

# Scorpio Technology NEWSLETTER



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### TEACHER CONFERENCES & WORKSHOPS



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

**DATTA VIC** – 4-12-2020 *Design  
Disruption*, VIRTUAL conference, 5-12-  
2020 MAKERSPACE - Various  
locations

Check out the diverse  
range of Sale items.  
Includes great GIFT  
ideas:

<https://www.scorpiotechnology.com.au/sale-items>

**CLEARANCE  
SALE**



Request a **FREE**  
sample **Yo-Yo  
kit** be added to  
your next order.  
Suits Primary &  
Year 7.

## WELCOME



Recharge your batteries by spending  
time outside and learning from our  
natural environment. We share great  
ideas and products for all year levels.

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 email us at [sales@scorpiotechnology.com.au](mailto:sales@scorpiotechnology.com.au)

## PRIMARY STEM: LET NATURE INSPIRE YOU

**MIDDLE & UPPER PRIMARY:** With the weather warming up it's  
the perfect time to take STEM learning activities and experiences  
outside. After all, Nature is a great teacher.

### Explore the environment up close using a magnifying lens.

**FIELD MAGNIFIER**  
(Code: MGHJ2118)



**MAGNIFIER WITH  
TRIPOD** (Code:  
MG0255)



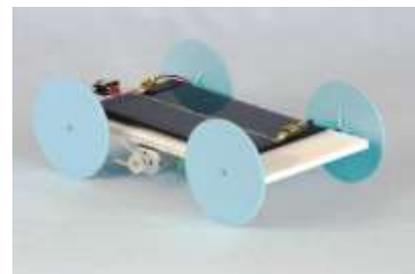
**HANDISCOPE**  
(Code: MGHJ2126)



Construct a **Solar House** – the  
solar panel powers the LEDs  
and ceiling fan.



Construct and experiment with  
the the Blue Bros. vehicle  
models. Choose from **Blue Sky**  
(solar powered belt driven),  
**Bluebird** (motor driven belt-  
drive), **Bluey** (basic vehicle with  
no motor) and **Breezy** (moves  
by a propeller mounted on a  
motor).



**LEARN TO MAKE,  
MAKE TO LEARN**

**“Let Nature be your teacher.”**  
*William Wordsworth*



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## SECONDARY:



New **Physics** curriculum resources continue to arrive.

Now available: **Van De Graaff Generator** (Code: **EM4134-101**) which can be used to demonstrate effects involving static electricity. Performance and reliability is excellent.

**2021 PHYSICS  
AND LABWARE  
PRE-ORDER &  
SPECIAL ORDER  
CATALOGUE**



Click here for great deals:

<https://www.scorpiontechnology.com.au/catalogues>

## This Month's Q&A Technology Tips: Lead vs. Lead Free Solder

### Q. What are the advantages and disadvantages of lead and lead free solder?

A. Soldering is an important skill that students use in several STEM subject areas. In the last few decades there has been a growing concern for health in regard to using lead solder. Whichever type of solder you choose, it is very important to follow safe work practices. We will briefly look at the advantages and disadvantages of each type.

A valuable free resource is available on Scorpio's website **Troubleshooting Electronics**

<https://www.scorpiontechnology.com.au/technology-kits>

### LEAD SOLDER - ADVANTAGES

- Leaded solder is usually a mixture of tin (60%) and lead (40%).
- It is easier to work with, requires lower temperatures decreasing the risk of overheating components, less electrical conductivity and mechanical strength issues with the joints.
- When solder cools it becomes smooth and shinier which makes problems easier to spot e.g. oxidation has a dull appearance.
- Is a cheaper alternative.
- The amount of lead used is so minuscule that it does not pose a hazardous threat to health.

### DISADVANTAGES

- Main health danger from using lead solder is due to inhaling the vaporised flux. You may choose to use a fume extractor. In any case, avoid breathing the immediate vapours from soldering, whether leaded or lead-free and regardless of the type of flux.
- Following Safety Protocols is very important. For example:
  - Wash your hands every time you touch solder.
  - Do not eat or drink when soldering.
  - Keep your work area clean and all items away from children and pets.
  - Collect solder (lead-waste) in metal container and dispose responsibly.

### LEAD FREE SOLDER - ADVANTAGES

- Lead-free solder is mostly tin, silver, copper or other metals.  
Required by some countries to be used instead of lead solder.

### DISADVANTAGES

- More difficult to use and harder to learn.
- Requires a higher heating temperature which poses a thermal threat to electronic components especially semiconductor components.
- Requires specialized tips and soldering iron that tolerate higher heat.
- More difficult to gauge a good solder joint.
- Lead-free solder that is old, expired, oxidized or using lead-free flux that is expired causes problems.
- Higher heat increases health dangers associated with vaporised flux. Avoid breathing the immediate vapours from soldering. You may choose to use a fume extractor.
- Tin whiskers (small, hair like conductive filaments that grow from some metals) can damage electronics by forming a bridge between components causing them to fail.

### REFERENCES:

- <http://www.pcbboardrework.com/difference-between-lead-and-lead-free-solder>
- <https://electronics.stackexchange.com/questions/70735/should-i-use-lead-free-solder>
- <https://www.quora.com/What-are-the-disadvantages-of-lead-free-solder-vs-lead-solder>
- <https://assist.asta.edu.au/question/4478/soldering?se-arch-id=d3c47f9> (Australian Science Teachers Association)

# It all STEMs from Nature



Two natural arches, one is a twisted piece of wood and the other is eroded sandstone in the desert.  
(Photo: Dwight Tracy)

"Nature never hurries, yet everything is accomplished"

Lao Tzu

Ancient Chinese philosopher and writer.



**Nature is a great teacher. By studying form and structure in Nature we can learn how to design and manufacture and improve it to minimise the detriment to the environment.**

We generally don't think of Nature as related to STEM except in the context of Biology or other natural sciences. This is not actually the true picture. Man has been intrigued by Nature since ancient times. By studying various aspects, mankind has been able to gain an understanding of the world around them. This has led to improvements in design. Famous scientists, mathematicians, inventors and even philosophers have gained much insight by studying the world around them.

In 1202, **Leonardo Fibonacci** introduced the **Fibonacci sequence** in his book *Liber Abaci*. Fibonacci sequence runs 1, 1, 2, 3, 5, 8, 13... (each subsequent number being the sum of the two preceding ones).

**Leonardo da Vinci** (1452–1519) noted the spiral arrangement of leaf patterns and that tree trunks gain successive rings as they age and other natural observations.

Many mathematicians and scientists who continue the study of Nature have developed theories or proven earlier hypotheses.

## PATTERNS IN NATURE

Nature's patterns inspire artists, designers and engineers to create beautiful and functional objects. Natural patterns are building blocks that are found everywhere. Nature takes advantage of spirals, curves, waves, stripes, symmetry, tessellations, efficient strong shapes and more. They are rarely smooth, round or square. Many patterns repeat and follow simple mathematical rules such as Fibonacci ratios, which are found in spiral patterns in many living things such as plants.

By observing shapes it has been learned that the hexagon shape used by bees in their honeycomb is the best shape. This is due to its strength and efficiency for packing much in a small area. Honeycomb structures have numerous engineering and scientific applications, including in the aerospace industry.

## BIOMIMICRY

The idea of Biomimicry was developed in 1997 by scientist and scholar, Janine Benyus. Biomimicry means to "*imitate life*". It involves looking at nature for inspiration and understanding to solve problems by questioning "*What would nature do here?*" Problems are approached with different objectives and perspectives leading to an opportunity to develop new thinking and conclusions about the end product. It has been used to develop new and innovative designs for products, systems, architecture and engineering.

Product design takes into consideration and focuses on minimal environmental impact, sustainable materials and manufacturing and full life of the product (closed loop system).

Commonly used items such as **Velcro** are inspired by nature. Swiss engineer George de Mestral observed the burrs on the burdock plant. Under a microscope he noted that the seeds have tiny hooks that

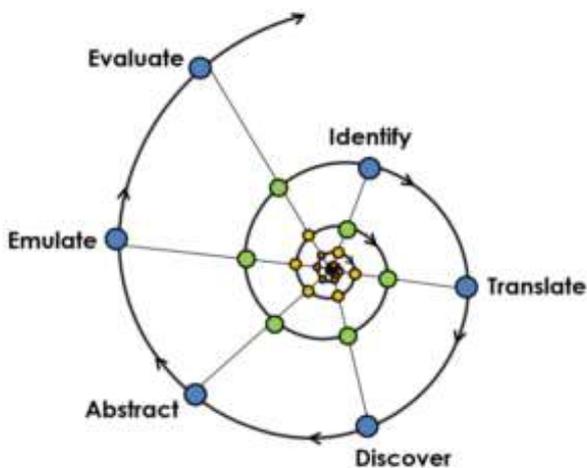
allow them to stick to things with loops, like clothing. This led to experimentation and the invention of Velcro (1941).



**Photovoltaic cells** make up solar panels which are designed to mimic the way the leaves of plants collect energy from the sun.



**Fastskin Swimwear** made by Speedo allows the swimmer to glide through the water like a shark due to layers of microscopic scales on top of each other.



### Biomimicry Design Spiral

Adapted from Carl Hastrich (2005) via The Biomimicry Institute

The Biomimicry Institute explains a lap around the **Biomimicry Design Spiral**:

- Identify one or more functions that you want your design to perform,
- Translate those functions into biological terms,
- Discover strategies that nature uses to perform those functions,
- Abstract those strategies back into technical terms,
- Emulate those strategies in your design solution,
- Evaluate your design against your design brief and Life's Principles, and then decide how you want to use your next lap.

This process is repeated allowing designers to explore many options and opportunities in a creative and innovative way. The result is achieved allowing for many changes in a shorter timeframe.

<https://biomimicry.org/biomimicry-design-spiral>

When we look at the natural world there are so many possibilities for future design. Nature is increasingly used as an inspiration for fashion, architecture, furniture, household goods and much more. Future design and product manufacture needs to take into consideration the whole life cycle of the product making it more sustainable and environmentally friendly. Just what Mother Nature requires.

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- <https://www.stem.org.uk/>
- <https://biomimicry.org/>
- <https://asknature.org/>
- <https://www.stemschool.com/articles/it-all-stems-from-nature>
- <https://slate.com/technology/2015/07/hexagons-are-the-most-scientifically-efficient-packing-shape-as-bee-honeycomb-proves.html>
- <http://www.spencerauthor.com/biomimicry/>

