



Designed by Nature:

A nature-based STEM learning experience.

Sally Fierenzi

Learning Innovation Programs Officer



Royal
Botanic
Gardens
Victoria





*Royal Botanic Gardens Victoria acknowledges the
Traditional Custodians of the land on which we work and
learn and pay our respects to their Elders past, present
and emerging.*





Life is sustained and enriched by plants.

Safeguarding plants for the wellbeing of people and the planet.



Royal
Botanic
Gardens
Victoria





Connections with Nature....

www.menti.com



'Quiet our human cleverness'



What can we learn FROM nature?

3.8 billion years of
research and
development!

The practise of Biomimicry provides “a rich framework for teaching that can be used to address a wide range of topics in science, engineering, sustainability and environmental literacy.

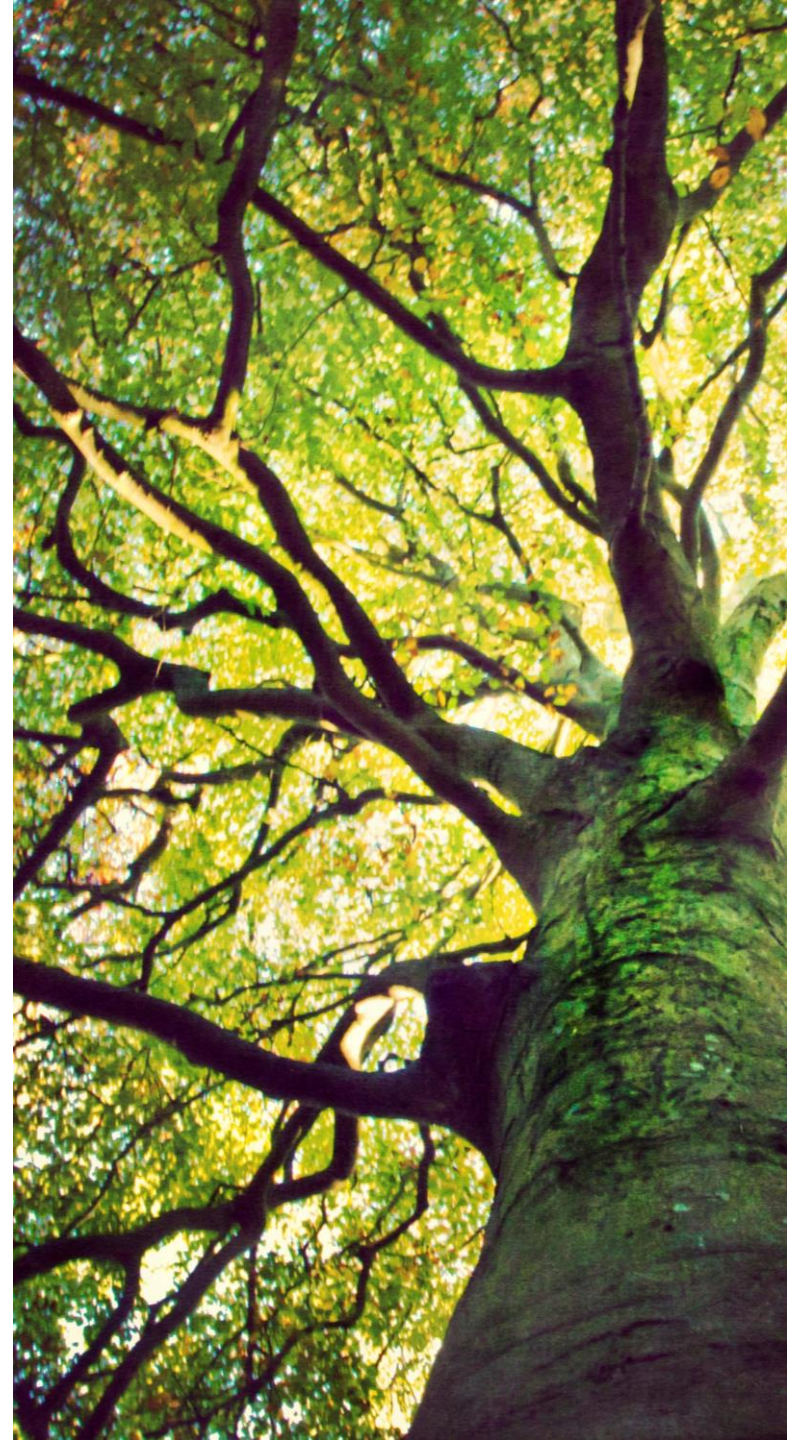
Biomimicry Institute, 2017

Biomimicry @ Royal Botanic Gardens Victoria



How do we teach Biomimicry?

- Examples of Biomimicry
- Biomimicry Skills
 1. Learning FROM nature
 2. Finding function



LEARNING ABOUT

'Can be some of the tallest structures in the world.'

'There are two types of trees; evergreen and deciduous.'

'Provide homes for wild life.'

'Trees can communicate with each other and help each other.'

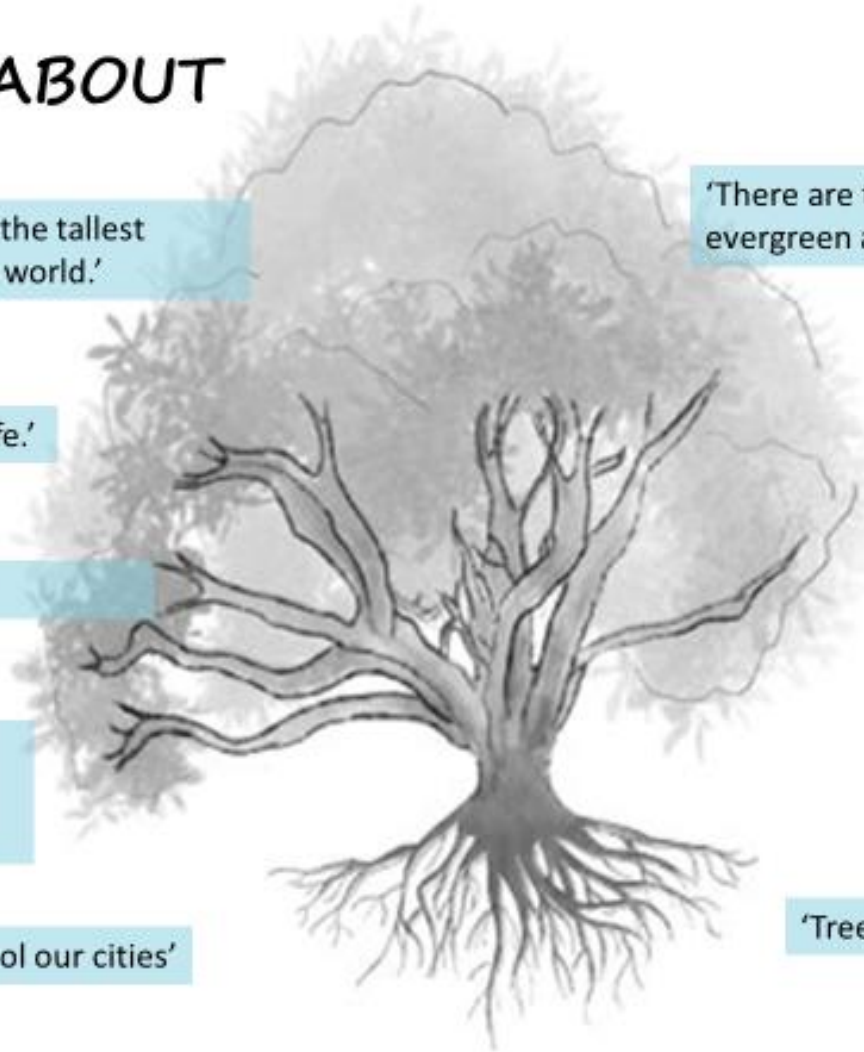
'Flexible branches.'

'They breathe in carbon dioxide and breathe out oxygen'

'They make H₂O (oxygen). They store Carbon and they also don't melt so they combust when lit on fire.'

'They cool our cities'

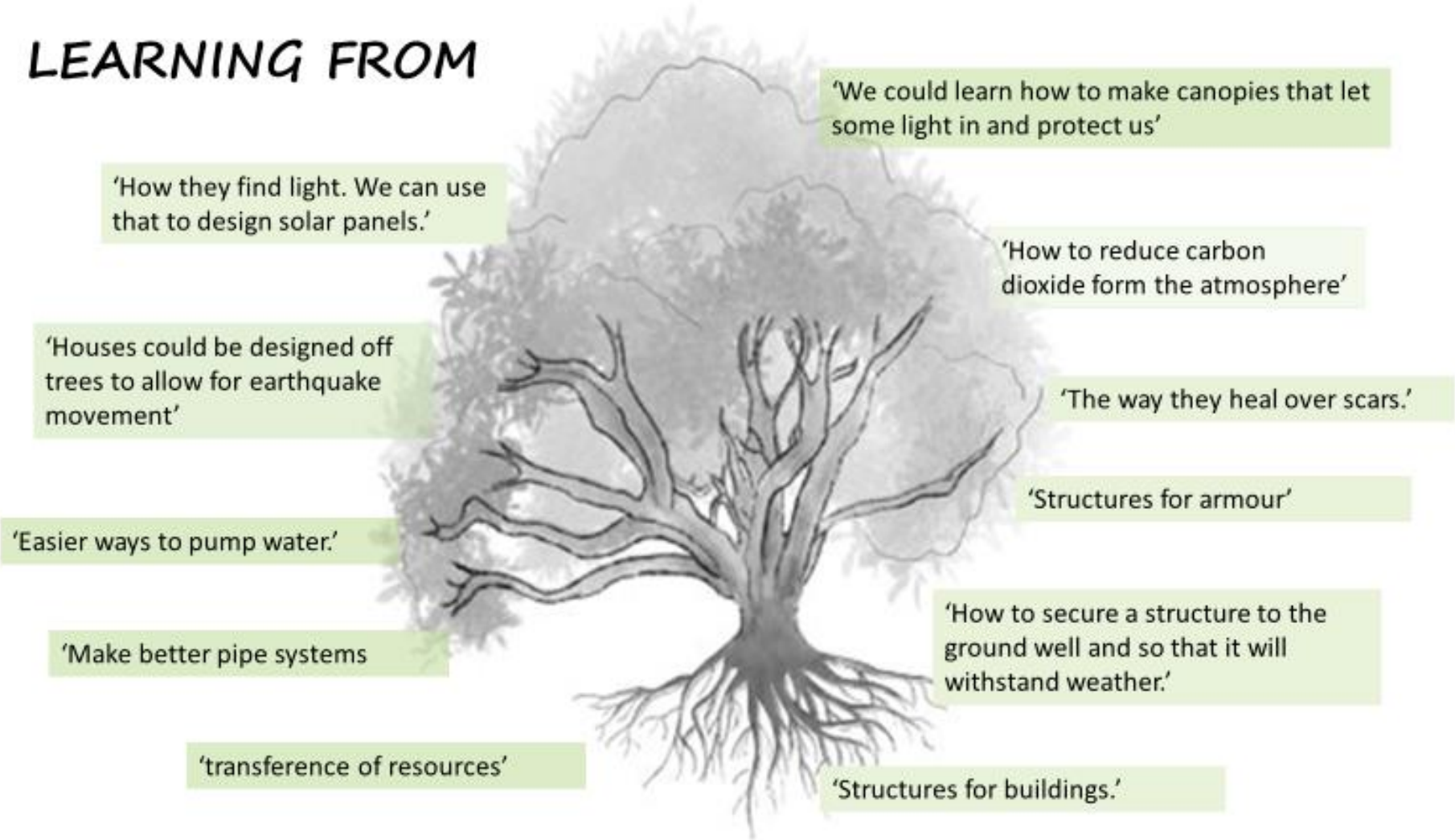
'Trees have roots.'



Royal
Botanic
Gardens
Victoria



LEARNING FROM



Royal
Botanic
Gardens
Victoria

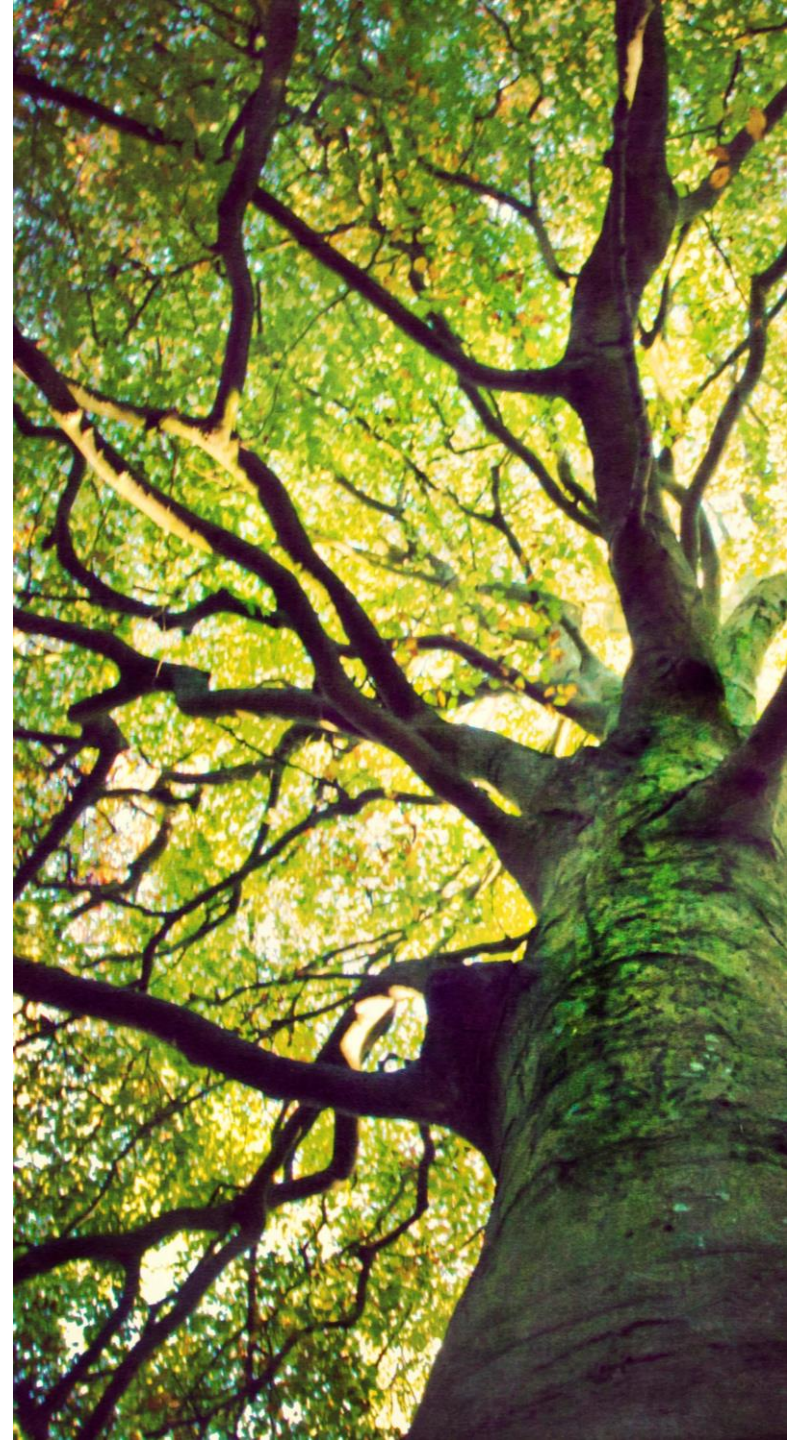


How do we teach Biomimicry?

- Examples of Biomimicry
- Biomimicry Skills
 1. Learning FROM nature
 2. Finding function



Royal
Botanic
Gardens
Victoria



What is Function?

Function is the natural purpose of something.

An adaptation, whether structural or behavioural, has function.



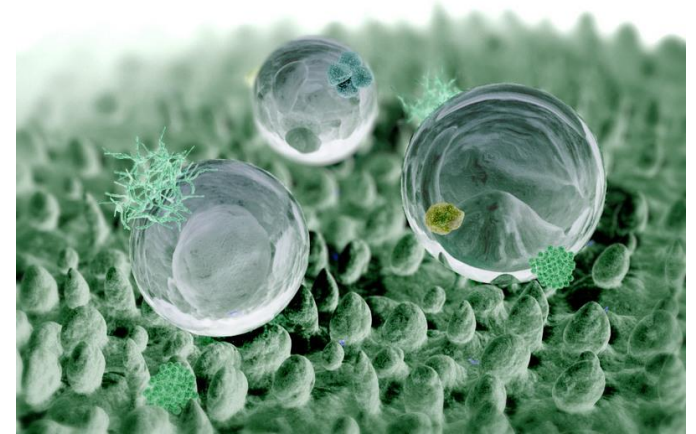
The Sacred Lotus, *Nelumbo nucifera*



Adaptation/Strategy:

Bumpy surface (structural adaptation).

Function: Repel water (and self-cleaning)



Function in *Nature*





StoColor Lotusan paint

Mimicking the “Lotus Effect”

Microstructures in paint create self-cleaning and anti-fouling surfaces.

Reference: AskNature.org
<https://asknature.org/idea/stocolor-lotusan-paint/>



Function in *Nature* – Function in **Design**



Your function is:

Describe the function you found in Nature.
(What type of plant is it? How does it work?)

Sketch the function you found in nature (the plant adaptation you found that displays the function).

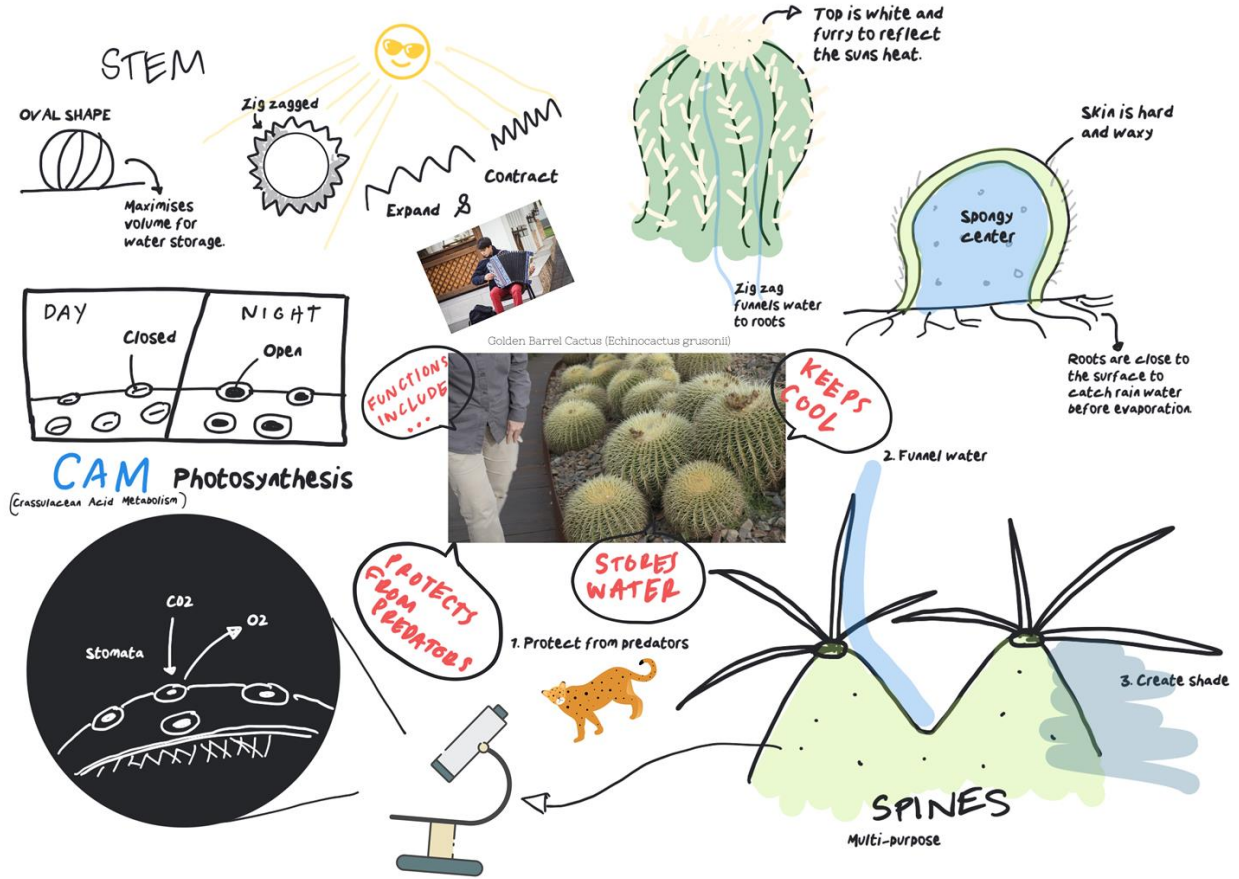
Draw a design idea that uses your given function, imitating your nature model.

What does your design do? What problem does it solve?



Royal
Botanic
Gardens
Victoria





Bio-inspired solution. Describe your design. What does it do? What problem does your design solve? How will it benefit people or the planet?

This design collects rain and sunlight, for drinking water and energy. It works best in hot areas, which are often rural and can benefit from this product. The rain is collected first going through a turbine, which generates extra power.

Nature model: Grows in Mexico and likes hot climates, they hold water inside the cactus

Final Design: water collects to flat turned into power + solar panels to collect solar energy, built in a form.

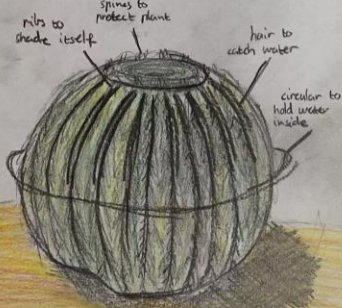


ROYAL BOTANIC GARDENS VICTORIA

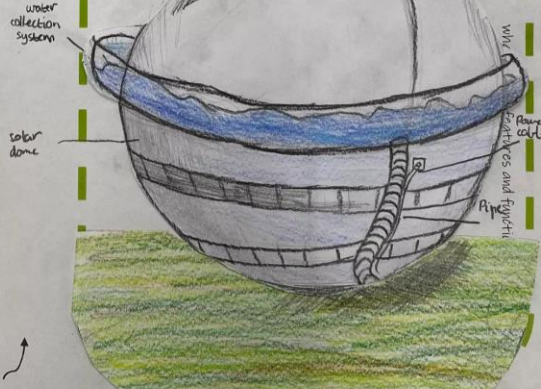
Water/Solar Generator

Created by five Year 7 students

Which features and functions are you inspired by?



Space for sketching ideas!



Function= what something does. It's purpose.

List 3 things your design must do or be like to be a success.

1. collect water in a large amount
2. produce solar energy to have and power their homes
3. help people in need create energy

How could it be made (materials)?

Solar panels glass, crystalline, silicon flexible, indigestible, smooth, lightweight



Royal Botanic Gardens Victoria

My design is a water tank inspired by the hairs of the old man of the mountain

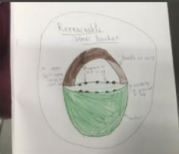


Our design idea is a product is inspired by the ribbed cage of the golden barrel cactus. By Lucas, Aiden, Alannah, Isabelle and Odin, year sevens.



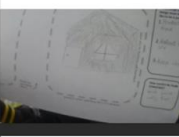
MY DESIGN IS A OIL SPILL CLEANUP FLOAT

By Scarlett, Olive and Edie- Y7 Northcote High School



fuzzy house

This house keeps the people who live in it cool, reflects UV/heat from the house and gets no frost because of the fuzz. The fuzz is made into a material which instalates the house. by Nini and Emilia DPS



Mole Digging Gloves

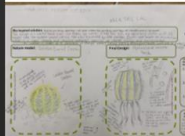
My Mole Digging Gloves are going to make digging easy! My design is inspired by the mole. Some things I need for my design

My final design... it's called a Greenhouse Lining or a Greenhouse Cover because it can be used as both a lining and a cover!

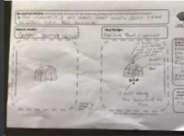


Golden Barrel Water Tank

Our design idea is an expandable water tank, that is easy to transport. It is inspired by the roots and expandable body of the Golden Barrel Cactus. Design by Maya, Amie, Ilana, Meriam and Zoe at Northcote High School.

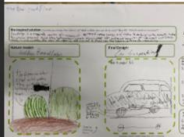


My design idea is a pool cleaner and filter inspired by the feature of expanding with the Golden barrel cactus



MY DESIGN IDEA IS CAR SUSPENSION INSPIRED BY THE EXPANDING OF THE GOLDEN BARREL CACTUS

BY NED, PETER, FINN, JACK, YEAR 7- northcote high school

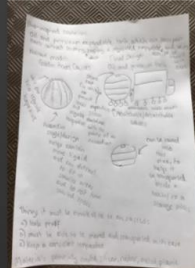


Nathan Church's idea

My idea is to create a bicycle tire

My design is an fuel and petroleum tank inspired by the golden barrel cactus

By Kety, 6P

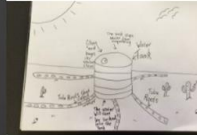


Cactus Rain Gauge

It is a water bottle that catches lots of water when it rains. My design is inspired by the barrel cactus. I was inspired by the slits in the side that guide the water to the roots. Some things I need for my design to be successful is being able to catch rain water, able to seal when full and have water storage at the

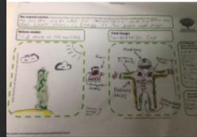
Some things I need for my design to be successful is being able to catch rain water, able to seal when full and have water storage at the

My design is a water tank inspired by the cardon grande cactus



Desert Survivalist Suit

I made this design to benefit Archaeologists and any job that makes people work in deserts for days at a time. This suit will be worn to keep the person inside cool in the daylight and warm at night.



A minor problem in our world today is that our bags to store things in are taking up quite a bit of storage space in our homes, so my idea is

Self cooling phone case

Cools the phone using designs from the Old Man Of The Mountain and the Golden Barrel Cactus.

By Claire and Sophie DPS



Protective Phone Cover


This phone cover is especially designed so that your phone can withstand extreme temperatures. It is made by using a replica of the fur that covers the "Old Man Of The Mountain" cactus, as well as solar panels and small wind turbines for a renewable power source. As well as being really useful it is also really comfortable due to the fur. It works by deflecting and attracting as much heat as possible, it does that by using a small thermometer to measure the temperature; depending on how much the ph

Biomimicry Programs

- **Designed by Nature**
 - Full Day Program
 - Primary (Years 3-6)
 - Secondary (Years 7-10)
- **Victorian Challenge and Enrichment Series**
 - FREE
 - Government School Students (Years 3-8)
 - VCES Regional (@ Regional Botanic Gardens for regional students)

<https://www.rbg.vic.gov.au/learn>



A lush tropical forest scene featuring a wooden boardwalk with a metal railing. A prominent tree trunk is visible, with a large tree fern growing from its base. The forest is filled with various green plants and ferns, creating a dense and vibrant environment. Sunlight filters through the canopy, casting dappled shadows on the ground.

“The people who design our world have a lot to learn from our natural world – all they have to do is take a look.”

99percentinvisible.org

Thank you

Want to get in contact?

E sally.fierenzi@rbg.vic.gov.au

W <https://www.rbg.vic.gov.au/learn/biomimicry>



Royal
Botanic
Gardens
Victoria

