

Illustration © John Joyce, 2006

## WHAT IS PRESSURE?

### Aim / Description:

The purpose of this exercise is to demonstrate what water pressure is.

### Background:

#### What is Pressure?

1 Atmosphere = 15 pounds per square inch (psi)

10 m underwater = 1 atmosphere

Another feature of submarines is PRESSURE.

Even though air is very light, it does weigh SOMETHING. When we are standing on land, there is a column of air above our heads about five miles high. This column of air is pressing down on us all the time. The weight that presses down is like having 15 pounds pressing on every square inch of our bodies. Over millions of years, we have grown used to the pressure – and hardly notice it at all.

Water is much heavier than air, so when we go diving, the weight pressing onto our bodies is much greater. It is called PRESSURE! For every 10 meters, we dive into the water, the pressure on our body doubles.

Water pressure is the reason that divers need to breathe air from tanks or high-pressure hoses when they dive beneath the surface of the sea. Water pressure,

## Explorer Education Programme

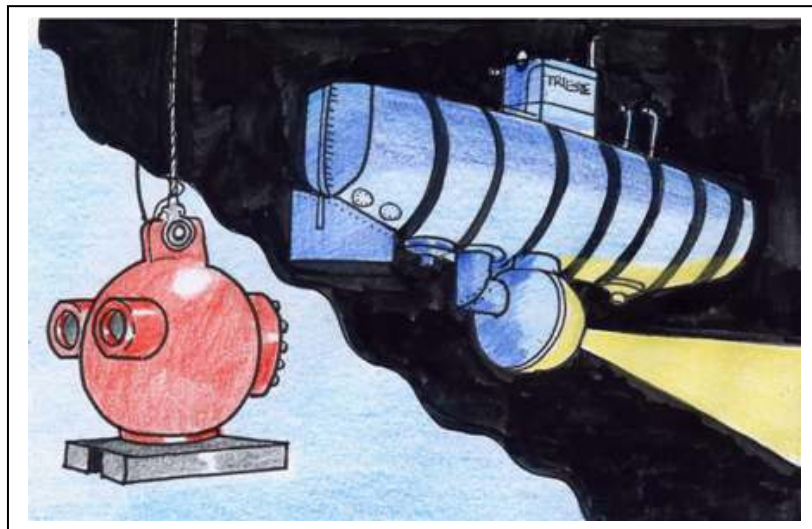


### Lesson Plan: What is Pressure?

pressing in on the lungs of a diver using a simple tube (or snorkel) pulling air from the surface will prevent a divers lungs filling.

It is only by breathing air at the same pressure as the water that a diver can breathe normally underwater. In days gone by, this air was fed under pressure from the surface with a pump. In 1945, the Frenchman Jacques Yves Cousteau and his friend Emil Gagnan invented a special valve that would deliver air from a high-pressure tank strapped to their back. Air is therefore, delivered at exactly the same pressure as the water around them. Cousteau's "Aqua-Lung" revolutionised diving and is known as SCUBA (Self Contained Underwater Breathing Apparatus) diving.

### Deep Diving Submarines



*Illustration © John Joyce, 2006*

Water pressure increases the deeper you dive.

This is why it is so difficult to explore the deep parts of the ocean. In fact, it was only in the last fifty years that human beings developed the technology to reach the deepest parts of the ocean such as in the Marianas Trench south of Japan.

These special submarines (or Bathyspheres) are made of thick steel spheres with portholes of glass that may be as much as a foot thick.

The pressure outside when they are in the deepest parts of the oceans is measured in TONNES per square inch.



Illustration © John Joyce, 2006

**Materials:**

- A basin of water
- A plastic bag – with no holes

**Activity 1: Pressure Bag Experiment**

Step 1. Ask the students to put their hand in a plastic bag and place it into the basin of water.

Step 2. Ask the students to describe what is happening to the bag.

Step 3. Get the students to explain why the bag is “shrink wrapping” their hand.

*(Students will feel the effects of water pressure by putting their hand in a plastic bag and putting their hand into a bucket of water. Water pressure – even at a very shallow depth – forces the plastic onto their hand when it is placed into the water - as if the hand was being shrink-wrapped).*



Illustration © John Joyce, 2006

#### Materials:

- A basin / bucket (to retrieve the water)
- 2 Litre soft drink bottle
- Brown sticky tape
- Scissors

#### Activity 2: 2L Bottle - Pressure Experiment

Demonstrate water pressure by using a 2 litre plastic bottle filled with water and allowing it to escape through a series of holes.

Step 1. Take a large (2 litre) soft drink bottle and make a series of holes down one side from the top to the bottom.

Step 2. Seal the holes with a strip of sticky tape.

Step 3. Fill the bottle with water and hold it over a bucket.

Step 4. Pull off the strip of tape in one quick movement. Water will flow from the holes into the bucket.

Step 5. Ask the students to observe what happens to flow of the water. Ask why the water flows faster from the holes at the bottom than the top of the bottle? *(When the water has a place to escape – water will flow from the holes at different rates of pressure. Progressively the flow from the top will become less in comparison to the water flowing from the bottom holes. The reason for this is that the flow of water at the bottom is under greater pressure due to the weight of the water above it. The water at the top does not flow as fast because there is less pressure from of the weight of air above it).*

#### Outcome:

Students will have developed skills:

- in observation, analysing and making conclusions - understanding the concept of pressure.