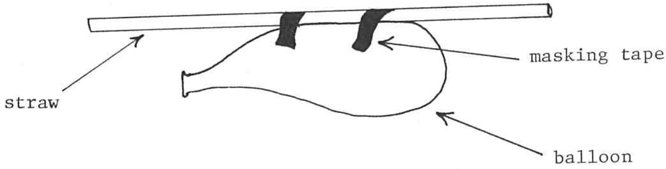
When used, cloudy cooking oil is heated up, clear spots appear all over the surface. Why?

How does a dandelion get its seeds?

- Instructions for the construction of a **parabolic solar reflector** capable of burning paper and cooking sausages are given in *Scientific American*, December 1973.

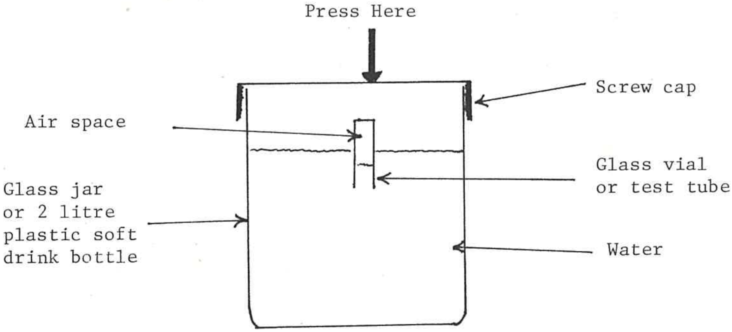
- **Study the effect of temperature, alcohol and aspirin on the heartbeat of Daphnia (Water Fleas).** Put Daphnia under a microscope, on a cavity slide, locate heartbeat. Do a base count. Add some warm water to the edge of the slide and draw it under the coverslip with tissue paper touched at the other side of the coverslip. Count heartbeat again. Use another Daphnia, do a base count, then add some 1% alcohol solution. Recount heartbeat. Use another Daphnia, repeat procedure using one aspirin dissolved in 20 ml water. Add a few drops to the slide. Work out % change in heartbeat for all conditions.

. **Balloon Rockets.** Take balloons of different shapes (round, spiral, thin, etc.). Tape a straw to the side of the inflated balloons, held in two places. The straw must be straight.



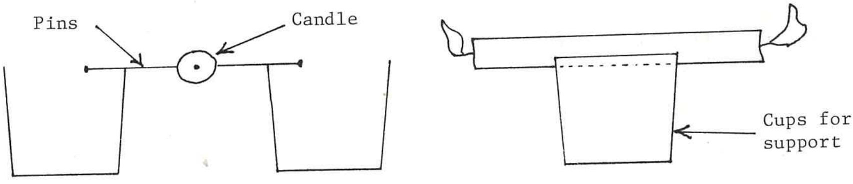
Feed fishing line through the straw and stretch the line across the room. Secure at two ends of the room. Let the balloons go and time how long it takes them to go across the room. Try to decide why some balloon shapes are faster than others.

. **Cartesian Driver**



Try putting a lid or stopper on the small bottle. Does it sink? Why?

. **One Candle Power Motor**



Light each end of the candle. What happens and why?

- **Invisible Inks**

  Three different methods are:

(i) Write on cardboard (white) using a toothpick dipped in 5% cobalt chloride or 5% sulfuric acid. Allow to dry. Place cardboard over flame and warm. Writing appears.

(ii) Write on white cardboard with toothpick dipped in phenolphthalein. Allow to dry. Expose card to 10% ammonia solution. Writing appears.

(iii) Paint cardboard with starch solution. Dry. Write on cardboard with toothpick dipped in iodine solution. Writing appears. Blot this with 15% sodium thiosulfate solution, and the writing will disappear.

- **Parachute.** Use a handkerchief, tissue paper or other suitable material. Tie to clothes peg 'man'. Does it help if you cut a hole in the parachute? Make a parachute out of paper. Try varying the: load, parachute area, material of construction, vent size, string length. Things to try: (i) the slowest parachute descent (ii) the unbroken egg high altitude drop (out of a window).

- **Drama in Science.** Perform or write and stage a science play. Organise a science club or a cooperative venture with the drama club at school. Two existing plays are 'Let there be Light' and 'The nuclear split'.

- During a **School Camp**, organise a number of science activities. Have a T.V. station or videotape enthusiast record these activities.

- Select a **theme in science** (either as a school or class). For example, careers in science, dangerous chemicals, endangered species of flora and fauna ...... Plan a display around the theme. These could then be displayed at a town centre, shopping mall, museum, shops or banks.

- Organise a **science slogan competion.** Perhaps design a sticker and forward it to your ASISW State Coordinator. If it is used in subsequent ASISW materials a $20 prize will be awarded.

- Purchase some stickers, badges or T-shirts for **prizes in school** science competitions or encouragement awards.

- Have the class **write an article** and take some pictures for the local newspaper. 'What we are doing for ASISW?'

- Hold an **astronomy night** at school. Invite parents to view the stars and see student projects on UFO's and interplanetary travel.

- **Dynamic - Practical Displays**

  Set up in the local supermarket or shopping mall: a real live science class. Practical work of course! (e.g. pH testing of shampoos; separation of mixtures; electric circuits). Encourage by-standers to become students too!
  (Seek permission first!)

- **Static Displays**

  Set up in any local place where people kill time - e.g. the railway station, the doctor's waiting room, the bank....Student project posters/photographs of/by students in science pursuits.

  (Seek permission first!)

- **Local Library** (and/or School Library)

  Suggest a display of science books/posters; science-related hobbies and careers.

- **Within school activities**

  Have some "mega" science demonstrations at a year-level, sub-school, or whole school assembly. (Preferably outdoors). e.g. Use a gas barbecue burner to heat one bucket of water in a 44 gallon (Oops: 200 litre) drum. Leave lid on but unscrewed until water begins to boil. Heat to boiling, turn off and remove heat, tighten cap/lid and hose down with cold water. Spectacular!

- Have some **"Why is it so?"** type demonstrations within your classes. e.g. The blue bottle experiment. Carry a bottle around with you all one day. Give it a casual shake each time it clears. 'Blue bottle' recipe: to a 1 dm^3 stoppered flask add: 20 g sodium hydroxide, dissolve in water, 20 g glucose, 2 cm^3 1% methylene blue in ethanol. Make up to 1 dm^3 with water. Stopper and shake well.

- Run a **"Science Fiction or Science Fact?"** Fancy Dress Day. Students and staff dress up as a character/object/concept. Have a parade at recess or lunchtime where prizes are awarded in various categories: best chemical idea, etc.

- Have an **open-house afternoon** when classes run later than usual in *science* activities where parents conme and observe/participate in science classes.

- Give all the **classrooms new names**: the Einstein Room; The Pasteur Room; The Curie Room, etc. Have a brief biography of the scientist on the door.

- Run a **Science Careers** night - emphasise it is for boys *and* girls. Have speakers/role models/videos and information on pre-requisites. Suitable for Post-primary schools - Levels 8 to 12.

- Publish a special **"Science Newsletter"** to Parents during the week: include information about science activities excursions that have occured during 1984 (preferably through the eyes of the students and in their language); science puzzles, jokes and/or "Did you know?" type sections.

- Organise **across-subject themes of a Science based nature** for English, Art, Mathematics, Geography, History, Physical Education, etc. activities within your school.

- If your school has a daily **Student Bulletin**, include an item each day. It could be a Science problem, puzzle, joke, one-liner, Did you know?, Science discoveries that improved human life, Science-discoveries we've forgotten about, etc.

- Run a **Lunchtime Science Show** - Chemical Magic, Physics of Music, Why Is it So? Demonstrations, etc.

- Run a **Science Competition** e.g.
  The best science collection (rocks, leaves, shells, etc.)
  The best science crossword/word-search.
  The tallest tower/strongest bridge built with newspaper only.
  Have a Science Treasure Hunt in the school grounds.
  Match the scientists name to the branch of science.
  Run a Science Quiz - When was nylon first produced? etc.

- **Suspend "normal" science lessons** for the week and do all those fantastic things you could never fit into the course before (or justify?!)

- Have each student in a year level/class/school/(state?) **fill a helium balloon** (or hydrogen-CAREFULLY) and design a tag which includes their name, form, school, date, message, or whatever. Assemble on the school oval on a suitably windy day, and release the balloons. If every child in Australia set off a balloon and looked for the landing balloons imagine what a success it could be! A note requesting the finder to return the balloon to the releaser including place, date and time found, should also be added to the tagged balloon. A study of air currents. *N.B. Monday, 15th October has been designated ASISW "Balloon Launch Day"*.

- Who can get the **largest biomass** from a pumkin seed over a 2 month period of time? (In winter!)

- Who can grow the **largest single crystal** for ASISW? We would like to hear about it and publish details! Did you hear about the true story of the Californian man who grew a 43 kg alum crystal. It took 11 years.

- Does paint really 'dry'?

- Why does a skater find ice so slippery?

- Why is rubber rubbery?

- Who can construct the best aeroplane/dart from a single sheet of paper? Tell us about it and send a photo.

- Why is soap slippery?

- What happens when the crude oil runs out? Write an essay or story.

- How much energy is required to life a 1 kg block from the Earth to the Moon?
- Construct a new classification system for animals based on: size, colour ... Does it work?
- How does a microwave oven work?
- What is the difference between an optical telescope and a radio telescope?
- How do deciduous trees know when to drop their leaves?
- Where do the flies go at night?
- If we know the moon's diameter how can we work out its distance?
- Buy a plastic toy or 'Dick Smith' electronic construction set and examine its workings.

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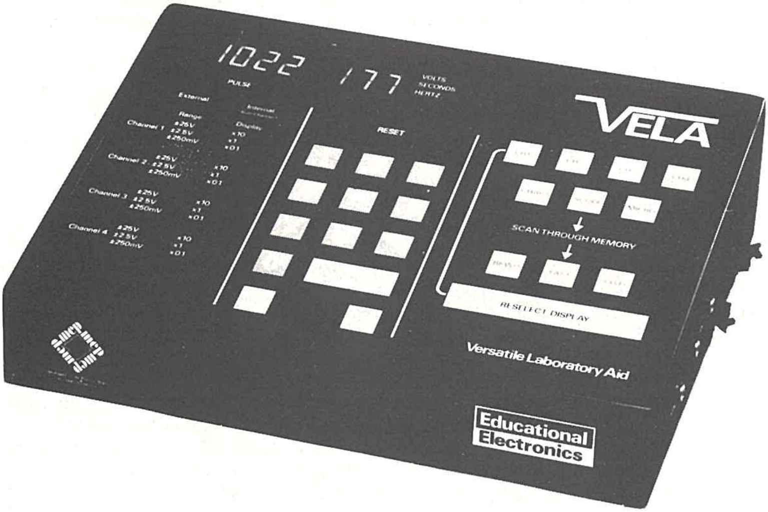

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SECTION 2

RESOURCE ARTICLES

"Science is Experimenting"

SEE HOW A CAMERA WORKS

- FROM THE INSIDE

R.P. Twardy

The good part: Darken a conveniently sized room with black garden plastic. Securely fix a 3m-4m long focal length lens over an appropriately sized hole in the plastic. Cardboard helps. See the light come in! Build some sort of flap that stops the light coming in until you want it to. Attach large sheets of whate paper all over the back of a cupboard or similar size board which can be jostled back and forth but remains stable by itself. Room lights off. Oooh look at the blurry picture! Move the cupboard some more. Wow!... the Principal's car and the flagpole are now clear and upside down!

The bad part: As your eyes adapt to the dark you can see where the light still comes in. Not so bad; your eyes are far more sensitive than you think. With more of the tape make the room dark enough so as not to be able to make out your hand in front of your face - after that any more light leaks don't matter. Some rooms have a more simple junction of window area with the walls which helps. The sun outside makes the black plastic look brown; second layer needed. The room gets hot and stuffy. A lens of such long focal length may not be easy to get. Ask other schools, or improvise one out of a positive/negative combination. It needs to have a long focal length so that people can be between the lens and its image; it is unsatisfying any other way. What were the kids doing in the dark while the shutter was down? Teacher - cheat a little: buy a brown 'safelight' globe; suitably positioned it won't drown out the image on the white paper, but you will still be able to see the class or the parents and visitors.

A better part: It is possible to obtain a 'photograph' of the scene outside. Attach a number of pieces of photographic paper to form a mosaic in the image plane on the cupboard. Expose the scene for 1 - 15 seconds depending on the brightness outside. The 'photograph' can be developed without any danger from the chemicals, inside the camera, under the safelight, in view of the people.

Use: Either 'Ilford' PQ developer and 'Hypam' fixer or similar substitutes. Get liquid stock for convenience, and no more than 500 ml each. Grade 4-5 paper for improved contrast. To hold the processing chemicals cut the flat surfaces out of the sides of two orange juice plastic containers. Temperature doesn't really matter.

Points to observe: Size of entrance hole and brightness. Adaption of eyes. Sensitivity of eyes. Peripheral vision. Lenses and imaging. Imaging without the lens using various sizes of aperture. Movement of scenery outside - time averaged blurring. Two influences on exposure: brightness/shutter time. Photosensitivity. Retina. Absorption of heat by black surfaces. Oxygen content of rooms, peoples' moods. Systematic trial and error. Variable conditions. Initiative and improvisation. Similarities and differences.

Total cost: About $25. Worth doing.

Please note that Wednesday 17th October has been designated ASISW "Camera Day".

Richard Twardy is our imaginative ASISW Coordinator from the Apple Isle.

ANT ACTIVITIES

Peter McMillan

Reprinted from SCIOS, STAWA

Ant nests can provide a lot of information if the observer is prepared to be patient and watch the occupants as they move around. Most areas have colonies of ants and an interested teacher can perhaps add to the list of ideas below. Some ants, such as Sargeant Ants, need to be treated with caution, others can be extremely shy and retiring and much time can be spent getting into a position where the creatures won't be disturbed.

Here are a few ideas:

1. Draw a map of the general area and indicate the nest position.

2. Draw a diagram of the nest and indicate any paths (trails) the ants use. Take compass bearings of the trails and nest position.

3. Watch feeding/forage trails - follow these and find out where the ants are going. How long are the trails? Are they all the same?

4. What are the ants feeding on or collecting? Are they feeding at the end of the trail? If not, then what are they doing?

5. Estimate ant flow - i.e. the rate of numbers of ants/minute past a given point.

6. Are the ant numbers the same going out and coming in?

7. Measure the speed at which ants are moving: time selected ants over a specific length, i.e. 1 metre. For example, the ants could be moving at a rate of 1 metre in 5 seconds - take several readings and average these.

8. Which lane moves the quickest - the OUT lane or the IN Lane?

9. Do all trails have the same rate of flow? If not, can you give any reasons?

10. How do the ants move? Smoothly - jerkily - in a searching pattern, etc. etc.

11. What do the ants do when they sense your presence?

12. Are all the ants on the trails the same size?

13. How long do the ants stay away from the nest? You could gently spot a tiny mark of quick drying paint on abdomens and time your marked animals.

14. How big is the nest? Can you think of a way of determing the approximate size of the ant population?

15. Are there any other insects or other animals associated with the ants?

16. Are any ants carrying something? If so, what is it?

17. Does the temperature have any effect on the ants movements or activities?

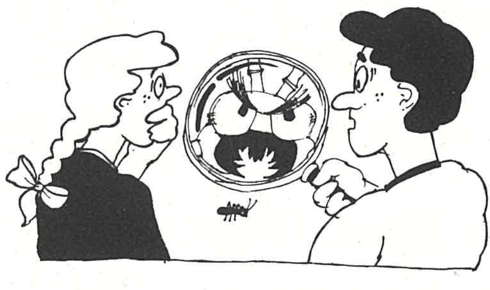
18. What happens when there is a change in the weather? Do your ants predict the change?

19. You may be able to do a long term observation on your nest. If so, then watch out for different types of activity at different times of the year.

20. There are many ants that do not advertise their presence. These can be found under logs and stones. If you turn over their shelter you can only observe the types of ants and other creatures present. Always cover up the ants with their original shelter once you have looked at them.

21. Think up some more activities and add to this list. I am sure they can lead to many open ended investigations.

Peter McMillan is at Claremont Teachers' College, W.A.



"Science is Natural"

LAND YACHT

Adapted from Science Craft, Melbourne University Resource Centre

Students should be encouraged to construct models of their own design, however the 'basic' version would require the following:

- 6 aluminium soft drink cans
- a sheet of balsa wood 30 x 8 x 1 cm
- PVA (white) wood glue
- sewing pins
- 4 clothes pegs
- a plastic or wooden cotton reel
- piece of 6 mm dowel 200 cm long
- thin plastic sheeting (freezer/ garbage bag) for sail
- masking tape
- sticky tape
- 2 match sticks
- 30 cm button thread
- small elastic band

Tools:

- craft knife, pencil, ruler, pliers, scissors, sandpaper, brace and 6 mm bit.

How it works:

This model is blown along by the wind. You need a large flat area with a smooth surface like a school playground. Full-sized land yachts race on hard sand by the sea-shore when the tide is out. Sometimes they reach speeds of 80 kilometres an hour. This model will travel at 4 kilometres an hour.

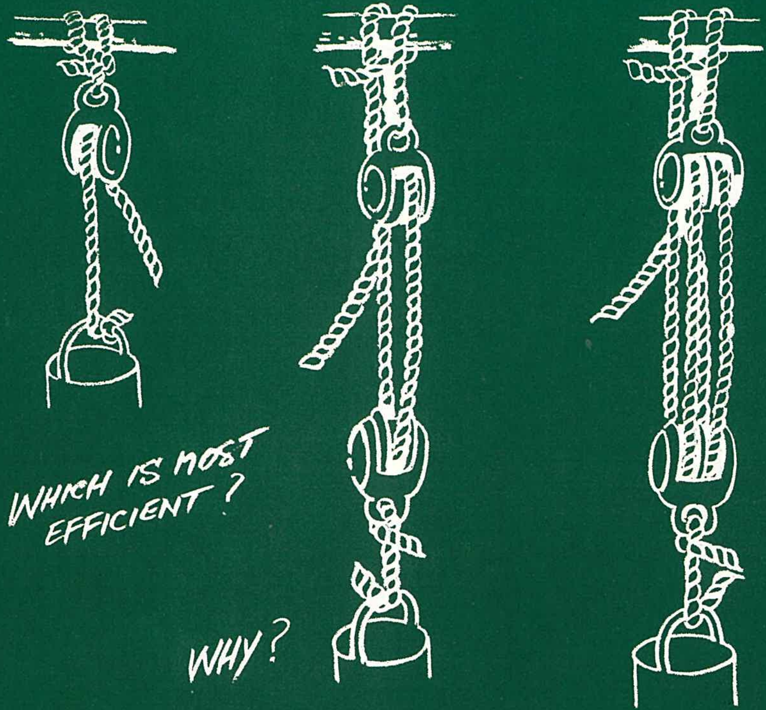
Some suggestions:

After the success of Australia II in the Americas Cup, it has been designated that Tuesday, 16th October during ASISW will be "Land Yacht Day" and as such students in schools throughout Australia can compete at school using land yachts of their own design over specified distances.

Variations in design are many, but include: size of sail, sail shape and design, sail material, number of wheels (are fanta cans better than pepsi?), size and construction of base, mast height, etc., etc. There is certainly much room for imagination.

Construction:

This should be left to the students' imagination, but the following might help:



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Helpful activity cards.

A set of twenty Activity Cards illustrating principles to be explored.

The front cover of each card depicts real life applications of these principles. Inside each card is found a step-by-step sequence for the construction of one or more models.

The back page extends the basic concept by showing a more complex model.

Useful teachers' guides.

Two Teachers' Guides are also available. One of the guides is intended specifically for teachers of children in the nine to twelve years age group while the other guide is more suitable for implementation with older students. These guides contain relevant information and practical classroom ideas which teachers can readily adapt to meet curriculum requirements.

For further information please contact:

Diane Barry,
LEGO Australia Pty. Limited,
P.O. Box 281,
North Ryde, N.S.W. 2113.
Tel. (02) 887 1433.

Or the LEGO Educational Consultant for your State.

VICTORIA:
Vivian Rowland (03) 870 8119.
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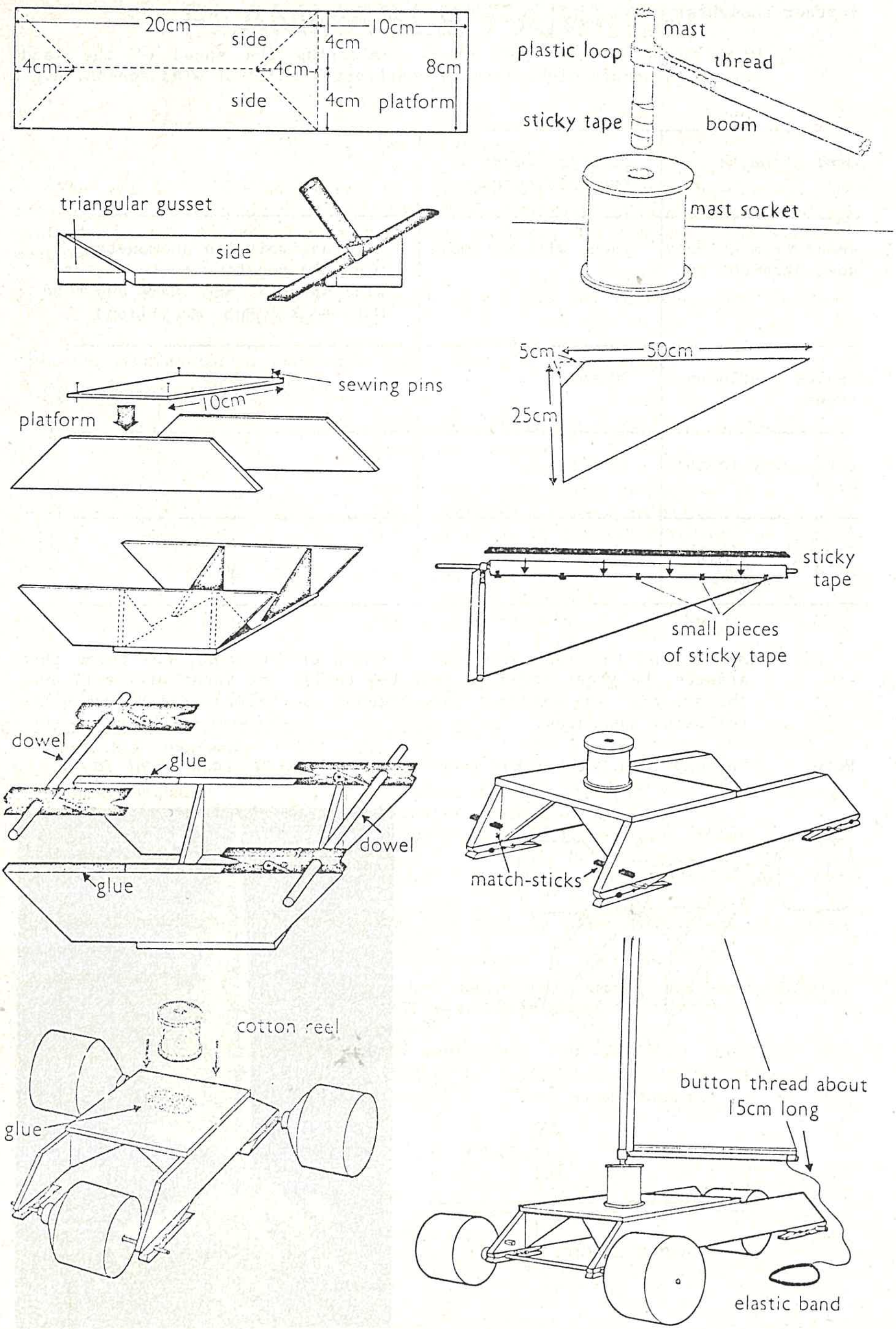
WESTERN AUSTRALIA:
Toni Chipper (09) 447 2467.

QUEENSLAND:
Ilse Ortabasi (07) 376 4161.

SOUTH AUSTRALIA:
Beverley Pope (08) 295 8644.


20cm
side
4cm
4cm
side
10cm
4cm
8cm
4cm
platform
mast
plastic loop
thread
sticky tape
boom
triangular gusset
side
mast socket
sewing pins
10cm
platform
5cm
50cm
25cm
sticky
tape
small pieces
of sticky tape
dowel
glue
dowel
glue
match-sticks
cotton reel
glue
button thread about
15cm long
elastic band

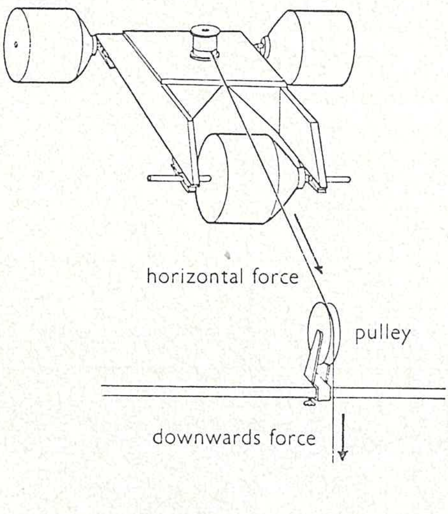
Further thoughts:

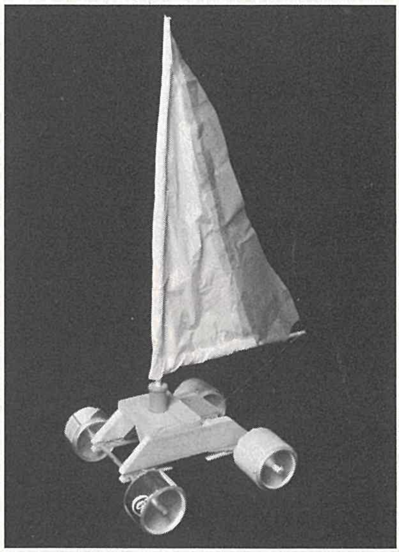
(i) Wind speed is important when considering the speed of the land yacht. Students might like to construct a scale of wind speeds, e.g.

wind strength	*time for yacht to cover 10 metres*	
smoke from chimney goes straight up	yacht will not move	Alternatively, an anemometer might be constructed to measure wind speed. (See 'Make and Find Out' Book 1 Pub. Macmillan)
leaves rustle on trees	30 secs	
trees sway in the wind	15 secs	
trees bend in the wind	10 secs	

(ii) Apart from the sails and the strength of the wind, one thing that affects the yacht speed is just how easily the yacht will roll over the ground. The smallest force needed can be measured by using the following apparatus.

Note: Tuesday 16th October has been designated ASISW *"Land Yacht Day"*.





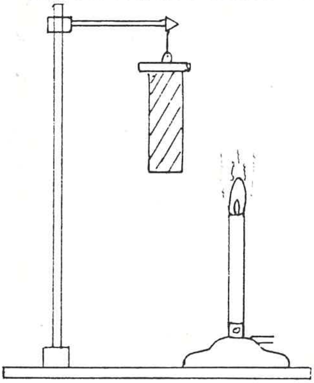
FLAMMABLE FABRICS

Glen Rossiter

The use of polymeric fibres in clothing and furnishings has caused new interest to be shown in their flammability. National Standards now exist to control the use of potentially hazardous fabrics, but how is "flammability" measured?

(1) Collect a set of fabric samples 16cm x 4cm and in turn clamp each one in the test apparatus.

Move the lighted burner under the fabric until it takes flame.



Test Rig involved:

Bunsen burner
Clamp and stand
Heatproof mat
6 cm wide bulldop clip

Remove the flame and record the following about the fabric.

(a) ease with which it catches fire
(b) whether it melts or drips
(c) whether it continues to burn or goes out
(d) time for complete combustion
(e) odour produced
(f) appearance of the residue.

Fibre Samples (16cm x 4cm):
Cotton
Viscose Rayon
Wool
Silk
Cellulose acetate (Tricel)
Polyester (Terylene, Dacron)
Polyacrylonitrile (Courtelle, Orlon, Acrilan)
Nylon

It may be necessary to repeat the test in order to collect all these observations.

Caution: The clip will be hot when you remove the burnt fabric. Perform this exercise in a well ventilated area.

Carry out this test for each sample and tabulate your results. Use this date to determine a flammability rating scale for the fabrics.

(2) It is claimed that soaking in a borax/boric acid solution will make cotton flame retardant.

Devise and carry out experiments to determine the best concentrations and methods of handling cotton to give it this property.

Write a full report on your methods and findings.

Table of typical results:

TEST SAMPLE	OBSERVATIONS ON MATERIALS					
	Takes Fire slowly/ easily	Melts or shrinks from Flame	Burns continuously/ Self Extinguishing	Approx. time for Burning	Odour on Burning	Appearance of residue
Cotton or Rayon	easily	no	continuous	1-2 min	burning paper	black char

Glen Rossiter is in the Curriculum Branch of the Department of Education, Queensland

CHEMISTRY & COLOURS

In printing coloured photographs from some magazines (e.g. Time Magazine), the printers use a matrix of small coloured circular dots to generate the required picture, but only the three primary colours (red, yellow and blue) are used to colour the dots. The chemical dyes used in colouring the dots absorb all the colours of white light except the desired primary colour. A magnifying glass can be used to examine how the density and colouring of the dots is used to generate the directed colours and texture of the print.

The screen on a coloured television set works in a similar fashion. Three dots on the screen are used to generate all the colours, but in this case an electron beam inside the television induces the chemical compounds in the dots to emit light of the desired colour.

These principles can be demonstrated using three pieces of coloured cellophane paper to produce the colours of the visible spectrum.

David Hill, University of Queensland

A NEW WAY TO CONSTRUCT KEYS FOR IDENTIFYING PLANTS AND ANIMALS

John Murphy

Reprinted from SASTA Journal April 1983 p. 18-19

Ever have trouble with wordy dichotomous keys for identifying organisms? Perhaps you, like many students, have also lost track of the species that you're trying to key out because the diagnostic features are scattered across several pages of the key. John Murphy has written a novel key for the identification of birds that seems to avoid these problems.

The diagnostic features used to identify 21 species of birds at Black Hill Conservation Park South Australia, are arranged radially into a homogram.

The homogram has been used successfully by several adults, and although it does not include all species present, it should provide a useful tool for identifying the majority of species.

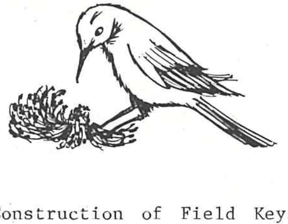
The complete set of materials developed includes, besides the homogram, notes on how to use this form of key, drawings and full descriptions of each species. The homogram by itself should give readers enough information on how to construct this type of key for other organisms.

Notes on the Use of the Key:

Decide whether the bird is larger than, smaller than or about the same size as a sparrow. Then work out from the centre of the key. At each outward step, a choice between two alternatives must be made. Check your classification by referring to drawings provided.

Example:

About the same size as a sparrow
long down-curved bill
yellow patch on wing
black forehead
breast streaked black and white
= New Holland honeyeater.

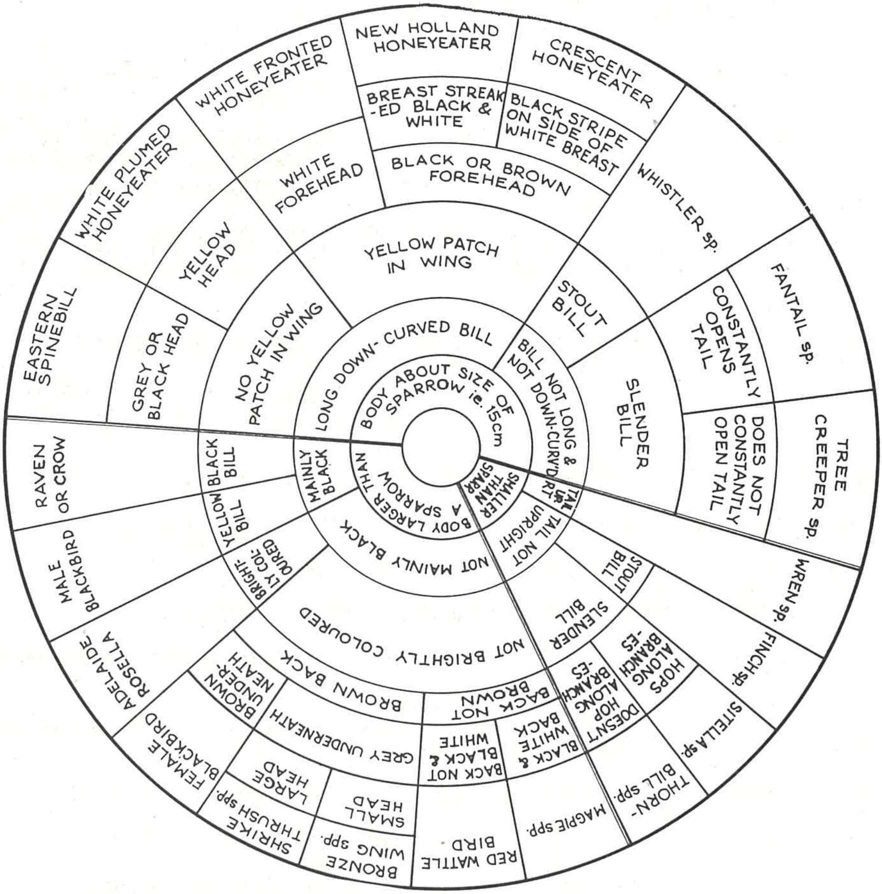


References:

Johns, R.J.(1978) - A new approach to Construction of Field Keys. Aust. Journ. Ecol. 3 : 403-409.
Haselgrove, P. et al. On the Wing. Education Dept. S.Aust.
Slater, P.(1977) - A Field Guide to Australian Birds. Vols. 1&2. Adelaide, Rigby.

Adapted from R. Johns' paper (1978, page 403-9) in The Australian Journal of Botany.

John Murphy is currently on leave studying a Graduate Diploma in Outdoor Education at Salisbury College of Advanced Education, South Australia.


BODY ABOUT SIZE OF SPARROW ie. 15cm
LONG DOWN-CURVED BILL
BILL NOT LONG & NOT DOWN-CURV'D
YELLOW PATCH IN WING
NO YELLOW PATCH IN WING
WHITE FOREHEAD
BLACK OR BROWN FOREHEAD
BREAST STREAK-ED BLACK & WHITE
BLACK STRIPE ON SIDE OF WHITE BREAST
NEW HOLLAND HONEYEATER
CRESCENT HONEYEATER
WHITE FRONTED HONEYEATER
YELLOW HEAD
GREY OR BLACK HEAD
WHITE PLUMED HONEYEATER
EASTERN SPINEBILL
STOUT BILL
SLENDER BILL
WHISTLER sp.
CONSTANTLY OPENS TAIL
DOES NOT CONSTANTLY OPEN TAIL
FANTAIL sp.
TREE CREEPER sp.
SMALLER THAN SPARR
TAIL UP
TAIL NOT UPRIGHT
WREN sp.
STOUT BILL
SLENDER BILL
FINCH sp.
HOPS ALONG BRANCH-ES
DOESN'T HOP ALONG BRANCH-ES
SITELLA sp.
THORN-BILL spp.
BODY LARGER THAN A SPARROW
MAINLY BLACK
NOT MAINLY BLACK
BLACK BILL
YELLOW BILL
RAVEN OR CROW
MALE BLACKBIRD
BRIGHT-LY COL-OURED
NOT BRIGHTLY COLOURED
ADELAIDE ROSELLA
BROWN BACK
BACK NOT BROWN
BROWN UNDER-NEATH
GREY UNDERNEATH
FEMALE BLACKBIRD
LARGE HEAD
SMALL HEAD
SHRIKE THRUSH spp.
BRONZE WING spp.
BACK NOT BLACK & WHITE
BLACK & WHITE BACK
RED WATTLE BIRD
MAGPIE spp.

SCIENCE FICTION ACTIVITY

Torquil Todd

S.S. = Short Story N = Novel C = Collection

Isaac Asinov:	(1)	"Nightfall" (S.S.), in "The Science Fiction Hall of Fame, Vol.I" (SFHF). Astronomy, Phil. of Science.
	(2)	"I Robot". (C) Artificial Intelligence (A.I.), Technology.
	(3)	"The rest of the robots". (C) A.I., etc.
	(4)	"The Martian Way". (S.S.), in SFHF V.IIB. Astronomy, Physics.
Paul Anderson:	(1)	"Call me Joe". (S.S.), in SFHF V.IIA. Planetary Physics, Biology.
	(2)	"Epilogue". (S.S.), in "Time and Stars". Evolution.
	(3)	"Brake". (S.S.), in "Cold Victory". Physics.
David Brin:		"Sundiver". (N) General Physics, Biology.
Charles Sheffield:		"The McAndrews Chronicles". (C) General Physics.
James P. Hogan:		"The Two Faces of Tomorrow". (N) A.I., Technology.
James Blish:		"The seedling stars". (C) Physics, Biology.
Walter M. Miller:		"A canticle for Leibowitz". (N) Hist. & Phil. of Science.
Fred Hoyle:	(1)	"A for Andromeda". (N)
	(2)	"The Andromeda Breakthrough". (N) Physics, Biology, A.I., Phil. of Sci.
John W. Campbell:		"Who goes there?" (S.S.), in SFHF. V.IIA. Biology.
Larry Niven:	(1)	"Ringworld" (N). Physics, Evolution.
	(2)	"Neutron Star" (C). Physics.
	(3)	"The Moat in God's Eye" (N). Physics, Biology.
	(4)	"The Flying Sorcerers" (N). Phil. of Sci.
John Windham:		"The Crysalids" (N). Biology.
Edmund Cooper:		"The Overman Culture" (N). Phil. of Sci.
Philip Hose Farmer:		"Sail on! Sail on!" (S.S.), in "Decade, the 1950's" (ed. Aldiss & Harrison). History of Sci.

T.J. Bass: "The Godwhale" (N). Biology.

Jerry Pournelle: "Black Holes" (C). Astrophysics.

Bob Shaw: "A wreath of stars" (N). Phil. of Sci.

Robert Heinlein: (1) "Universe" (S.S.), in SFHF, V.IIA.
(2) The Moon is a Harsh Mistress" (N), Physics, A.I. "Fireproof" (S.S.), in "Decade, the 1940's" (ed. Aldis & Harrison). General Physics.

Racoona Sheldon: "The Screwfly Solution" (S.S.), in "The Best S.F. of the Year # 7" (ed. Carr). Biology.

Stanislaw Lem: "The Invincible" (N). Evolution.

Robert Sheckley: "Ghost V" (S.S.), in "The Robert Sheckley Omnibus", Phil. of Sci.

Robert Abernathy: "Pyramid" (S.S.), in "The Penguin S.F. Omnibus" (ed. Aldiss). Biology.

George R. Martin: (1) "Call Him Moses" (S.S.), in "Analog" Magazine, Feb. 1978 Biology.

(2) "A Beast for Norn" (S.S.), in "Andromeda" (ed. Weston). Biology.

Dean McLaughlin: "Dawn" (N). Astronomy, Hist. & Phil. of Science.

Some activity suggestions:

(i) After reading one or more of the above stories, have students discuss the question of science fiction versus science fact.

(ii) Students could write their own short science fiction story (with help from an English teacher).

(iii) Have groups of student enact a science fiction play (enlist the aid of a drama teacher).

(iv) Does intelligent life exist on other planets in the Universe?

Torquil Todd is a Dip. Ed. student at Melbourne University.

CONTRIBUTIONS TO SCIENCE

Glen Rossiter

Match these descriptions with the pictures on the following page:

A. An Austrian monk who combined talents for gardening and statistics to arrive at the laws of genetic inheritance.	H. Experimented with a technique for preventing the dreaded smallpox. His vaccination technique used innoculation of a patient with cowpox.
B. Experimented vigorously to investigate the properties of X-rays he had discovered with simple cathode ray tube apparatus.	H. Discovered the laws of the pendulum, designed and constructed telescopes. He proved objects accelerate equally under force of gravity.
C. Proposed the basis for the laws of motion and the importance of gravity. Developed reflecting telescopes and the mathematical calculus.	I. Initiated the industrial revolution by developing an efficient steam engine. Also introduced the governor as a simple means of automation.
D. This Australian scientist identified and classified solar radio emissions and placed Australia at the forefront of the field of radio astronomy.	J. Proposed the modern theory of gravitation and deduced the equivalence of matter and energy - the basis the basis of modern atomic physics.
E. Discovered that magnetism could induce electric current to flow in a conductor and offered methods of converting mechanical energy into electrical energy.	K. Developed experimental apparatus in Australia to enable a substance to be analysed for metal elements, called atomic absorption spectroscopy.
F. Separated the elements radium and polonium and researched deeply into the property of radioactivity.	L. Invented the original atom smashing machine called the cyclotron as well as conducting programs into the use of nuclear reactors.

Answers can be found on p.40

Glen Rossiter is in the Curriculum Branch of the Department of Education, Queensland.

1. James Watt

2. Isaac Newton

3. Louis Pasteur

4. Paul Wild

5. Albert Einstein

6. Galileo Galilei

7. Wilhelm Roentgen

8. Gregor Mendel

9. Michael Faraday

10. Marie Curie

11. Ernest Lawrence

12. Alan Walsh

WHY IS THE SKY BLUE?

Kerrie Mullins-Gunst

Light from our sun is yellowish-white. However, Newton showed that it can be broken up using a prism, into all the colours of the rainbow: red, orange, yellow, green, blue, indigo and violet.

Each colour is actually light (or electromagnetic radiation) of a differenct wavelength. Red light has a long wavelength, blue light has a shorter wavelength and violet has an even shorter wavelength. The other coloured lights have wavelengths in between.

White light does not have a specific wavelength. White is the colour our eyes register when we look at a mixture of all the wavelengths, or all the colours, of light.

When light from the sun passes through the atmosphere it sometimes collides with the tiny particles of oxygen and nitrogen which make up the earth's atmosphere. These are very small, even compared to the small size of light wavelengths.

Light with a short wavelength, such as blue, is much more likely to be scattered by such tiny particles. Longer wavelength light suffers fewer collisions and consequently is scattered less.

When we look up at the sky we see light which has been scattered as it passed through the atmosphere. Blue light, with its shorter wavelength, is scattered five times more strongly than red. Therefore the sky looks blue.

We see the 'bluest' skies near the equator or, in our own region, at mid-day when the sun is directly overhead. This is because the light from the sun travels the shortest distance through the atmosphere to our eyes. Only the blue light is significantly scattered in this short distance and by the tiny particles.

In the evening sunlight travels obliquely for a longer distance through the atmosphere and passes through air closer to the ground. This air is more dense and much more likely to contain dust or other large particles. Consequently light of longer wavelengths will be scattered more, causing the sky to appear orange or red at sunset.

The water droplets in clouds scatter all wavelengths of light fairly evenly. So clouds appear white. If the cloud has so many water droplets that the scattered light hardly passes through, it looks black and we call it a rain cloud.

Kerrie Mullins-Gunst is a Lecturer in the Department of Chemistry and Physics at Melbourne CAE.

TOOTH CHEMISTRY

Reprinted with permission from Scifile No. 13 August, 1981.

Carbohydrates remaining in the mouth after a meal are utilised by bacteria. In doing this, the bacteria produce acids which can erode the outer enamel and inner dentine of teeth. But where does the attack begin and why are some teeth more susceptible than others?

Scientists from the Division of Chemical Physics in Melbourne and (formerly) at the New Zealand Medical Research Council Dental Research Unit have used an electron microscope to examine carious lesions, the sites of early decay, in both natural and synthetic enamel.

Dental enamel is the hardest substance in the body. Its strength comes from its high content of the mineral hydroxyapatite, which is often one form of calcium phosphate, and the orderly arrangement of this mineral into crystals lined up perpendicularly to the tooth's surface.

As bricks are neatly patterned in a wall, so most of the crystal atoms form a neat lattice, but some of the atoms are different. Here and there a calcium ion has been replaced by another metal such as sodium, or a carbonate group has substituted for phosphate.

About 4 per cent of natural enamel consists of such inclusions as carbonate, sodium, zinc, strontium, lead, fluorine, and chlorine. The exact composition of enamel varies from person to person, from tooth to tooth, and even within each tooth.

Some of the 'intruder' ions occupying calcium sites are smaller than calcium ions. If one brick is too small, a wall will be weak, and the scientists believe that such crystal lattice defects are chinks in the enamel's chemical armour, where the lactic and acetic acids made by bacteria are most likely to launch their attack on the enamel.

If the scientists are right, then it may be possible to strengthem teeth by plugging calcium-deficient sites with ions of suitable metals, perhaps in a mouth-rinse.

Scifile is produced by the CSIRO and is included each term with the Australian Science Teachers' Journal.

SCIENCE IN SCHOOLS

A PERSONAL VIEW ON SOME ASPECTS

R.P. Twardy

If my school has, among other things, something like an open day for parents and visitors for the coming Australian Science in Schools Week, I shall make sure that we take the opportunity virtually **to brag** about why we believe that Science is **good** for kids.

If we believe that the subject called 'Science' is taught for certain worthwhile reasons, then to 'blow our own trumpet' is a respectable and legitimate thing to do. The problem is that while pupils have perhaps four years to aquire all the good results and influences of a science education, the parents need to be able to form a fair and reasonable idea of what these good results and influences are in less than one visit. This is not necessarily an easy thing to do since many of the desirable long term effects of a scientific education are quite subtle. We should start off by discrediting quite emphatically any mistaken notions that 'Science' is just a stamp collection of facts, or is just a game of getting the teacher's right answers. Equally mistaken is any belief that only scientists can do anything scientific. In our attempt to re-educate the general public, let us disregard the academics around the world who will argue among themselves as to what Science 'is', and as teachers, offer instead some philosophy of our own that should be acceptable to parents, *et al.* So, in addition to providing some interesting and entertaining open day material to view and operate, what about a **message** that includes something like this ......

Science in school provides an opportunity to acquire attitudes, skills and knowledge of certain kinds, useful far beyond the normal bounds of the classroom.

Curiosity is a natural and common reaction throughout our daily life. Through science in schools kids learn not only that their curiosity is good, but even more importantly how to satisfy their curiosity. This advice is appropriate for the rest of their life.

Certain character and personality attributes are desirable in anybody no matter what their calling in life. Science in schools is one vehicle particularly suited to encouraging pupils to be systematic, curious, initiative, accurate, knowledgeable, critical, expressive, ... Their work will display how these attributes develop as they grow older.

Richard Twardy is the Tasmanian Coordinator for ASISW.

GIRLS AND PHYSICAL SCIENCE

Dr. Irene Irvine

Concern has been expressed in many quarters about the under-representation and lower-achievement of girls, compared to boys in the physical sciences. Studies into the reasons underlying this state of affairs have shown it to be a complex intermingling of factors involving the girl herself, parental expectations, schooling experiences and societal pressures.

A great deal is now known about what specific factors or experiences greatly influence a girl's choice of subjects, career path and ultimate performance level. Unfortunately space does not permit an elaboration or full discussion of the myriad of issues involved.

What this article does, I hope, is to provide classroom teachers with a smorgasboard of suggested strategies and activities shown to have been successful in reversing the existing trends. It is probably unrealistic to expect busy science teachers to implement all of them but even if only a few were tried initially it would be an improvement upon the existing situation.

Checklist of Ideas for Increasing the Participation of Girls in the Physical Sciences.

1. Discuss the issue in class. Gauge student opinion about strategies. Convince them about the need for intervention on the behalf of girls.

2. Tape one of your science lessons. Analyse it for sexism, role assumptions. How much time did you spend talking versus listening to students? How many minutes did boys receive your attention?

3. In your lessons do you use an equal number of male-female related examples? i.e. golf clubs, sewing machines, etc.

4. Examine the text books and teaching materials you use. Do females and women feature as often as boys and men? Are they doing similar things or are the roles stereotyped?

5. Look at your teaching style. Girls perform better in co-operative group work rather in teacher-directed questioning styles.

6. Examine your own attitude towards girls and the physical sciences. Do you make disparaging remarks about women? Do you unconsciously reinforce girl's feelings of inadequacy?

7. Place less emphasis on the rigor and purity of the subjects and more upon encouraging girls to "give it a go". Give easier tests in the initial stages to boost their confidence.

8. Provide students with female role models. Show both boys and girls that women can and do succeed in science.

9. Use everyday meaningful examples of scientific phenomena. Emphasise that these are not always well understood, even by scientists.

10. Supply information about a wide variety of scientific careers. Show scientists at work in a range of surroundings.

11. Run single sex practical classes.

12. Choose girls to help in demonstrations. Encourage them to be assertive.

13. Check that girls get "a fair go" at equipment in the laboratory.

14. Capitalise upon girl's enthusiasm for the biological. Introduce topics via this avenue.

15. Emphasise the role women have played in science in the past. Find examples of their work and discoveries, don't just let Mme Curie be a token representative.

16. Enlist the help of the careers teacher, parents, library staff in promoting science to girls, run a science careers week.

17. Set tests with an equal weighting of multiple choice/long answer questions, girls do better in the latter, boys the former.

These are only a few suggestions. Ask around your department for others. GOOD LUCK!

Irene Irvine is a lecturer in the Department of Chemistry and Physics at Melbourne CAE.

"We Dig Science"

SAFETY IN THE SCHOOL LABORATORY

THE ROYAL AUSTRALIAN CHEMICAL INSTITUTE

From:
Western Australian Chemical Education Group, RACI

The information in this article is designed as an introduction to safety in the chemical laboratory. It provides the basis for a safe workihng attitude. Experienced students should learn more about the requirements for safety in handling chemicals. Further information is available from various sources.

WHAT ARE THE DANGERS?

Chemistry is fun, but it can be dangerous. The experiments that you will do in the laboratory have been designed to be as safe as possible; however accidents can happen and it is up to you to prevent them by developing good safety habits when dealing with chemicals.

Adopt a *positive attitude* to safety. Try and recognize those operations which may involve a hazard and then act to minimize the chance of an accident. Examine the provision of safety facilities in the laboratory, such as safety shower, fire exits, fire buckets, fire blankets, first-aid kit.

Remember **SAFETY FIRST**

The major dangers in the chemical laboratory arise from two areas: accidents arising from the use of equipment and from the use of chemicals.

EQUIPMENT DANGERS

Cuts and Burns

Most of the equipment that you will use is made of glass. Be careful not to knock beakers, flasks and other equipment onto the bench or the floor or into the sink. If any equipment is chipped, or cracked report it immediately. Never try to force glass tubing or a thermometer through rubber or cork stoppers because it may break and cause deep cuts.

Burns are most often caused by picking up hot tripods, beakers or bunsen burners. Remember, if you have been using a burner for an experiment, then all of the apparatus will remain hot enough to burn you for up to half an hour after the end of the experiment. When picking up a tripod **always** pick it up by two of the legs - it may be hot. *Never* put hot equipment away in cupboards or boxes as fires may result.

When using a bunsen burner, make sure that the equipment is firm and not easily knocked over. All flammable substances such as paper, plastics and especially solvents should be removed from the immediate area. If a fire does occur stand well back and call your Teacher immediately. *Never use your hands on a fire.*

When lighting a bunsen burner use matches or a taper only and light it with the air hole closed. Never use a lighted piece of paper from another burner because on disposal this sometimes sets the rubbish bin on fire. Such fires can be difficult to put out. Take particular care when you are heating liquids to avoid spillage, bumping or boiling dry (which may lead to cracking of the apparatus).

ELECTRICITY

If you are using electricity in an experiment the dangers are twofold - fire caused by short circuit and electric shock. If an electrical fire does start, turn off the power and disconnect the equipment from the supply. Unde_ no circumstances use water on an electrical fire. When you have set up your equipment, ask your Teacher to check the connections *before* you plug it in. Remember not to handle any electrical euqipment with wet hands, as this can lead to a shock.

CHEMICAL DANGERS

When dealing with chemicals you must always treat them as if they are poisonous. This is true not only of chemicals used in the laboratory, but also household chemicals such as pool chemicals, pesticides, garden chemicals or garage chemicals.

When handling chemicals, the following rules should be followed:

(1) **Never** eat, drink or smoke in the laboratory. You also should not drink or eat from beakers or other laboratory apparatus outside the laboratory - they may be contaminated.

(2) **Never** touch chemicals with your bare hands - always use a spatula. This keeps the chemical from becoming contaminated and may also save your hands from a chemical burn.

(3) **Never** taste anything in the laboratory. Very small amounts of some chemicals will make you ill, or worse!

(4) **Never** smell a chemical by directly putting your nose over the top of the container. If you are asked to smell a chemical, waft the fumes towards you with your hands.

(5) **Never** suck a corrosive or toxic liquid into a pipette by mouth - always use a pipette bulb or filler. This will protect you from poisoning and your teeth from chemical attack. It is desirable that pipettes should *always* be filled by using a pipette bulb or filler, but these items are often expensive, difficult to use and have a short working life; therefore, they are sometimes unavailable in schools. Only solutions specified by your teacher as harmless should be sucked into a pipette by mouth.

(6) **Never** put anything in your mouth while you are in the chemical laboratory. This includes pencils, food and chewing gum; it is easy for these things to be contaminated with the chemicals you are using.

(7) **Never** carry out any unauthorised experiments either at school or *at home*. Mixing chemicals to see what happens may result in injury to you or to others.

(8) **Never** point a test tube at anyone while you are heating it. The contents often "bump" out with great speed.

(9) **Never** remove chemicals from the laboratory.

(10) If safety glasses and/or gloves are provided make sure that you wear them when handling chemicals or performing experiments.

(11) Take particular care with any apparatus under pressure or vacuum - glassware should not have any cracks or even scratches, and preferably should be enclosed or covered (including thermos flasks).

"Science is Great"

GENERAL INFORMATION

You should only enter the laboratory if your Teacher is present. Never run or raise your voice in the laboratory. It is important that you can hear your Teacher's instructions and that your Teacher can hear you should you need help.

Do not wear thongs, slippery or open sandals, or bare feet in the laboratory. Long hair, ties and floppy clothing should be restrained to avoid it catching fire or knocking apparatus over. Laboratory coats are desirable and should be worn only in the laboratory. School bags and other bulky items should not be taken inside the laboratory as they may cause accidents.

Always keep the bench clean where you place your notebook or textbook. Always clean up after you have finished. Replace chemicals and apparatus in the appropriate storage areas. If necessary use a damp cloth to wipe down the bench. This should be handed in for cleaning or disposal. If you do spill any chemicals, first ask your teacher how to clean up and then following the instructions carefully.

Finally, make sure you wash your hands after each laboratory session.

This article was prepared by the Chemical Education Group of the Western Australian Branch of the Royal Australian Chemical Institute. Comments from various sources, including the Toxic Hazards Committee and the Queensland Chemical Education Group of the RACI have been incorporated.

The information in this article is intended for students, who will undertake classes in laboratories and handle apparatus and chemicals, etc. Teachers are invited to photocopy the article and distribute it to students.

The Royal Australian Chemical Institute publishes a 6-page brochure on LABORATORY SAFETY, which is designed to unfold into a wall chart. Two are required to display both sides of the brochure and it is very suitable for use in chemical laboratories. A bibliography on Laboratory Safety, Hazard Control and Toxicological Data is included. These brochures are available from the Royal Australian Chemical Institute, 191 Royal Parade, Parkville, Vic., 3052 (Tel. (03) 347 1577) for $1.00 each including postage.

Note: Safety signs similar to those illustrated in this article, and others, are available on pliable, adhesive-backed vinyl from a variety of sources, including Selby Scientific.

Answers to 'Contributions to Science', p.30

ASISW aims at developing initiate and investigative skills. You would not want us to let you have the easy way out would you? It is up to you to work out how to ascertain the answers that you do not know.

CSIRO SCIENCE EDUCATION CENTRE

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In association with State Departments of Education, CSIRO is establishing Science Education Centres in capital cities with the following aims:

- to provide varied and stimulating scientific experiences for students;
- to illustrate the application of science and technology to industry;
- to provide students with further opportunities to learn how basic scientific concepts are applied in selected areas of current research;
- to convey the importance of communication in science;
- to act as a scientific focus for students and teachers;
- to provide in-service education activities for teachers in the areas of science and technology.

Activities at the Centres, such as the Energy and Polymer themes in the Melbourne Centre, promote an awareness of science through experience rather than learning. Hands-on displays and experiments form the core of a Centre's programs. Class teachers are encouraged to discuss special requirements with the Education Officers so that students can relate their experiences at a centre to topics in the syllabus.

More details of the CSIRO Science Education Centres appear in *Scifile* — CSIRO's current-awareness booklet for teachers, published once a term and distributed with the Australian Science Teachers Journal.

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