SCIENCE NEWS of the week

'88 Set Warm Record; '89 Looks Cooler

Global temperature measurements show 1988 as the warmest year in a century of recorded weather information, British climatologists reported last week. Last year joins a string of recent years that have topped the temperature charts and thereby transported the term "greenhouse effect" from scientific journals into the public lexicon. However, experts do not expect 1989 to follow suit, because a climate phenomenon in the Pacific is now causing ocean temperatures to drop and should make this year significantly colder than 1988.

Researchers at the United Kingdom Meteorological Office and the Climatic Research Unit of the University of East Anglia in Norwich, England, found that the global average temperature for 1988 exceeded by 0.34°C the average for the period 1950-1979. The year 1987, the second highest mark, was only slightly cooler at 0.33°C above the 30-year average, says climatologist Phil D. Jones from East Anglia. In total, the 1980s claim six of the warmest years in the last century (SN: 4/30/88, p.282).

The researchers based their analysis on a global average of land and sea surface temperatures measured at nearly 1,000 stations.

Reflecting the caution of most climate experts, Jones and his colleagues hesitate to blame the recent warm years on the rising atmospheric concentrations of many "greenhouse" gases such as carbon dioxide, methane and chlorofluorocarbons. "It's still a bit ambiguous. We can't associate this warming with the greenhouse effect," Jones says, while adding: "I think it's the most likely cause."

Researchers can speak more firmly about the effect of the climate phenomenon known as the El Niño-Southern Oscillation (ENSO). During an ENSO, a large patch of warm water develops in the central equatorial Pacific at about the same time the atmospheric pressure drops over the eastern part of the ocean relative to the west. Lasting about a year to 18 months, ENSOs rearrange traditional patterns of precipitation, bringing fierce rains to coastal Peru and drying out India and Australia. The individual events recur roughly three to seven years apart, and scientists have yet to determine what causes the phenomenon.

The year 1983 saw the strongest ENSO in a century. The next ENSO developed in early 1987 and carried through into early 1988. Jones says it is clear these events helped raise global temperatures during 1983, 1987 and part of 1988. But even with the ENSO effect removed, these years remain warmer than the 30-year mean, he says. It is this background warming that has scientists concerned.

Jones and most other climate experts expect global temperatures to drop markedly in 1989 due to a climate phenomenon that resembles the reverse of an ENSO. Scientists have yet to agree on what to call this interaction between the ocean and atmosphere. Some have named it the "cold phase" based on ocean temperature. Others call it the anti-El Niño. Still others have dubbed it La Niña, which is Spanish for "the girl," in an attempt to give it equal footing with El Niño ("the boy" or "Christ child," a reference to its winter timing). The confusion over names reflects the fact that scientists have only recently recognized the importance of this phenomenon.

Chester Ropelewski and Michael Halpert of the Climate Analysis Center of the National Oceanic and Atmospheric Administration in Camp Springs, Md., have completed a statistical examination of precipitation records around the globe, and they find several recurring patterns associated with La Niña. The researchers focused on 19 areas of the globe that clearly experience some sort of effect during ENSOs and found that 15 of the regions also show characteristic precipitation change during La Niñas. These results will appear in an upcoming issue of the JOURNAL OF CLIMATE.

Ropelewski and Halpert found that during most La Niñas, Indian and Australian summer monsoons strengthen, as do the rainy seasons in northeastern South America and southeastern Africa.

Imaging ionic tides and soft surfaces

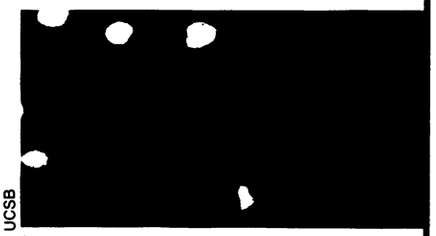
Cellular membranes abound with ionic flows. Minibursts of sodium, potassium and other ions rush in and out of the cell as tiny channels open and close. This frenzied activity plays a key role in such things as neural impulses and muscle-fiber contractions.

A new tool — the scanning ion-conductance microscope (SICM) — should help biologists witness this surface activity in greater detail, say its designers. "It can image soft nonconductors such as cell membranes without touching them, and it can image ion fluxes through pores in the membranes," says codeveloper Paul K. Hansma of the University of California, Santa Barbara.

Like the scanning tunneling microscope, the SICM builds up an image of a sample surface by scanning a sharply tipped probe just above the surface's tiny hills and valleys. A feedback system raises and lowers the probe to maintain a constant electric current between the probe and the surface. Then a computer reconstructs an image from all of the probe's tiny displacements.

Electrons carry current in the scanning tunneling microscope, a device limited to imaging nonliving samples. Ions make up the current in the SICM, which "is designed specifically for biology and electrophysiology," the researchers say.

The SICM probe is a hollow glass microelectrode filled with a conductive salt solution. The researchers lower the probe toward the sample surface, which is covered in the same solution. By applying a voltage across the probe and another electrode in the sample solution, they generate a current of ions that travels through the probe. But as the probe gets very near the surface, space for ionic movement gets scarce and conductance decreases. In a scanning mode, the feedback system adjusts the probe height to maintain a constant current, creating a topographic map. For imaging local ion currents, the probe scans at a constant height and monitors the changing currents.



UCSB

Ion currents in a synthetic membrane filter with 0.8-micron-diameter pores. Current is strongest in white, weakest in black, and intermediate in colors.

"Clever physiologists" might use it for making topographic maps of cell membranes and measuring the distribution and behavior of ion channels, says Hansma, who with colleagues describes the SICM in the Feb. 3 SCIENCE.

So far, the SICM researchers have successfully imaged the surfaces of acetate film and a synthetic, pore-ridden membrane filter. "It's a new way of looking at the microscopic world," says Kumar Wickramasinghe, a physicist at the IBM Thomas J. Watson Research Center in Yorktown Heights, N.Y. But he and Hansma agree that refinements in the existing device must come before its use for sophisticated membrane and ion-channel studies. — *I. Amato*

Some areas, like the Gulf of Mexico, tend to dry out. In general, ENSOs and La Niñas affect these regions in opposite manners.

At last week's meeting of the American Meteorological Society in Anaheim, Calif., Ropelewski reported the current La Niña seems to be progressing true to form. By mid-1988, water temperatures in the central Pacific had plummeted to abnormally cold levels, signaling a climate swing directly from an El Niño into a La Niña. Such a pattern does not always occur. For instance, two ENSOs developed between 1976 and 1984, but no La Niña split the two warm phases.

As expected during a La Niña, strong monsoons pounded India and Bangladesh last summer. Then, in December, heavy rains visited Australia, repeating the pattern of most La Niñas, Ropelewski says. Even weather in Alaska seems in character. The bitter cold felt in this region during recent weeks follows the statistical La Niña temperature pattern for the area.

Jones says the La Niña has already started to cool ocean temperatures, but land temperatures have not yet followed. He says the average global temperature for 1989 should drop from this year's high, although he still expects it to exceed the 30-year mean. Climatologists are laboring to determine if this background warming is indeed caused by the greenhouse effect, or by some unknown natural climate shift. The natural variation could be analogous to something like a century-long version of the ENSO.

– R. Monastersky

Spill threatens research

Diesel fuel leaking from a wrecked Argentine ship threatens biological research at the U.S. Palmer Research Station on the Antarctic Peninsula, says Ted DeLaca, head of the National Science Foundation's polar science section.

The 435-foot-long *Bahía Paraíso* started leaking fuel and partially sank after underwater rocks ripped a 30-foot-long gash in its hull on Jan. 29. Primarily a supply vessel for Argentine bases, the ship carried 81 tourists and had just finished a sightseeing visit to the U.S. station. It was within 1.5 miles of the science installation when it was abandoned by passengers and crew.

The fuel slick has spread throughout the water near the station and has started to harm area wildlife. Washing up on shore are thousands of krill, which form the basis of the local food web. Penguins and other birds have also died.

DeLaca says it is not yet possible to gauge the impact of the spill on the nearly pristine Antarctic environment. He adds that the spill may affect animal populations for many years and could taint the results of future studies there. □

NIH finds scientific errors but no fraud

A National Institutes of Health (NIH) panel has cleared Nobel laureate David Baltimore and several colleagues of scientific fraud. But it did find "significant errors of misstatement and omission, as well as lapses in scientific judgment," according to a report released last week.

The three-member panel absolved the authors of any serious wrongdoing, but the issue seems unlikely to subside. Critics still harbor doubts about the research, and powerful members of Congress have taken on this episode and the issue of scientific fraud in general with a vengeance. The entire affair has forced scientists to reexamine their system of monitoring error and outright fraud.

The controversy centers on a scientific paper published in the April 25, 1986 CELL by a team of researchers at the Massachusetts Institute of Technology and the Whitehead Institute for Biomedical Research in Cambridge, Mass. Baltimore, director of the Whitehead Institute, has taken much of the heat, along with coauthor Thereza Imanishi-Kari, formerly at MIT and now at Tufts University School of Medicine in Boston. The research in question involved the insertion of foreign genes into mice and the effect on the animals' immune systems.

Allegations of scientific error began when Margot O'Toole, a postdoctoral scientist working under Imanishi-Kari, began suspecting serious flaws in the research method. O'Toole spoke up, but Imanishi-Kari dismissed her concerns. O'Toole says she would have let the matter drop, but another junior researcher alerted Walter Stewart and Ned Feder, two NIH researchers who serve as unofficial watchdogs of scientific misconduct. Stewart and Feder found evidence suggesting the Boston team's data failed to support its conclusions. Baltimore and his colleagues called for an officially sanctioned NIH review. NIH Director James B. Wyngaarden complied last year, appointing three outside scientists to investigate.

The panel interviewed the researchers as well as O'Toole and others involved in the dispute. They found factual and clerical errors in the data and problems with a reagent that could have skewed conclusions. The panel recommended the team send a correction letter to CELL. Baltimore and his colleagues say they've already done that in a Nov. 18 letter to the journal, but the panel maintains that letter doesn't go far enough.

On balance, Baltimore and colleagues profess satisfaction with the NIH report. "I feel vindicated," Baltimore said in a prepared statement issued after the report's release. "The document supports my original judgment that this research work would be a significant contribution to the literature."

O'Toole and others contend the report brushed aside evidence of significant scientific error. "The panel's report is laced with equivocal and evasive phrases," O'Toole wrote in a comment letter to NIH. She called the report an "inadequate scientific analysis of the facts."

The whole controversy may end up in Washington again. Rep. John Dingell (D-Mich.), chairman of the House Energy and Commerce Committee, has held hearings on the "Baltimore paper" in the past. "We may have Mr. Baltimore and the NIH before the committee to discuss [the report] in greater detail," Dingell says.

– K.A. Fackelmann

Panel steps up cancer war

The National Cancer Advisory Board, a presidentially appointed panel advising the National Cancer Institute, wants tobacco regulated as a drug. This is one of a series of recommendations it issued this week aimed at cutting the U.S. cancer death rate in half by the year 2000.

Eliminating smoking tops the board's list of prevention recommendations. Smoking accounts for 30 percent of all U.S. cancer deaths, including 87 percent of all lung cancer deaths, according to the Department of Health and Human Services. The advisory panel supports a smoking ban on all airline flights and asks Congress to classify tobacco as a drug, putting it under the regulatory aegis of the Food and Drug Administration. Special efforts should be made to deter children from smoking or chewing tobacco, the panel says, noting that 100,000 kids under 12 use tobacco.

Screening tests for breast, cervical and colorectal cancer should be readily available, says the panel. In particular, it notes, widespread use of mammography among women aged 40 and older could reduce breast cancer deaths by 50 percent. Yet many physicians do not routinely suggest mammography to patients at risk of breast cancer, the group says.

The panel urges schools, state and local governments, and even employers to help in the battle against cancer. But it also calls on individuals to adopt a healthier lifestyle, recommending that people reduce their fat intake to 30 percent of daily calories or less and get more fiber by eating fruits, vegetables and grains.

Cancer is the second leading cause of death in the United States, and is expected to kill about 502,000 people in 1989, according to the American Cancer Society. □