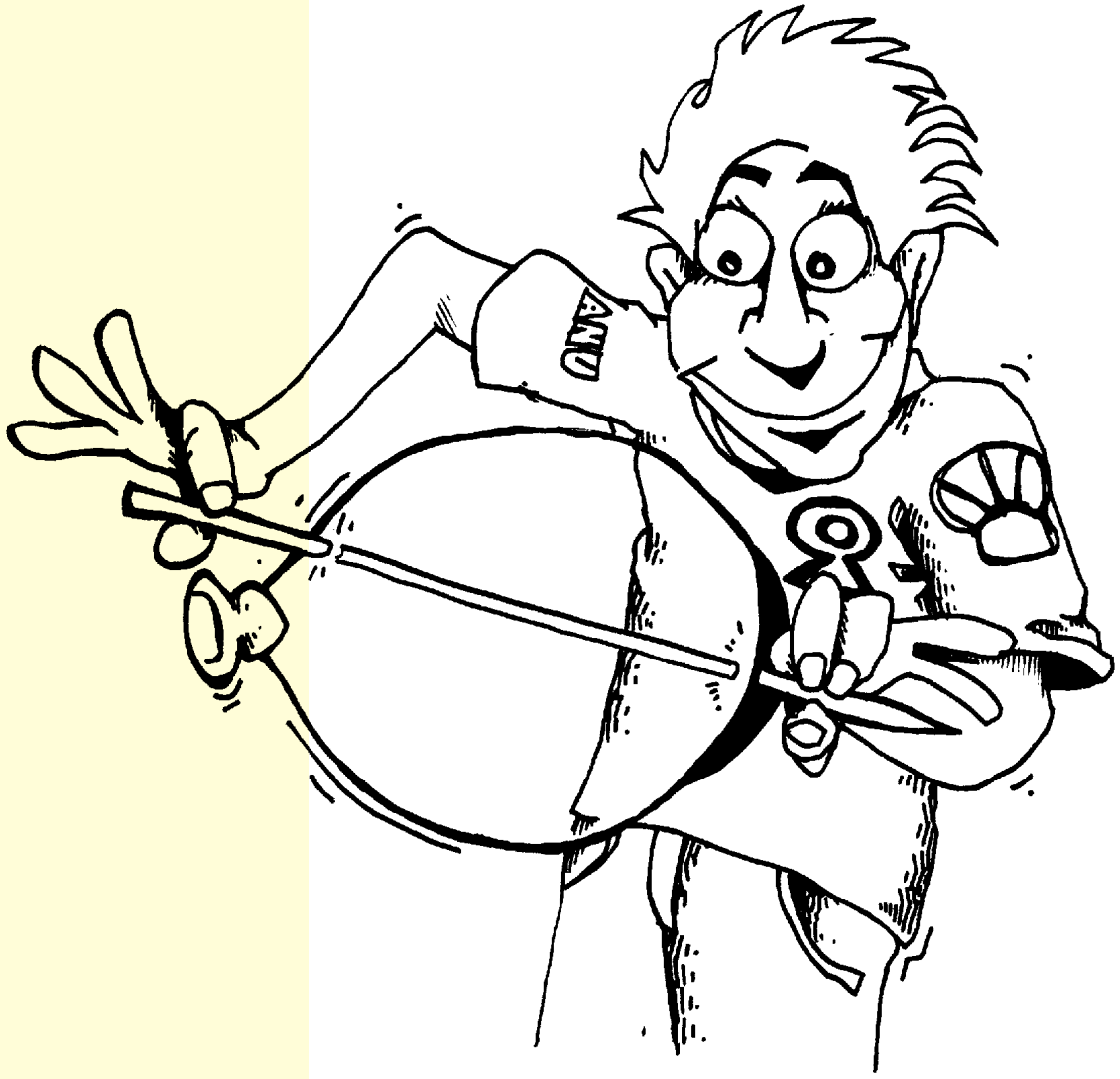
Shell Questacon Science Circus

THE AUSTRALIAN NATIONAL UNIVERSITY

Post-visit resource for teachers

The Balloon Show



Supplementary information for teachers whose classes have experienced the Shell Questacon Science Circus Shows

Thank you for hosting a team from the Shell Questacon Science Circus. We hope you enjoyed our visit.

Our science shows are designed to educate and entertain. Did they spark your students' curiosity?

If so, you may be keen to extend the show with more activities. Enclosed is information to supplement your own ideas and resources with which to follow-up our visit.

The Balloon Show

This show explores a wide variety of interesting scientific concepts using balloons. It is an excellent example of how ordinary items can be used to make science enjoyable, relevant and accessible.

Show summary

The content of the Balloon Show varies depending on the presenter's choice of demonstrations, time available, age of audience and available materials. Our favourite Balloon Show demonstrations are summarised here.

Cups on a balloon
Two cups are stuck on a balloon using nothing but air pressure to hold them on.

Bernoulli balloons
Two balloons of equal size are held together and the presenter blows between them, causing them to move together. This result is not what the audience expects and is caused by differences in pressure or Bernoulli's Principle.

Blow-drying a balloon
In this demonstration, a hair dryer is used to illustrate Bernoulli's Principle. The greater pressure outside the stream of moving air pushes on the balloon, holding it, seemingly magically, in the air.

Water sprayer:
Yet another example of the same concept, this time showing how an older style of pump action spray can works on this same principle. The presenter blows across the top of a straw in a cup of water, causing the water to be sucked up the straw and sprayed over the unsuspecting audience.

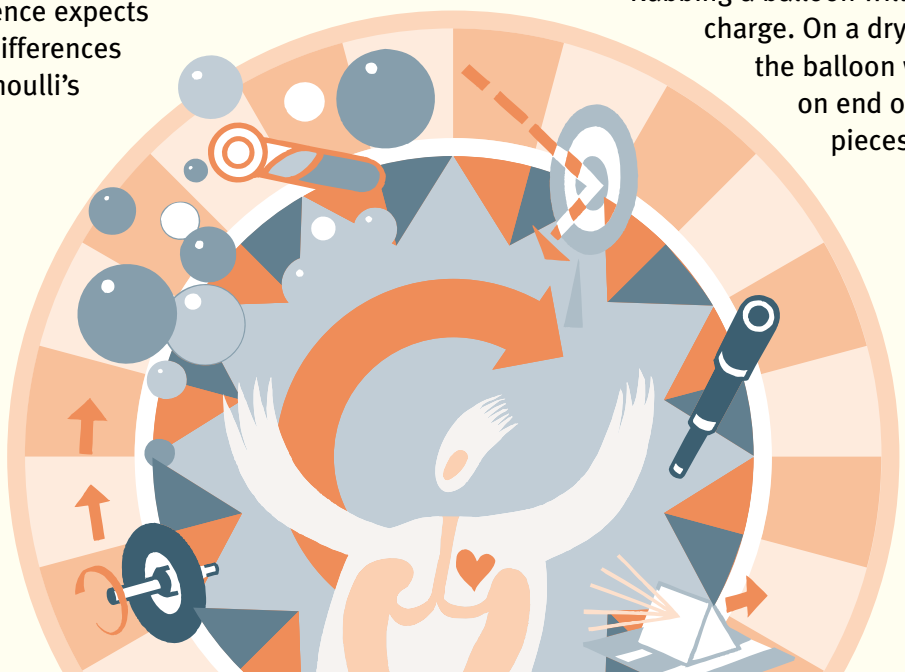
Balloons in bottles
Two volunteers race to blow up a balloon within a bottle, only one of which has a hole in the bottom. As air is difficult to compress, the contestant without a hole in the bottle fails.

Coins in balloons
Two or three coins are shaken within a clear balloon until they start to race around the inside. When looked at closely, it can be seen that the coins actually roll on their edge rather than slide on one side, reducing the amount of friction.

Hovercraft
This demonstration uses a balloon connected to a flat piece of wood or plastic with a hole in it to make a model hovercraft. When the balloon pushes air through the hole, the hovercraft moves on a cushion of air with little or no friction.

Balloon kebab
The surface of a balloon can be pierced without popping it if it is done carefully in the area of the balloon's surface where the rubber isn't as stretched.

Static electricity
Rubbing a balloon will give it some extra charge. On a dry day, once charged, the balloon will make hair stand on end or attract small pieces of paper.



Helium and hydrogen balloons
This demonstration looks at the idea of objects lighter than air floating. Both helium and hydrogen are lighter or less dense than air. Helium is often used in balloons and blimps while hydrogen is no longer used as it is highly explosive!

Safety caution and disclaimer

This show has been developed to be presented by scientists with technical training. It is not implied by the provision of these notes or the show performance that the demonstrations are safe for students or teachers to perform. Teachers should carry out their own health and safety assessments of materials and techniques before using them

The wine cask is an Australian invention which makes use of atmospheric pressure. It is designed so liquid flows out of the container but no air flows in.

Scientific Principles demonstrated in the Balloon Show

- increasing the volume or space that is available to the same amount of air results in a lower pressure.
- air always moves from an area of high pressure to an area of low pressure. This is the reason and mechanism that holds the cups on the balloon.
- Bernoulli's Principle states that a fluid moving quickly has a lower pressure than the same fluid moving slowly.
- Newton's First Law states that every object continues in a state of rest, or uniform motion in a straight line, unless it is acted on by a force.
- objects tend to do things in a way that offers the least resistance. For example, a rolling coin experiences less friction than a sliding coin.
- like charges repel. Opposite charges attract.
- as air heats up it expands. Thus, a volume of hot air weighs less than the same volume of colder air and is less dense. This is the reason that hot air rises.
- both helium and hydrogen are less dense than air. Balloons or blimps filled with either of these two gases therefore float. Hydrogen is no longer used, however, as it is highly explosive.

Suggested follow-up activities

1 Review the show by having students describe their favourite demonstration from the Balloon Show and explain what it showed.

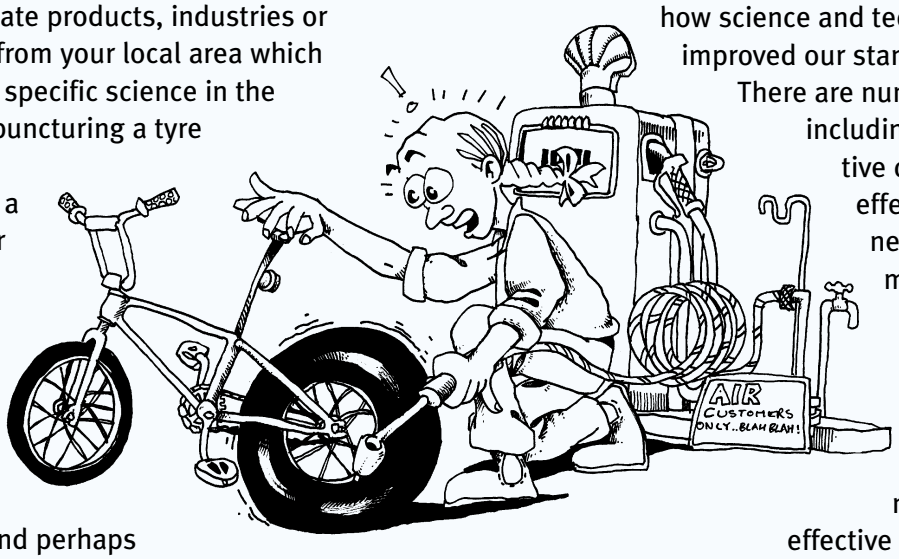
2 Ask students to explain and discuss other examples (from their own experiences) where they have seen some of the ideas in the Balloon Show.

3 Discuss or indicate products, industries or natural phenomena from your local area which exemplify any of the specific science in the show. For example, puncturing a tyre or putting air into tyres; trying to push a balloon or ball under water; examples of friction.

4 Most students are familiar with hot air balloons. Set a design project for your students to devise and perhaps build a small scale hot air balloon.

5 Provide time and materials for students to extend their knowledge of some of the phenomena, concepts and inventions mentioned in the show. Examples include density of gases and fluids, static electricity, hovercrafts, helicopters and rockets.

6 Ask students to devise and carry out their own experiments using balloons. Divide your class into groups (research teams) of 3 for experiment planning. You may like to allocate specific roles eg recorder, equipment manager, communicator within each group. Emphasise the cooperative nature of laboratory work. Teamwork is essential in science, as is safety! Include a good reader in each group. Textbooks and the Internet are useful starting points. Encourage students to gather as much information as they canbefore they begin to do anything. Before any practical work begins, provide a few basic project management guidelines for your students.



Air pressure is used in many inventions including the pneumatic tyre. Can you think of other inventions that rely on air pressure?

7 Look for science activities and demonstrations on the Questacon Web site.
Visit http://www.questacon.edu.au

8 (For senior secondary students) Extend studies of differences in pressure or compression of gases.

9 Initiate discussion on the general contribution of science and scientists to our culture, economy and environment. For example:

- Discuss or find examples of how science and technology have improved our standard of living. There are numerous examples including more productive crop plants; more effective medicines; new and better materials and processes; faster and more reliable communication and information technology; more effective ways of identifying and treating environmental problems; better food production, processing and storage; cleaner and more efficient mineral extraction methods.
- Discuss past and present examples of people being curious about nature and how scientific study is one way of satisfying our curiosity. For example, compare ancient and modern ways of explaining and studying the weather or the night sky.
- Discuss the skills we need to develop for doing experiments. For example, observing, imagining, recording, discussing, interpreting, and designing are a few of the things we need to practice in science.
- Research the lives and achievements of some of Australia's past and present outstanding scientists. There are numerous people who could be included. eg Macfarlane Burnet; Carolyn Mountford; Gustav

Did you know?

The common wine cask works because of changes in volume and pressure. It was invented in Australia in the 1960s by several wine companies for economical and lightweight transport of wine overseas.

Nossal; Peter Doherty; John Eccles; Mark Oliphant; Don Metcalfe; Frank Fenner; William Farrer; Peter Medawar; Kate Helms; Helen Newton Turner; Howard Florey; Nancy Millis; Ernest Titterton; Bede Morris; Nancy Burbidge; Paul Wild; Susan Serjeantson; Peter Bishop; Elizabeth Truswell; and Kerin O'Dea.

10 Arrange an excursion to Questacon. Australia's leading interactive Science and Technology Centre is Questacon in Canberra. Exhibitions are constantly changing. There are numerous other fascinating exhibits which model scientific concepts, natural phenomena and inventions. Tel. (02) 6270 2893 for group bookings.

Try this!

Make a rocket balloon! Thread a drinking straw onto a length of fishing line or string. You will need two people to hold each end of the line. Blow up a balloon and tape it underneath the straw so that the open end points towards the closest end of the line. Countdown. BLAST OFF! How far does it travel? How much air do you need for your rocket to reach the other end of the line?

Student and teacher resources

There are many resources available for inspiration and information. Some of our favourites which contain up to date ideas are:

- *Questacon Exsciter Science kits.* These contain numerous tried and tested ideas and materials for hands-on activities. Tel (02) 6270 2807 for details.
- *Questacon's award winning web site:* http://www.questacon.edu.au/
- *Ingenious CD* Tel. (02) 6270 2807 for details
- *Questacon Mag* Tel. (02) 6270 2855 for subscription details
- *Australian Science (incorporating Search)* Tel. (03) 9824 1699 for subscription details
- *Science Australia* by the Curriculum Corporation (national secondary science texts) Tel 1800 337 405
- *Primary Investigations* by the Australian Academy of Science (national primary science texts) Tel (02) 6247 5777 for a free information package.
- *New Scientist* Tel 1300 360127 for subscription details
- *Scientriffic magazine* Tel. (02) 6276 6643 for subscription details
- *The Helix magazine* Tel. (02) 6276 6643 for subscription details
- *Australian Innovation Magazine* Department of Industry, Science and Resources GPO Box 9389 Canberra ACT Australia 2601 Tel. (02) 6213 6304 or fax (02) 6213 6818
- *Australian Academy of Science web site:* http://www.science.org.au/nova/
- Contact ASTA, PO Box 334 Deakin West ACT 2600 Tel (02) 6282 9377 email: asta@asta.edu.au for information about professional associations.
- An extensive range of kits, books and fascinating science teaching resources are available from the Questacon shop in Canberra or by mail order from Questacon, King Edward Terrace, Canberra ACT 2600 Request a catalogue by Fax (02) 6273 5100 or Tel (02) 6270 2807.

National curriculum links

Presenters vary the show according to the age and level of audience. Accordingly, curriculum links will also differ on each occasion. The following table indicates which outcomes can be achieved with the Balloon Show depending on the level and content that is emphasised.

STRAND	Earth and Beyond	Energy and Change	Natural and Processed Materials	Working Scientifically
OUTCOMES* linked to The Balloon Show	1.1, 4.2	1.5, 2.5	1.10, 2.10, 1.11	1.13, 1.15, 2.15, 3.15, 1.16, 2.16, 3.16, 1.17, 2.17, 2.18

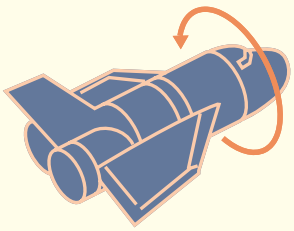
*Source: Science – a curriculum profile for Australian schools (1994), Curriculum Corporation.

Key scientific words and concepts

pressure, atmospheric pressure, low pressure, high pressure, inflate, volume, stretching, Bernoulli Principle, fluid, compression, friction, tension, static electricity, hydrogen, helium

The Shell Questacon Science Circus

The Shell Questacon Science Circus is one of several national Outreach Programs of Questacon–The National Science and Technology Centre. It is staffed by science graduates who are completing a Graduate Diploma in Scientific Communication at the Australian National University. The Science Circus takes the fascination and enjoyment of science throughout Australia by exhibiting in public venues and presenting shows in schools and other community places. Our other Outreach Education Programs include the Questacon Science Squad, Questacon Maths Centre, Starlab and NRMA RoadZone. Information about our Outreach Programs can be obtained by phoning (02) 6270 2820 or by visiting our Internet site http://questacon.edu.edu.au



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