“ “IS THERE AN OCEAN IN THE HOUSE?”

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| Level | **Investigations** | | | |
| Topic | **Temperature** | | | |
| ‘*OITH bench-top’s* | Introduction, Definitions, changing. The nature of water.  GTV 2.1  GTV 2.2 | Tool, (setup)  manufacturing, testing, modification.  GTV 2.2, 2.3 and 2.4 | Tool, standardization and calibration, issues of range and sensitivity. (and more system error.)  GTV 2.5 and 2.6 | Doing with the tool. Enquiry. Problem. Proposition.  GTV 2.7 and 2.8 |
| Support material | Overview and  worksheets | Concept, analogy and creativity | Data handling, conversions. Graphing, (recording and statistical error)  GTV 2.3 and 2.9 | Review  GTV 2.10 |

**The sea can be hot or cold! (Well down South here it is mostly COLD!)**

You can link to more about heat and temperature here:

<http://coolcosmos.ipac.caltech.edu/cosmic_classroom/light_lessons/thermal/differ.html>

<https://energyeducation.ca/encyclopedia/Heat_vs_temperature>

<https://energyeducation.ca/encyclopedia/Heat>

<https://energyeducation.ca/encyclopedia/Temperature>

BUT in summary **HEAT is the total energy in a system**,

**TEMPERATURE is the average energy taken at one point in time and space**.

HEAT has a molecular energy basis, the more the molecular/atomic motion…. the more energy…. the greater the HEAT. The greater the mass…. the more the molecules/atoms and…. the more total motion; therefore the greater the total energy and therefore the greater the HEAT.

TEMPERATURE gives us a measure of the energy at one point, a measure of the energy of molecular motion impacting that instrument at that time and place.

So we find that a very small mass with a high TEMPERATURE, high molecular motion but not many molecules, will have less HEAT (total energy) than a huge mass with a low TEMPERATURE, low average molecular motion but lots of molecules.

In this Topic we will be exploring the molecular nature of Water in relation to its thermal properties and develop, build, standardize and calibrate our own thermometer before carrying out an investigation into the effect of mass on heat. In the process we will learn more about Nature of science and bring our understanding of the ocean closer to home!

To Start you will need a small kit for

*Benchtop 1.* **(GTV 2.1 and 2.2***)*

Kit

* Kitchen sink
* 1 or 2 bottles with long narrow necks (wine bottle etc)
* Marker pen

Procedure 1

*In which we investigate thermal expansion and make a simple thermoscope.*

* Fill the bottle/s with cold tap water to about halfway up the narrow neck.
* Mark the bottom of the meniscus with a marker pen.
* Place the bottle/s in the sink, put in the plug and fill with HOT water.

(Take care to make sure that the bottles aren’t going to break!!)

* Watch what happens to the water level in the neck,
* remark the new height of the water.

Now you can SEE the effect of heat on volume (the bottle is SHOWING you the heat in the sink and so is a THERMOSCOPE). There is energy transferred from sink to bottle (HEAT transfer). With more energy put into the system (‘Water in a bottle’) there is more molecular motion and so with more motion more space is taken up. Volume increases but number of molecules stays the same (MASS).

Same mass, greater volume = less density.

So warmer water is less dense than colder water.

Whoa! We connected back to Density already?!!