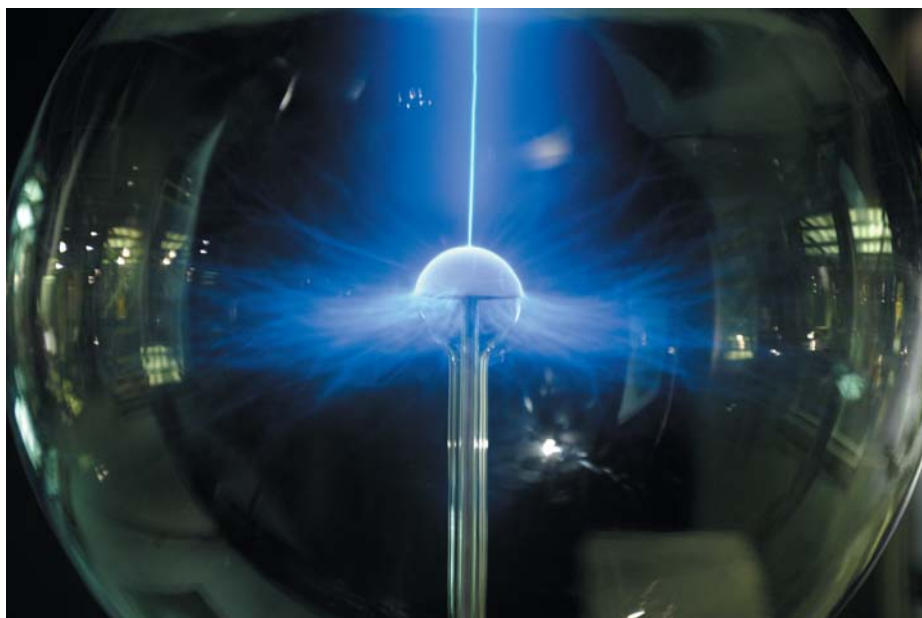


EXPERIMENTATIONS



This exhibition looks at the science behind familiar things and shows how experiments have answered questions and changed our ideas. Come and experiment yourself. You can explore electricity, rediscover colour, investigate gravity ... and lots more.

There are many science topics that can be investigated in *Experimentations*. A visit before your class excursion would be very worthwhile. You will see a variety of ways to study light, colour, heat, air-pressure, electricity, magnetism, gravity and many other topics. Senior students can benefit from our displays on resonance, gyroscopes, polarised light and gas discharges.

With many attractive displays and engaging interactive exhibits, it may be difficult to keep your group focused on one area. Allow sufficient time to browse through the exhibition to satisfy this curiosity and interest.

Encourage your group to look and read as well as 'do'. Some of the explanations are written as fun poems but all try to make the exhibits easy to understand. The objects in the showcases range from

the priceless to the everyday but all illustrate applications of the concepts demonstrated by the interactives.

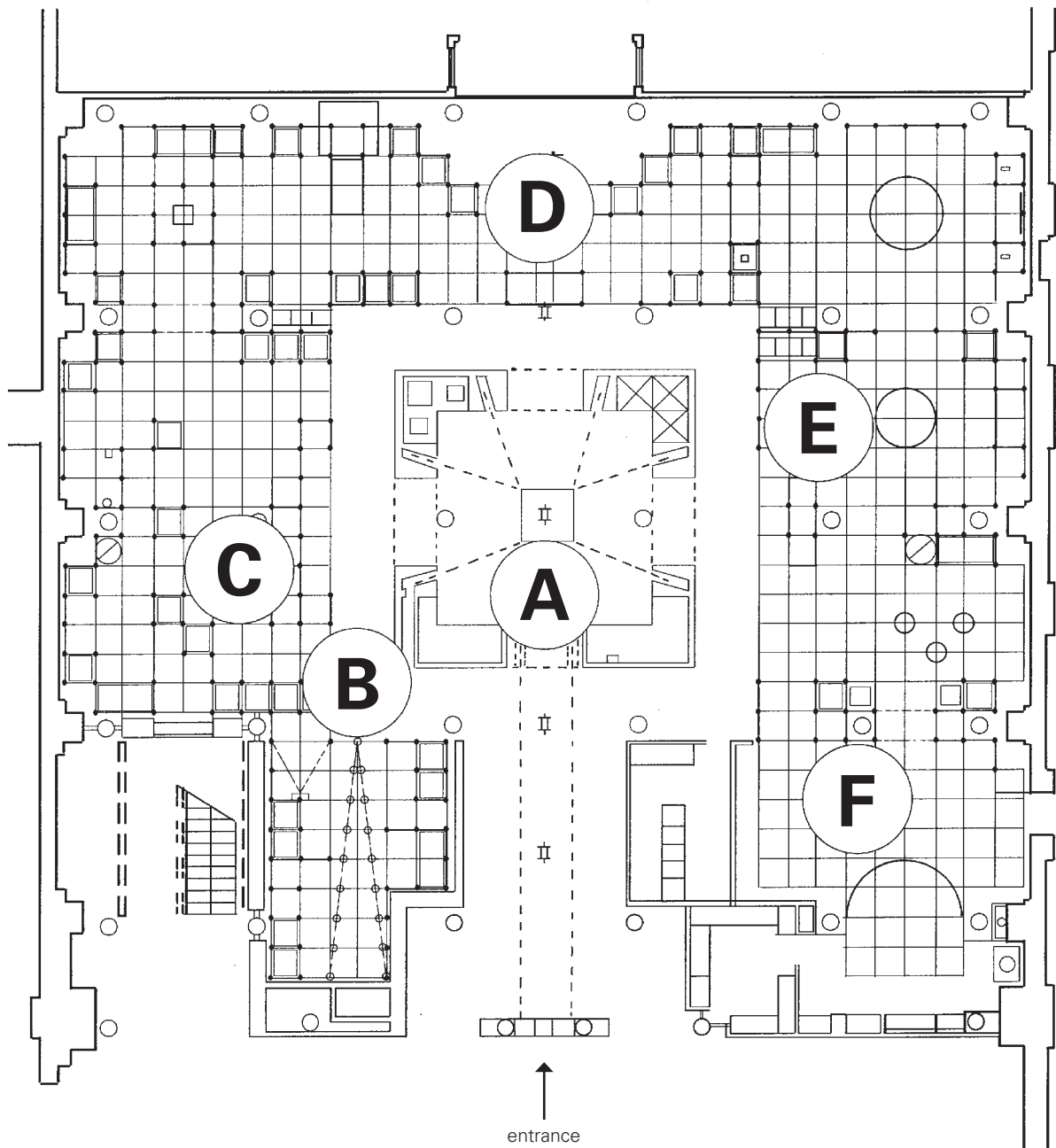
Don't rely too heavily on one interactive when planning your visit. Despite our best efforts, they sometimes break down. The interactives are grouped together, so neighbouring exhibits convey similar concepts.

With 35 interactive exhibits and a demonstration area, *Experimentations* is one of the most 'active' parts of the Powerhouse. The exhibition is divided into seven sections:

- A. The central area where the nature of experimenting is introduced and examined
- B. 'Lamps and light' looks at light and lighting
- C. 'Nuclear matters' is all about the nucleus and radio-activity
- D. 'Serious charges' examines electricity and magnetism
- E. 'Chemical attractions' explores tastes and smells and looks at the chemistry in things from chocolate to perfume
- F. 'Science on show' ... a demonstration area.

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Exhibition floor plan



- A.** Introduction
- B.** Lamps and light
- C.** Nuclear matters
- D.** Serious charges
- E.** Chemical attractions
- F.** Science on show

Experimentations

A. Introduction

Follow the 'light sculpture' into the exhibition. Light from a powerful projector lamp is reflected, collimated and refracted to form beautiful colour spectra in the centre of the exhibition.

Around the centre are four settings that allow you to contemplate some aspects of experimentation, by focusing on individuals:

- Galileo sees a regular pattern that had not been noticed before
- Gray takes his experiments to great lengths to test the limits of an effect
- Joule shows great patience and precision in measurement to prove his point
- Newton reinterprets a known effect and tests his idea.

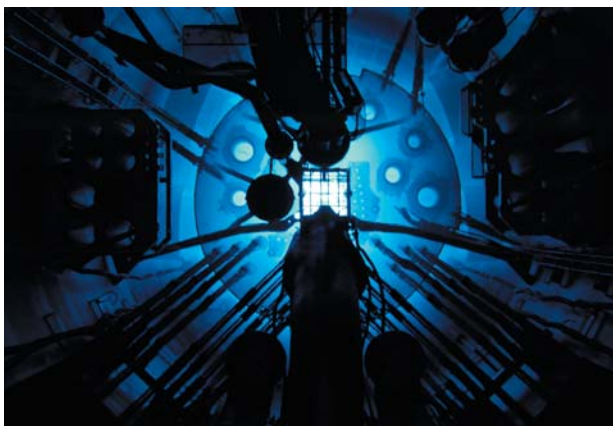
Together, these examples show some of the major influences in experimentation ... curiosity, inspiration and perseverance.

B. Lamps and light

This small section is near the entrance.

There are three subsections:

- **Colour.** Colour has fascinated many people through the ages. See some surprising effects of coloured light on coloured objects. See how polarised light can be used to test the stress in structures. Spin some patterned discs and see colours appear and disappear.



Inside the OPAL research reactor at Lucas Heights. Photo courtesy ANSTO.



Follow the history of lighting in 'Lamps and light'.

- **Lamps and candlesticks, lenses and light bulbs.** At the flick of a switch we can read after sunset. Our streets are lit. The dark is pushed back. But it wasn't always so. Follow the history of lighting from Roman oil lamps to lasers.
- **How light can be mixed, split and bent.** Microscopes were invented about 1590 and telescopes soon after. Both of these greatly enlarged our view of the world. See some of these historic devices and try out a stereomicroscope.

C. Nuclear matters

Sponsored by ANSTO.

In this section you can explore nuclear science, see how it works and how it is used. With this information, you can form your own opinion about nuclear matters.

There are five subsections:

- **Nuclear basics: bananas, isotopes and the sun.** What is radiation and radioactivity? Are they safe at any level? How do we measure them? Can everyday things, like bananas, be radioactive?
- **Nuclear in our lives: more than medical.** In this section you can see how radioactivity is made, packaged, transported and used safely around Australia everyday.
- **Nuclear sciences: probing, dating, analysing, developing.** In this section we explore how beams of neutrons and radioisotopes are used in scientific research, for medicine, industry and even to investigate climate change.

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- **Nuclear power generation: more complicated than $E=mc^2$.** In this section you will compare different power sources and their impact on the environment. What are the relationships between electricity and ecological impacts?
- **Nuclear perspectives: what are the issues?** Since its discovery in 1896 people's attitudes to the use of radioactivity have changed from naive enthusiasm to cautious concern. Some people oppose its use altogether. So take a look at the strong views on both sides of the nuclear debate.

D. Serious charges

Look for the plasma ball. Electric discharges travel eerily through the ionised gases inside. The presence of your hand on the outside alters the electric field and changes the pattern of discharges inside. Four subsections look at the following:

- **All charged up and nowhere to go?** Static electricity is a build-up of electric charges. When there are too many charges on a surface, some jump off. This is a spark. See how static electricity can be made, stored and released as sparks.
- **When electric charges get moving ... you've got an electric current.** This section shows three ways of making electric current: generators; batteries; solar cells. You can generate some electricity, turn your hand to making a battery and see solar cells. Energetic people can climb onto our pedal-power generator and power the electrical devices on a fire-engine. The smaller or more genteel visitor may like to turn a generator by hand to power a model train.
- **Everybody is electric!** Some animals have special organs for detecting electricity. Some can even produce electric shocks. But in every animal electric charges are going on all the time ... in the brain, nerves and muscles. Take a seat in our electric chair to find out if you are good conductor.
- **Magnetism: an attractive discovery.** Thousands of years ago, people found that some rocks were naturally magnetic. Only last century it was discovered that electricity makes magnetism too!



Generate electricity with pedal power.

Experiment with magnets and see some of their uses. See the patterns of force around a magnet. Find out which metals are strongly affected by magnets. Feel how attractive and repulsive magnets can be. Use magnets to make an electric motor work. Distort a picture of your face on TV.

E. Chemical attractions

Sponsored by the Royal Australian Chemical Institute (NSW) and World's Finest Chocolate.

Almost everything you taste, smell, see or touch is made of chemicals. A fractional distillation column introduces this section. This 'still' separates ethanol from a mixture of ethanol, water and dye. Watch the liquid boil and notice the clear ethanol at the top of the column. 'Chemical attractions' has five subsections:

- **The flavour of chocolate.** Chocolate is one of the most popular foods and flavouring around. See where it came from, how different types of chocolate are made and taste chocolate in the special interactive.
- **Whiffs and sniffs.** Smells that make life better (and sometimes worse) have been around since people started living in groups. Smell perfumes and deodorants and find out the chemical similarities between two different smells.
- **A colourful world.** Look at why things are brightly coloured and find out how CFCs affect the ozone

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layer. How do fireworks get their colours, and why do some rocks glow in the dark? See all this in the chemistry of colour.

- **On the surface.** Find out how important surface effects are in everyday life and see how chemicals take the dirt from your clothes. Watch how detergent spreads across the surface of water.
- **Plastics galore.** What is a plastic and what is a polymer? Find out a short history of plastics — how they are made and what they are made from.

F. Science on show ... a demonstration area

Sponsored by James N Kirby Foundation.

'Science on show' is the name of the demonstration area. A selection of science shows is available for school groups who book in advance. For science show descriptions visit www.powerhousemuseum.com/teachersguide and book by phoning (02) 9217 0122.



Experiment with different smells in whiffs and sniffs.

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Focus questions

Select questions that will help your students interpret the exhibition. If necessary, adapt the questions to suit the ability of your group. The answers can be found by looking at the objects, photographs, videos and labels, and by using the interactive (hands-on) exhibits.

Start in the centre of *Experimentations* at the paper sculptures.

A. Introduction

- What did Galileo discover when he looked at the chandelier?
- Gray wasn't very famous. But he kept on plodding with his experiments on electricity. What did he find?
- Joule was a stickler for accuracy in measurement. How precise were his temperature measurements?
- What were the simple questions about light that Newton asked? What answers did he find?

B. Lamps and light

- Find the Newton's disc interactive. Can you make colours vanish? What was Newton trying to prove when he did this?
- What is a spectrum? (answer is on large photograph.)
- What discoveries were made by looking at *spectral lines* through spectroscopes like those in the showcase? (The chemical elements helium, cesium and rubidium were found.)

C. Nuclear matters

- Can you name some everyday things that are radioactive?
- Identify four uses for radioisotopes.
- What is Australia's only nuclear reactor used for?
- What kind of nuclear reaction takes place inside stars?

D. Serious charges

- Find and read the poem *Hair raising*. Does the poem make it easier to understand static electricity?
- How does a generator work?
- Try the battery interactive. Can you see similar metal plates in Volta's pile? (Showcase to right.) Which bit of the interactive is like the leather soaked in salty water? (Your body!)
- Which metals are attracted by a magnet? (Try the interactive ... cobalt, nickel and steel should be.)
- What are two medical uses for magnets? (See showcase.)

E. Chemical attractions

- Which culture invented chocolate and how was it eaten? (answer in chocolate showcase)
- Where are some places that surfactants are used? (answer in plastics showcase)
- What differences are there between a natural and synthetic aroma? (answer in interactive and showcase of commercial products)
- Try the smells in the fragrance section. Do you recognise any of them, how long do you think the perfumes took to be developed?
- What makes the colour in fireworks? (answer in fireworks interactives)

Experimentations

Available from the Powerhouse Shop

Experimentations, a full-colour booklet about the exhibition.

ISBN 1 86317 019 7, 8 pp, \$3.30

Also in the same series:

Space: beyond this world. ISBN 1 86317 006 5, 8 pp, \$3.30

For more information on the exhibition
***Experimentations*,**
visit the Powerhouse Museum's website
<http://www.powerhousemuseum.com>

For more information about education support
or your booking, contact Education and Program
Development at the Powerhouse Museum:
Telephone — (02) 9217 0222
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