Planet posts temperature record for 1997

Last year, Earth squeaked past the previous record high for globally averaged temperatures, continuing a balmy trend that has made this decade the hottest in more than a century of temperature data, report three teams of climate scientists.

"All of us are pretty happy with the agreement of the different methods," says Thomas R. Karl of the National Climatic Data Center (NCDC) in Asheville, N.C., who announced his group's findings last week. "There are differences [among the teams' findings], but they are small."

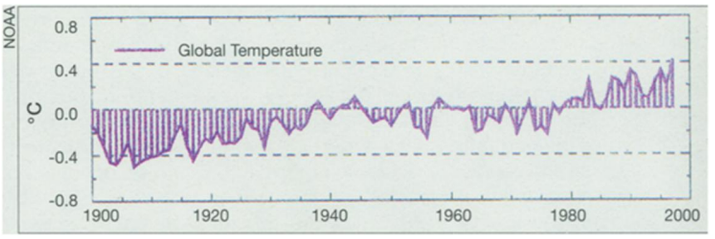
Earth's land and ocean surface last year was 0.42°C warmer than the long-term average of 16.5°C for the reference period 1961 through 1990, says Karl. The NCDC team analyzed data from more than 5,000 land stations and from water temperature readings collected by satellite sensors, buoys, and ships.

1997 came in almost a tenth of a degree warmer than the previous record years, 1990 and 1995, which were virtually identical in the NCDC data. Researchers play down the differences among these three years because the uncertainties in the figures exceed the gaps between them. The important message, they say, is that 9 of the top 10 warmest years on record have occurred since 1987.

Such evidence adds weight to arguments that humans are altering climate in noticeable ways. It is likely, says Karl, that greenhouse gas emissions are playing a role in the sustained upward trend in temperatures.

El Niño helped push Earth's temperature into new territory last year by producing a vast pool of warm water in the equatorial Pacific Ocean. Even without El Niño, however, global temperatures would have remained high. During the first few months of 1997—before El Niño blossomed—the land surface was already quite warm, says Karl.

In contrast to the global pattern, eastern North America stayed cooler than normal last year, as did the eastern Mediterranean and northern India.



Combined land and sea temperatures, shown relative to the 1961–1990 average.

In their analysis of global temperatures, researchers at the United Kingdom Meteorological Office in Bracknell found 1997 to be 0.43°C above average—the highest since they began keeping records, in 1860. Their calculations do not yet include December data, but the value will not change appreciably, they say.

A third study of global temperatures, conducted at NASA's Goddard Institute for Space Studies in New York, puts 1997 temperatures at 0.40°C above the average for the base years 1951–1980.

Although consistent with each other, these surface measurements contrast with satellite readings of Earth's lower atmosphere. The temperature between the ground and an altitude of 6,000 meters last year hovered slightly below the average value for the years 1982 through 1991. In the 19-year record of satellite data, 1997 ranked as the eighth coolest, says John R. Christy of the University of Alabama in Huntsville.

Satellite data indicate that the lower atmosphere has cooled over the last 19 years. However, when Christy corrects for the strong cooling effects of volcanic eruptions and warming effects of El Niño, the satellite trend turns into a warming of 0.07°C per decade. The surface has warmed at twice that rate.

Climate scientists are investigating this discrepancy. The two data sets need not agree perfectly, because they measure different parts of the planet. Still, the size and duration of the difference has raised concerns. It is highly unlikely that the atmosphere and surface could behave independently for so long, says NASA's James Hansen.

Last year, a team of researchers reported finding evidence of problems that artificially lowered the satellite temperature measurements (SN: 3/15/97, p. 156). Christy counters that these satellite readings agree almost perfectly with balloon readings. —*R. Monastersky*

Engineered blood vessel is only human

During bypass surgery, a doctor redirects blood flow to the heart by patching in a vein taken from elsewhere in the patient's body. Many research groups are developing artificial blood vessels for cases in which the patient's own veins won't do the job.

Now, researchers are adding a third option—growing a replacement vessel from the patient's tissues. Using only human cells, François A. Auger and his coworkers at Laval University in Quebec City have sculpted new blood vessels that are as strong as natural arteries. These are the first vessels produced "without any synthetic materials, yet [with] the strength to allow grafting," says Nicolas L'Heureux. The team reports its achievement in the January FASEB JOURNAL.

Manufactured human blood vessels should sidestep some of the problems present in synthetic grafts, says L'Heureux, now at the University of California, San Diego. For example, artificial blood vessels cannot be used at present to repair narrow arteries, because blood clots form too easily there.

The vessels constructed by the Laval team have three layers of cells— endothelial, smooth muscle, and fibroblast—as do natural arteries. The researchers grew fibroblasts and smooth muscle cells separately in a medium containing vitamin C, which stimulated the cells to produce extra collagen and elastin. These proteins formed a scaffold that organized the cells into well-structured sheets.

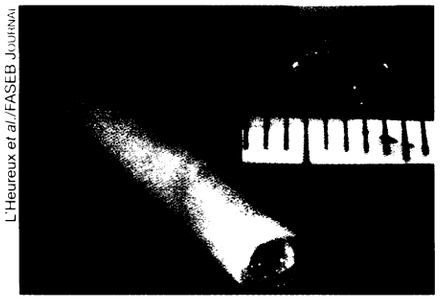
The researchers then rolled the sheets—smooth muscle cells inside and fibroblasts outside—around a cylinder. Bathed in nutrients, the cell layers merged. Finally, the researchers lined the inside of the tube with laboratory-grown endothelial cells.

The finished blood vessels can withstand more than 20 times normal blood pressure—more than the natural veins used for grafts can. As an initial test, the group placed a modified graft in a dog to make sure it didn't tear or stretch.

L'Heureux and the Laval group plan to reproduce their technique with animal cells in order to carry out long-term implantation studies. Human trials probably won't begin for at least 5 years, predicts study coauthor Lucie Germain.

In 1986, scientists made blood vessels entirely out of biological materials but found them too weak to be used. The Laval team "is using more current technology," says Stuart K. Williams of the University of Arizona in Tucson.

A human blood vessel "is a very nice idea, but we ought not to give up on synthetic grafts yet," Williams says. Hybrid vessels containing cells supported by an artificial matrix "are still the future of the field," he adds. —*C.W.*



L'Heureux *et al.*/FASEB JOURNAL

Engineered blood vessels made entirely from cultured human cells have openings about 3 millimeters in diameter.