RESOURCE BOOK

sponsored by CSIRO, BHP and ASTA

Australian Science in Schools Week

An initiative of the Australian Science Teachers' Association

14th-18th October 1985

AUSTRALIAN SCIENCE IN SCHOOLS WEEK
14–18 OCTOBER 1985

Australian Science in Schools Week aims to

- **focus community attention on science and its importance in the school curriculum**
- **promote the image of science**
- **involve students in a broad range of science-related activities**
- **extend and encourage science education beyond the classroom**
- **promote science as being fun**

Resource Book compiled and edited by
Brenton Honeyman and Helen Burfitt

Cover Design by
Lesley Gordon

Printed by
Canberra Publishing and Printing Co., Fyshwick, A.C.T.

CONTENTS

PREFACE

Australian Science in Schools Week, held for the first time in 1984, is one of the important initiatives by the Australian Science Teachers Association in recent years. Other projects include the commissioning of a national study entitled "The Place of Science in the K-12 Curriculum of Australian Schools", the National Symposium held during ASISW in 1984 to develop recommendations relating to areas of concern in science education, participation in major national ventures such as the BHP Science Prize and the CRA Fellowship Program, the production of a Handbook of Experiments with the assistance of CSIRO, and the appointment of an ASTA Project Officer to co-ordinate action in relation to problems experienced by girls in science.

More than any other event, ASISW has the potential to involve school communities. This week of activities can do much to bring science education to the attention of the whole community.

This Resource Book provides teachers and students with ideas that can be used inside, or better still, outside the classroom. Most of the activities are simple and are easily adapted to suit students at any level. No matter what the backgrounds of students may be, ASISW is an event for all. The success of ASISW is irrespective of particular facilities or circumstances — it depends on what you make of it. Many of the more successful activities in 1984 involved little or no cost — simply some thought and effort.

A central part of this national week is the program of Designated Activity Days when students participate in the knowledge that other students throughout Australia are taking part in the same activity at the same time. Another nationally co-ordinated event is the Poster Competition which provides an artistic outlet for our young scientists. The Speakers Scheme provides an opportunity for students to meet not only prominent research scientists, but also men and women who use science as part of their job. There are also many services items for sale which can be used to promote ASISW and encourage students in their endeavours.

Australian Science in Schools Week is much more than a week of fun with science. It also serves to communicate the importance of science in the school curriculum to students, school staff, parents and the wider community. I urge you all to join in the activities of ASISW — I promise you a rewarding experience.

Don Hyatt
National Director

NATIONAL POSTER COMPETITION

The Poster Competition was very successful last year and the National Executive Committee is looking to this year's competition as an excellent way to promote ASISW. Its success will depend on your support and enthusiasm. Please encourage your students to enter. There are three topics to choose from:

Topics

- SCIENCE FOR LIVING
- CONSERVATION
- CURIOSITY

Categories

- Primary
- Secondary

Requirements

- Approximately 30×40 cm in size
- Aim to promote ASISW in some way.
- Try to incorporate the ASISW Logo in the poster.
- The poster should be colourful and appealing and contain a slogan or simple message related to one of the three topics.
- The poster should be original.

The five best posters in each category for each state will be forwarded to Melbourne in early September for the national judging. Lego and Heinemann are sponsoring the prizes to be awarded to the 5 National Prize Winners in each category.

Judging guidelines

- Communication of the message

  Relevance to the topic
  Legibility at a distance
  Clear, original message
  Thought provoking
  Clever use of wording

- Design

  Well balanced and spaced
  Good initial impact
  Effective use of colour

- Technical execution

  Competence of basic drawing
  Attention to detail
  Media well handled

- Creativity

  Imaginative ideas
  Special effects used

Posters must be received by State Co-ordinators by 16 August 1985. For further information contact the Poster Competition Director or your State Co-ordinator.

Alan Pepper
Poster Competition Director

SPEAKERS SCHEME

Science is the greatest innovator and guide for the future direction of our society. The Speakers Scheme is an effective way to underline this point to your students during ASISW. No matter where your school is, your community will have a large number of women and men in science-related occupations. Here are some ideas for speakers.

Local clubs

Astronomical societies, birdwatching groups, the Society for Growing Australian Plants, conservation groups, computer user groups, speleological groups, etc.

Local industries

Electrician, auto-electrician, photographer, horticulturalist, pest controller, dairy factory, abbatoir, timber mill, vet, doctor, dentist, pharmacist, radiographer, optometrist, local TAFE, etc.

Government agencies

Hospital, ambulance, forestry, fire-brigade, police (radar, breathalyser, forensic, drugs), local government (health inspector, shire engineer, pastures protection board), Telecom, national parks, local university, CAE, CSIRO division, etc.

Professional associations

Royal Australian Chemical Institute (RACI), Australian Institute of Physics (AIP), The Institution of Engineers, Australian Academy of Science, etc.

Large private companies

BHP, CRA, BP, Shell, Phillips, Comalco, etc.

So why not throw your doors open to a world of science. Here are some ideas to get you started.

- Make initial contact with your speaker(s) and negotiate a date and topic. Confirm in writing.
- Outline a list of objectives to be attempted or modified by the speaker(s). Offer the services of any audio-visual equipment. Include this in your written confirmation.
- Make any necessary modifications to your school/faculty timetable in order to accommodate the speaker(s).
- ASTA has approached CSIRO, RACI and AIP about the Speakers Scheme. These organisations are keen to hear from you.
- Primary school teachers would welcome secondary science teachers as guest speakers. Demonstrations involving the Van der Graaf generator, colourful reactions, a skeleton, the microscope, etc., will communicate the fascination of science to primary students.

For further information, contact the Speakers Scheme Director or your ASISW State Co-ordinator.

Stephen Manahan
Speakers Scheme Director

SHELL SCIENCE FELLOWSHIP

In conjunction with the Australian Science Teachers Association, Shell Australia has initiated the Shell Science Fellowship. This venture is designed to promote the spirit of ASISW by selecting two Australian students to attend the Singapore Youth Science Fortnight in May/June 1986. Air fares and full accommodation will be provided for each student and, during their stay in Singapore, the students will be invited to attend the Activity Camps for Singaporean and international students and see the many activities of the well established Singapore Youth Science Fortnight. Seeing the fabulous Singapore Science Centre is a must.

Two highly able students have been awarded the first Shell Science Fellowships to attend the 1985 Singapore Youth Science Fortnight. Selection for the 1986 Shell Science Fellowships will be based on four criteria:

- the completion of some technological application of a scientific principle. This very broad criterion may take the form of a new development, a model or some other form. It should be completed by, or soon after ASISW this year.
- a report from the school as to the suitability of the applicant to represent Australia, and indicating other interests.
- a report on the academic ability of the student.
- an interview by the State Science Teachers Association.

Students will be judged initially by representatives of their State Science Teachers Association, and then by a National Judging Panel which includes representatives of the Australian Science Teachers Association and Shell Australia.

It should be emphasised that the selection of students will be based on a range of abilities, interests and initiatives, therefore students of highly able, well rounded abilities are encouraged to apply. Applicants should be studying at Year levels 7–10 during 1985.

Closing date for application forms is 19 August 1985. Closing date for entries is 1 November 1985. Application forms are available from the ASISW National Director.

DESIGNATED ACTIVITY DAYS

The concept of Designated Activity Days provides an opportunity for students to participate in activities in the knowledge that students throughout Australia are, at the same time, engaging in the same event. This therefore provides a true sense of national unity during ASISW. This year the Designated Activity Days are:

MONDAY
14 OCTOBER — **A**IR DAY

TUESDAY
15 OCTOBER — **S**UN DAY

WEDNESDAY
16 OCTOBER — **I**NFLATION DAY

THURSDAY
17 OCTOBER — **S**TRUCTURES DAY

FRIDAY
18 OCTOBER — **W**EATHER DAY

The activities proposed for each day are not intended to be exhaustive. You are encouraged to add your ideas, and to modify those included here so that the activities your students participate in are challenging, enjoyable, and appropriate to their abilities.

AIR DAY

GO FLY A KITE!

Kites can be constructed in all shapes and sizes — sail kites, diamond kites, sled kites, and box kites are just a few of the many types.

The number of activities that you can do with kites are limited only by your imagination. To start your thinking, here are a few ideas.

- Using the same materials and basic design for each kite, construct kites of different sizes. How does size affect a kite's performance?
- Investigate the effect of different tails and streamers on the stability of a kite.
- Research the various forces and airflow principles which operate as a kite is flown. Design improvements to your kite to take into account your findings.
- Attach a maximum-minimum thermometer to your kite. Using a kite string which is marked each metre along its length, and a device to measure the angle of the kite above the ground, calculate the height of the kite trigonometrically. When you have lowered the kite to the ground, record the minimum temperature shown on the thermometer. How does this reading compare with the temperature of air at ground level?
- Investigate the relationship between the angle of attack of the kite and the stalling of a kite. Use this knowledge to design improvements to the bridle — the system of strings attaching the kite to the main line.

PLANE SAILING!

The object of this competition is to design and build a paper plane which can fly the greatest distance or obtain the longest flight time. The plane must be built to these specifications:

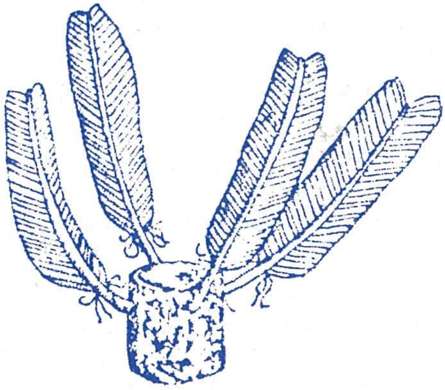
- The plane is to be constructed from paper, paper clips, and glue. No other materials may be used.
- The plane must not be self propelled.
- The plane must resemble a plane and not a spear or missile.
- The plane should have the entrant's name clearly printed on it.

The competition is best conducted in a large hall. Competitors must launch their planes from a non-elevated position behind the start line.

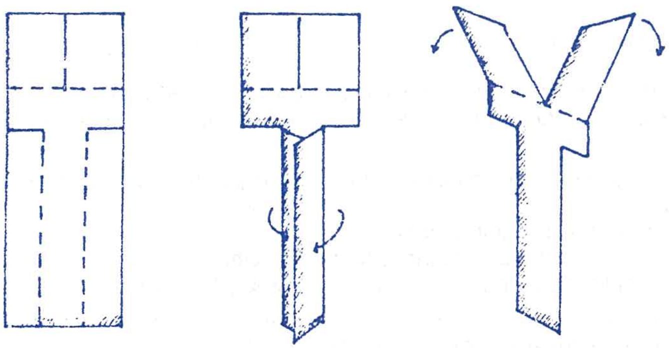
J. Baker
Gladstone State High School, Qld

WHIRLYBIRDS

Long before people were able to fly in helicopters, toy helicopters were made using feathers stuck into corks as rotors. Try building one yourself. Make four slanting holes in the cork and push four feathers into these holes. Make sure that all the feathers are twisted the same way. Throw the "whirlybird" up and watch it fall.



There are a number of interesting experiments you can try by building a paper helicopter. The following diagrams show you how. A paper clip can be attached to the base to increase its stability. Drop the paper helicopter from an elevated position and watch it fall.



Try varying each of the following:

- angle of the blades
- length of the blades
- weight of the helicopter
- number of blades

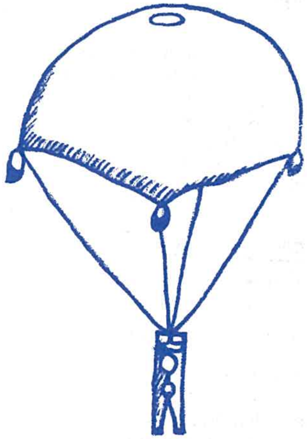
As these are varied, what happens to the rate of descent? What happens to the rate of rotation? What happens to the flight path?

Some of the early toy helicopters were powered by string and a piece of springy wood. Try and find out how this was done and build one yourself.

PARACHUTES

In 1797 in Paris, Jacques Garnerin became the first person to make a successful parachute jump when he dropped from his balloon at a height of about 1000 metres. His parachute was designed rather like a huge umbrella and, although he landed safely, his parachute swayed wildly as it came down.

You can make a model parachute with a piece of cloth about the same size as a large handkerchief. Tie a short length of string to each corner, then attach the strings to a load such as a clothes peg as shown here.



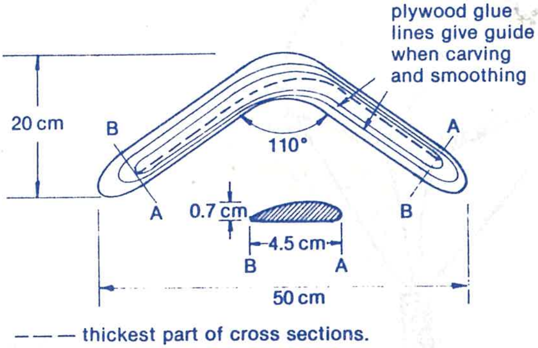
Try the following experiments to find out what things affect the rate of descent and the flight path of parachutes.

- Cut out a vent hole in the centre of the canopy. Try different sized vents.
- Increase the amount of load on the parachute.
- Change the type of canopy material.
- Vary the length of the parachute strings.
- Increase or decrease the size of the canopy.
- Vary the shape of the canopy.

BOOMERANGS

The returning boomerang was developed by the Aboriginal people of Australia thousands of years ago. AIR DAY is a great opportunity to learn how a boomerang works and — for senior students — something of the complex physics and mathematics which apply to boomerang flight.

Plastic or wooden boomerangs are readily available in many stores, but should you wish to make your own, the following diagram illustrates how to cut and shape a right-handed boomerang out of thick plywood. The plywood glue lines provide a guide as to the correct shape.



From Simons, M., *Airflow*, AE Press, Melbourne, 1984 (used with permission)

Right-handed boomerang, thickness distribution and cross-section. A = leading edge, B = trailing edge of arm. A left-handed boomerang should be a mirror image of this form. Perfect accuracy is not necessary.

By holding the boomerang with its leading edge facing in the direction you wish to throw, you should quickly succeed in making the boomerang return towards you.

Did you know that boomerangs will work well with more than two arms? You can easily make a four-armed boomerang with two rulers bound in the shape of a cross. Six or eight armed boomerangs can be made in a similar way. Try building some.

There are many factors which affect the flight and path of a boomerang. One of these is the distribution of mass. You may like to investigate the effects of changing the mass distribution by attaching lead weights to the arms. What happens when the weights are moved closer to or further from the centre?

HOW CLEAN IS OUR AIR?

Grease one side of several clean microscope slides with a very thin layer of vaseline. Place these slides indoors and outdoors in a variety of locations. After a day or so, observe each slide under a microscope.

What types of particles can you see? Do the particles vary in size? In which location is the "dirtiest" air? Which place has the cleanest air?

Another way to test for particulate pollution is to obtain leaves from various places — edge of a dirt road, next to a factory, in the bush, etc. Press each side of each leaf onto separate pieces of sticky tape. Remember to label each piece of sticky tape with appropriate details. Remove the sticky tape from the leaf and stick the tape onto a microscope slide. Observe under a microscope.

BUBBLE BONANZA

Budding bubble blowers will need wire with which to make wire loops, various detergents, glycerine, containers of water, and a stopwatch.

Add some detergent to a container of water, dip in a wire loop, and . . . blow bubbles! But that's not all there is to being a professional bubble blower! Investigate answers to these questions:

- How can you make your bubbles bigger or smaller?
- How hard do you need to blow to make a bubble? Why?
- What colours can you see in your bubbles?
- If you change the size of your wire loop, what happens to your bubbles?
- If you change the shape of your wire loop, what happens to your bubbles?
- What is the greatest number of bubbles you can get from one blow?
- Which detergent makes the best bubbles?
- What happens to the bubbles if you add more water to your detergent solution? If you add more detergent?
- What happens to the bubbles if you add glycerine to your detergent solution?
- What ratio of detergent, water and glycerine makes the biggest bubbles? Makes the longest lasting bubbles?
- How are bubbles joined together?
- Which last longer — big bubbles or small bubbles?

EXTRA IDEAS FOR AIR DAY

- Go sailing or windsurfing!
- Refer to books such as Barnaby, Ralph S., *How to make and fly paper aircraft*, John Murray, 1971.
- Using sodium metabisulfite solution as a source of sulfur dioxide gas, investigate the effect of sulfur dioxide on plant seedlings over a period of one day.
- Design and construct model sailboats and race them across the local pond. Investigate the effect of different sail shapes and sizes on the performance of the model sailboats.
- Take out of storage the land yachts you made during ASISW 1984, modify and improve them if necessary, and challenge last year's winner.
- For many more ideas, and an excellent theoretical background, consult the recently published book: Simons M., *Airflow*, AE Press, Melbourne, 1984.

SUN DAY

YOU TOO CAN MEASURE THE EARTH'S CIRCUMFERENCE

Some history

Contrary to popular opinion, not everybody before Columbus believed that the Earth was flat. In fact, a remarkably accurate measurement of the Earth's circumference was made in the 3rd Century B.C. by Eratosthenes — an astronomer, historian, poet and director of the great library of Alexandria. He read in a papyrus manuscript that at midday on a certain day of the year at Syene (now Aswan) vertical sticks cast no shadow, and the reflection of the Sun could be seen in a deep well. He tried the experiment at Alexandria (at the mouth of the Nile) on the same day of the year and found that shadows were cast by vertical sticks.

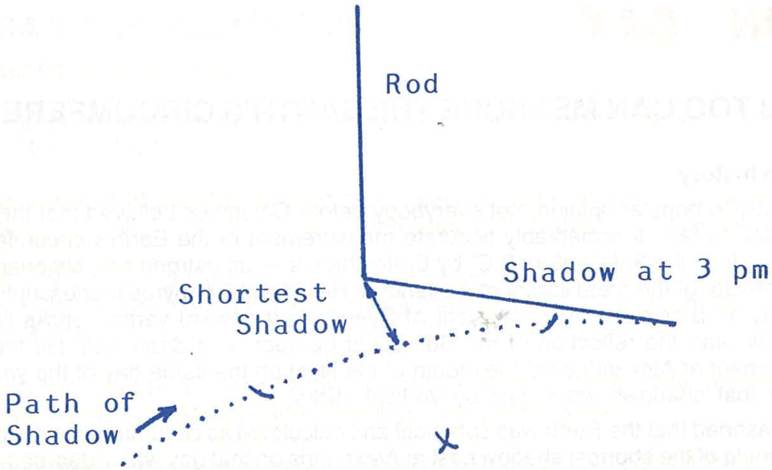
He reasoned that the Earth was spherical and calculated its circumference as follows. The angle of the shortest shadow cast at Alexandria on that day was 7 degrees, which is about one fiftieth of a circle. He then measured the distance between Alexandria and Syene. Some say that he hired a man to pace out the distance. Others say that he used the time taken for a camel to undertake the journey. The distance was found to be 5000 stadia — kilometres were not yet in vogue — hence the circumference was calculated to be $50 \times 5000 = 250\,000$ stadia or 46 300 km. This figure was only about 15% larger than the currently accepted value.

The measurement activity

Try this activity on SUN DAY. Hopefully, it will be a sunny day, or at least a day with intermittent sunshine. You will need

- a straight rod (1 to 2 m) on a stand
- a ruler
- a plumb-line
- a flat level surface (concrete, bitumen) open to sunshine during the day
- chalk to mark the surface
- a 3 m length of string

1. Early in the day (about 9 am) set up the rod on a flat level surface. Use a plumb-line to ensure that the rod is precisely vertical.
2. Mark with chalk the position of the shadow end.
3. Repeat marking points at half-hourly or hourly intervals as convenient. You may wish to mark points more frequently near solar noon. It does not matter if a few points are missed.
4. At the end of the day, draw a curved line through the points to trace the path of the shadow. Using a string of fixed length extended from the base of the rod, scribe two arcs that intersect the shadow path (see diagram). Use the string again to scribe intersecting arcs from the two intersections on the shadow path. From this determine the length of the shortest shadow.



5. Measure the height of the rod above the surface and, using values of tangents, determine the angle of the sun at solar noon. What fraction of 360 degrees is this angle?
6. Next, determine the distance between the point of your observation and that point on the Earth's surface where the sun is directly overhead at solar midday. This can be calculated as follows.
7. The declination, d, of the sun on any day during the year can be found from the equation

$$d = 23.45 \sin \left(360 \frac{284 + n}{365}\right)$$

where n is the day number of the year. Substitute the value of n for 16th October. The negative value you obtain will indicate the line of latitude south of the equator where the sun is directly overhead.
8. From a map, locate this latitude and determine the distance along the meridian between your position and that latitude. Use the same reasoning as Eratosthenes to calculate the circumference of the Earth.

D. Hyatt
CSIRO Science Education Centre, Vic.

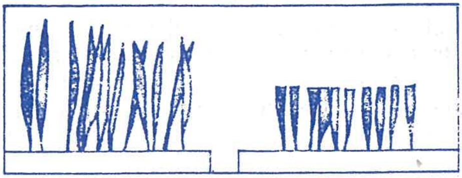
RESPONSE OF PLANTS TO SUNLIGHT

Germinate some wheat seeds in three shallow trays of soil. When they have germinated, place one tray under a light-proof box — a shoebox is ideal. Place the second tray under a similar box with a few small holes punched low down on one side. The holes should face a window. The third tray should be exposed to light.

After 5 to 7 days, observe the wheat plants in the three different places. What do you see? What caused this to happen?

If you would like to extend your investigation into this phenomenon — known as phototropism — try this second experiment.

Germinate some wheat seeds in two shallow trays of soil. When the seedlings are a few cm high, place one tray under a box with a few small holes punched low down on one side. Cut the tips of the second tray of seedlings and place under the same box as shown.



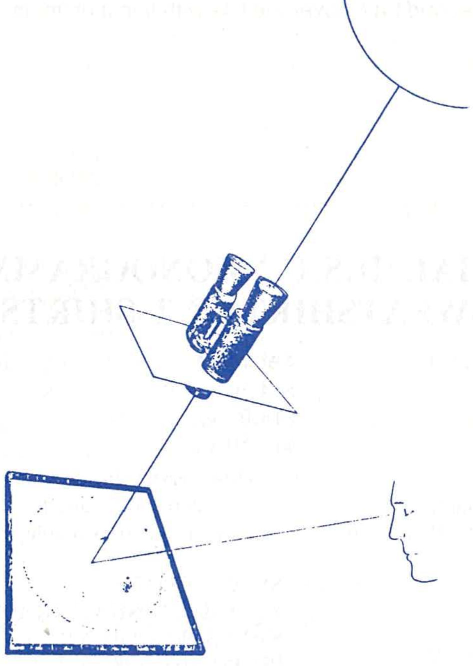
After a few days, observe the wheat plants in the two trays. What part of the seedling responds to light?

As another variation repeat the second experiment but, instead of cutting the tips off the seedlings in the second tray, cover the tips with thin aluminium foil.

OBSERVING SUNSPOTS

The Sun must never be looked at directly — either with your unaided eyes or through a telescope or binoculars. Permanent damage to the eyes is certain to be the result! If you wish to examine the surface of the Sun or to watch the progress of an eclipse, the method outlined here is safe and effective.

A telescope or a pair of binoculars can be used to project an enlarged image of the Sun onto a screen so that larger sunspots can be seen. If binoculars are being used, a cap should be placed over the lens of the left-hand barrel and a large piece of card with holes to allow the eye-piece lenses to poke through should be attached. The binoculars should point directly to the sun and should be secured to prevent any shaking.

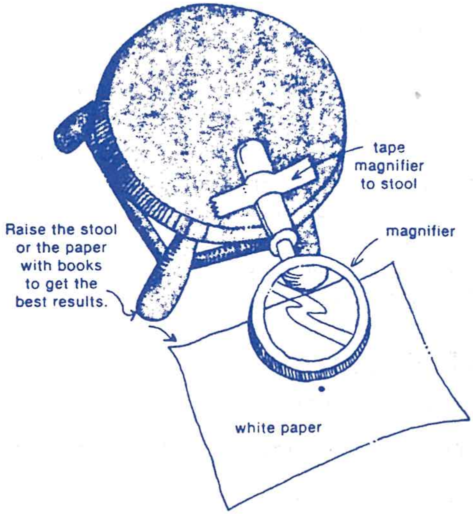


The surface of the screen should be placed perpendicular to the Sun's rays. The image can now be focused onto the screen to reveal any large sunspots.

TRACKING THE SUN

Here's another question for you to answer. At what time of day does the Sun appear to move across the sky most quickly? This experiment should help you to answer.

Fix a large magnifying lens onto some type of support like the stool shown in the diagram. Position a piece of white paper under the magnifying lens so that sunlight is focused onto the paper.



Once the sunlight is focused onto the paper, draw a circle around the focused spot on the paper. Measure the time it takes for the light to leave the entire circle.

Repeat this procedure at various times during the day. At what time of the day did the spot of focused sunlight move most quickly? Your results will demonstrate how complicated it is to use reflectors and lenses for collecting solar energy!

From CONTACT Newsletter, October 1984

FOCUSING SUNLIGHT

How much faster can you burn paper with a 6 cm magnifying lens than with a 3 cm lens? Find out by doing this simple experiment!

Position a large magnifying lens — about 6 cm or larger — so that the sun's rays focus onto a piece of black paper.

How many seconds does it take before the paper starts to smoke?

Now cover the lens with a piece of black paper that has a 3 cm hole cut in the centre. How long does it take this time?

Try focusing sunlight onto different colours of paper. Does this change the time it takes to burn?

From CONTACT Newsletter, November 1984

MAKING SUNTAN CREAM

Moderate exposure to sunlight is beneficial, but an excess may lead to inflamed skin (sunburn) and may produce skin cancer. The skin pigment, melanin, and sweat give some protection, but the chief protection is given by the thickening of the outer layers of skin. A suntan cream uses sunscreen chemicals to allow tanning with a minimum of sunburn. Here is a method to help you make your own suntan cream. Since this is an untested formulation, we advise that you use a commercial product with an appropriate SPF rating for your skin.

Place 10 g of stearic acid and 1 g of lanolin into a 150 ml beaker. Heat carefully to 75°C.

To a second 150 ml beaker containing 50 ml of water, add 0.3 g of potassium hydroxide, 0.2 g of sodium hydroxide, and 3 g of glycerol. Heat carefully to 75°C.

When both beakers have been heated to 75°C, slowly pour the contents of the second beaker into the first beaker. Stir the mixture as you pour. Add 3 g of zinc oxide — a sunscreen chemical — to the mixture and keep stirring until the mixture cools to 40°C. Stir in a small amount of perfume and allow to stand overnight.

As an extra project, carry out a survey of suntan creams and lotions available on the market. Note the SPF factor, the active ingredient, and the cost of each one.

EXTRA IDEAS FOR SUN DAY

- Construct a sundial to tell the time of day.
- Build a solar parabolic reflector and boil a tin of water at its focus.
- Make a model solar hot water heater.
- Build a glasshouse.
- Design a house which optimises energy conservation by making effective use of solar energy.
- Investigate phototropisms in flowering plants such as sunflowers, daisies, etc.
- Watch out for the August 1985 Issue of the Australian Science Teachers Journal to obtain more ideas for SUN DAY.

Science is full of SURPRISES!

CSIRO SCIENCE EDUCATION CENTRES

Education Officers: Melbourne: Mr Don Hyatt
Ph. (03) 5550333
Adelaide: Mr Phil Allan
Ph. (08) 2680111

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 and the "Science and Technology" theme in the Adelaide 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.

ASISW Resource Book 1985 $1.00

- Extra copies are available crammed with lots of activity suggestions and all you need to know
- Copies of ASISW Resource Book 1984 are available at the same cost — many more activity suggestions and items of interest

ASISW Certificates 5c

- Certificate of Participation
- Certificate of Merit

ASISW Balloons with Logo 25c

- Use these to help you up and away on Inflation Day

ASISW Slogan Stickers 15c

- "Physics is Bohring"
- "Biology grows on me"
- "Science is FUNdamental"
- "Astronomy is out of this world"
- "How is your experimental technique?"
- "Biology is for the birds and the bees"

MATERIALS

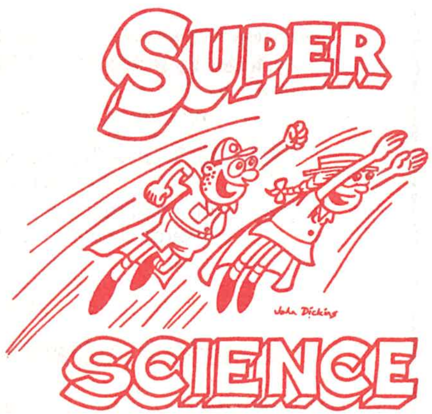
ASISW "Super Science" T-shirts	$6.50
ASISW Badges with Logo	45c

ASISW High Tech Kit — Price on application

- A unique collection of oddities including PSZ, nitinol, optical fibre, solar cell, liquid crystal, hologram, kinetic box. This kit comes with brief explanations and suggested activities — but hurry, only 500 available!

ASISW Cartoon Stickers — 25c

- "We dig Science"
- "Science is far out"
- "Science is full of surprises"
- "Science is experimenting"
- "I get a bang out of Chemistry"



Contact your State Science Teachers Association or State Coordinator for further details. Postal charges are not included in the above prices.

INFLATION DAY

NATIONAL BALLOON LAUNCH

The balloon launch is scheduled for Wednesday 16th October at 12 noon EST. This is a special opportunity for primary and secondary students alike to participate in a spectacular nationwide event. The balloon launch was a highly popular aspect of the inaugural 1984 ASISW. This year, we are combining the fun of the balloon launch with a flight path study, the scope and scale of which has never before been attempted in Australia!

This year, we request that you tag your balloons with labels as shown below. This tag can be copied and duplicated from this page. Students should fill in the name and address of the school with a water resistant pen, and attach the tag to the balloon with a short length of light string.

This balloon was released on 16–10–85 by____________________

as part of a national scientific experiment during the Australian Science in Schools Week.

PLEASE COMPLETE:

Found at ____________________

Time __________ Date __________

PLEASE RETURN THIS TAG TO:

____________________ School

____

____

Thankyou for you help

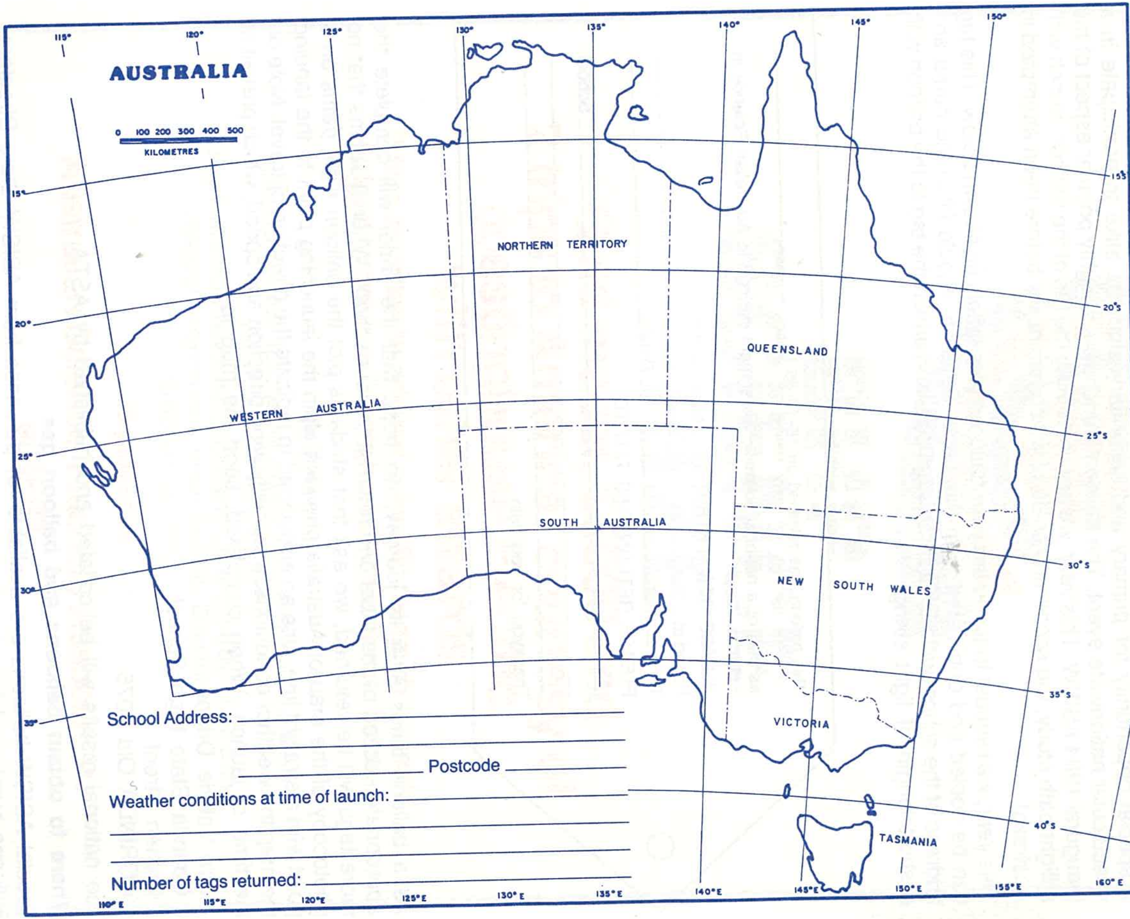
As a balloon lands after its journey, we hope that the finder will complete the appropriate section of the label and return it to your school. When it seems that no more tags will be returned, we ask that students plot the balloon flight paths on a photocopy of the map of Australia provided. Join the launching point to the landing point with a straight line. Use an arrowhead to indicate the direction of travel. Note on the map the weather conditions, especially wind direction and speed, which prevail at the time of launch. When completed, send the map to:

Mrs Valerie Dripps
Corinda State High School
Pratten Street
CORINDA Qld 4075

The national results will be collated and published by ASTA.

Where to obtain balloons and balloon gas

Special ASISW balloons are available for purchase from ASISW State Directors. Balloons purchased from local stores are also satisfactory. Try approaching local building societies, banks and other businesses for balloons they use for promotional purposes. Some schools have found that these businesses are willing to donate not only quantities of balloons, but also balloon gas.


AUSTRALIA
0 100 200 300 400 500
KILOMETRES
NORTHERN TERRITORY
QUEENSLAND
WESTERN AUSTRALIA
SOUTH AUSTRALIA
NEW SOUTH WALES
VICTORIA
TASMANIA
School Address:
Postcode
Weather conditions at time of launch:
Number of tags returned:

CIG sells balloon gas which is ideal for the purpose. Some ASISW State Co-ordinators have negotiated a discount with CIG for schools during ASISW and you are advised to check with your State Co-ordinator for details. It is important that you reserve your supplies from your local CIG agent well beforehand. When you order a cylinder of balloon gas, be sure to order the appropriate regulator/tap so that you can easily inflate the balloons. Because balloon gas diffuses quite rapidly, fill the balloons as close as possible to the time of launching.

C. Shea
Board of Secondary School Studies, Qld

LEAD BALLOONS

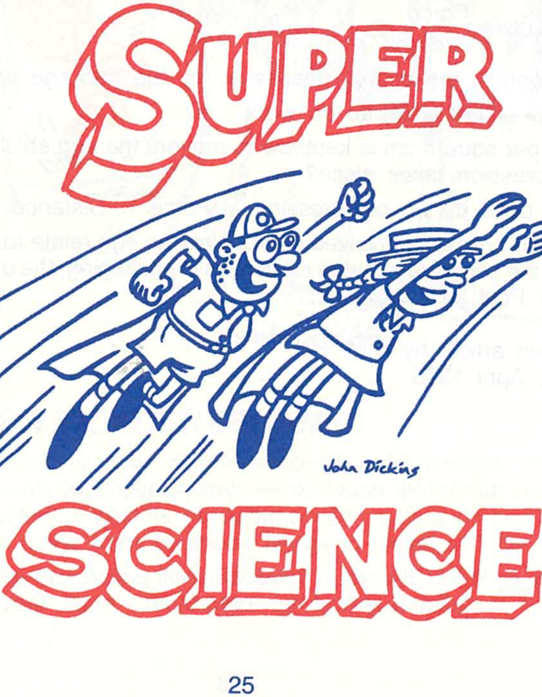
While thousands of balloons are soaring skywards on INFLATION DAY, try this activity for a change!

This competition involves inflating a spherical balloon with air, adding accessories up to a certain mass, and measuring how quickly the balloon falls from a height of 10 metres.

- The balloon must be at least 20 cm in diameter.
- Fins, fairings, etc. can be added to increase the rate of fall. However the maximum mass of the balloon and its accessories cannot exceed 30 g.

Each competitor will be given two timed drops. The faster time will be counted. In the event of a tie for first place, the second time for each competitor will be used to break the tie.

S. Higg
Melbourne Grammar School, Vic



STRUCTURES DAY

SCRAMBLED EGGS

Students are required to design a structure made only of drinking straws and cotton thread which is capable of carrying a complete raw hen's egg. The structure containing the egg must be designed to be dropped from a height of 3 metres or more on to a concrete or bitumen surface so that the egg remains unbroken.

Students may wish to name their design — for example "Baker's Bomb". If a number of entries achieve a successful drop, subsequent drops may take place to determine the winner!

Ingenuity of design may also be used as an additional aspect to this 'smashing' competition.

J. Baker
Gladstone State High School, Qld

DROPPING EGGS SCIENTIFICALLY!

For those who want to consider the physics of this problem, here are some questions to ponder.

- What happens to the egg as the protective container strikes the surface?

  Hint: Newton's First Law of Motion
- Would the egg be less liable to break if, on impact, it is side on?

  Hint: $\text{Pressure} = \dfrac{\text{Force}}{\text{Area}}$
- What happens to the energy possessed by the package upon impact?

  Hint: Energy is the ability to do work
- If the force per square cm is kept low to prevent the egg shell from cracking, how much compression takes place?

  Hint: Work done during compression = Force × Distance compressed
- How do these principles involved in dropping the egg relate to passenger safety in car design, the use of corrugated cardboard in packaging, the use of dimpled plastic in Australia Post jiffy bags, etc.?

Based on an article by D.M. Hill
LAB TALK, April 1976

MAKING FOSSILS

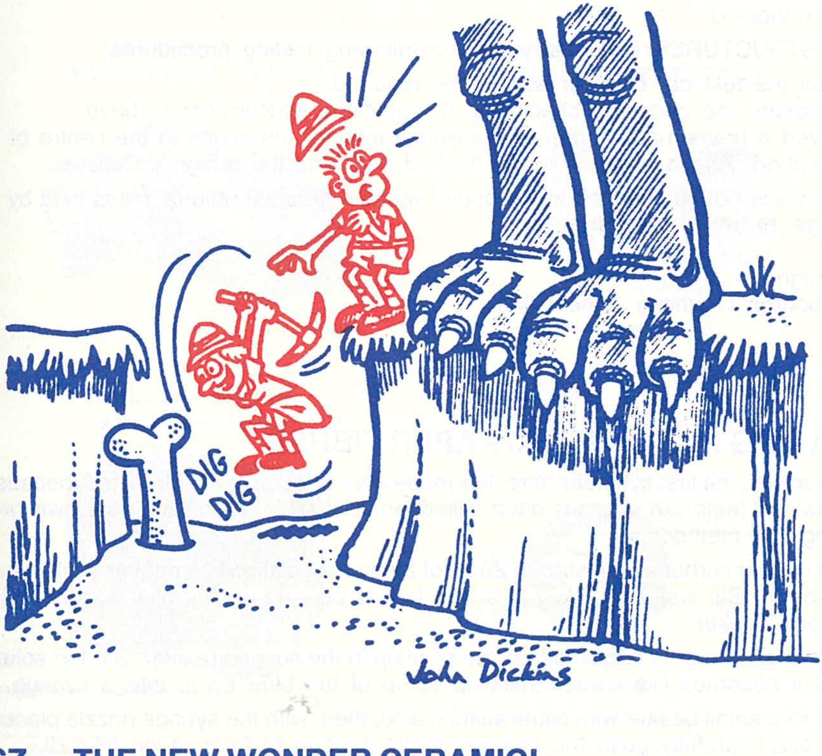
Here is an activity which young earth scientists may like to try on STRUCTURES DAY.

You will need a block of potter's clay about 8 × 5 × 2 cm depending upon the size of the fossil to be made. Coat a real fossil, or a model of one, with a thin layer of oil. Press the oily fossil firmly into the clay block, then carefully remove it.

Mix some Plaster of Paris and water in a small disposable container until the mixture is thick but slightly runny. Fill the clay block impression with the Plaster of Paris mixture and leave to set for about 15 minutes.

Peel off the clay to reveal the fossil you have made! The clay can be reused to make other fossils and, when not in use, it should be kept wrapped in a refrigerator.

I. Loiterton
Campbell High School, ACT



PSZ — THE NEW WONDER CERAMIC!

PSZ, partially stabilised zirconia, was researched and developed in Australia by CSIRO. It is the world's toughest ceramic — so tough that it can be struck with a hammer without shattering! With its incredible scratch resistance and thermal shock resistance, its uses range from computer heads to diesel cylinder linings.

PSZ is just one of the fascinating items included in the ASISW High Tech Kit. Don't miss out! Contact your State Co-ordinator for further details.

BUILDING BRIDGES

The object of this competition is to construct a bridge which will support the greatest weight according to the following specifications:

- Minimum span = 25 cm
- Minimum vertical clearance over "river" = 10 cm
- Maximum height = 15 cm
- Maximum length = 45 cm
- Maximum total mass = 30 g

You may wish to specify that the bridge be constructed entirely of balsa wood, or paddle pop sticks, or some other material. Alternatively, you may wish to leave this choice open to students.

The materials may be joined using any glue and/or any type of joint. The bridge must include a roadbed which will allow a test car (or roller) to be rolled across the bridge. The roadbed should also have an empty space at its centre so that the test load can be connected.

On STRUCTURES DAY, carry out the following testing procedures:

- Roll the test car or roller across the roadbed.
- Measure the bridge to check that it meets the specifications above.
- Invert a brass mass carrier or equivalent through the space in the centre of the roadbed. Attach masses to the hooked end until the bridge collapses.

First place will be awarded to the bridge with the greatest ratio of 'mass held by the bridge' to 'mass of bridge'.

S. Higg
Melbourne Grammar School, Vic

MAKING RAYON FROM PAPER FIBRES

Rayon was the first synthetic fibre. It is made from wood pulp or cotton and, because it looks and feels like silk, it is often called 'artificial silk'. Try making your own rayon using this method.

Add copper carbonate crystals to 20 ml of ammonia solution in a beaker until no more dissolves. Stir well and leave to stand, before pouring off the blue solution into a second beaker.

Add small pieces of paper to the blue solution in the second beaker. Stir the solution until it becomes like syrup. Suck up some of the blue syrup into a syringe.

Half fill a small beaker with dilute sulfuric acid, then, with the syringe nozzle placed in the acid, carefully push the plunger of the syringe to form rayon thread!

RUBBER BAND POWER!

The object of this competition is to build a rubber-band-powered vehicle which will travel the greatest distance along a straight track with sidelines about 3 metres apart. The following specifications apply:

- The vehicle is to be made with the following materials only:

  50 paddle pop sticks
  5 pencils
  10 paper clips
  1 metre of string
  5 cotton reels
  10 rubber bands
  any type of glue

  These are maximum amounts — you may use less if if you wish.
- The rubber band's source of energy must be part of the vehicle itself. Catapults and other launching devices, not attached to the vehicle, are not permitted.
- The vehicle must have at least one wheel, and at least one wheel must be in contact with the ground at all times.

On STRUCTURES DAY, each competitor will be given two measured runs on the track. The longer of the two runs will be counted. If the vehicle strikes the sideline, that point will be marked as the end of the run.

S. Higg
Melbourne Grammar School, Vic

EXTRA IDEAS FOR STRUCTURES DAY

- Construct landform models to highlight various forms of erosion.
- Make a large, walk-through model of the human heart!
- Construct musical instruments which demonstrate how vibrating strings, pieces of metal, or columns of air produce various musical sounds.
- Design and build a balloon-propelled jet rocket which will fly in a straight line.
- Make your own paper from plants using a procedure such as that found on p 750, *Science Teachers Resource Book*, Volume 3, Sapphire Books, 1975.

WEATHER DAY

BECOME A WEATHER WATCHER

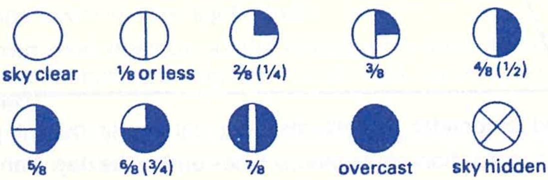
A special chart is included below to help you record weather information. The chart can be used to measure weather variables at a number of times during WEATHER DAY or it can be used to record information each day for a week.

WEATHER-WATCH CHART							
Date							
Time of day							
Temperature (°C)							
Wind direction							
Wind speed (km/h)							
Cloud type							
Cloud cover							
Precipitation (in millimetres)							
Barometric pressure (in millibars)							
Relative humidity							

If you do not have some of the weather instruments normally used to measure weather variables, do not despair. The following pages contain ideas and instructions for building your own simple instruments.

RECORDING CLOUD COVER

Meteorologists use the following symbols to report how much of the sky is covered by clouds. Use these symbols when recording cloud cover on your weather-watch chart.



MAKING YOUR OWN CLOUDS

Place a plastic bag containing ice cubes over the top of a small beaker containing 50 ml of cold water. Hold onto the bag and observe what happens inside the beaker.

Repeat this activity, using hot water instead of cold water. What happens inside the beaker this time?

Remove the plastic bag from the beaker of hot water. Light a match and then drop it into the hot water. Straight away place the plastic bag and ice cubes over the top of the beaker. Do smoke particles affect the amount of mist (cloud) which forms?

Now that you have finished this experiment, can you explain how clouds form?

TIME LAPSE PHOTOGRAPHY OF CLOUDS

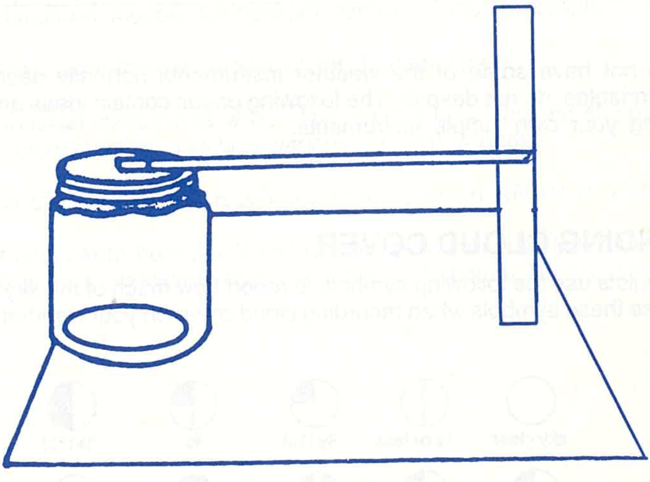
This activity can be carried out with a still camera or a suitable movie camera.

If you are using a still camera, set it up on a firm tripod. Scan the sky for a cloud which is likely to produce a good picture and, allowing for the direction in which the cloud is blowing, point the camera so that the cloud is clearly visible in the viewfinder. Take a series of photographs at intervals of 30 seconds or more. When the photographs are printed, display them in their correct sequence.

A movie camera which can be operated to make one exposure every second, will produce a film which, when projected at normal speed, shows the cloud changing at about thirty times its actual rate.

MAKING A BAROMETER

You can make a simple barometer by stretching a piece of rubber balloon over the top of a babyfood jar and securing it with a rubber band. Fix a plastic straw with sticky tape so that one end is at the centre of stretched balloon. As the air pressure changes the plastic straw moves up or down as a pointer.



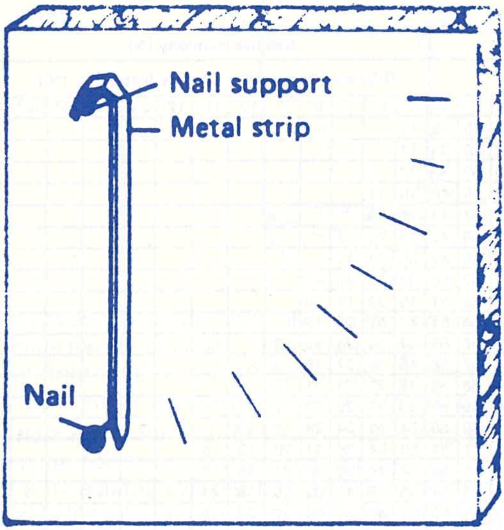
Use an aneroid barometer to calibrate your barometer over a number of days. Note how air pressure changes at various times during the day. Can you explain why?

MEASURING WIND SPEED

Here are two ways to determine wind speed. The first method involves simple observations of the wind's effects. By referring to a Beaufort Wind Scale, you can estimate the wind speed.

A second method is to bend a thin metal strip around a nail support on a board as shown in this diagram.

This device can be easily calibrated in km/h by holding it out the window of a moving car on a calm day.



WHICH WAY IS THE WIND BLOWING?

A simple method involves constructing a wind vane with a 10 cm piece of cassette tape attached to a nail which is driven partly into the end of a length of dowel. The points North, South, East and West are marked on the top of the dowel around the nail.

To measure wind direction, align the point marked north on the dowel with the direction of a compass needle. Without altering the alignment, hold the dowel at arms length in front of you and note the direction in which the tape is blowing. The cassette tape gives readings even in very light winds.

Remember to record wind direction as the direction the wind is blowing *from*. For example, if the cassette tape is blowing to the south east, report the wind direction as *from* the north west.

Try detecting eddy currents on the sheltered side of the school building. An interesting project is to plot the direction of air flow around school buildings.

CALCULATING HUMIDITY

Cover the bulb of a celsius thermometer with a gauze sleeve which has been moistened with water. Record this temperature reading as the 'wet bulb temperature'. With a second thermometer, measure the air temperature. This second reading is the 'dry bulb temperature'.

Knowing the dry bulb temperature and the difference between the dry and wet bulb temperatures, it is possible to calculate the % humidity using this table.

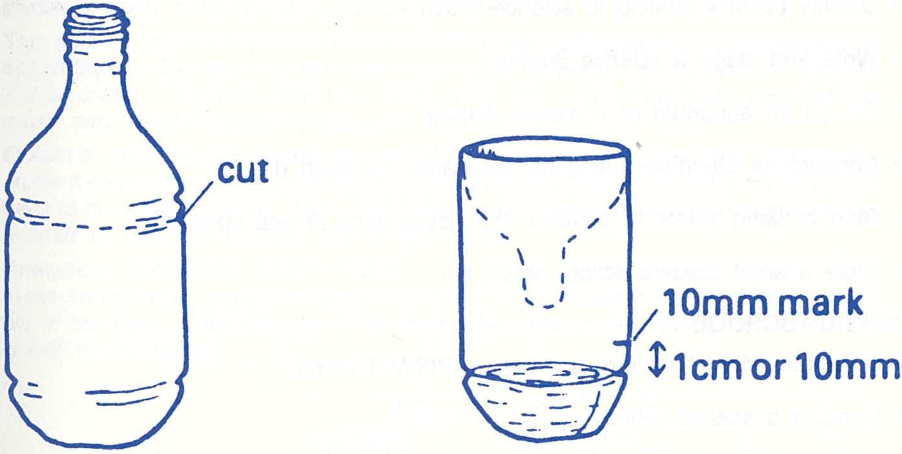
For example, if the dry bulb temperature is 20°C and the wet bulb temperature is 4° lower, then the humidity is 66%.

Dry-Bulb Temp. (°C)	Relative Humidity (%)																			
	Difference Between Wet- and Dry-Bulb Temp. (°C)																			
	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°
0	81	64	46	29	13															
1	83	66	49	33	17															
2	84	68	52	37	22	7														
3	84	70	55	40	26	12														
4	85	71	57	43	29	16														
5	86	72	58	45	33	20	7													
6	86	73	60	48	35	24	11													
7	87	74	62	50	38	26	15													
8	87	75	63	51	40	29	19	8												
9	88	76	64	53	42	32	22	12												
10	88	77	66	55	44	34	24	15	6											
11	89	78	67	56	46	36	27	18	9											
12	89	78	68	58	48	39	29	21	12											
13	89	79	69	59	50	41	32	23	15	7										
14	90	79	70	60	51	42	34	26	18	10										
15	90	80	71	61	53	44	36	27	20	13	6									
16	90	81	71	63	54	46	38	30	23	15	8									
17	90	81	72	64	55	47	40	32	25	18	11									
18	91	82	73	65	57	49	41	34	27	20	14	7								
19	91	82	74	65	58	50	43	36	29	22	16	10								
20	91	83	74	66	59	51	44	37	31	24	18	12	6							
21	91	83	75	67	60	53	46	39	32	26	20	14	9							
22	92	83	76	68	61	54	47	40	34	28	22	17	11	6						
23	92	84	76	69	62	55	48	42	36	30	24	19	13	8						
24	92	84	77	69	62	56	49	43	37	31	26	20	15	10	5					
25	92	84	77	70	63	57	50	44	39	33	28	22	17	12	8					
26	92	85	78	71	64	58	51	46	40	34	29	24	19	14	10	5				
27	92	85	78	71	65	58	52	47	41	36	31	26	21	16	12	7				
28	93	85	78	72	65	59	53	48	42	37	32	27	22	18	13	9	5			
29	93	86	79	72	66	60	54	49	43	38	33	28	24	19	15	11	7			
30	93	86	79	73	67	61	55	50	44	39	35	30	25	21	17	13	9	5		
31	93	86	80	73	67	61	56	51	45	40	36	31	27	22	18	14	11	7		
32	93	86	80	74	68	62	57	51	46	41	37	32	28	24	20	16	12	9	5	
33	93	87	80	74	68	63	57	52	47	42	38	33	29	25	21	17	14	10	7	
34	93	87	81	75	69	63	58	53	48	43	39	35	30	28	23	19	15	12	8	5
35	94	87	81	75	69	64	59	54	49	44	40	36	32	28	24	20	17	13	10	7

MEASURING RAINFALL

To make a rain gauge, cut the top off a large plastic bottle just below the shoulder. Use the top part as the collecting funnel.

Fill the rounded bottom part of the bottle with water. Using the water level as a zero point, use a ruler to measure 10 mm above the zero point. Mark the 10 mm point.



Using a measuring cylinder which has been filled to the top with water, add water to the bottle until it reaches the 10 mm mark. Note how many ml of water was required to raise the water level from zero to the 10 mm mark. Divide this amount by 10 to calculate how many ml of water is equivalent to 1 mm of rain collected by the bottle.

Your rain gauge is now ready for use. Empty the water and stand the bottle in an icecream tray with some soil to prevent the rain gauge from falling over. Pour any collected water into a measuring cylinder and measure the total volume in ml. The rainfall in mm is equal to the total volume in ml divided by the number of ml in 1 mm of rainfall.

EXTRA IDEAS FOR WEATHER DAY

- Visit your local Bureau of Meteorology or the nearest local official weather station (often the Post Office).
- Investigate the cost of insuring an event such as a school fete or athletics carnival against rainy weather.
- Investigate the relationship between climate and human body features such as skin and eye colour, epicanthic eyefold, steatopygia and other body shapes, etc. Why would you expect all Australians to have dark skin?
- Investigate the relationships which exist between the various measurements you have recorded, including air temperature, humidity, cloud cover, etc.
- Launch a balloon filled with balloon gas and track its movement with a theodolite. Calculate the direction of the wind in the upper layers of the air.
- Measure the temperature in your classroom at a number of positions and elevations. Plot a temperature distribution for your classroom. Where is the warmest spot? Where is the coolest spot?

ADDITIONAL ACTIVITIES

IN YOUR CLASSROOM

- Display pictures of famous scientists — both women and men.
- Display posters relating to science-based careers.
- Write and stage a science drama.
- Set up an aquarium or a mouse display.
- Conduct an attention-getting demonstration for each day.
- Start growing plants to enhance the appearance of you classroom.
- Write a short science fiction story.

IN YOUR SCHOOL

- Distribute ASISW stickers and wear ASISW T-Shirts.
- Conduct a special science quiz.
- Hold a SCIENCE EXPO.
- Show science films at lunchtime.
- Initiate "Science on the School Oval".
- Encourage students to enter the National Poster Competition.
- Invite a guest speaker under the ASISW Speakers Scheme.
- Hold a School Science Open Day.
- Conduct an astronomy night.

IN YOUR COMMUNITY

- Display science posters by students in a local store.
- Write an article for your local newspaper about science in your school, or invite a local journalist to write such an article after visiting your school.
- Visit places in the community where students can see science at work.

READ ON FOR MORE ADDITIONAL ACTIVITIES . . .

TRUSTING THE LAWS OF SCIENCE

Try this experiment to see how much your students are willing to trust the laws of science!

According to the Law of Conservation of Energy, a pendulum, released from a certain position, swings away from, and then returns to that position. Do your students really believe this?

This activity is more dramatic in a room with a high ceiling such as a gymnasium or assembly hall. By means of strong string or rope, suspend a heavy mass — such as a 2 kg mass, a medicine ball in a strong bag, etc. — from the ceiling so that the mass can travel through a large arc without touching the floor.

Obtain a volunteer who trusts the Law of Conservation of Energy and position the student so that the mass is just touching the student's nose when the mass is pulled back to one side of the arc. With a high ceiling, you may wish to stand the student on a chair or table to increase the length of arc.

Release — WARNING, DON'T PUSH — the mass. The student will see the heavy mass swing away, reach the other side of the arc, and start to swing back towards his or her nose. Watch to see if the student flinches as the mass gets closer and closer to the nose!

SCIENCE IS FAR OUT!!

JUMPING MOTHBALLS

Place about 10 g of marble chips and about 5 g of salt in a large 2 litre jar. Add about 30 ml of dilute 1M hydrochloric acid, a small amount of food colouring or indicator solution. Add water to fill the jar and stir well.

Drop in several mothballs. After a few minutes, the moth balls will rise and fall. If movement does not occur, stir in some more salt. If the gas bubbles are produced too slowly, add more acid. This reaction should last for several hours.

As a variation, try adding mothballs, raisins, or other objects to aerated soft drinks such as lemonade or dry ginger ale.

RUNNING A SCIENCE EXPO

Here is an account of a Science Expo held as an annual event at Normanhurst Boys' High School, NSW. The program has been modified to suit the context of ASISW.

Participation in Expo was compulsory for all students. The competitive section, based on the NSW Science Talent Search Program, was optional however. Expo was held after school at times which allowed parents to attend. It was seen very much as a student-parent-teacher event and, for six weeks beforehand, regular bulletins were sent home informing parents of the program and seeking their involvement. Some valuable resources were unearthed in this way, and the displays, etc., set up by some parents were extremely enriching.

A student committee, with staff advisers for each section, undertook the organisational responsibilities. Many good ideas were contributed by students, including the setting up of an archive display of equipment and instruments used "in the old days". It was a little embarrassing that some items obtained were the same as that which we were currently using!

In order to actively involve visitors, students set up a Parent Practical Test. A worksheet was provided and, as parents progressed through six stations, they were required to complete certain questions. A student timed participants and then marked the worksheets immediately. In some cases, the idea was more successful than the marks! While some students analysed foodstuffs — including % carbon dioxide in carbonated drinks, amount of vitamin C in orange juice, and % sulfur dioxide in dried apricots — others taught visitors to do a volumetric analysis, and then set them the task of determining the concentration of an acid or base.

Students also demonstrated the more spectacular side of science in a Chemistry Magic Show, a Physics Spectacular, and a Jumping Geology Display complete with erupting volcanoes.

The Expo Show Bags almost caused a riot as students rushed to purchase them at the bargain price of $1. Contents were limited only by our imagination. This idea started because we wanted to dispose of unwanted rocks in the geology department. We labelled them "crude krypptonnitte" (deliberately misspelled in case Superman caused trouble). From Reverse Garbage, we obtained small ceramic tiles which we labelled "refined krypptonnitte". We filled old film spool containers with everything from dehydrated water to samples of air from one of the labs. Spool containers with copper sulfate, washing soda, and Epsom salts (labelled with chemical names) were included together with instructions for growing crystals. Sample packs, assorted pamphlets, and other freebies were also included.

Other events included designing and constructing games of scientific skill such as buzz boards and devices to test reaction time, producing a science journal, and constructing working models.

The aim of Expo is to present Science as challenging and as fun. We have found it to be a great success. Try it at your school — you'll find it a great morale booster!

M. Ford
Normanhurst Boys' High School, NSW

TIME CAPSULE REVISITED

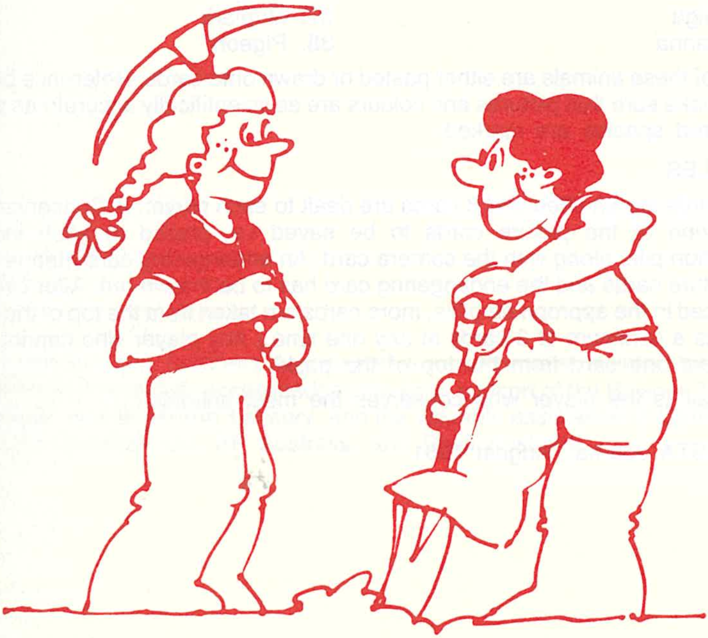
It was particularly appropriate to end the inaugural 1984 ASISW with a day designated as "Time Capsule Day". A number of schools throughout Australia took the opportunity to deposit something of historical significance to be retrieved at a later date.

However the special offer made by the Director of the Antarctic Division of the Department of Science and Technology was not taken up. Fortunately, this opportunity is being made available again this year.

The offer is to deposit, in the Antarctic, a time capsule constructed by students. The site of deposition is our choice. One suggestion is that the capsule be placed in a glacier where it would emerge after 1000 years or so. Another suggestion is that it could be deposited 1600 km inland in which case it would be buried at a rate of 2 m a year as it worked its way to one of the surrounding oceans. The time taken for emergence would then be considerably longer than the first option. Either way, a container would have to be an extremely strong structure.

Some suggestions appear on pp 13–14, Australian Science Teachers Journal, No. 93, August 1984.

If you wish to take up this offer (a television program has shown great interest in this activity) then send a photo and details of construction and contents to the ASISW National Director by 8th October 1985.



CONSERVATION GAME

Contents 58 Cards
38 Australian animals, birds and reptiles
10 Endangering cards (firearms, broken glass, overstocking, polluted rivers etc.)
10 Conservation cards (cameras)
The 38 names selected for the cards are.

1. Kangaroo
2. Possum
3. Koala
4. Echidna
5. Wombat
6. Platypus
7. Bandicoot
8. Marsupial Mouse
9. Blue Tongue Lizard
10. Bearded Dragon
11. Flying Fox
12. Black Swan
13. Kangaroo Rat
14. Cus Cus
15. Tasmanian Devil
16. Water Rat
17. Pelican
18. Brolga
19. Goanna
20. Frill Neck Lizard
21. Cassowary
22. Plain Turkey
23. Emu
24. Kookaburra
25. Kingfisher
26. Bell Bird
27. Lyre Bird
28. Brush Turkey
29. Fairy Penguin
30. Bower Bird
31. Wedge Tail Eagle
32. Rosella
33. Owl
34. Major Mitchell Cockatoo
35. Spoonbill
36. Magpie
37. Mudlark
38. Pigeon

Pictures of these animals are either pasted or drawn onto cards. Reference books are used to make sure that pictures and colours are as scientifically accurate as possible. Endangered species are marked.

THE RULES

The 58 cards are shuffled and 8 cards are dealt to each player. A Conservation card enables one of the picture cards to be saved i.e. placed in each individuals conservation pile, along with the camera card. An endangering card means that one of the picture cards and the endangering card has to be thrown out. After cards have been placed in the appropriate piles, more cards are taken from the top of the pack. (A player has a minimum of 8 cards at any one time.) Any player who cannot make a move picks one card from the top of the pack.

The winner is the player who conserves the most animals.

From SASTA Journal, August 1981

NATIONAL ADVISORY COMMITTEE

Dr M. Dack
Co-ordinator
Community Interests Group
Science Communication Unit
CSIRO

Mrs R. Warnock
Public Affairs Officer
BP Australia Limited

Dr B. Chapman
Competition Director, UNISCAN
Education Testing Centre
The University of N.S.W.

Mrs L. Hardy
Public Affairs Officer
BHP Co Limited

Mr I. Hore-Lacy
Principal Consultant
Corporate Relations
CRA Services Limited

Mrs G. Sweetland
Corporate Programs Manager
Shell Australia

The Australian Science Teachers Association is proud to have initiated this unique national event and gratefully acknowledges the keen support of the Science Teachers Association in each State and Territory, and the valuable assistance of CSIRO, BHP Co Ltd, CRA Services Ltd, BP Australia, and Shell Australia.

NATIONAL EXECUTIVE COMMITTEE

National Director
Don Hyatt
CSIRO Science Education Centre
PO Box 26
Highett Vic 3190
Ph: (03) 555 0333

Resource Book Editor
Brenton Honeyman
Wanniassa High School
Wheeler Crescent
Wanniassa ACT 2903
Ph: (062) 31 0044

Poster Competition Director
Alan Pepper
Marion High School
York Avenue
Clovelly Park SA 5042
Ph: (08) 276 1699

Speaker Scheme Director
Stephen Manahan
Strathfield Girls High School
Albert Road
Strathfield NSW 2135
Ph: (02) 76 6990

Services Director
Bob Ross
Eltham College
PO Box 40
Research Vic 3095
Ph: (03) 437 1421

Co-ordinator, New South Wales
Grahame Humphrey
Marrickville High School
Northcote Street
Marrickville NSW 2204
Ph: (02) 569 2444

Co-ordinator, Queensland
Keith Money
Pinerivers State High School
Gympie Road
Strathpine Qld 4500
Ph: (07) 205 1909

Co-ordinator, Western Australia
Sarah Chandran
Cannington Senior High School
Cecil Avenue
Cannington WA 6107
Ph: (08) 458 3225

Co-ordinator, Northern Territory
Elizabeth Jacob
Nightcliff High School
Ryland Road
Nightcliff NT 5790
Ph: (089) 85 2744

Co-ordinator, Victoria
Lorraine Shannan
Eastern Metropolitan Region
Parkhill Drive
Ashwood Vic 3125
Ph: (03) 277 2055

Co-ordinator, South Australia
Tom van Ruth
Goodwood High School
Lilly Street
Goodwood SA 5034
Ph: (08) 272 4500

Co-ordinator, A.C.T.
Elizabeth Dangerfield
Dickson College
Phillip Avenue
Dickson ACT 2602
Ph: (062) 47 5377

Co-ordinator, Tasmania
Richard Twardy
Clarence High School
Wentworth Street
Bellerive Tas 7018
Ph: (002) 44 2544