Kingdom, and Allan Goldstein of George Washington University School of Medicine. All three might ultimately be used either for prophylaxis or for immunotherapy in people already infected with the AIDS virus.

Three other workers described "pseudovirion" vaccines, which include constructs that resemble whole HIV particles, but are modified to exclude the viral genome (which mediates infection) or render the genome harmless. Larry Arthur, who works for NCI contractor Program Resources, Inc., in Frederick, Maryland., is manipulating HIV core proteins to develop an RNA-deficient pseudovirion. Joel Haynes of the Connaught Centre for Biotechnology Research in Canada has chosen the route of removing part of the viral genome in constructing his pseudovirions. And a group led by Dennis Panicali of Applied bioTechnology in Cambridge, Massachusetts, is making HIV-like particles by stitching HIV genes into a vector that has also been used for other vaccines: the vaccinia virus.

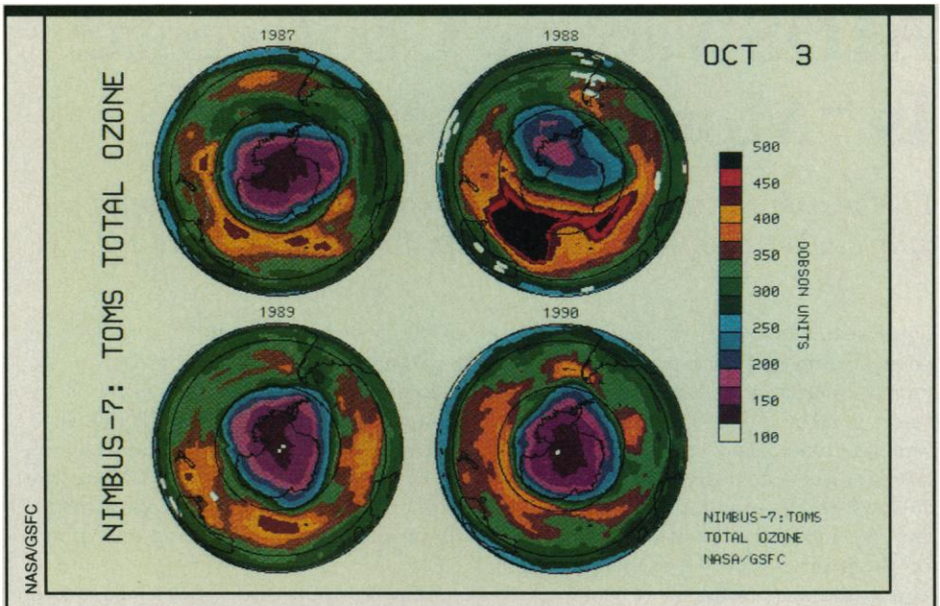
Perhaps the ultimate extension of the "more is better" approach is the use of whole, killed virus vaccines. Jonas Salk has long advocated using whole HIV in a killed preparation, both for prophylaxis and for therapy. Salk's work, presented at the last two international AIDS conferences, has aroused controversy. Here Salk outlined the next step in his vaccine research program, presenting plans for a 1-year trial of his gp120-depleted (but otherwise whole) HIV preparation. That trial will rely on PCR data, among other tests, to find out how much Salk's experimental preparation can reduce the viral load seen in asymptomatic, infected patients.

Although the whole-virus technique is still viewed with skepticism by much of the field, new results seem to give it more credence. Jim Stott of the U.K. Medical Research Council reported here that, using a whole, killed SIV vaccine, his group protected monkeys against a challenge with a strain different from the one used to formulate the vaccine. Protecting against such a "heterologous" challenge, which is obviously a likelihood in real-life situations, has been of prime concern to researchers who feared that some AIDS vaccines might protect only against the single strain they were made from.

Such results suggest that what seemed utterly farfetched just a couple of years ago may in the not-too-distant future enter the mainstream of research leading to an AIDS vaccine.

■ JON COHEN

Jon Cohen is a free-lance writer based in Washington, D.C.



Another Deep Antarctic Ozone Hole

For the second year in a row, the annual destruction of stratospheric ozone over the South Pole has equaled its historic maximum. "Pretty much all the ozone at the base of the stratosphere is destroyed," says Arlin Krueger, who has been monitoring this year's Antarctic ozone hole via satellite. This is the third time in the past 4 years that such extreme ozone depletion has occurred. It may now be the norm.

The 1990 hole got off to a roaring start. Ozone destruction, which is brought about by sunshine acting in combination with the chlorine released from chlorofluorocarbons (CFCs) by icy stratospheric clouds, usually begins over Antarctica in mid-August and reaches a maximum in early October. This August, the amount of ozone, as monitored by the satellite-borne Total Ozone Mapping Spectrometer, rapidly plummeted to about 140 Dobson units, far below the 220 Dobson units typically seen over Antarctica before the hole forms. By mid-September, however, the rate of decline had slowed so that the hole reached a minimum of 125 Dobson units on 4 October, according to Krueger, who works at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

Such extensive ozone depletion made this year's hole comparable to 1987's record-setter (121 Dobson units) and the 1989 hole (124 Dobson units). In all three years, almost all of the ozone was wiped out in the stratospheric cloud region between the altitudes of 15 and 23 kilometers.

The hole is defying the empirical rules meteorologists had developed to predict its depth. Last year's depletion was severe even though the stratospheric winds over the equator blew from the east, a circumstance supposedly linked to shallow holes (*Science*, 20 October 1989, p. 324). And the 1990 hole breaks the pattern in which years of severe, persistent ozone destruction alternated with years of more moderate, shorter-lived depletion.

It may be, says Mark Schoeberl of Goddard, that CFC concentrations have now increased enough to ensure the near total destruction of ozone in the lower stratosphere in most years. If so, the longevity of CFCs in the atmosphere would guarantee that such extreme holes would be around for much of the next century. And things could get even worse before international controls on CFCs take hold. Further increases in CFC concentrations might cause the ozone hole to extend upward or outward, Schoeberl says.

If the hole grew, it would bulge over more of the Antarctic Ocean, push toward the southernmost population centers of the Southern Hemisphere, and greatly increase the volume of ozone-depleted air dispersed over the hemisphere each year. That would increase the exposure of the hemisphere's human populations and marine ecosystems to the possibly damaging effects of ultraviolet radiation. Schoeberl does not expect such hole expansion in the next few years, but he is not so sanguine about the mid to late 1990s.

■ RICHARD A. KERR