8.11: Studying Clues to Past Climates

- 200 years of documented temperature and climate
- Informal records before that kept in journals, oral histories etc.
- Paleoclimatology: is the study of climate change taken on the scale of the entire history of the Earth
- Natural materials such as rock and ice preserve clues to discovering the climate of the past
- Done by using proxy records, which are stores of natural information that we can measure today that tell us what the climate was like in the distant past.
- Proxy records are indirect records of climate; not quantitative measurements of temperature of precipitation
- Scientists compare proxy records with quantitative records to determine proxy observations present

Ice Cores

- Ice in Greenland/Antarctica contains air bubbles that have been trapped for centuries
- Scientists drill deep into ice to extract long cylinders of ice called “ice cores”
- Top of ice core is recent, bottom may be up to 800 000 years old
- Ice cores are cut into thin slices , and the air bubbles are tested for various gases
- To establish how much carbon dioxide, methane and nitrous oxide was in the air when the air bubble formed
- Show that the concentrations of these greenhouse gases have changed dramatically
- Also tested for different types of oxygen: different types of atoms exist, some with are heavier than others
- The ratio between the lighter and heavier atoms can obtain information about the air temperature
- Also give information about precipitation and volcanic eruptions through preserving layers of dust
- During warm periods, levels of greenhouse gases were higher; when it was cooler, levers were lower

Tree Rings and Coral Reefs

- Trees create one growth ring per year
- Thickest in years with good growing conditions, thinnest in bad growing conditions
- Warm, wet= good conditions; Cold, dry= bad conditions
- Coral reefs also add layers of growth each season
- Scientists drill cylinders of coral and study layers
- Help determine the temperature of the surface ocean when each layer was growing

Rock, Ocean Sediment, and Caves

- Clues in layers of soil and rock could be plant pollen or fossils, which help describe the climate at that time
- Fossils of pollen grains can be used to identify plants that grew thousands of years previously (studied specifically by size, shape, and presence of pores, furrows, and air sacs)
- In the ocean, layers of sediment drift to the ocean floor and form layers of rock
- Scientists drill cores and find fossils of marine plants and animals that lived in warmer water than the location where they are found today; evidence of warmer climate
- In caves, rock formations grow as the minerals are dissolved in dripping water solidify into rock
- Scientists can measure and date layers from these rocks
- Rock formations grow faster in rainy weather, therefore precipitation levels can be analyzed