



BRUCE MUSEUM
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Climate Change: From Snowball Earth to Global Warming **June 28, 2008 to November 9, 2008**

Bruce Museum
1 Museum Drive, Greenwich, CT 06830



Earth sunset. July 21, 2003

An International Space Station crewmember took this photo of the sun setting over the Pacific Ocean.
Anvil tops of thunderclouds are also visible.
Image Science & Analysis Laboratory, NASA Johnson Space Center ISS007-E-10807

The Bruce Museum in Greenwich, Connecticut, presents a hot topic this summer with the new exhibition ***Climate Change: From Snowball Earth to Global Warming***. Opening Saturday, June 28, 2008, and continuing through Sunday, November 9, 2008, the show explores the evidence behind theories of past climate change and the science used to model global warming and its effects on our local community. Fossils, geologic samples, cultural and biological specimens, graphics and interactives are used to tell the complex story of climate.

Hot deserts, soggy rainforests, arctic tundra and temperate forests – these are a few climatic regions spread across our planet. Unlike weather, which is chaotic and difficult to predict on a daily basis, climate is the expected weather for an area averaged over time. But climate is not static and itself changes with time.

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Climate Change explores our planet's history of climate shifts between periods that were cooler and others that were warmer than it is today. About 700 million years ago, the entire Earth was so cold that scientists refer to it as "snowball Earth." The cold and ice was inhospitable to life aside from some hardy single-celled bacteria. Layered mounds created by these bacteria are on display in the exhibition as well as some of the first multicellular life forms that started to flourish as the planet warmed.

During the age of the dinosaurs, the Earth was significantly warmer than it is today. In fact, an extremely warm period lasted for over 60 million years and climaxed in the modern era when most of the planet had a subtropical climate. *Corythosaurus*, a print by dinosaur illustrator Douglas Henderson, and fossil plants like a 110-million-year-old subtropical fern from Washington State demonstrate conditions at the start of this period. The warmth continued through 45 million years ago, the approximate age of the displayed crocodile skull from Utah.

While records from weather instruments provide good data for the last 100 years of climate on Earth, climate scientists use a variety of methods to reconstruct climate from different age ranges and from across the globe. The exhibition includes part of a core drilled from a South Pacific coral in 2004 that dates to 1836, a bristlecone pine tree section from California that documents growing conditions from 2219 BC to AD 1956, and a stalagmite from an island in the Indian Ocean that ranges in age from 52,000 to 40,000 years ago. An ice core replica represents climate data stored in Antarctic and Greenland ice, which extend the record hundreds of thousands of years, with one ice core going back 800,000 years.

Currently, Earth's climate is warming, and scientists continue to need good data with global coverage. The exhibition features an APEX profiler, one of over 3,000 floating instruments that send temperature data from the world's oceans to satellites and then to international climate data centers. Increasing temperatures result in altering environmental conditions and ecosystems. Sea level is now rising at an accelerating rate of 3 millimeters per year (~12 inches per 100 years if it were constant) as the result of both melting glaciers on land and the thermal expansion of water.

While melting sea ice does not significantly affect sea levels, the polar bear in the exhibition is an icon for the stress on arctic ecosystems. Displays of corals, cod and a sea urchin represent other marine organisms that are having difficulty adapting to the changing conditions.

Terrestrial ecosystems are also being affected, and specimens in the exhibition include the golden toad, a tree swallow and a rice plant. The golden toad occupied a very specific niche in a cloud forest in Costa Rica and was unable to adapt to the changing conditions. On the other hand, as the insects that sustain tree swallows during mating and hatching season appear earlier in the spring, the bodies of the swallows are ready to mate earlier so the birds keep pace with their food source. Changing climate is affecting human agriculture, and one example of our attempts to adapt includes developing strains of rice that can withstand salty water, drought and excess water.

The presence of humans is a major distinction between climate in the past and climate now. *Homo sapiens sapiens* flourished in the relatively stable climate of the past 10,000 years, and we wish to continue to sustain our life on Earth. Minor climate variations affected people in the past, although some were cultures occupying marginally suitable climatic regions. An Anasazi pot in the exhibition reminds the visitor of an ancient culture of the U.S. Southwest that thrived in a relatively wetter period but then disappeared, likely, in part, as the result of drought and unstable climatic conditions.

What causes these variations in the Earth's climate? The climate system involves complex, dynamic processes, and a number of different factors can both perturb and sustain it. A computer game allows visitors to change aspects of the Earth's rotation on its axis and its revolution around the Sun to see how that affects the amount of incoming solar radiation. Volcanic rock specimens are on display to describe some of the natural ways in which the composition of the atmosphere can change. Specimens of coal and cultural artifacts such as an ancient lamp indicate that human activities also affect the amount of greenhouse gases in the atmosphere. An interactive allows visitors to express their understanding of and response to current global warming.

The exhibition is supported by the Charles M. and Deborah G. Royce Exhibition Fund and a Committee of Honor under the leadership of Daniel Barrett, Dick Bergstresser, Bill Evans, and Fred Elser.

The Bruce Museum is located at 1 Museum Drive in Greenwich, Connecticut, USA. General admission is \$7 for adults, \$6 for seniors and students, and free for children under five and Bruce Museum members. Free admission to all on Tuesdays. The Museum is located near Interstate-95, Exit 3, and a short walk from the Greenwich, CT, train station. Museum hours are: Tuesday through Saturday 10 a.m. to 5 p.m., Sunday 1 p.m. to 5 p.m., and closed Mondays and major holidays. Groups of eight or more require advance reservations. Museum exhibition tours are held Fridays at 12:30 p.m. Free, on-site parking is available. The Bruce Museum is accessible to individuals with disabilities. For information, call the Bruce Museum at (203) 869-0376, or visit the Bruce Museum website at www.brucemuseum.org.

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