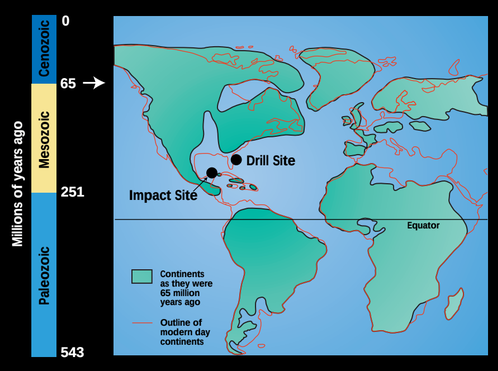
Blast from the Past

Ocean Drilling Program science at the Smithsonian's National Museum of Natural History

One bad day, 65 million years ago...

An asteroid nearly 10 km (6 mi) wide slammed into what is now Mexico's Yucatan Peninsula and blasted debris into the atmosphere. When the dust cloud settled, a 177 km (110 mi) wide crater scarred the Earth. A large number of marine and terrestrial creatures became extinct.

The impact: where and when



The drillship, *JOIDES Resolution,* recovered a sediment core from the seafloor 563 km (350 mi) east of modern day Florida at a water depth of 2,658 m (8,860 ft). This core was recovered 2,011 km (1,250 mi) from the now-buried impact crater. It contains a detailed history of the asteroid impact and its effects on the Earth. The map above shows the shape and location of the continents as they were 65 million years ago when the impact occurred.

The Ocean Drilling Program


John Beck, ODP/TAMU

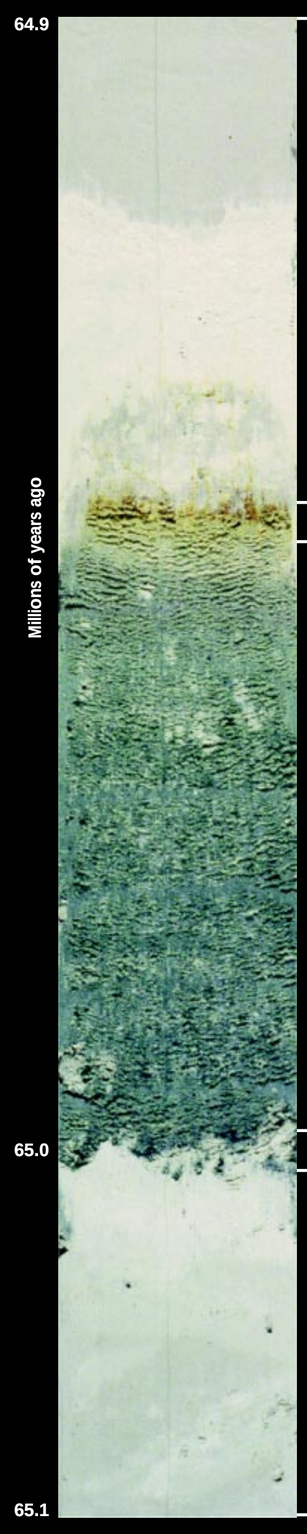
The Ocean Drilling Program (ODP) is an international partnership of scientists and research institutions organized to explore the evolution and structure of the Earth. The program's research vessel, *JOIDES Resolution,* has traversed the world's oceans since 1985 collecting cylindrical cores of sediment and rock from the seafloor. By studying the cores and lowering instruments into the drill holes to study the surrounding seafloor, ODP scientists gain a better understanding of Earth's past, present, and future. ODP is sponsored by the U.S. National Science Foundation and ODP international members.

For more information

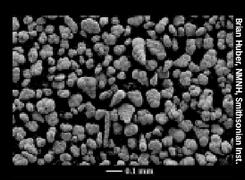
Visit these web sites: www.nmnh.si.edu/paleo/blast and www.oceandrilling.org. Or contact: Ocean Drilling Program, Joint Oceanographic Institutions, 1755 Massachusetts Avenue, NW, Suite 800, Washington, DC 20036-2102, USA; (202) 232-3900; joi@brook.edu.

Deep-sea core shows impact

This sediment core recovered by the Ocean Drilling Program records the cataclysmic event that changed life on Earth 65 million years ago.

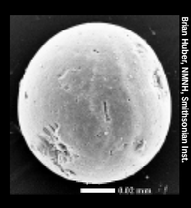


AFTER THE IMPACT:
Only tiny, less ornate foraminifera microfossils are found in this layer; a few new species have evolved. Notice the tremendous difference in size between the foraminifera microfossils shown here compared to those from before the impact.


Brian Huber, NMNH, Smithsonian Inst.

FIREBALL LAYER:
Contains dust and ash fallout from the asteroid impact.

EFFECTS OF THE IMPACT:
Ejecta including tektites – glassy spherules condensed from the hot vapor cloud produced by the asteroid impact – are found in this layer of the core. Debris thrown into the atmosphere by the impact rained down on the Earth for days to months after the event. The impact and ensuing global climatic changes devastated life. In the ocean, 95 percent of the free-floating foraminifera died out.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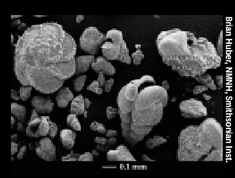
MOMENT OF IMPACT:
K/T (Cretaceous/Tertiary) Boundary

BEFORE THE IMPACT:
This layer contains microfossils of the large and ornate foraminifera that flourished in the oceans during the time of the dinosaurs.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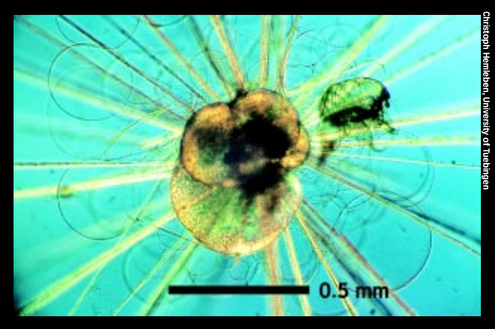
Tiny creatures tell a big story



Christoph Hemleben, University of Tuebingen

Foraminifera are single-celled organisms that have inhabited the oceans for over 500 million years. They come in many shapes and sizes. This living, free-floating foraminifera from the Caribbean has just captured its next meal. When the organism dies, its spiny shell will be preserved on the seafloor as a microfossil. Their abundance, wide distribution, and sensitivity to environmental variations make the foraminifera indicators of past climate change. By studying foraminifera microfossils scientists can better understand ancient organisms, environmental conditions, and dramatic events in Earth's history.

What happened on land?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How do we know that the extinction in the ocean also occurred on land? Scientists have recovered continental cores containing iridium, shocked quartz, and soot from global wildfires that coincide with the mass extinction at sea. This evidence allows scientists to visualize what conditions must have been like on land. After the asteroid impact, a searing vapor cloud sped northward. Within minutes, the North American continent was in flames. The rain of burning debris from the impact caused wildfires and turned most of the land into a "global broiler." Super hurricane-force winds scoured the Earth. Ash, soot, and debris darkened the skies causing sub-freezing temperatures over most of the land surface for weeks to months after the impact. Many species were extinguished by the blast from the past, including *Triceratops.* Small mammals like the ones in the foreground survived. This pivotal event changed the course of evolution.