

Welcome

to the Climate Change edition of the *Natural Inquirer!*

Is the climate changing over time? You probably have heard many different opinions about climate change. In the past few years, most scientists have agreed on at least one thing about climate change. They have agreed that measured and recorded changes in Earth's climate over the past 100 or more years point to a warming of Earth's surface greater than they would have expected from normal cycles. Normal cyclical (**si kli kəl**) changes in Earth's ocean currents and atmospheric (**at mə sfir ik**) pressure cause changes in weather and climate patterns on land. (Read "It's a Small World" to learn more!)

What are Earth's normal cycles? Scientists have discovered that Earth has many different oceanic (**ō shē a nik**) and atmospheric cycles. In this *Natural Inquirer*, you will read about research concerning a short-term cycle called El Niño. El Niño is part of a cycle that occurs every 4 to 7 years. You will also read about cycles that occur every 30 to 40 years. Even longer cycles have been discovered as well; one of these cycles lasts about 1,500 years, and still longer cycles last for thousands of years. Each of these cycles has a cool phase and a warm phase, which occur when Earth's climate either cools a little or warms a little.

Earth's average temperature depends on how much of the Sun's energy comes through the atmosphere to Earth's surface, and how much escapes back into space. About 90 percent of the Sun's energy is trapped by gases in the atmosphere, including carbon dioxide, methane, and nitrous oxide. This trapped energy is sent back to Earth in all directions, warming the planet. This warming is called the greenhouse effect, and the gases are called greenhouse gases.

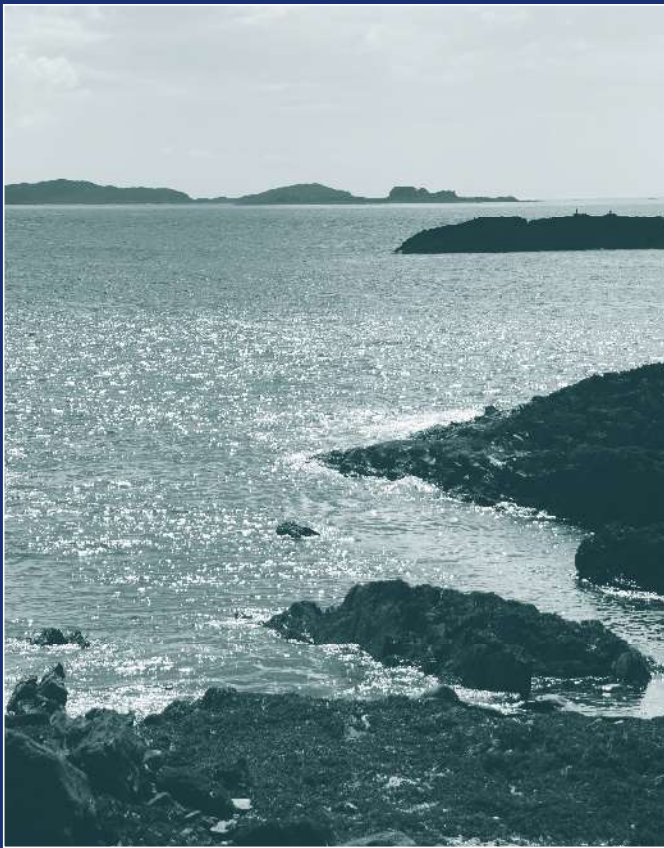
Without these gases, humans and other forms of life would not be able to survive on our planet.

During the past 150 years, however, the amount of greenhouse gases in the atmosphere has risen sharply. This increase has been happening since the beginning of the Industrial Revolution. Scientists believe the sharp rise in greenhouse gases is caused by an increase in the burning of fossil fuels, such as oil, coal, and natural gas. These higher levels of greenhouse gases in the atmosphere trap more of the Sun's heat that is reflected off of Earth's surface. This additional trapped heat leads to increasing temperatures on Earth.

Evidence from scientific measurements gives scientists more confidence in their conclusions about global climate change. Every year, global temperatures have been rising, the amount of Arctic sea ice has been shrinking, and glaciers are getting smaller. Scientists are now able to use computer programs to track and predict both atmospheric and oceanic movements across the globe. They are able to see how these movements affect short-term and long-term weather patterns.

Global climate change is sometimes called global warming. Scientists use the term "global climate change" because many aspects of Earth's climate are changing. Along with rising yearly temperatures, scientists predict increases in both droughts and flooding. The effects of climate change will be different in different places on Earth. Some places will experience periods of heavy rain, for example, and others will experience periods of low rainfall.

As the global climate changes, we will experience changes on Earth. In "Did They Make the Gradient?" you will learn what



*As the climate changes, scientists predict that sea level will rise.
Photo courtesy of Babs McDonald.*

scientists have discovered about rising stream temperatures. As the climate changes, the types and numbers of trees and other plants will shift where they grow. Some trees and plants will die off in areas, and they may grow in new areas. A warmer climate with more summer rainfall, for example, may cause an increase in the growth of grasslands in the United States. Trees that grow in the Southern United States may begin to grow farther north. You will read about how the habitat of trees may change in “Moving on Up.” The places where animals are found will change, in connection with changes in vegetation and temperature. One type of butterfly, for example, is now found living farther north than it lived in the past. In “There’s Snow Place Like Home,” you will learn how the habitat of the wolverine has changed over time.

While humans work to reduce the amount of fossil fuels being burned, we also must work with the coming changes. To do so, scientists and forest managers are thinking in the following new ways:

1. Instead of fighting change, work with it. Do what you can to reduce the impact of climate change, but be prepared for change and adapt as needed.
2. Understand that we do not know exactly what will happen in the future, but we do the best job we can using predictions. Sometimes, we will make a decision about what to do only to discover that later, we may have to make a different decision.
3. Accept that the way we did things in the past may not be the best choice for the future.
4. Focus on the way forests and other natural systems live, grow, and change, instead of what they look like.

In this *Natural Inquirer*, you will learn how scientists are using trees that died many years ago to predict the future (“Back to the Future”). You will also learn how information from satellites is helping scientists to understand how forests are changing on Earth (“The GLAS is Half Full”).

Although climate change is bringing challenges for everyone, it is also helping us to think in new ways and do some things differently. In this *Natural Inquirer*, you will find suggestions about things you can do to help. You might come up with new ideas yourself! Every day, every individual has a chance to do something to help our environment.