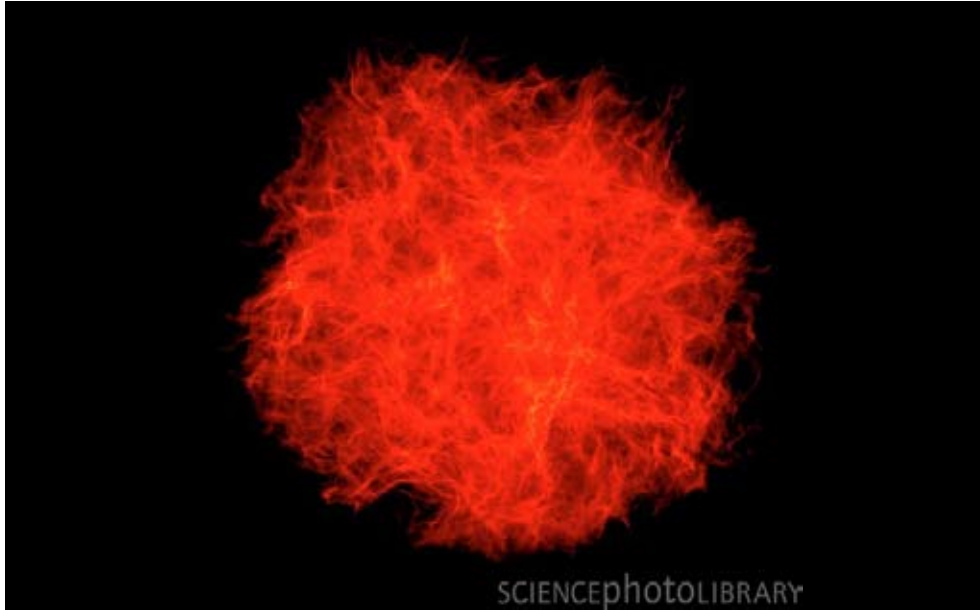


## The Very First Day

The “Big Bang” brings the universe into being



A conceptual computer illustration of the Big Bang, showing the rapid expansion of the “singularity.”

There was, of course, no “bang”, big or small, as there was no medium in which sound could exist or travel. It was the beginning of time, space, matter, energy, everything, all inexplicably created out of a “singularity” in which none of these existed before.

In the 1960s, scientists detected the echo of the Big Bang in the form of background radiation from across the sky, and dated it by estimating the size and rate of expansion of the observable universe. Impressively, they have produced a theoretical explanation of what must have happened in the very first second of the universe, when it was still tiny and incredibly hot. This was followed by a sudden expansion—or inflation—as matter moved from the minute quantum scale to that of a small but growing

cosmos. Vast amounts of matter and antimatter were created, almost all of which mutually annihilated, leaving just a tiny proportion of matter—out of which the entire universe as we know it was made.

Vast clouds of hydrogen collected, cohering into ever-denser masses which compacted under the force of gravity until hydrogen atoms at the center fused into helium, releasing energy which made them burn as stars. When some of these exploded into supernovae, heavier atoms were made, and the raw materials for the universe were formed.

Since it was first proposed, both theoretical studies and observations have made the Big Bang theory the unchallenged scientific explanation of the origins of the universe. **PF**

## The End of the Dinosaurs

Did an asteroid kill the great prehistoric beasts?



The K/T boundary, marked with a dot, in rock near Gubbio, Italy. The black layer is made of material ejected from an asteroid impact.

Having ruled Earth for more than 100 million years, the dinosaurs suddenly died out. So too did most marine reptiles, many species of plankton, and many marsupials. Somehow small, primitive mammals survived, plus most species of bird, insect, lizard, and amphibian. In some parts of the world more than half of all plant species also became extinct.

Scientists have long debated how quickly the extinctions occurred—whether in the space of a few catastrophic years, or over several millennia. The most likely theories suggest one or several large asteroid impacts, causing massive atmospheric disruption and creating huge tsunamis and firestorms across the Earth, followed by a drastic lowering of the sea level. One site now clearly identified with this is in

the sea off the coast of Yucatán, which involved the impact of an asteroid 6 miles (10 km) in diameter. Other smaller sites of possible asteroid impacts have also been located; one may have been linked to a powerful series of volcanic eruptions in an area of India known as the Deccan Traps.

The K/T boundary, as this event is called, marked the end of the Cretaceous (K) and beginning of the Tertiary (T) period. Yet it is not clear why some groups of animal were devastated while others survived. Smaller, burrowing animals were less affected than large surface dwelling ones, and free-swimming species suffered more than bottom-feeding ones. But the survival of birds suggests that the atmospheric disruptions may have been short lived. **PF**