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HEADLINE: YOUNGER, TRIMMER **UNIVERSE** DESCRIBED

BYLINE: By LEE BOWMAN; SCRIPPS HOWARD

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BODY:

The **universe** is at once older and lighter weight than has previously been thought by many astronomers, a group of researchers reported to the American Astronomical Society today.

That means that galaxies and their stars are unlikely to ever stop **expanding** out from their original Big Bang positions and collapse back upon themselves, though it will eventually turn dark and cold as nuclear furnaces and even massive black holes run out of fuel.

The scientists reported on five independent efforts to measure the mass of all matter in the universe and the rate it has expanded. They studied the light and radio signals from galaxy clusters and long-ago supernovas, reaching an unusual consensus among astronomers that the universe has only about 20 percent to 30 percent of the critical density needed to stop its expansion. They also believe the universe is in the neighborhood of 15 billion years of age, give or take a few billion years.

"There's simply not enough matter to close the universe and make it stop expanding," said Princeton University Observatory astronomer Neta Bahcall, leader of a team that has been calculating the mass of the universe based on when massive clusters of galaxies formed. "What we see is a relatively slim universe."

Bahcall's method, relatively new to astronomy, is based on the theory that galaxy clusters would have formed and collapsed early in the history of a dense universe. But with images from the Hubble Space Telescope indicating that the clusters have formed relatively recently, the evidence seems to point to a low-density cosmos.

Yet another Princeton University team came to the same conclusion by measuring radio "hot spots" in distant galaxies to detect how distant they are from one another and thus how fast they are moving away from one another.

"All the indications from our observations of supernovae spanning a large range of distances are that we live in a

universe that will expand forever. Apparently there isn't enough mass in the universe for its gravity to bring it to a halt," said Saul Perlmutter of the Lawrence Berkeley National Laboratory. He leads an international Supernova Cosmology Project that has studied the light from more than 40 giant stars that exploded some 7 billion years ago.

"The neat thing about this period in astronomy is that with the Hubble and other measuring devices, we're finally able to start gathering hard evidence about the universe to challenge or support theories that have been tossed around for decades. By the end of the millennium, we'll know if we live in a universe that will ever come to an end," Perlmutter said.

Other astronomers using many of the same methods to study exploding stars out on the edge of where Hubble can look said last spring they believe the universe to be between 11 billion and 14 billion years old. They used faster expansion rates based on the assumption that there is more matter in the universe.

Another researcher presenting research at the conference today, Bradley Shaefer of Yale University, used new scientific tools to remeasure the light of supernovas that peaked and were recorded between 1895 and 1990. He came up with an expansion pace about a third slower than the rate used by many astronomers who think the force of the Big Bang will eventually diminish and the cosmos will start collapsing back upon itself - maybe in 15 billion or 20 billion years.

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