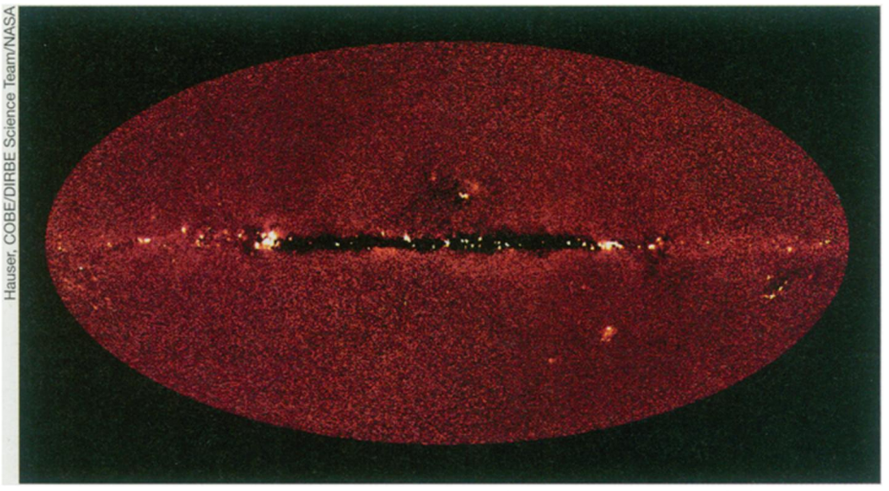
Astronomers Aglow About Infrared Maps

There's more to the universe than meets the eye. New sky maps that paint a broad-brush portrait of the cosmos in the far infrared provide graphic proof of that astronomical adage. The pictures reveal that at these invisible wavelengths, the universe is a far livelier place than many scientists had imagined.

The maps portray a uniform glow that arises from dust warmed by all the stars that have existed since the universe began. They indicate that the sky may be 2.5 times brighter in the far infrared than in visible light. To put it another way, dust in the cosmos absorbs about two-thirds of the visible light emitted by galaxies.

After analyzing data gathered by NASA's Cosmic Background Explorer (COBE) satellite, two groups of researchers unveiled their infrared pictures Jan. 9 at a Washington, D.C., meeting of the American Astronomical Society.

Although the craft's detectors could not discern the individual sources of the infrared background, researchers suspect that a substantial portion comes from dust cloaking the earliest, most primitive galaxies in the universe.



This false-color image shows background glow of extragalactic light at 240 millimeters. The center line is an artifact of subtracting light from our galaxy.

Dust readily absorbs ultraviolet and visible light emitted by stars and reradiates it in the near infrared and mid infrared. Because the expansion of the universe shifts all light to longer, or redder, wavelengths, a distant observer would detect this radiation in the far infrared.

Mapping the infrared background wasn't easy, notes Michael G. Hauser of the Space Telescope Science Institute in Baltimore. He and his colleagues analyzed the radiation recorded between December 1989 and October 1990 by the craft's diffuse infrared background experiment (DIRBE).

The instrument surveyed the sky at 10-infrared bands, ranging from 1 to 240 micrometers (μm). Before deducing the extragalactic glow, Hauser's team had to estimate and subtract two local infrared signals—radiation from interplanetary dust in the solar system and from dust and stars within the Milky Way galaxy.

Indeed, the contribution from interplanetary dust is so strong at the shorter infrared wavelengths that the researchers could detect the background clearly only at 140 μm and 240 μm.

Another team, which includes Marc Davis of the University of California, Berkeley, stumbled upon the infrared background while using DIRBE to measure the amount of dust in the Milky Way. This team's maps show a similar far-infrared background, Hauser says.

A third group, building on its earlier analysis of data from a COBE detector that surveys the sky at longer infrared wavelengths, also finds evidence of a substantial, though smaller, infrared background. Bruno Guiderdoni of the Institute of Astrophysics in Paris and his colleagues reported this finding in the Nov. 20, 1997 NATURE.

COBE made headlines in the early 1990s, when it measured the microwave background—radiation left over from the Big Bang (SN: 5/2/92, p. 292). In contrast, the infrared background comes from galaxies, which formed several hundred thousand years later.

Recent studies with the Infrared Space Observatory bolster the belief that the infrared background indeed comes from dust associated with distant objects making stars at a feverish rate, says Joseph I. Silk of the University of California, Berkeley. "Most likely we're looking at the youthful counterparts of nearby [galaxies] in their very bright formation phase," he says. During that epoch, bits and pieces of galaxies may have coalesced, trigging intense star formation.

Testing this notion will require a new generation of telescopes, ones that can resolve individual galaxies in the smooth infrared background. A slew of instruments, including the Space Infrared Telescope Facility and the Far InfraRed and Submillimeter Telescope, scheduled for launch early in the next decade, may provide answers.

Over the next 6 months, astronomers plan to use the Hubble Space Telescope's near-infrared camera to survey the Hubble Deep Field, the patch of sky most intensively studied in visible light. If many more galaxies show up in the near infrared than in visible light, it would indicate that dust plays a major role in hiding distant galaxies, says Mark E. Dickinson of Johns Hopkins University in Baltimore. —*R. Cowen*

Science Talent Search future

After CBS Corp. absorbed Westinghouse Electric Corp. last month, thoughts of science educators and students around the country turned to the Science Talent Search (STS). For 57 years, the contest funded by Westinghouse and administered by Science Service has honored and provided scholarships to thousands of high school students.

The Westinghouse Foundation is providing funds for the STS through 1999, says Thomas Peter Bennett, president of Science Service. "Since Science Service is committed to ensuring the continuation of the STS, we are currently engaged in conversations with several prospective corporate sponsors," he adds. "This year's competition will be unaffected by changes at Westinghouse."

The 300 semifinalists for the 1998 STS will be notified next week, and the 40 finalists will be announced January 27.

Five STS winners have gone on to win Nobel prizes, two have received Fields Medals in mathematics, and three have garnered National Medals of Science. Thirty have been elected to the National Academy of Sciences and four to the National Academy of Engineering.

Science Service, a not-for-profit organization whose mission is to advance public understanding and appreciation of science, publishes SCIENCE NEWS. —*J.A. Miller*