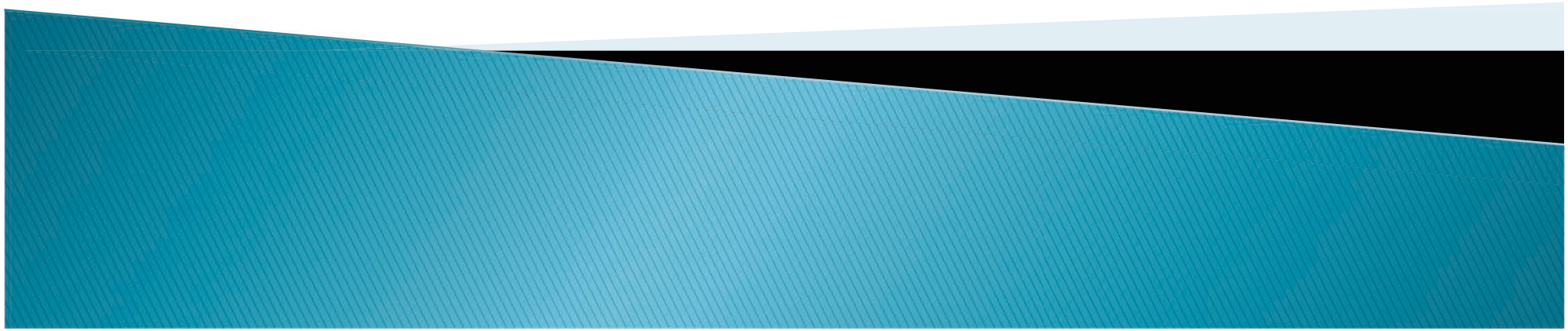
Prosthetic limbs

The Ellen Wilkinson School for Girls

What are prosthetic limbs?

- *Prosthetics are artificial replacements for lost body parts either due to accidents or for people who were born without them.*
- *Our brief was to work with the 100m sprinter Jonnie Peacock*
- *We did an investigation to see which materials would be best to make prosthetic limbs.*
- *We carried out some experiments which helped us decide the most suitable material for our prosthetic limb.*
- *This project wasn't all about the experiments. We also had to do some research on how prosthetic limbs are made and the physiological impacts .*

PSYCHOLOGICAL IMPACTS OF PROSTHETIC LIMBS



Effects!

- You may feel:
- Depressed (or sad)
- Suicidal
- Alienated from everyone else
- Grief-similar to losing a loved one
- It might lower your self esteem and affect your confidence
- In the beginning you might deny that you need to adapt to life with a prosthetic limb. E.g. refuse that you need physiotherapy

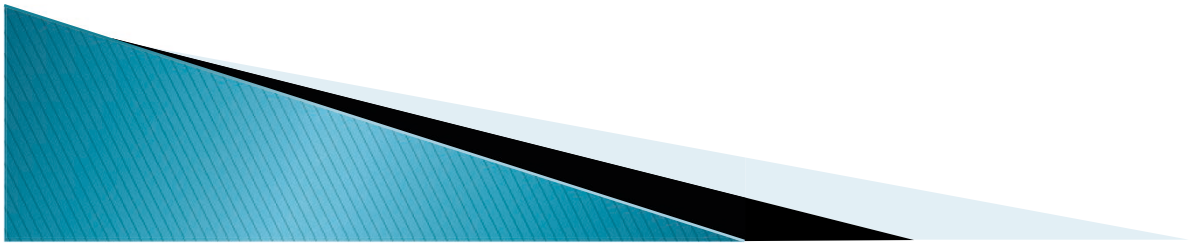
Phantom limb pain

What is phantom limb pain?

Pain felt in the area where they have amputated a limb. The pain can be felt from mild to extreme. Phantom limb sensations often disappear, or the pain decreases over time.

What are the causes of phantom limb pain?

- Tingling
- Cramping
- Heat and cold in the portion of the limb that was removed



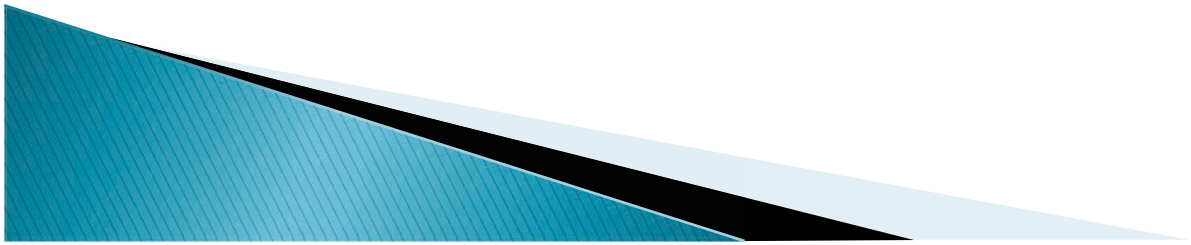
Experiences

People with prosthetic limbs may feel that they are being excluded from activities.

Here is a list of other things they had mentioned:

- "My disability is part of who I am as a person just as much as having green eyes and a gregarious personality." (By Jan Garrett).

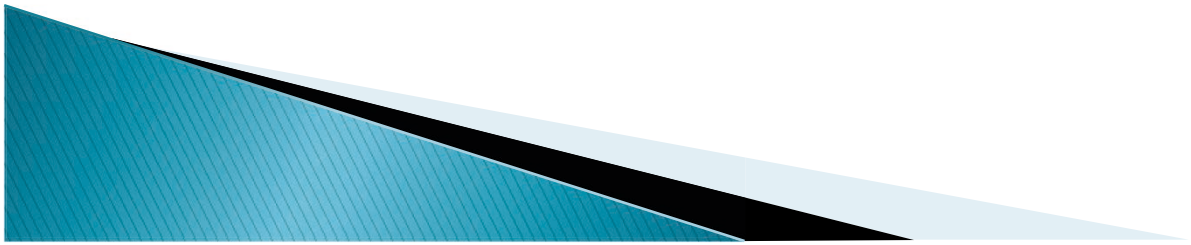
- "It has made people realise that athletes are athletes and people are people. It doesn't matter if you're Usain Bolt or in a wheelchair, we're all people. And everyone just wants to talk about the sport now, so that's good,"- Charles Walker



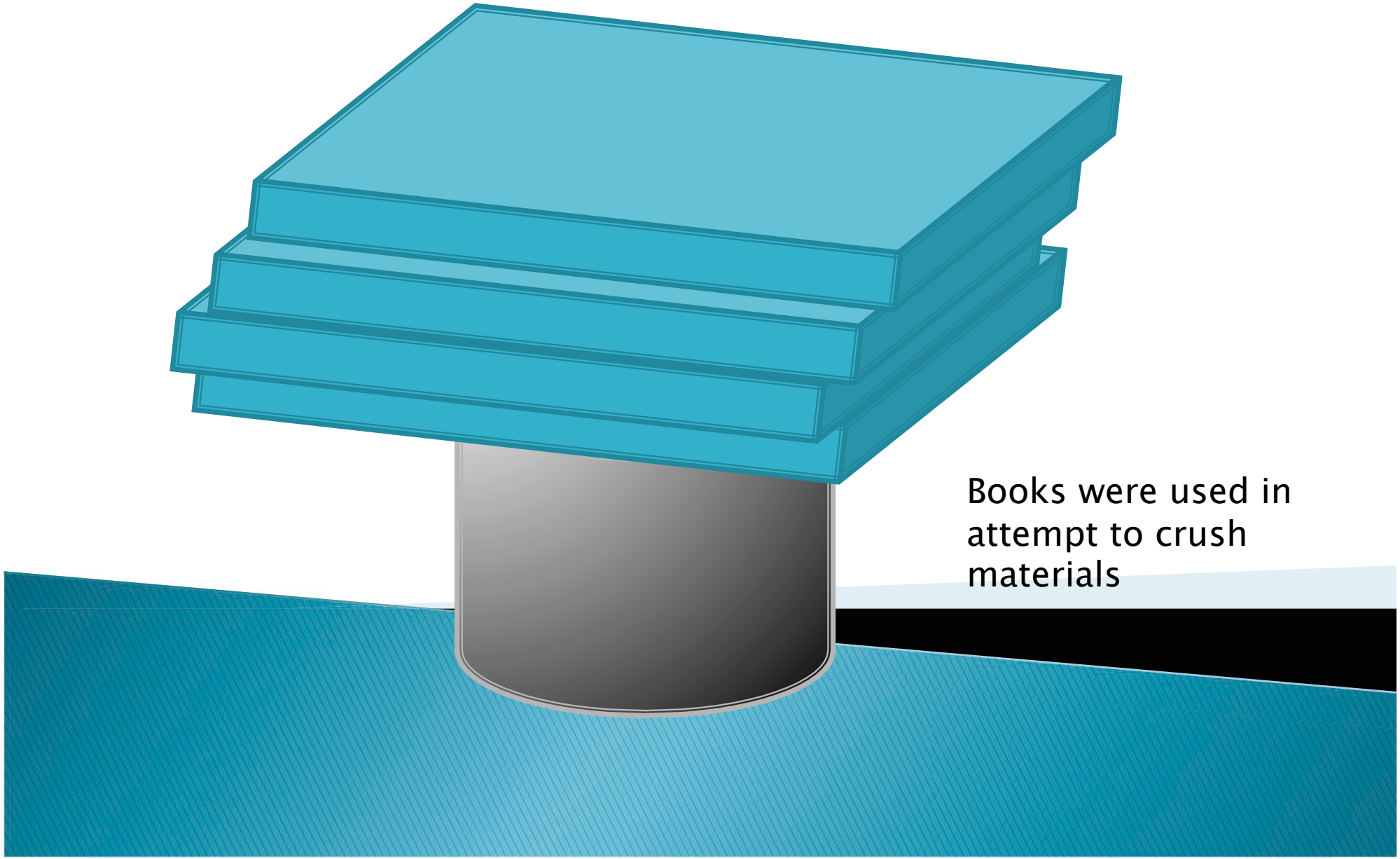
Our Experiments

The equipment we used were the following

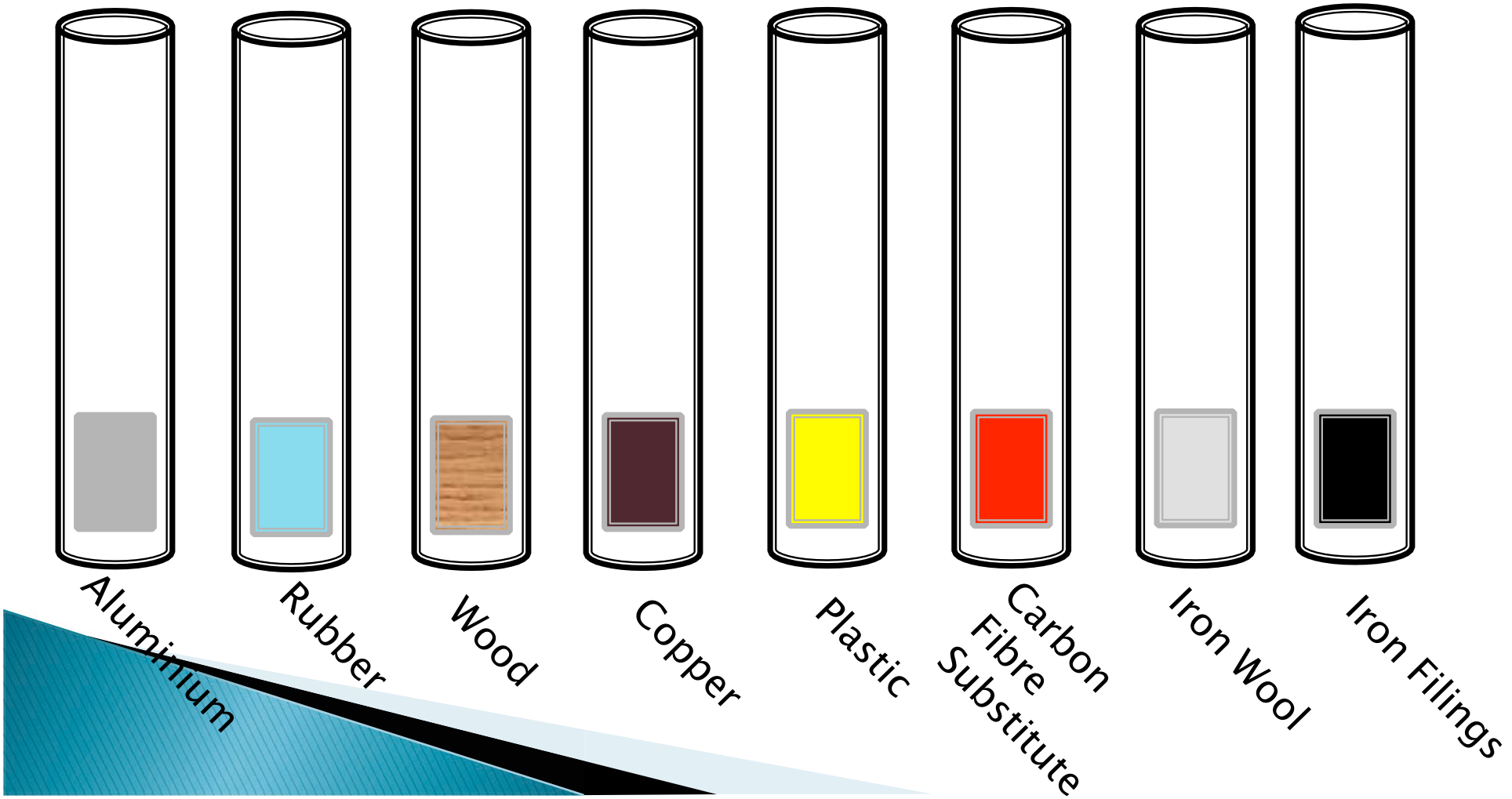
- Clamp stands x2
- Iron x8 cylinder
- Aluminium x8
- Rubber x8
- Cardboard x8 scale
- Weights
- 15cm string x4
- Ruler x2
- beakers x4
- measuring
- pipette
- sulphuric acid
- weighing

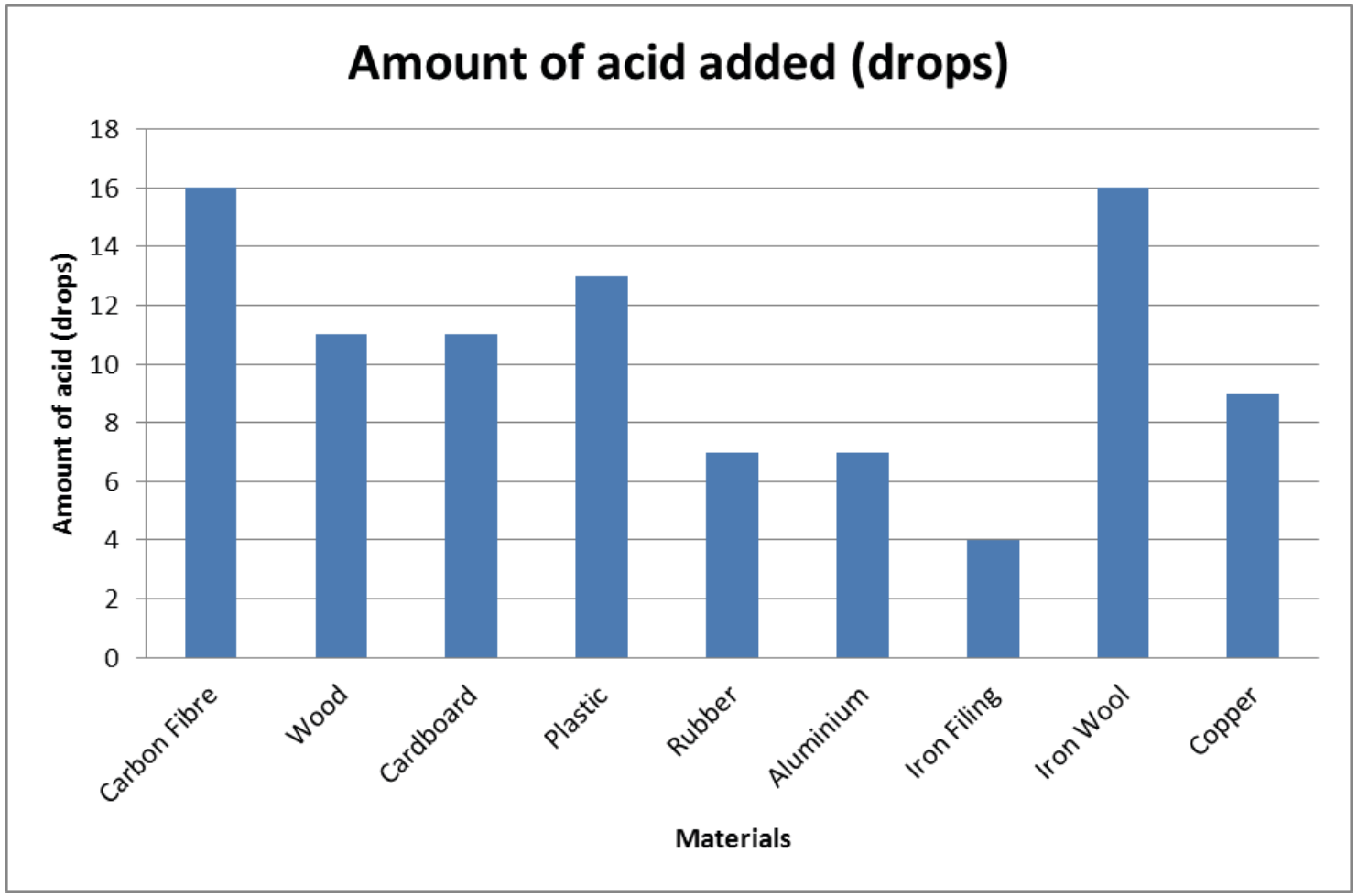


Strength

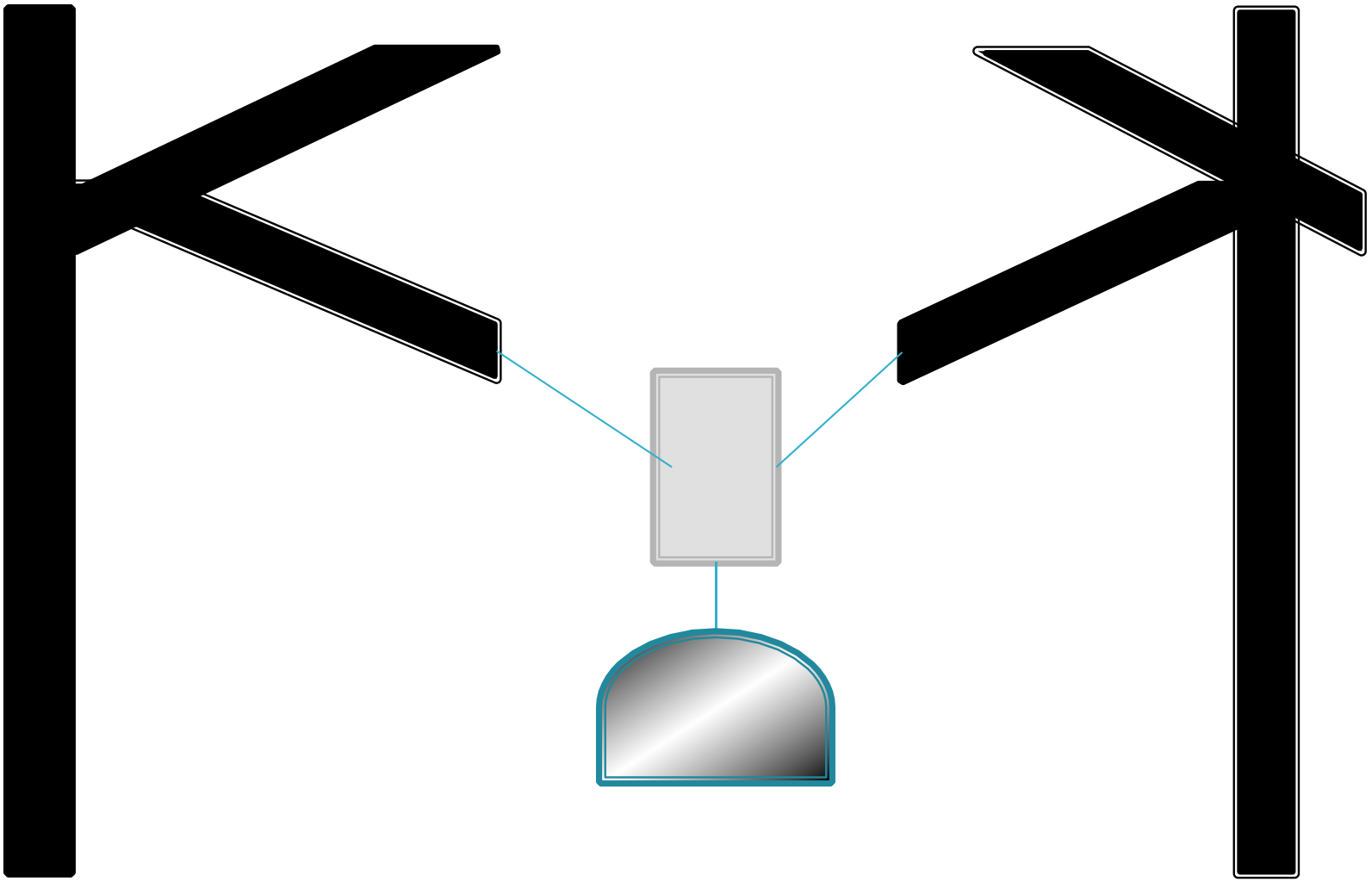


To test resistance to corrosion



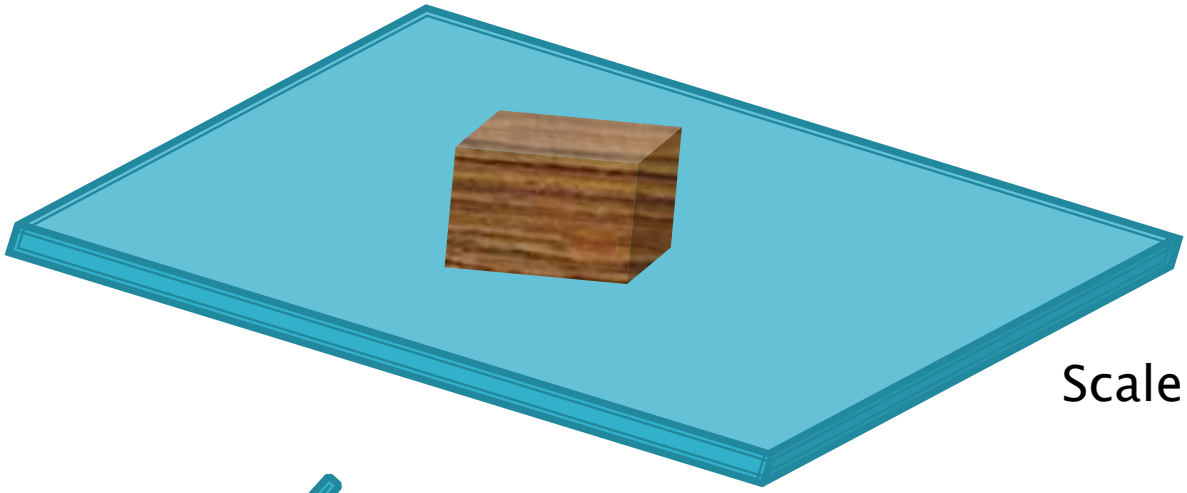

Amount of acid added (drops)
Amount of acid (drops)
18
16
14
12
10
8
6
4
2
0
Carbon Fibre
Wood
Cardboard
Plastic
Rubber
Aluminium
Iron Filing
Iron Wool
Copper
Materials

flexibility

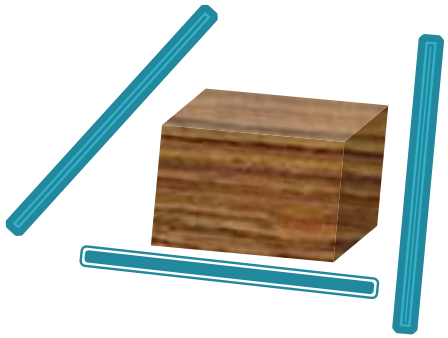


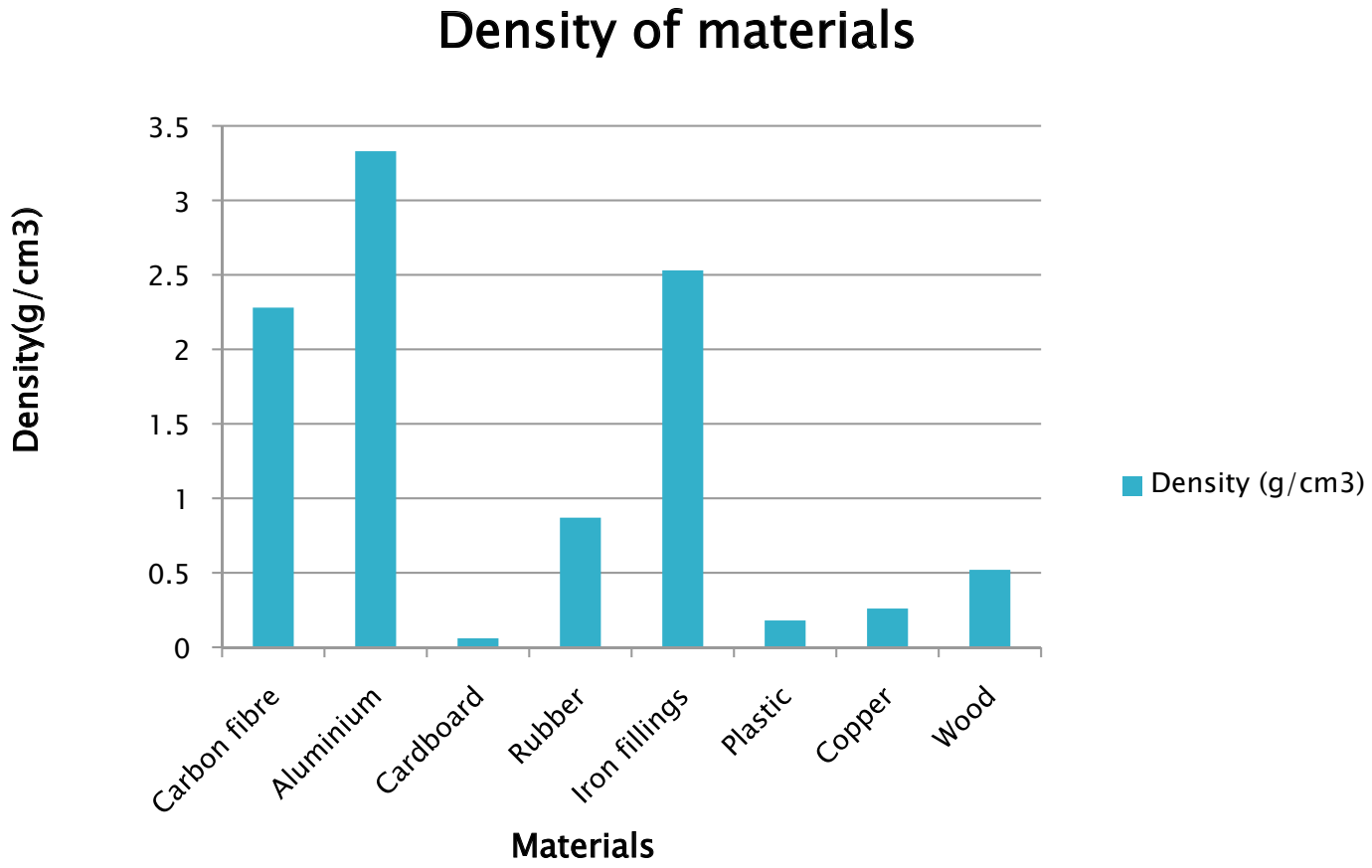
Material	Degree bent(up to 90)
Cardboard	90
Iron wool	90
Aluminium	0
Rubber	90
Copper Foil	90
Plastic	0
Wood	1
Carbon fibre	90
Iron Filing	0

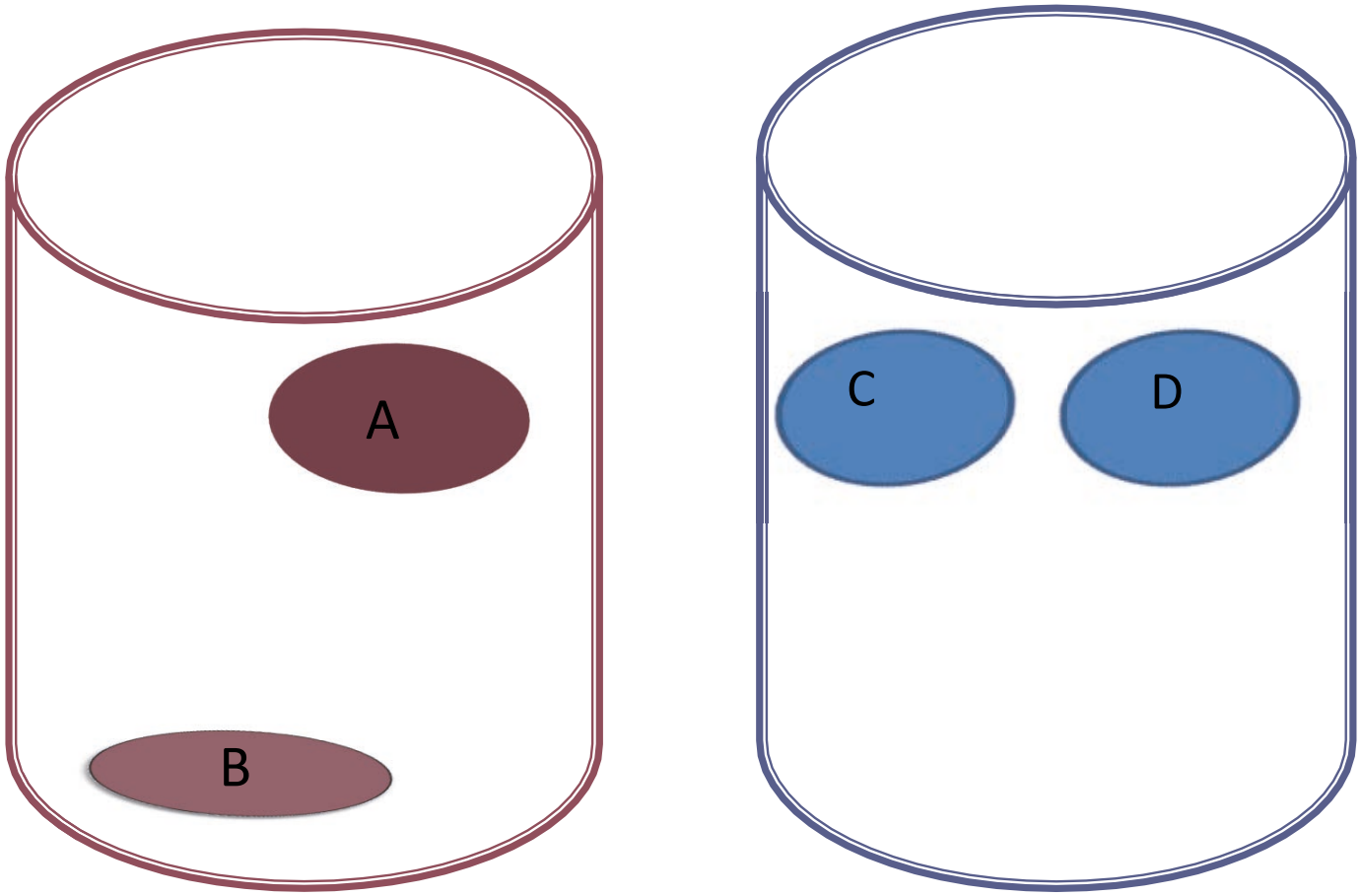
To test density



Scale

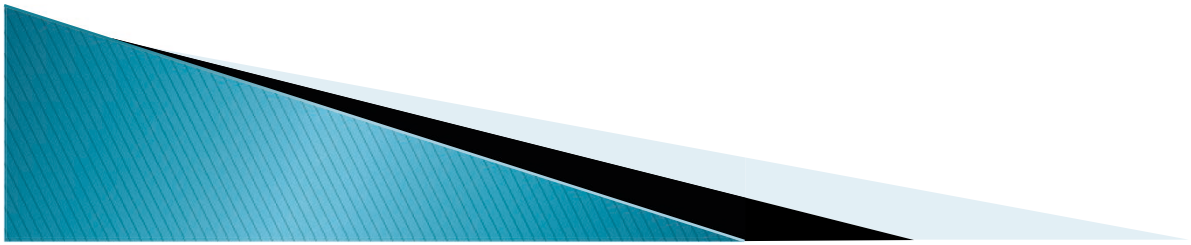



Density of materials
Density(g/cm3)
3.5
3
2.5
2
1.5
1
0.5
0
Carbon fibre
Aluminium
Cardboard
Rubber
Iron fillings
Plastic
Copper
Wood
Materials
Density (g/cm3)

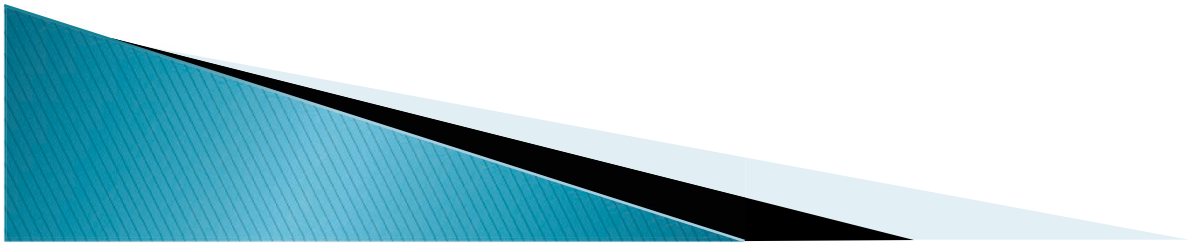

A
B
C
D

Day	Observations – Beaker 1> A +B	Observations – Beaker 2> C+D
Tuesday	A is floating and B has drowned, They are currently waterproof as it hasn't absorbed any water yet.	C and D are both floating; they are currently waterproof as it hasn't absorbed any water yet.
Friday	The water has turned milky white and B is still at the bottom of the beaker and A is still floating. The layers are starting to open up at the sides.	The water in this beaker has also turned milky but both C and D are floating, and like beaker 2, they layers are also slightly opening.
Monday	The water has gone white completely from the glue, and the material has absorbed some water and the top layer is peeling off. B is still at the bottom of the beaker whilst A is still floating.	The water has gone white completely from the glue, and the material has absorbed some water and the top as well as the second layer have started peeling off.
Thursday	The water hasn't changed colour but the layers are shifting, this shows that it has absorbed the water; B is still at the bottom of the beaker whilst A is still floating.	The water hasn't changed colour but the layers are shifting, this shows that it has absorbed the water; C and D are both floating in the beaker.

Conclusion



Evaluation



Future of prosthetic limbs

TMR

TMR is currently being developed by an institute in Chicago. They take an amputated limb and reroute the nerves to another muscle in the body. An example; when the amputee moves their arm signals travelling through the rerouted nerve cause the trunk muscle to contract. Muscles that have electrodes connected to them detect activity and send signals of control to the prosthetic arm. By doing this the patient is allowed to move their arm through thoughts

Fibre optic interface

Researchers from the Neurophotonics Research Centre are being funded $5.6 million. Amputees have a chance to experience what it is like to have a natural limb. With the introduction of Fibre Optics, wires have become irrelevant and Fibre Optic Interface now uses light to transport information in a faster, more efficient way, allowing the body's nerves and prosthetic limb to communicate.

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