

unknowns and concluded that even given these unknowns, "there is a 3 out of 4 chance that continued release of CFM's at the 1977 level will result in an ozone depletion that lies in the range of 9% to 24%."

The panel realized that the scope of their study was limited. They considered only two halocarbons, F-11 and F-12, because all others that are released into the atmosphere are removed, to some extent, in the troposphere by HO radicals, with the exception of methyl chloride, methyl chloroform and F-22 (CHClF₂). Appreciable fractions of these three substances do reach the stratosphere and contribute to ozone destruction. They were not considered, however, because the fraction of these chemicals that reaches the stratosphere depends on the HO concentrations in the troposphere, which are only poorly known. "If the rapidly increasing use of F-22 and methyl chloroform continues unabated," the panel said, "the release rates and atmospheric behavior of these compounds will require careful attention. However, since chemical reactions remove appreciable fractions of these compounds before they reach the stratosphere, substitution of F-22 for F-11 and F-12 would be beneficial."

The group also admitted that "it is difficult to project accurately the effect of increased halocarbon release when the release of other man-made pollutants may also be increasing in an undetermined way. A moderate increase in stratospheric NO_x resulting, for example, from increased use of nitrogen fertilizers, would reduce the effect of halocarbons on ozone because of the coupling between ClO_x and NO_x chemistry and would increase the ozone amount at lower altitudes." Carbon dioxide, they said, could also offset the decrease caused by halocarbon release to a small degree by cooling the stratosphere and thereby increasing stratospheric ozone.

The UK Department of the Environment released a parallel report on ozone depletion almost simultaneously with the NRC's. *Chlorofluorocarbons and their effect on stratospheric ozone*, the report put out by the UK, took essentially the same data as did the NRC group but drew from it significantly different conclusions. Although they agreed with the NRC that, if the projected ozone depletion is calculated from available data a 16.5% depletion is derived, the British argued that such calculations are really not reliable at this point, because "basic scientific understanding, although progressing rapidly, is still inadequate in many respects."

The UK group also placed less importance on the role of ozone levels in determining climate than did the NRC group.

The reliability of the available models was another source of conflict: "...dis-

crepancies between model calculations and measurements bring into question the validity of the models presently used to predict ozone perturbations," the UK group said.

Finally, the two groups reached different conclusions about the uncertainties associated with the estimates. The British assert that the uncertainty range may have actually increased, not decreased as the NRC claims, since 1976. "It is not possible to assign numerical values to the associated uncertainties and this limits the reliance that can be placed on current models for predictive purposes."

Schiff, head of the NRC panel, told PHYSICS TODAY that the discrepancies between the NRC conclusions and those of the British report can be partly attributed to the fact that his panel had access to some more recent data than did the group in the UK. Also, the British group, he said, tended to focus its attention on the relatively few shortcomings of the models, rather than their successes.

The United Nations Environment Program committee on the ozone layer last November lent tacit support to the NRC's document by recommending additional action to reduce chlorofluoromethane emissions significantly.

A second NRC report, *Protection Against Depletion of Stratospheric Ozone by Chlorofluorocarbons*, estimated that a 16.5% reduction in ozone would eventually result in several hundred thousand additional cases of nonmelanoma skin cancer each year and several thousand additional cases of melanoma in the US alone. The report stresses the need for international cooperation in controlling ozone depletions and highlights the rapidly growing nonpropellant uses of CFC's.

—MEJ

NSF to support eight new regional facilities

The National Science Foundation has awarded a total of \$11.39 million to eight universities for the establishment of regional instrumentation facilities. This brings the number of such facilities established under the two-year old program to 14. The program makes sophisticated instruments broadly available, taking advantage of the economies that result from sharing such instruments.

Arizona State University was awarded \$1.5 million for a high-resolution electron microscopy facility that will include capabilities for scanning transmission and analytical microscopy with a resolution of around 3 Å and a computer-based theoretical approach for image interpretation. John Cowley, Peter Buseck, LeRoy Eyring and John Spence will direct the facility.

Sunney Chan will direct a \$1.2-million very high-field (11.7–12.9 tesla) nmr

spectroscopy facility at Caltech. This facility will allow studies on organometallic compounds, membranes, molecular recognition of DNA and other biological systems.

The University of California, Berkeley, and Stanford University will get \$1.8 million to establish the San Francisco Laser Center. It will include a laser lending library to provide state-of-the-art lasers for use in an investigator's own laboratory. Research to be conducted at the facility includes metal combustion processes and multiphoton dissociation of molecules. The laser center will be directed by Yuan Lee and Bradley Moore of Berkeley and John Brauman and Richard Zare of Stanford.

The University of Illinois, Urbana, received a \$1.4-million grant for a high-resolution nmr spectroscopy facility to be directed by Herbert Gutowsky and Eric Oldfield. It will include capabilities for three spectrometers, solid-state "magic-angle" experiments, large sample multinuclear operation, cooled-coil and cooled pre-amp high-sensitivity probe and ¹H, ²H and ¹³C operation.

Michael Feld will direct the Northern Regional Center for Laser Spectroscopy and Dynamics at MI. Costing \$1.5 million, it will include capabilities for state-of-the-art pulsed and continuous sources of laser radiation from the far infrared to the near ultraviolet.

Montana State University received \$1.4 million for a facility for surface science and submicron analysis. It will allow x-ray and ultraviolet photoelectron spectroscopy and scanning Auger microprobe and many ancillary measurements. Gerald Lapeyre will direct the laboratory.

The University of Minnesota will establish an Upper Midwest facility for surface analysis with a \$1.4-million grant. Lanny Schmidt and Robert Hexter will direct the facility, which will emphasize epitaxial film growth as well as scanning Auger microscopy and x-ray and uv photoelectron spectroscopy.

Yale University will establish a facility for high-field (11.7–12.9 tesla) nmr spectroscopy with its \$1.2-million grant. Biochemistry and biophysics research will be conducted there, including metabolite transport, DNA-protein binding and properties and structure of steroids and macromolecules. A. Lyons, D. Crothers, J. Faller, J. Prestegard, M. Saunders and I. Armitage will direct the facility.

in brief

The 107-ton, 18-kG superconducting magnet that operated at Argonne's 12-foot bubble chamber will become part of the high-resolution spectrometer at PEP, saving an estimated \$5 million and three years construction time. □