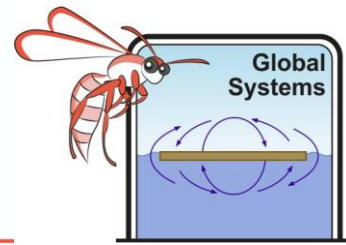


## Radiocarbon – Student Activity



### Dealing with data

Researchers need to collect data that is both accurate and precise. However, as Clifford Stroll famously said:

***“Data is not information***

***Information is not understanding***

***Understanding is not wisdom”***

***Garbage in = Garbage out***



Researchers into climate change cannot directly use temperature measurements before three hundred years ago. The first accurate thermometer was only built by Daniel Gabriel Fahrenheit in 1709. It used a standard scale named after him. Prior to that instruments could only indicate if substances were cooler than or hotter than others.

To assess if changes in temperature are atypical or lie within the normal range of variation, researchers need information that stretches beyond a few hundreds of years. They need information that ranges over geological time. Milankovic cycles are variations in Earth’s average temperature from 12°C to 22°C. Data suggest that they repeat over 100,000 year cycles.

Data must be o\_\_\_\_\_able, m\_\_\_\_\_able and r\_\_\_\_\_able.

**Primary data** is data \_\_\_\_\_

\_\_\_\_\_

**Secondary data** is data \_\_\_\_\_

\_\_\_\_\_

**Proxy data** is data \_\_\_\_\_

\_\_\_\_\_

### Example

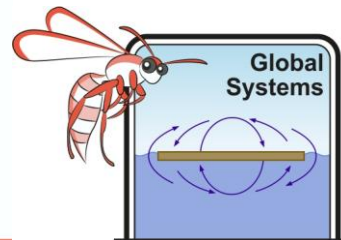
An Australian scientist observes and measures the length of 150 year 10 students’ left arms.

Which type of data is being collected? \_\_\_\_\_

The scientist then compares their data with that collected by a Japanese scientist. What type of data is being used now? \_\_\_\_\_

To get a long term world wide perspective, the scientist then uses information from an old sewing pattern giving the sleeve lengths of uniforms given to fifteen years old Swedish maritime students during the 1914 to 1916 period.

What kind of data is being used now? \_\_\_\_\_



## Radiocarbon – Student Activity

To support the concept of Milankovic Cycles, scientists have drilled deep into the Antarctic Ice Cap. From ice core they have collected air bubbles trapped. From the volume carbon dioxide they can estimate the percentage of carbon dioxide in the atmosphere at that time using the carbon-14 to carbon 12 ratio in carbon dioxide they can also estimate the age of the specimen. From this they can infer the ambient global temperature changes over a long period of time. Ice at the base of the cap in East Antarctica is estimated to be 1.5 million years old.

From the paragraphs above:

Give two examples of primary data collected and explain your choices.

---

---

Give two examples of proxy data and explain your choice.

---

---

**Interesting fact:** Although the incidence of radiocarbon in the atmosphere has remained fairly constant at 1.2 parts per trillion to carbon-12 over the last few thousand years, above ground atomic bomb testing in the 1950s and 1960s caused a doubling of concentration in the atmosphere. This “spike” was absorbed into tooth enamel and can be used as a marker to accurately estimate a person’s age. CSIs also use radiocarbon to estimate the age of bodies buried over 400 years ago.

