Climate Change - Evidence

Learning Objective:

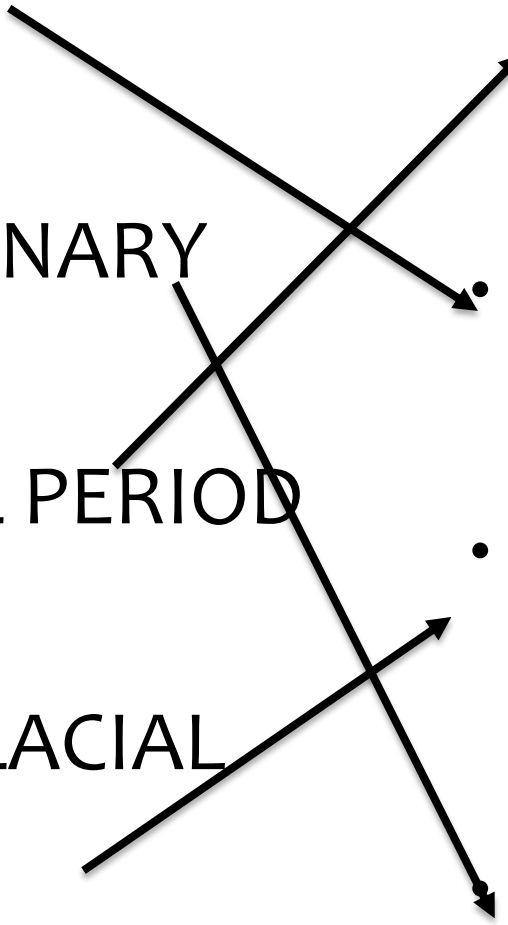
- **Assess** the evidence for climate change

Learning Outcomes:

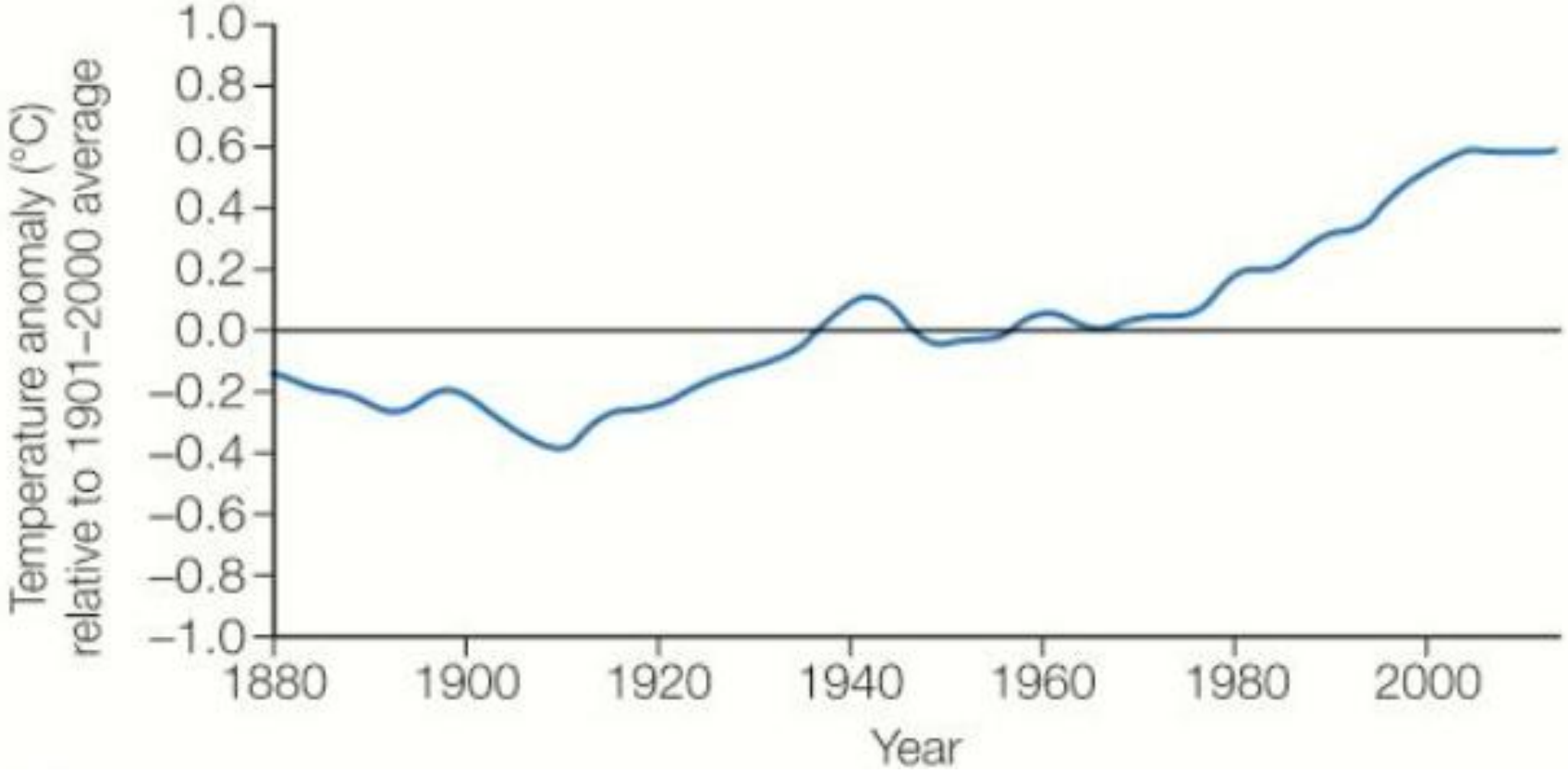
- **Analyse** climate graphs
- **Classify** the impacts of climate change
- **Assess** recent evidence for climate change

MIX AND MATCH THE KEYWORDS

- ICE AGE
- QUATERNARY
- GLACIAL PERIOD
- INTERGLACIAL PERIOD



- A cold period of time lasting between 80,000 and 100,000 years
- An extended period of time when it is cold
- A warm period of time lasting between 10,000 and 15,000 years
- The last 2.6 million years of geological time



Average global temperatures (1880-2013) based on recent temperature records

T – The graph shows clear recent global warming, with temperatures rising sharply.

E – Between 1980 and 2000 it rose by 0.4°C

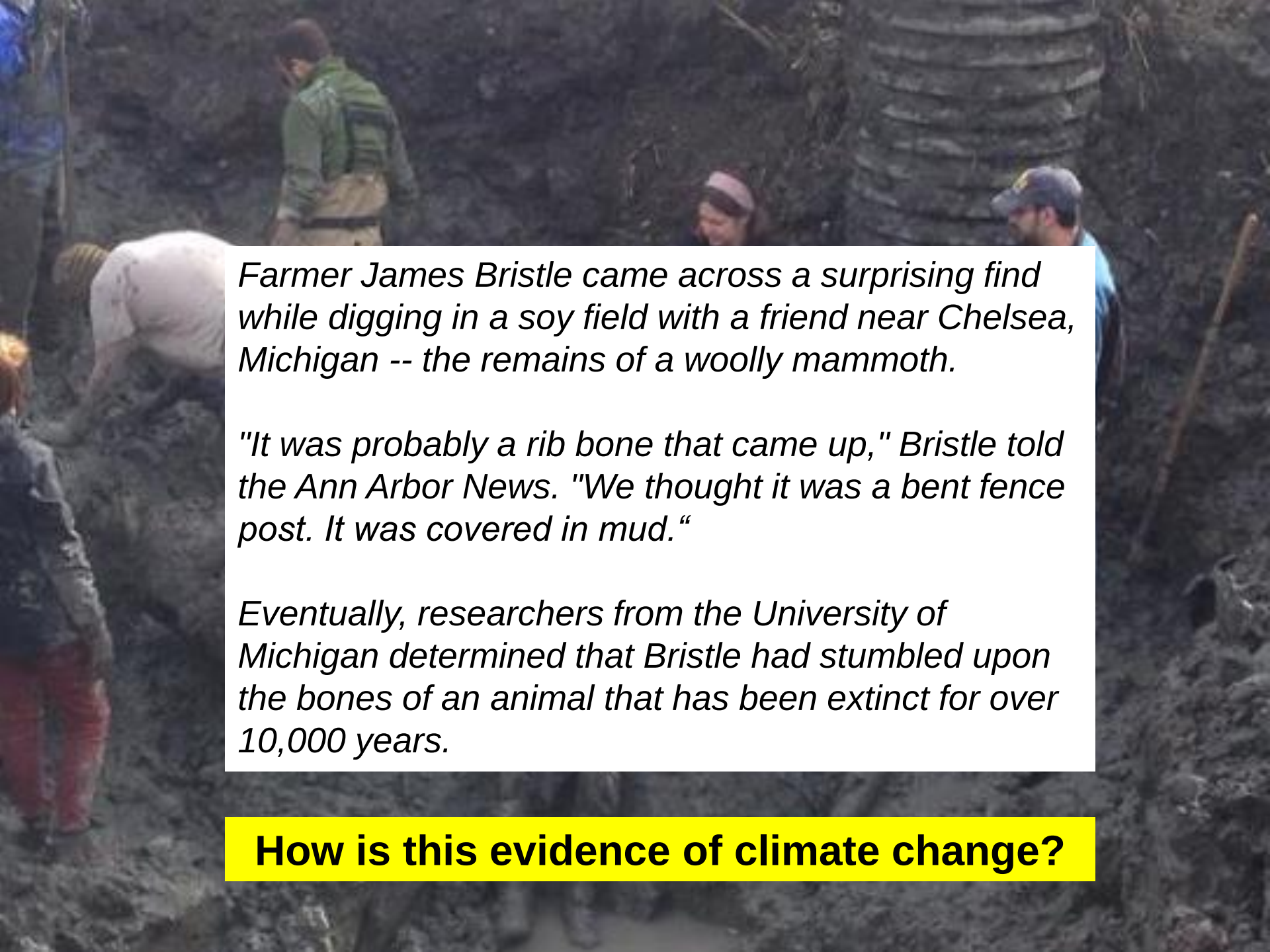
A – There was a fall between 1890 and 1910.

Climate Change

Social, **Economic** and **Environmental** Impacts.

Glaciers shrink and ice sheets like Greenland melt.	Areas are difficult to inhabit – too hot or too dry	Sea ice shrinking = loss of polar bear habitats.	Lack of water for residents leading to tensions between countries.
Low-lying coastal areas (Maldives) flooded regularly.	Crops have suffered – Maize is smaller due to the heat.	Lower crop yields leads to malnutrition and ill health.	Coral bleaching with sea temperature increase.
Species found in higher latitudes due to warming.	Death due to heat have increased, but also so have deaths due to cold.	Extinction of species (ones that are specially adapted to a climate).	Some farmers benefit from the warmth – more crops.

Science guy...



Farmer James Bristle came across a surprising find while digging in a soy field with a friend near Chelsea, Michigan -- the remains of a woolly mammoth.

"It was probably a rib bone that came up," Bristle told the Ann Arbor News. "We thought it was a bent fence post. It was covered in mud.“

Eventually, researchers from the University of Michigan determined that Bristle had stumbled upon the bones of an animal that has been extinct for over 10,000 years.

How is this evidence of climate change?

Evidence?

What is the evidence for climate change?

Temperature is measured directly using an instrument called a thermometer. Reliable measurements using thermometers go back only about a hundred years. In the UK, for example, reliable weather records began in 1910. So, how do we know what temperatures were in the distant past?

Without the use of thermometers, scientists use indirect data stored as a fossil record. These are found in deep ocean sediments and frozen ice cores.

When layers of sediment or fresh falls of snow become buried they trap and preserve evidence of the global temperature at that time. Scientists can study the oxygen in ocean sediments or water molecules in ice to calculate temperature. They can be accurately dated and this information used to plot graphs such as graph **A**. Ice cores have been used to reconstruct temperature patterns from as long as 400000 years ago (photo **C**).

Shrinkage of Arctic sea ice – 1979-2012 (yellow = sea ice in 1979)

What is the recent evidence for climate change?

Shrinking glaciers and melting ice

Glaciers throughout the world are shrinking and retreating. It is estimated that some may disappear completely by 2035. Arctic sea ice has thinned by 65 per cent since 1975 and in 2014 its extent was at an all-time low (photo **D**).

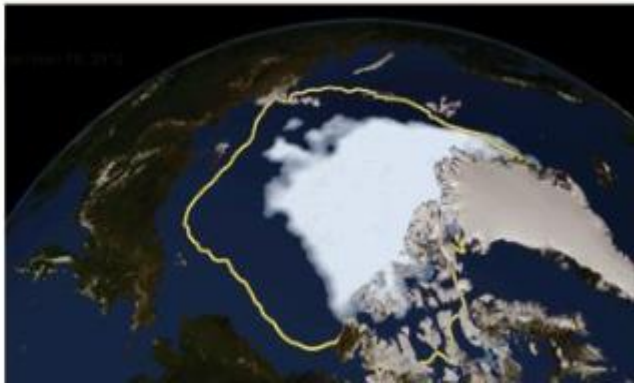
Rising sea level

According to the Intergovernmental Panel on Climate Change (IPCC), the average global sea level has risen between 10 and 20 cm in the past 100 years. There are two reasons why sea levels have risen:

- When temperatures rise and freshwater ice melts, more water flows to the seas from glaciers and ice caps.
- When ocean water warms it expands in volume – this is called thermal expansion.

Seasonal changes

Studies have suggested that the timing of natural seasonal activities such as tree flowering and bird migration is advancing. A study of bird nesting in the mid-1990s discovered that 65 species nested an average of 9 days earlier than in the 1970s. Could this be evidence of a warming world?



Explain how the shrinkage of Arctic Sea ice is evidence of climate change.

(4 marks)

- The extent of the ice shown on the photo has shrunk by one third in the period 1979–2010.
- The ice has thinned by 65 per cent over a similar period.
- Sea levels have risen by 10–20 cm over the last 100 years.
- A likely cause of sea level rise is the release of large amounts of water which had been frozen and trapped in the Arctic sea ice.