Cosmic ripples net physics prize

The discovery that finally turned cosmology into a hard science has scooped this year's Nobel Prize in Physics. John Mather and George Smoot's measurements of the earliest moments of the Universe, made with the COBE (Cosmic Background Explorer) satellite, created a whole field of research and captured the imagination of millions around the world.

"We used to have derision cosmology," says Max Tegmark, a cosmologist at the Massachusetts Institute of Technology. "People used to make fun of this field as being very flaky and philosophical. Now we have precision cosmology."

COBE's goal was to study the heat left from the Big Bang. The existence of this afterglow, know as the cosmic microwave background, was predicted in the 1940s and confirmed by measurements made in the 1960s.

The Nobel prize is awarded for two discoveries. The first, from a team led by Mather, now at NASA's Goddard Space Flight Center in Greenbelt, Maryland, is the measurement of the microwave background's spectrum, which confirmed that it had the shape of 'black-body' radiation. Such radiation is emitted by an object of a particular temperature — in this case, by the Universe when its temperature was thousands of degrees hotter than today.

This result was the first indication that cosmologists would be able to use properties of the radiation to test theories about the origin of the Universe. Mather showcased the findings at a conference in January 1990 and was greeted with a standing ovation. "In my whole career, it's the only one I've witnessed," says Carlos Frenk, a cosmologist at the University of Durham, UK, who has worked with COBE data.

Smoot, now at Lawrence Berkeley National Laboratory in California, was in charge of seeking slight fluctuations in the temperature of the microwave background. These are the imprint of the Universe's early structure — the clumps of matter that formed the seeds of today's galaxies and stars. Detecting this anisotropy was a feat that some thought beyond the sensitivity of COBE. "A lot of people thought they weren't going to find anything," says Tegmark.

But in 1992 Smoot announced to worldwide acclaim that he had found the ripples. This was the strongest evidence so far that the Big Bang happened. "Anisotropy is like looking at the fossil record and having that exposed for the first time," says Anthony Lasenby of the University of Cambridge, UK.

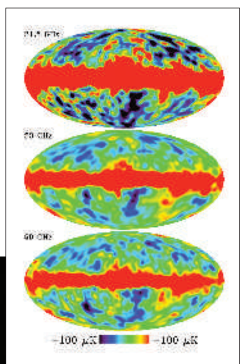
At the time, Lasenby was very close to finding similar results of his own. "We were working on an experiment in Tenerife," he says. "It was showing the first signs of fluctuations but we needed more time." Smoot got there first. But it was important to verify and correlate Smoot's results, says Lasenby, without a hint of bitterness.

After COBE came WMAP (the Wilkinson Microwave Anisotropy Probe), named after David Wilkinson, who was instrumental in setting up the COBE mission and who died in 2002. Many believe he would have shared today's prize had he survived. WMAP surveyed the background radiation in even greater detail, and will be followed in 2008 by the European Space Agency's Planck satellite.

But the impact of COBE is so far unmatched. Physicist Stephen Hawking caught the mood in 1992 when he described Smoot's results as "the greatest discovery of the century — if not of all time". There was controversy too, when Smoot said that looking at the observations was like looking into the face of God. "Bringing God into science is not always a good thing," says Frenk.

Mather and Smoot are known to have clashed personally, says astronomer George Efstathiou at the University of Cambridge, and fell out over the way the anisotropy results were released. "But maybe now that their names will be forever linked together as co-prizewinners, they might resolve their differences."

Katharine Sanderson and Jenny Hogan



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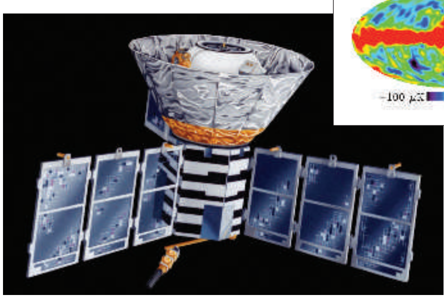

Glowing report: the COBE satellite produced data (inset) that shed light on the early Universe.

For details of the 2006 Nobel Prize in Chemistry, see www.nature.com/news