This leads to a clear philosophical distinction which appears to be at the basis of the differences between Rowland and Molina and the fluorocarbon industry. There is, on the one hand, the review involved in the refereeing of published papers and, on the other hand, the much more stringent test of nature. Thus one hears statements to the effect that the theory has been around for a year and no one has seriously challenged it. This is somehow regarded as establishing its validity, which, of course, it does not. Similar reasoning is implicit in the statements in the Rowland-Molina letter concerning removal mechanisms and heterogeneous processes.

All of the above would indeed be academic if it were not for the fact that Rowland has asked for a fluorocarbon ban. This is the stage at which the implicit assumption of correctness of the conclusions enters the picture. If that is not the case, how is it that other eminent scientists, not related to industry, have said the evidence is not conclusive and a ban is premature?

It is clear that experiments can be performed to validate or invalidate the theoretical conclusions and that no undue risk is involved in taking the time to perform them. Large-scale government and industry programs are under way. Under these circumstances, reason would appear to dictate that we should permit science to pursue its normal course to enable public policy-makers to make informed judgments based on fact.

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References and Notes

1. A value of 280 percent has been calculated using the original (*2*) set of HO_2 rate constants (N. D. Sze, personal communication).
2. S. C. Wofsy, M. B. McElroy, N. D. Sze, *Science* **187**, 535 (1975).
3. M. J. Molina and F. S. Rowland, *Nature (London)* **249**, 810 (1974).
4. ———, *Geophys. Res. Lett.* **1**, 309 (1974).
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The "Greenhouse Effect"

The term "greenhouse effect" continues to be incorrectly applied to the effect of the atmosphere in warming the earth's surface by absorbing and reradiating infrared radiation. In fact, because of the importance of understanding climatic change (including man-induced change), use of the term is becoming part of "accepted knowledge" (*1*).

The facts as they relate to the atmo-

sphere is largely transparent to the sun's radiation, but is largely opaque to the infrared radiation emitted by the earth's surface. Much of the energy absorbed in the atmosphere is radiated back to the earth with the result that the mean temperature of the earth's surface is about 35°C (63°F) higher than it would be if the atmosphere were absent. Glass also absorbs infrared radiation while transmitting visible radiation—hence the term "greenhouse effect."

However, greenhouses are warmer than the surrounding air because the glass prevents the warm air inside from rising and removing heat from the greenhouse. Absorption of infrared radiation by the glass contributes only a little to the warming effect. Polyethylene sheets, even though they are largely transparent to infrared radiation, are just about as effective as glass in greenhouses. The essential facts were established by a simple experiment carried out by Johns Hopkins University physicist Robert W. Wood in 1909. He found that two model greenhouses, one covered with glass and the other with rock salt (which is transparent to both short- and long-wave radiation) reached very nearly the same high temperatures. Thus the "greenhouse effect" results from suppression of vertical convection by a rigid lid.

Persistence of the term "greenhouse effect" in the face of verified fact is an interesting phenomenon in its own right. Perhaps we feel more comfortable with the illusion that we live within a rigid protecting envelope. However, it should be noted that agriculturalists, who are well aware of how greenhouses work, do not apply the term "greenhouse effect" to the atmosphere.

In 1963 we proposed in a textbook (*2*) that the term "atmosphere effect" should replace "greenhouse effect" as applied to the atmosphere. The suggestion has had no detectable effect on popular or scientific literature. So long as references to the "greenhouse effect" appeared only rarely in the literature, misconceptions engendered by the term probably were of little consequence. But in view of the greatly increased interest of the radiative properties of the atmosphere, it is time that scientists correct their misconceptions and clean up their language.

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References and Notes

1. See, for example, "Micropedia," in the new *Encyclopaedia Britannica* (Encyclopaedia Britannica, Chicago, ed. 15, 1975), vol. 4, p. 718; H. A. Wilcox, *Hothouse Earth* (Praeger, New York, 1975).
2. R. G. Fleagle and J. A. Businger, *An Introduction to Atmospheric Physics* (Academic Press, New York, 1963).