Scorpio Technology NEWSLETTER

INSIDE THIS ISSUE

SALE ITEMS: Check out the diverse range of Sale items. Includes great gift ideas for all ages: https://www.scorpiotechnology.com.au/sale-items.

TEACHER CONFERENCES & WORKSHOPS

Scorpio is attending or supports these Design & Technology teacher activities:

SCITECH 2020- 12-9-2020 *Conference for Science & Technology Teachers*, Daramalan College, Canberra
DATTA AUSTRALIA – 12 to 18-10-2020, Design & Technologies Week *Developing creative problem solvers*. New 2020 website launched! https://dattaaustralia.com/design-technology-week-2019/
DATTA VIC – 4-12-2020 *Design Disruption*, Virtual conference, 5-12-2020 MAKERSPACE - Various locations
ITE (NSW) - 24 to 26-11-**2021**, Sydney

LEARN TO MAKE, MAKE TO LEARN

WELCOME

This year continues to bring unexpected challenges. Many states are now back to classroom teaching while others states have off-site learning. This month we bring you ideas that can be used on-site and off. Enjoy!

As always, we are here to help, so if you have any issues or questions, don't hesitate to contact us at (03) 9802 9913 or sales@scorpiotechnology.com.au

PRIMARY: MIRRORS

MIDDLE & UPPER PRIMARY: Investigate the fascinating world of mirrors and reflections.

	**Hinged mirrors Code: MIR11657** Three sets of two 3mm thick rigid, unbreakable and distortion free plastic mirrors taped together. Investigate light, reflection, create angled reflections and more. Size 15x10cm, Length 11cm, Width 3cm and Height 16cm
	**Unbreakable double sided mirror Code: MIRHL0976-01** Acrylic double sided, hgh quality mirror finish. Mirror can be bent or cut easily. Use for Science experiments with light, Maths shape and symmetry and Art projects.
	**Unbreakable mirrors Code: MIR51225** 10 pieces of flexible double-sided plastic mirrors Preformed with a convex /concave shape. 10 x 10cm
	**Mirror – 3 cornered -120mm sides Code: HL2170-001** Has 3 x front surfaced mirrors mounted inside a plastic moulded housing so that the 3 faces are mutally at 90 degrees. This special mirror reflects light rays back to the source. A mirror of this type was placed on the moon so that, providing a light beam reached the mirror at any angle, there was always a reflection from the mirror back to the source of the beam.

In middle of every difficulty lies opportunity.
Albert Einstein

PRIMARY: MIRRORS cont.

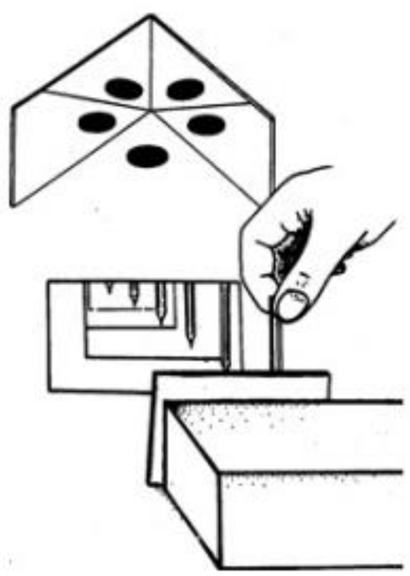
Light is a type of energy that can be observed with the use of mirrors. When light meets the surface of an object, three things can happen. The light can be bounced (reflected), bent (refracted), or absorbed. When you look at an object in a mirror, what you see is the reflection (image) of light from that object.

We've put together some fun learning activities to get you started with the mirrors in our product range.

Flat or Plate mirrors:

- The reflection has the same size as the actual object. If the mirror's upright, the image is upright as well. If the mirror is horizontal, the image is upside down.
- Investigate symmetry (e.g. shapes, words, numbers, animals). The centre line is called the Mirror line.
- Make a flat mirror with aluminum foil. If it is smooth it will reflect light. Compare with a real mirror. Crumple foil to note changes.
- Redirect a light beam from a bright torch using mirrors. Try using a number of mirrors to build a light maze. How many times, using lots of different mirrors, can you bounce / reflect the light around the classroom?
- Put two plane mirrors standing up parallel to, and facing, each other. Put a small object between them. "What do you see?" *(An endless number of reflections as the light is bounced backwards and forwards between the mirrors).*
- Make a kaleidescope from an empty paper towel roll and mirrors. Discover the interesting patterns it creates.

Hinged mirrors:



- Use a protractor to mark degrees on a piece of paper. Open mirrors to these marks. Place small objects in the middle. Establish the relationship between the size of the angle and the number of images visible when you make the angle between the mirrors greater or smaller. When do you see the most images? *(The number of reflections increases as the angle between the mirrors decreases).*

Convex /Concave mirrors:

- Not all mirrors are flat. Concave (bows inwards) and convex (bows outwards) mirrors change / distort the image but are useful in many ways. Concave mirrors are used in telescopes. Convex mirrors on car doors allow drivers a wider view of the road and traffic behind them. What other uses of concave and convex mirrors can you find?
- Make a soft drink can mirror. Wrap a can with reflective material to make a concave mirror. Investigate how shapes and images are reflected.

Inventors

- **Galileo's** telescope (1609) used a *convex* lens.
- **Isaac Newton** was the first person to make a telescope using a *concave* mirror in 1688.
- **Leonardo da Vinci** wrote using "mirror writing." His writing went backwards from right to left, instead of from left to right. To read the reversed writing you needed to use a mirror. The reasons for writing this way left handed-ness and as a way to protect his ideas from others.

- Among **Leonardo's** many inventions was a mirror grinding machine — so not only did he understand how mirrors work, but also was trying to improve the technology to create them.

SECONDARY: SCIENCE

To help illustrate the various concepts of optics, we recommend our metre-long **Optical Bench Kit (Code: PH0649)**. Students can use it to investigate geometric optics of different lenses, reflection, the differences between concave and convex lenses, to name a few.

The **Laser Ray Kit (Code: AR1110752)** features a Diode laser box that consists of 5 independent laser modules with peak wavelength of 635mm; a variety of optical components including lenses, mirrors, prisms; and several optical instruments template; on a magnetic board.

This Month's Q&A Technology Tips: Matching the motor and the power source (continued from July 2020)

When designing a project, you MUST consider a number of things to make sure that the project performs as required. The critical thing to do is to match the Motors performance / power requirement to the power source, as not any battery or solar panel will drive any motor.

Q. I've bought one of your kits and I would like to substitute a 9 volt battery clip for the supplied battery holder – will that work?

A. In most cases no. When considering changing battery holders, you need to consider both voltage **and** current (milli-amp) usage of the motor. It is easy to overlook the current requirement.

For example:

- a good 9 volt battery only provides 500 mAh, whereas an alkaline AA battery can supply 2,000 mAh or more.
- MOT17 can draw up to 1 amp (1,000 mA) under load – more than the 9 volt battery can supply.
- the MOT17 has a no load current draw of 250 mA, and it is easy to think the 9 volt battery provides enough power as the wheels will spin when holding the motor / vehicle in the air. But as soon as you put it on the ground it won't go anywhere, as the motor is then under load and draws a lot more current.
- under load at maximum efficiency MOT17 draws 1 amp – when not at max efficiency it will draw even more mA out of the battery.

SOLAR POWERED

Q. Will any electric motor work with any solar panel?

A. No – the voltage and amperage generated by the solar panel must be enough to power the motor. It also depends on what you plan to do with the motor – is it just to demonstrate that solar power works, or will it drive a model car?
- if you want to drive a car or boat, we can advise which motor / panel combinations work well together (and which kit we use them in).
- with the smaller panels we haven't developed any specific projects for using them

Q. How do I work out what motor to use with which panel?

A. To get the best combinations you need to look at the motor's Current (Amps) and the Voltage it requires, and compare that to the solar panel.
Remember that:

- solar panel ratings are rated at "100% sun", and under lower sunlight will not provide that much power.
- the solar panel generates its maximum power when angled at 90 degrees to the sun – the ideal time is midday, when the sun is directly overhead.

NOTE: the "No load" current is not what you need: as the name implies it should spin the wheels - if you have the car in the air! As soon as you put it down it won't go anywhere, as it needs the current (Amps) in the "Under load" row.

The Telescope With Shortsightedness ... Well, Sort Of!

Article written by Alex Kapoyanis

Everybody has very likely come across the amazing photos of our cosmos from the Hubble Space Telescope (HST), named after American astronomer Edwin Hubble. Most secondary school science text books will contain a beautiful, clear photo of an astronomical object taken by HST.

"*Hubble has really opened our eyes to what the universe is made of, its structure, and has helped us learn how little we know about the universe*". John M. Grunsfeld (American physicist and a former NASA astronaut).

The exciting results from the Hubble, other satellites and probes would not have been possible without innovative solutions to many technical problems.

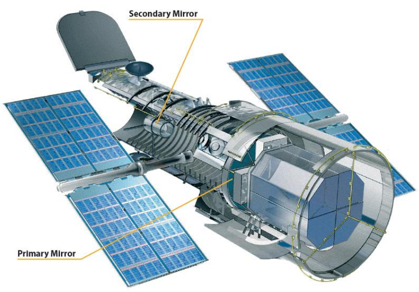
Nancy Roman 1925 –2018)

American astronomer

What many people may not know, is that the beginning of HST's mission did not quite go according to plan. The telescope was launched into Earth orbit from the cargo bay of the Space Shuttle Discovery in April 1990. Shortly after, it became evident that the images sent back to control on Earth were quite fuzzy. They looked somewhat like the telescope suffered from myopia (short sightedness).

In reality, it was discovered that due to miscalibrated equipment of the 2.4 metre primary mirror's manufacturer, the edges of the mirror's surface had been ground minutely flatter than desired. The curvature of the mirror was off by about 2 microns, or 1/50th of the width of human hair. This resulted in a spherical aberration. The incoming light from celestial objects was not focusing. Hubble could only focus about 12 percent of a star's light into the central disk, as opposed to a desired 85 percent in a perfect image. The rest of the light spread into a huge area around the star. The result was images that were blurry with less sharp detail than expected.

For the next three and a half years, experts at the Space Telescope Institute used computer image reconstruction techniques to mitigate the effects of the flawed primary mirror, to a degree. This was only a band-aid fix at best.



In December 1993, NASA launched the first of four servicing missions. Astronauts performed several space walks (EVAs) to install special corrective instruments to fix Hubble's vision, as well as replacing some outdated or failed equipment such as solar arrays and gyros.

The result was obvious within weeks. The clarity and detail of the objects in photos was like nothing seen by the astronomical community before. Numerous faint stars, galaxies and other astronomical objects have been photographed by this amazing (and expensive) space telescope, and many advances have been made in the field of astronomy thanks to Hubble.

Hubble is still operating today, more than 30 years after it was launched, thanks to a dedicated team of scientists, engineers, IT experts and other support staff. Not bad for a mission that was only expected to last about 15 years!

The Hubble Space Telescope, like many large modern-day telescopes, uses mirrors to focus objects. However, modern day amateur and early telescopes, such as the refracting telescope used by Galileo to discover four of Jupiter's moons, use lenses. The astronomical telescope, also known as a Keplerian, was developed by Johannes Kepler over 300 years ago. That, too, uses lenses (and even prisms) instead of mirrors.

The use of lenses, rather than mirrors, is arguably better for demonstrating the principles of optics. For example, a light can be shone through a lens and you can see its focal point. Students can look through a lens and visualise concepts much easier than with the use of a mirror.

The Hubble can only take images in black and white. The telescope takes a number of pictures of the same object using a variety of filters. These images show different parts of the colour spectrum. The resultant images are combined for a full-colour composite.

Astronaut F. Story Musgrave, anchored on the end of the Remote Manipulator System arm, prepares to be elevated to the top of the Hubble Space Telescope.

Nebula

Equipped with his five senses, man explores the universe around him and calls the adventure Science. Edwin Powell Hubble

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