

the secrets you can find in

# THREE MILES OF ICE

2007 AD

## WHAT ARE ICE CORES ALL ABOUT?

- How would you like to have a **time machine** that could take you back anywhere over the past 300,000 years? Ice sheets a thousand feet thick blanketed Canada and northern Europe. Well, scientists have one called an ice core. Scientists collect ice cores by driving a hollow tube deep into the miles-thick ice sheets of Antarctica and Greenland.
- The long cylinders of ancient ice that they retrieve tell us what was happening in the world over the past several ice ages. That's because each layer of ice in a core corresponds to a **single year**, and whatever fell in the snow that year remains behind, including wind-blown dust, ash, atmospheric gases, even radioactivity!



1400 AD

## WHY DID THE VIKINGS DISAPPEAR?

- Viking colonies in Greenland abruptly vanished toward the end of the 14th century. **Why?** In colder periods, seas become stormier because of the greater contrast in temperatures between the tropics and the poles, and so more sodium—an indicator of seasalt—winds up on the ice caps.
- About 1400 AD, the ice cores show a sharp rise in sodium, marking a period of much cooler temperatures some scientists call the **Little Ice Age**. For the Vikings, a series of abnormally cold winters in the late 1300s spelled doom.

25,000 BP (before present)

## WHAT WAS THE TEMPERATURE 25,000 YEARS AGO?

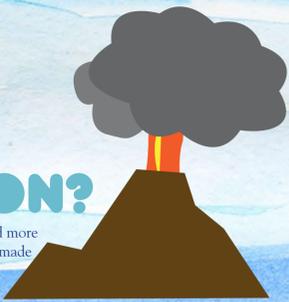
- Temperature has yo-yoed over the ages as wildly as it does in any single year. A core drilled in central Greenland shows how temperatures have risen by more than 36°F since the height of the Ice Age 25,000 years ago.
- Like natural thermometers, ice cores record these fluctuations, which scientists can "read" by examining isotopes of **oxygen** and **hydrogen** in water trapped in the ice. Light isotopes have regular hydrogen and oxygen, while heavy isotopes have hydrogen or oxygen with one or two additional neutrons. Since heavy isotopes precipitate out of the atmosphere more quickly than light ones, scientists can measure the ratio between the two isotopes to **estimate** the temperature at any given time.



73,000 BP

## WHAT IS THE LARGEST KNOWN VOLCANO ERUPTION?

- An Indonesian volcano known as Toba erupted with enough force to send more than **600 cubic miles** of volcanic material into the atmosphere. This made it the largest eruption in the past 500,000 years!
- Toba might not be the largest eruption that has ever happened, but this eruption spewed so much ash and sulfur into the atmosphere that it blocked sunlight, lowered temperatures and led to **centuries** of cold climates. Ice cores give scientists the best way to learn how past eruptions have affected climate.



160,000 BP

## IS THIS THE FIRST TIME THERE HAS EVER BEEN GLOBAL WARMING?

- No way! Ice cores in Antarctica show that about 130,000 years ago levels of carbon dioxide and methane were very high, and so were the global temperatures.
- However, the amounts of these gases in our atmosphere today far exceed levels from any time in the past few **million years**. This is worrying for the idea of future global warming and the future of living creatures today.



## WHEN THE CORE HITS BOTTOM

- Once the core hits the earth beneath the ice sheets scientists and researchers can analyze the entire core and move on to other locations. The long cylinders of **ancient ice** help scientists piece together our age-old past. More importantly, the records allow researchers to predict the impact of significant events—from volcanic eruptions to global warming—that could strike us today.

**WANT TO KNOW MORE?** Go to [www.cresis.ku.edu](http://www.cresis.ku.edu) to find out more about ice cores!