

Session 5 Focus on Science Global Warming



A VIEWING AND DISCUSSION
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As you stand on the Earth, the atmosphere, like the ocean, appears endless. When we burn wood in a fireplace the smoke rises and is absorbed by the sky. Even the smog over Los Angeles can be cleared by a strong wind-it blows away and seems dissipated and gone. How did we manage to punch a hole in the chemistry of the stratosphere 50 kilometers over Antarctica?

The layer of air surrounding our planet is actually a relatively delicate membrane: Around a 12-inch globe, the 50 kilometers of lower atmosphere -the troposphere and stratosphere, which contain nearly 100% of the air over our heads-are about the thickness of ten sheets of paper. Furthermore, there are a lot of people on the planet these days, and in some respects we have been too clever by half.

In 1928, a General Motors researcher named Thomas Midgley, Jr., devised Freon, a gas with wonderful properties-colorless, odorless, nonflammable, noncorrosive, and nontoxic. It was hailed as a miracle chemical, and the trademark name Freon soon came to represent a whole class of similar chlorofluorocarbons (CFCs). Millions of pounds found use in solvents, pesticides, defoliants, cleaners, and foam for insulation, bedding, and packing. Most notably, though, CFCs were used in refrigeration. Then, with Robert Abplanalp's 1949 invention of a cheap, reliable spray-can valve, the venting of CFCs into the atmosphere became an everyday activity for hundreds of millions of people around the world.

Less than 60 years after Freon's creation, an international agreement (the Montreal Protocol of 1987) planned the elimination of CFCs, as well as other compounds such as the widely used pesticide methyl bromide. It had become clear that these substances were making their way to the upper atmosphere, where the chlorine and bromine were getting loose to break down ozone. There isn't a lot of ozone in the stratosphere, but it serves the very important function of absorbing harmful, high-energy ultraviolet light that would otherwise cause skin cancer and general ecological damage. Owing to a constellation of air movement, temperature, sunlight, and chemistry, the ozone depletion was particularly dramatic over Antarctica. By 1998, the ozone hole opening over the South Pole was as big as North America. In recent years an Arctic hole has been growing, with far broader implications for human populations.

Today's aerosol cans, refrigerators, and automotive air conditioners no longer need CFCs, and the Montreal Protocol calls for an end to their use by 2010. Unfortunately, there is still a lot of active equipment that was made to use them. Adapting that equipment to use the newer chemicals is expensive, and as a result CFC smuggling is second in dollar value only to narcotics at many US border crossings.

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