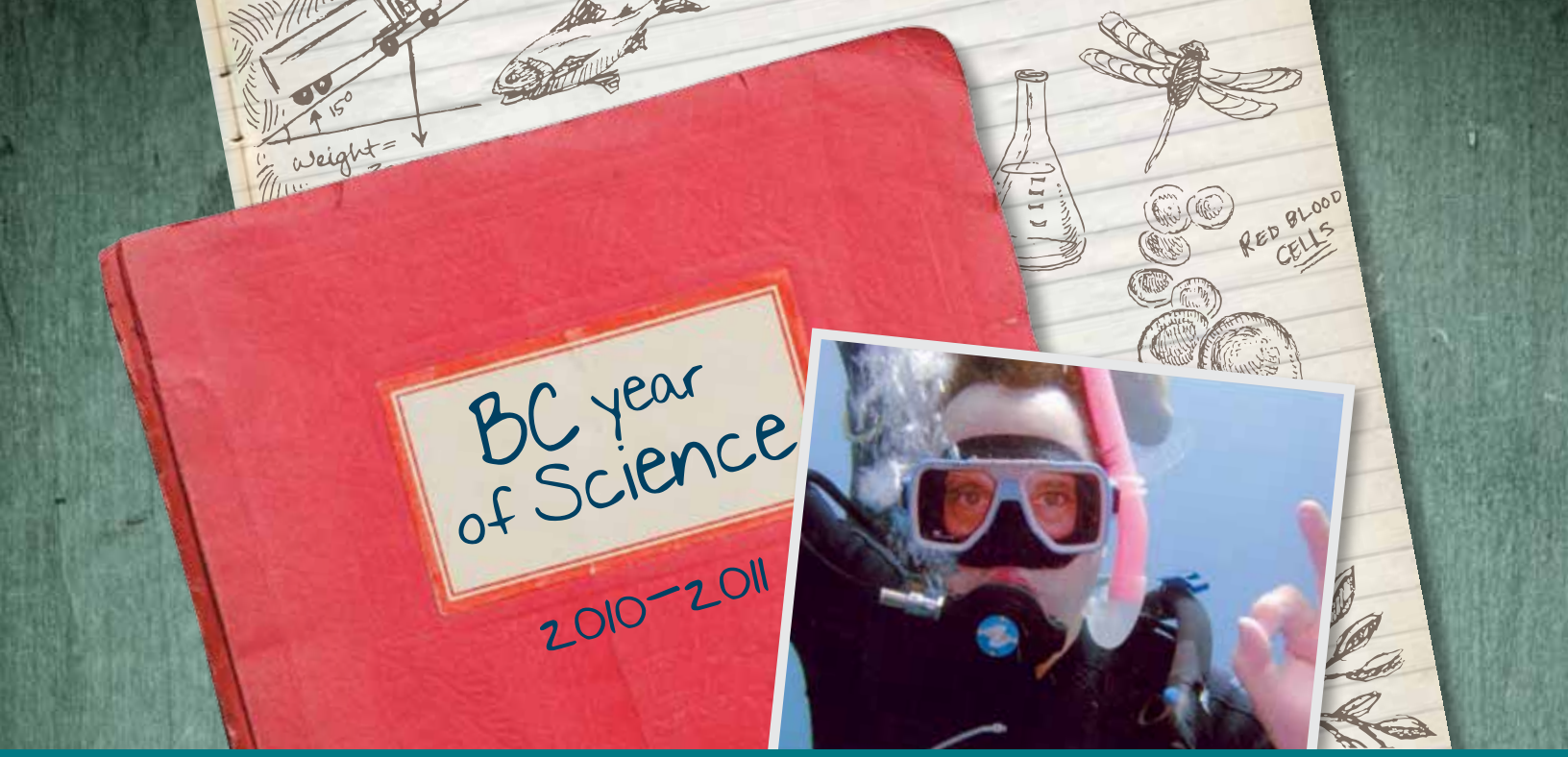

February | Activity of the Month

Science to Understand the Oceans: building a diving machine or Remotely Operated Vehicle (ROV) to explore the Deep ocean

What's it about:

From space the Earth is a blue planet. Seventy percent of its' surface is ocean, and these huge, deep bodies of seawater contain over 90% of our planets' living space. The oceans are amazingly important for us: they affect global climate and weather, provide us with food, and many people in BC depend on the ocean for their jobs. In spite of how important, and vulnerable, the oceans are, we know relatively little about them, especially the deeper parts further away from our shores. Scientists like **Mairi Best** and **Kim Juniper**, together with NEPTUNE Canada **www.youtube.com/neptunecanada**, are helping to change this. With the average depth of the ocean clocking in at around 4 kilometres, ocean scientists need to be creative! How do you take measurements, collect samples, or explore where you can't easily go in person? NEPTUNE Canada is leading the way with remote observatories right on the seafloor. But for many marine scientists remotely operated vehicles or ROV's are their eyes into the deep.

Your mission, should you choose to accept it…to build your own Remotely Operated Vehicle that dives below the ocean surface. Just follow the instructions below!

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University of Victoria Science

What you need:

- Large plastic pop or juice bottle
- Pen cap, modeling clay or gum, and 2 paper clips

What to do:

1. Clean out the pop bottle, remove the label, and fill your bottle 'ocean' to near the top with water.

2. Using the pen cap, piece of clay or gum and a paperclip, construct your remotely operated vehicle (ROV), which you'll use to take equipment to the bottom of your bottle.

3. With another piece of clay or gum and a paper clip, make a piece of 'equipment' that you will be placing on the 'ocean' floor.

4. Now connect the equipment (step 3) to your ROV (step 2), and place in the bottle. The vehicle should float with the equipment attached. Fill the bottle to the very top and tightly cap it.

5. Gently squeeze the bottle. The ROV should sink as you squeeze. The harder you squeeze, the faster your vehicle should descend. If you let go of the bottle your vehicle should surface. If neither of these things happen you may need to remove the ROV and adjust the amount of air in the ROV pen cap.

6. Once your vehicle is working properly, try and place the equipment on the bottom of the bottle. Imagine doing this at 4 kilometres under the ocean.

7. If you are up for an extra challenge, try these ideas;

   - Draw a target on the bottom of the bottle ocean and try to place the equipment there.
   - Empty the bottle and refill it (very carefully) with cold water on the bottom half and hot water on the top. Using a small thermometer as an ROV probe, see if you can detect at what depth the temperature changes in your 'ocean'.
   - Empty your bottle and fill it with two different fluids – such as water and another fluid of a different density to water (such as vegetable oil, rubbing alcohol or corn syrup). See if your ROV can travel through each different layer.

What else you can do

See NEPTUNE Canada's ROV doing the same manoeuvers:
www.youtube.com/neptunecanada#p/u/7/newv3pS3KBw
www.youtube.com/neptunecanada

What's going on?

Congratulations on making your ROV work! Why do you think it rose and sank in the bottle? It's all about buoyancy! Bubbles of air in the ROV pen cap make the ROV less dense than the fluid around it so it floats. When you squeeze the bottle, the air bubbles shrink, increasing the density of the ROV so it sinks. Archimedes, a Greek scientist, who lived from 287-212 BC, discovered the concept of buoyancy when he noticed that people in a bath displace roughly the same volume of water as their body size. He noticed that denser objects, like gold, tend to sink (or are negatively buoyant) while others, like wood, float (positively buoyant).

NEPTUNE Canada's ROV (called ROPOS) is much more complex than our bottle ROV, but operates along the same principals. To control buoyancy ROPOS scientists use electrical motors and remote controls.

Did you Know:

- NEPTUNE Canada is the largest underwater cabled system of observatories in the world.
- NEPTUNE Canada has three ROVs. One called ROPOS explores the ocean from the surface to the bottom, while two deep water crawlers, WALLY 1 and WALLY 2, operate on the seabed.
- NEPTUNE Canada is studying many aspects of the deep oceans including plate tectonics, currents, and the ecologies of different areas around Vancouver Island and out into the Pacific Ocean.

This activity is brought to you by the University of Victoria Faculty of Science and Pacific CRYSTAL.