Ozone and global warming: What to do?

If a recent Senate hearing is any indication of the congressional mindset, policymakers are convinced that ozone depletion and "greenhouse" warming are the most serious environmental problems facing the world today. And some senators at the Jan. 28 joint hearing of the Environmental Protection and the Hazardous Wastes and Toxic Substances subcommittees were steamed up for action. The question now is: What action is best?

One course being taken by the United States and other countries is to negotiate controls of chlorofluorocarbons (CFCs) — human-made chemicals used for refrigeration and other purposes — and other compounds that attack stratospheric ozone. In early December, under the auspices of the United Nations Environment Programme (UNEP), 120 participants from 25 nations met in Geneva, Switzerland, to begin negotiations through the Vienna Convention for Protection of the Ozone Layer, which was ratified by the United States in August 1986.

According to Assistant Secretary of State John D. Negroponte, who testified at the Jan. 28 hearing, the U.S. proposal contains three points: a near-term freeze of ozone-attacking chemicals at their 1986 levels; a longer-term phaseout; and a periodic reevaluation of goals. Negroponte told the subcommittees that Canada, Finland, Norway and Sweden generally support the U.S. approach.

The greatest resistance, particularly to a long-term phaseout, has come from Japan and the Soviet Union, who want to ensure use of CFCs for their technological development, and from the European Communities. According to the lead U.S. negotiator, Richard Benedick, the European Communities are reluctant to use the flammable substitutes for destructive CFCs because they pose a risk for their many small factories nestled in cities. Benedick also notes that European chemical companies have a strong influence on their governments and that European environmental groups have yet to take up the ozone issue with gusto.

Negroponte says that before the next round of negotiations takes place Feb. 23-27, the United States will consult with other nations in a variety of ways. For example, a U.S. scientific team will exchange information on ozone depletion when it visits the Soviet Union Feb. 3-9.

But while Negroponte and Benedick have stressed how far negotiations have come, Sen. John H. Chafee (R-R.I.) has criticized the U.S. delegation for "backing off from its original position" of seeking a near-term freeze and scheduled phaseout, to a more general attempt to discuss the reduction of CFC levels. According to one congressional aide, the delegation was unable to publicly discuss any specifics, such as the extent or timing of a proposed freeze and phaseout, because the delegates disagreed among themselves about the U.S. position.

"That is what is troubling Chafee and others, that . . . the State Department did not appear to be in total control of these negotiations," says the aide. "One purpose of this hearing was to make sure that that changes."

Chafee and some other senators suggest that if negotiators fail to reach a meaningful international accord, the United States should go it alone. Indeed, in the next few weeks Chafee and Sen. Max Baucus (D-Mont.) plan to introduce legislation to Congress that would begin to phase out the production, use and importing of harmful CFCs by the United States. But Negroponte is unenthusiastic about unilateral action, saying the industries would only move to other countries that don't have strict controls.

As for the issue of global atmospheric warming from the emission of carbon dioxide, methane and other "greenhouse" gases, the subcommittees considered a number of policy options, from public awareness to energy conservation programs. Chafee noted that the Environmental Protection Agency (EPA) has agreed to study policy options and there is some indication that UNEP might be interested in hosting negotiations on a treaty to limit greenhouse gases.

In his testimony to the subcommittees, Wallace S. Broecker, a geochemist at Lamont-Doherty Geological Observatory in Palisades, N.Y., also stressed the need for basic research conducted in isolation from political pressures. He thinks the EPA, the Department of Energy and other mission-oriented agencies have done a poor job of managing environmental research, in part because they are interested only in short-term results.

What's more, Broecker thinks the earth's atmosphere-ocean system is far more complicated than what is currently modeled in computers. While these models suggest that the warming will be a smooth, gradual process, Broecker says deep-sea and ice cores have shown that past climate changes have occurred very abruptly. He writes in his testimony, "[W]e must consider the possibility that the major response of the [climate] system to our greenhouse provocation will come in jumps whose timing and magnitude are unpredictable. Coping with this type of change is clearly a far more serious matter than coping with a gradual warming." — *S. Weisburd*

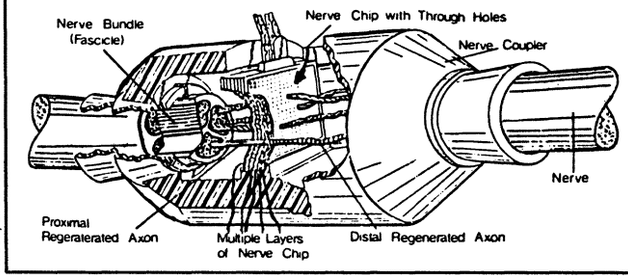
Good connections? It's in the chips

Severed nerves may reconnect, but they don't usually regain all of their original function. If a new approach is successful, specially designed computer chips implanted in the body may someday not only reconnect nerve fibers, but also act as a "switchboard" to transmit nerve signals that could reverse paralysis. The device is far from human use, but nerve endings have been induced to grow through chips in rats and monkeys.

Called a "merger of microsurgery and microelectronics" by its inventors, the technique depends on a chip full of laser-drilled holes. On each 1-by-1.5-millimeter chip are 2,500 of these openings, which act as tunnels through which nerve endings called axons can grow. The chip was developed by Joseph M. Rosen, from Stanford University's School of Medicine, and Morton Grosser, an independent researcher and consultant in Menlo Park, Calif.

The chip "will be essentially a switchboard that redirects the correct nerve paths," Grosser told SCIENCE NEWS. It is designed to train nerve endings to reconnect; eventually each chip will be programmed to pick up signals from the brain sent to one end of a severed nerve, and electronically transmit those signals across to the other end of the damaged nerve. In this manner, muscles affected by nerve damage could receive signals from the brain.

The next research step, says Grosser, is to develop the electronics on the chip by providing a built-in grid to intercept the brain's signals. It may be five years before scientists know whether a chip can successfully carry messages for injured nerves, according to Grosser. "It is very important to emphasize that this is very preliminary work," he says. — *D. D. Edwards*



Rosen/Grosser

As envisioned by researchers, microchips receive nerve impulses from one end of a severed-and-reattached axon and transmit those impulses to the axon's other end.