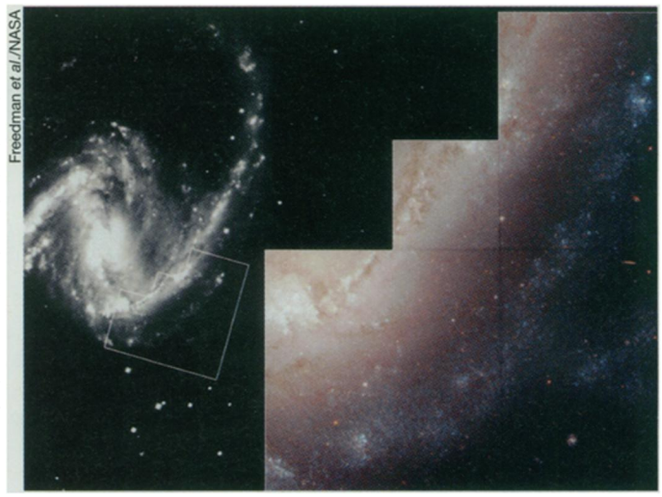
# Age of the Cosmos: A First Consensus

For the past few years, two groups have held center stage in the controversy over one of the most fundamental quantities in cosmology—the age of the universe. Using the sharp eye of the repaired Hubble Space Telescope, these researchers have reported significantly different values of the Hubble constant, a measure of the expansion rate of the cosmos that's linked directly to its age (SN: 10/8/94, p. 232).

In press releases, journal articles, meetings, and public forums, the teams have duked it out. Now, new findings, some reported this week at a meeting at the Space Telescope Science Institute in Baltimore, have narrowed the age gap.

"We're on the path to convergence, and everyone is excited about it," says Abhijit Saha of the science institute and a member of both teams.

Each of the groups used Hubble to look for Cepheid variables, a kind of star whose brightness, and therefore distance, can be inferred from its pulsations. Researchers led by Wendy L. Freedman of the Carnegie Observatories in Pasadena, Calif., measured the distance to the Fornax galaxy cluster. They then used that distance as a yardstick to gauge the distance of faraway clusters whose velocity measures cosmic expansion. At the meeting, Freedman reported a Hubble constant of about 73 kilometers per second per megaparsec, which corresponds to a universe between 9 and 12 billion years old.




*Black-and-white image, taken from the ground, shows the galaxy NGC 1365 in the Fornax cluster. Color image, taken by Hubble, zeroes in on young stars (blue dots), including Cepheid variables.*

The other group, led by Allan R. Sandage, also of Carnegie, used Cepheids to calibrate distances to a specific type of exploded star, or supernova, which the team then found in more distant galaxies. This group reported a Hubble constant of 57 in the March 20 ASTROPHYSICAL JOURNAL LETTERS. According to Saha, this puts the age of the universe between 11 billion and 16 billion years.

The range of ages depends on the amount of matter in the universe. The younger ages assume the universe has a critical density—just enough matter to teeter between perpetual expansion and ultimate collapse. The older ages assume much lower cosmic densities.

Although the new measurements of the Hubble constant agree to within 25 percent, half the difference of just 5 years ago, not everyone is smiling. The findings may spell trouble for cosmologists who argue that the development of structure in the universe can best be explained if it has a critical density.

The problem arises from estimates of the ages of globular clusters, assemblages of the oldest known stars. Two teams of researchers now argue that globular clusters are, on average, 14.7 billion years old and no younger than 12 billion years (SN: 2/24/96, p. 127). Don A. VandenBerg of the University of Victoria in British Columbia presented these calculations last week at a meeting of the American Physical Society in Indianapolis.

Astronomers believe the universe may be about a billion years older than the globular clusters. Thus, its age must lie at the high end of the ranges derived from the Hubble constant, indicating a low-density universe. "It's just about impossible to reconcile these values" with the type of universe desired by theorists, says VandenBerg. New Hubble observations over the next 18 months may shed further light on the issue. —*R. Cowen*

## Peking Man grows much older in new study

A group of Chinese fossils known collectively as Peking Man dates to at least 400,000 years ago, considerably earlier than previous estimates, according to preliminary analysis of sediment at the site where the finds first emerged in 1921.

If the revised age holds up, it suggests that *Homo erectus*—the species to which Peking Man belongs—lived in East Asia before modern humans did. The former age estimate of 200,000 to 300,000 years for the fossils raised the possibility that *H. erectus* and an early form of *H. sapiens* existed simultaneously in that part of the world.

Even given a markedly older Peking Man, however, current debates over the nature of human evolution appear unlikely to vanish. For instance, Ian Tattersall of the American Museum of Natural History in New York City sees no reason at this point to revise his opinion that *H. erectus* evolved only in East Africa as a dead-end species and that separate *Homo* species in Africa eventually led to modern humans.

Alternatively, *H. erectus* may have spread from Africa to Europe and Asia, giving rise to *H. sapiens* in perhaps one geographic region, argues G. Philip Rightmire of the State University of New York at Binghamton. Rightmire acknowledges that the new Peking Man date will probably get a warm greeting from scientists who contend that modern humans evolved separately in Africa and Asia. But, he adds, "we need to wait and see if the revised date for the Chinese specimens is determined to be acceptable."

Richard Teh-Lung Ku, a geochronologist at the University of Southern California in Los Angeles, directed the new study. It is slated to appear in the August ACTA ANTHROPOLOGICA SINICA, a scientific journal published in China.

Ku devised a technique in which he uses a mass spectrometer to analyze limestone crystals extracted from soil in the Chinese deposits, located in the Zhoukoudian cave near Beijing. From measurements of small amounts of radioactive uranium and thorium in the limestone, Ku then calculated the material's age.

The crystals were located just above the region where excavators unearthed the Peking Man fossils and are unlikely to be contaminated because they are so small, Ku asserts. Until now, he states, the dating of Peking Man relied on less precise analyses of fossilized bone.

Investigators have found at least 40 *H. erectus* individuals at the cave, as well as stone tools and evidence of fire use. —*B. Bower*