According to SCIENTIFIC AMERICAN, a new report from AT&T Bell Laboratories shows that "not only has global warming arrived, the climate shift is irreversible." [1] AT&T engineer David J. Thompson -- a well-known researcher in the field of signal processing -- used a novel approach to analyze climate change. He examined locations around the world with long historical records, such as central Europe where climate records date back 344 years, to 1651. Among such records, Thompson examined the dates when the change of seasons occurred. In a paper presented in December to the American Geophysical Union (and not yet fully published), Thompson reported that the timing of the seasons changed slowly -- about one day per century -- until 1940; since 1940, a "pronounced anomaly in the timing of the seasons has appeared in Northern Hemisphere records," says SCIENTIFIC AMERICAN.

Thompson's novel approach allowed him to "sidestep completely the nasty problem of compiling an accurate global average temperature from limited historical records," says SCIENTIFIC AMERICAN. Jeffery J. Park of Yale University says, "The important result [of Thompson's] paper is that the match between this timing shift [in the change of seasons] and the CO2 increase [in Earth's atmosphere] is very good, UNLIKE the match (or lack of it) between CO2 and the global temperature increase in the last century. The seasonal shift since 1940 appears to be an anthropogenic [human-created] signal," Park says.[2]

CO2 is carbon dioxide, a gas that is increasing steadily in Earth's atmosphere, trapping the sun's energy, and thus -- sooner or later -- heating the planet. CO2 is released by the burning of fossil fuels -- oil, natural gas, and coal. The chief scientific debate over global warming is not WHETHER it will happen, but WHEN its effects will become undeniably obvious. The scientific problem is one of detecting the signal (compelling evidence of greenhouse warming) among all the noise (the natural fluctuations of weather and climate, including temperature). In 1990, in 1992, and again in 1994 the Intergovernmental Panel on Climate Change (IPCC) -- made up of 140 scientists from 80 countries -- issued reports published by the World Meteorological Organization and the United Nations stating their consensus belief that the CO2 buildup in Earth's atmosphere will lead to an average global temperature increase of between 2.7 and 8.1 degrees Fahrenheit during the next century. In 1994, the IPCC reaffirmed its conclusions of 5 years earlier. [3] John Houghton, a British climate researcher who co-chaired the scientific working group that produced the IPCC's 1994 report said, "It is interesting that in this very uncertain area, over a period of 5 years, the essential story remains the same. There's been no evidence that's come to light to destroy those basic findings."

In the U.S., the National Academy of Sciences said in 1990, "The future of the earth's climate and perhaps, its inhabitants, depends on how much concentrations of carbon dioxide [CO2] and other trace gases are likely to rise." [4, pg.33] CO2 concentrations in the atmosphere have increased about 25% since the 18th century, from 280 to 350 ppm [parts per million], and are steadily climbing. [4, pgs.33,35] The Academy said in 1990 that the "greenhouse effect" -- whereby the CO2 in Earth's atmosphere acts like the glass covering a greenhouse, trapping heat energy to produce a warming effect -- explains why gases produced by human activity will probably cause the earth's average temperature to increase within the lifetimes of most people living today." [4, pg.63]

Even earlier, in 1989, the editors of SCIENCE magazine had concluded that global warming is the most serious environmental problem that humans face. SCIENCE is the official (and profoundly conservative) voice of the American Association for the Advancement of Science. "As serious as the problems of acid rain, toxic waste and depletion of the ozone layer are, the greenhouse effect looms over all of them because it poses such great potential damage to the environment and is by far the most difficult to solve." [5] SCIENCE then called for "...a massive effort to use solar power," saying, "To develop solar energy technology to supply large amounts of power... should be a major priority of our civilization."

The IPCC's 1994 report offered new information concerning efforts to curb emissions of greenhouse gases, such as CO2. In 1992, 155 nations signed a treaty in Rio de Janeiro pledging to stabilize atmospheric concentrations of greenhouse gases at an unspecified level. Toward that goal, developed nations agreed in a nonbinding way to scale back their emissions to 1990 amounts by the year 2000. The treaty does not say whether countries must cap their emissions after that time. The wealthy nations produce about 80% of greenhouse gases.

The 1994 IPCC assessment concludes that the guidelines set in the Rio treaty will not stop the atmospheric accumulation of greenhouse gases. To stabilize concentrations at today's amounts or even twice those, nations will need to decrease their emissions to well below 1990 levels, Houghton told SCIENCE NEWS.[3]

The Clinton administration has done little to bring the U.S. into compliance with the 1992 treaty. The NEW YORK TIMES reported in August, 1994, "During his campaign for the Presidency, Bill Clinton promised to set higher standards for automotive fuel efficiency, but his Administration has instead favored a largely voluntary approach, which has done little to reduce automotive pollution." [6] Worldwide, automobiles account for 1/3 of all oil use.[4, pg.49]

The IPCC and the U.S. National Academy of Sciences agree that one major effect of global warming is likely to be more extreme weather -- longer droughts, worse floods, hotter summers and colder winters, more and stronger hurricanes, tornadoes and wind storms. In 1994, the head of the IPCC, Professor Bert Bolin of Stockholm University, warned that, "Most of the damage due to climate change is going to be associated with extreme events, not the smooth global increase of temperature that we call global warming." [7]

In the U.S., the winter of 1994 broke low temperature records in several eastern states.[8] In June 1994, heat records were broken in the southwestern U.S. when the thermometer hit 120 degrees Fahrenheit. [9] In Europe, 1994 set heat records from the Netherlands to Hungary and Poland; German Environment Minister Klaus Töpfer said he was afraid the unusual heat signaled a possible climate change from the greenhouse effect. [10] A heat wave in Japan set records in Tokyo in 1994, and blistering, prolonged heat in India in June 1994 killed "thousands of people," according to the NEW YORK TIMES.[10]

Dr. James E. Hansen, who heads the National Aeronautics and Space Administration (NASA) Goddard Institute for Space Studies in New York told the TIMES in 1995 that he is "more confident than ever" that there is "a real warming which is not just a chance fluctuation but is a long term trend, and that trend is due to the greenhouse effect." [11, pg.A13] Hansen in 1981 published the first paper showing that the average temperature of the Earth had, in fact, increased during the past 100 years, a finding that is now widely accepted; the CAUSE of that temperature rise is still in dispute because not all CLIMATOLOGISTS are yet convinced that
the greenhouse effect is causing the observable warming. However, unlike climatologists, much of the insurance industry is coming around to the view that extremes of weather are increasing along with global temperature, and that greenhouse gases (CO2 and others) are the cause.

Munich Re, the world's largest re-insurance company (whose business is insuring insurance companies against catastrophic losses) observed in 1993 that in the 10-year period 1983-1992 insured losses from natural disasters were almost 12 times higher than in the decade of the 1960s, even allowing for inflation. Commenting on Munich Re's analysis, LLOYD'S LIST INTERNATIONAL (a publication of Lloyd's, the London insurance giant) writes, "The convenient theory that the increase in the size of losses is mainly a reflection of higher wealth --and consequently, of insured values-- in those countries affected by natural disasters seems to be incorrect. It is far more likely that other causes, such as climatic changes, have already taken over as main factors pushing losses upwards."[7, pgs. 108-109]

In late 1993, Skandia, one of Sweden's largest insurance companies, stopped insuring weather-related damages. Ake Munkhammar, Skandia's expert on storms and natural catastrophes, said climatologists have the luxury of delaying their decision as to whether the bounds of natural variation in the weather have been exceeded, but insurance companies do not.[7, pg. 135] Climate change could bankrupt the insurance industry, and, without insurance, civilization as we know it would be impossible. More next week.~

--Peter Montague


[2] Park's comments appeared on the Internet in the usenet news group sci.environment February 12, 1995. Park's e-mail address is jjpark@minerva.cis.yale.edu. Thanks to Tony Tweedale of University of Montana for forwarding Park's comments to us.


[7] Quoted in Jeremy Leggett, editor, THE CLIMATE TIME BOMB; SIGNS OF CLIMATE CHANGE FROM THE GREENPEACE DATABASE (Amsterdam, Netherlands: Stichting Greenpeace Council, 1994), pg. 154. This extraordinarily comprehensive and useful volume is available for $25.00 from: Greenpeace, 1436 U Street, N.W., Washington, D.C. 20009; phone (202) 319-4444. To request information about a semiannual update to this volume, send e-mail to lyn.goldsworthy@green2.dat.de, or send regular mail to The Climate Impacts Unit, Greenpeace International, P.O. Box 800, Surry Hills, New South Wales 2010, Australia.


