

In arguing for an aerosol ban, Dr. Sherwood Rowland is up against a \$9 billion industry.

IN HIS OWN

## WORDS

### **WHY BAN AEROSOL SPRAYS? A NOTED CHEMIST TELLS HOW THEY ENDANGER THE OZONE—AND US**

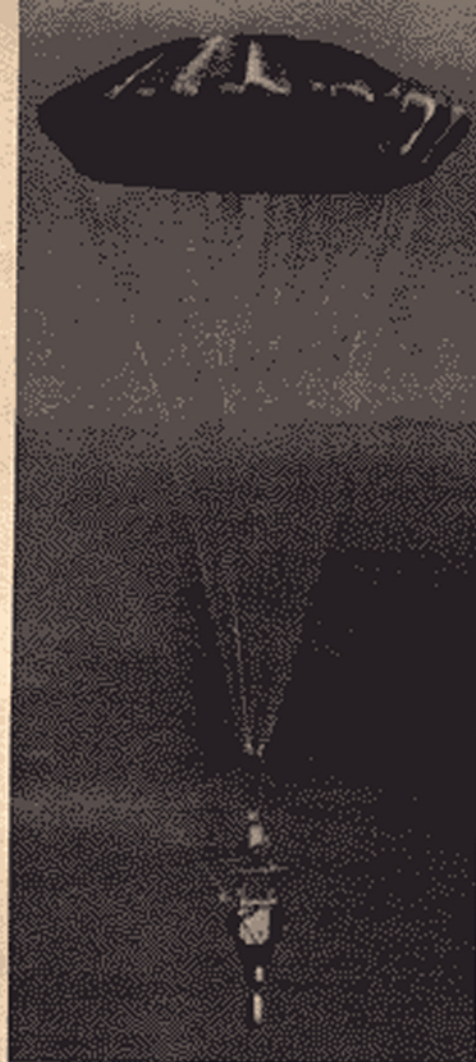
*When the "Rowland-Molina hypothesis," which claims that the fluorocarbons in aerosol sprays are damaging the stratospheric ozone, first hit the headlines two years ago, chemistry professors F. Sherwood Rowland and Mario Molina were plunged into the kind of public controversy few academicians experience. Their findings*

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were called a "planetary time bomb." Fluorocarbon-related industries, which are led by Du Pont and represent about \$9 billion in goods and services, predictably questioned the Rowland-Molina findings. Few critics, however, could fault the credentials of the two scientists. Molina, 33, is assistant professor of chemistry at University of California-Irvine. The senior member of the team, Rowland, 49, came to the Irvine campus in 1964 as the first chairman of its chemistry department. Son of a math professor and a Latin teacher, he went from Ohio Wesleyan to a Ph.D. in chemistry at the University of Chicago and taught at Princeton and the University of Kansas. Four weeks ago the National Academy of Sciences issued a report verifying the conclusions of the two researchers, thus assuring some future ban on the use of fluorocarbons. Professor Rowland spoke with S. J. Diamond of PEOPLE.

**T**he ozone layer is called the earth's "protective shield." What is it exactly, and what is its value to us?

The presence of ozone really defines the stratosphere, the layer of the atmosphere which exists roughly be-



Evidence that fluorocarbons are destroying the ozone is gathered by devices dropped from balloons at 150,000 feet.

tween eight and 30 miles above the earth. There ultraviolet radiation from the sun has converted the normal two-atom molecule of oxygen into a molecule with three atoms, or ozone. We are normally not exposed to this particular ultraviolet radiation; much of it is screened out by the ozone, which converts it into heat. In this way the ozone layer may affect our temperature and climate as well.

*How do aerosol sprays damage ozone?*

The problem is that certain propellants in aerosol sprays, known as chlorofluorocarbons, are chemically very unreactive. They persist in the earth's atmosphere instead of being chemically broken down and washed out by rain. These fluorocarbons just keep rising until they get above the ozone, where the radiation is capable of breaking them apart. By a series of chain reactions, the chlorine atoms thus released take the extra atom from a lot of ozone molecules, converting them back to oxygen. In a word, that means less ozone.

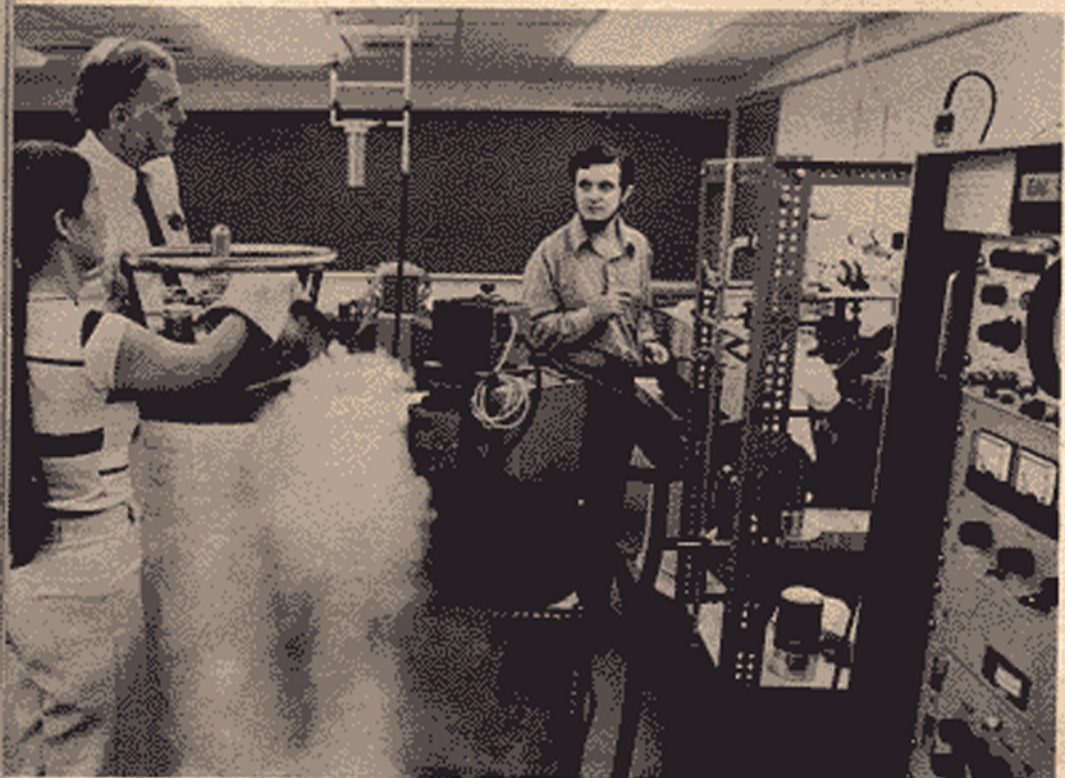
*What effect will this depletion have?*

As you know, some ultraviolet radiation does reach the earth, causing sunburn and sometimes skin cancer. The extra radiation which will get through if we deplete the ozone will cause an increase in skin cancers. We can also expect changes in temperature and climate. And we're only starting now to worry about its effect on other life—from cattle to corn to plankton in the sea.

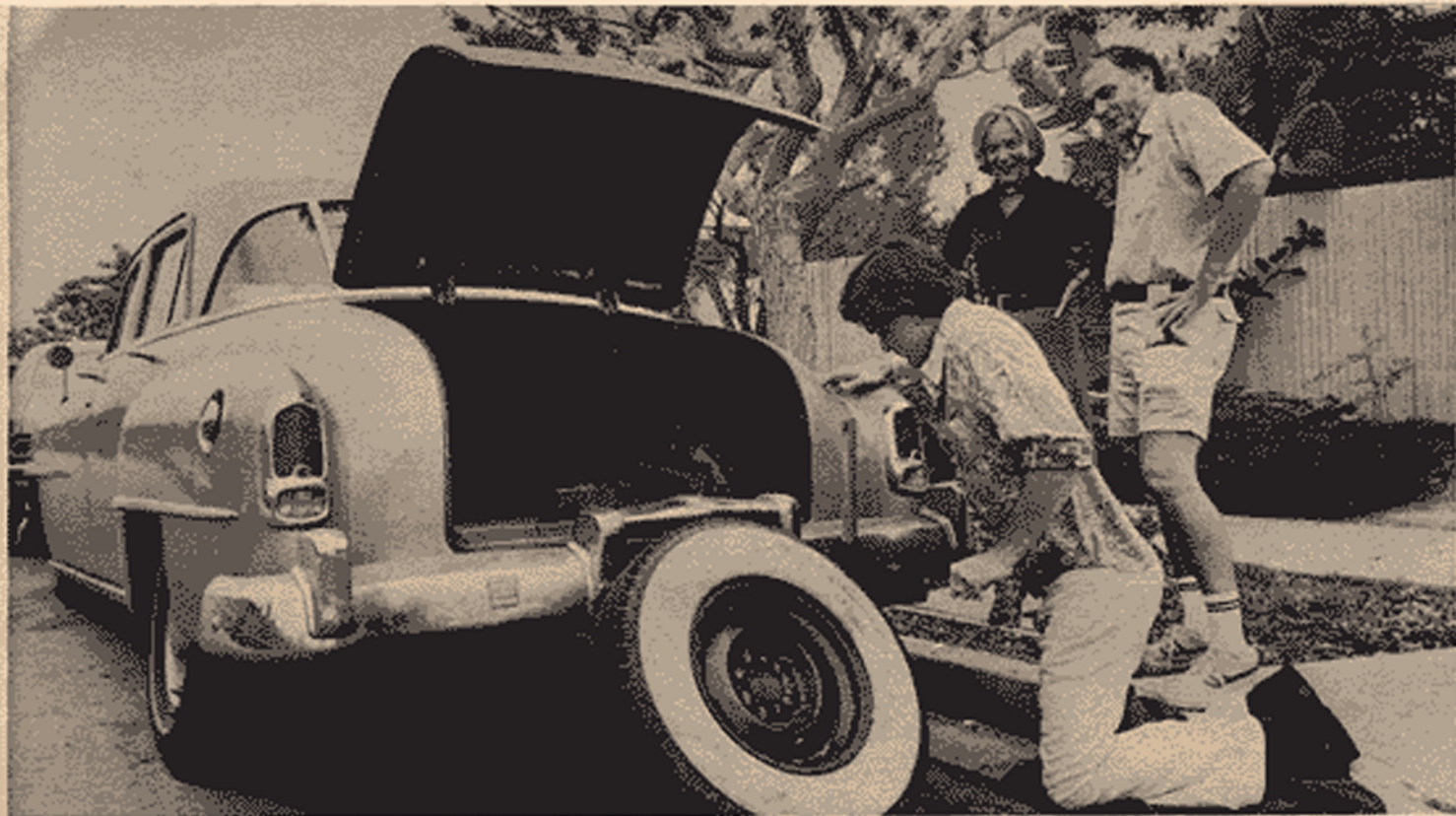
*Is any damage already occurring?*

We calculate now that about one-half to one percent of the ozone layer has already been destroyed. This would rise to between seven and 13 percent in the next century if fluorocarbons continue to be released at their current rate. Right now, almost a million tons a year are going into the atmosphere, the greatest part of that from aerosol sprays, and half of the total from usage in this country. If the use of aerosol sprays were to increase 12 or 13 percent a year, as was the case until 1974 when sales leveled off, the ozone depletion would be even greater.

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Rowland visits his colleague, Prof. Mario Molina (right), and Molina's chemist wife, Luisa, in their research lab.



Sherwood and Joan Rowland kibitz as son Jeff, a 21-year-old applied science student, changes a tire on his 1952 Chrysler.

#### **Words** CONTINUED

*What has been the reaction to your information?*

We first took it to the scientific world with a paper in June 1974 which drew little public attention. But our presentation to the American Chemical Society in September 1974 got widespread coverage. Then the National Academy of Sciences called together a committee, which said this was a serious problem that should be looked into. In December 1974 there were congressional hearings which recommended study, and in June 1975 a federal task force again found cause for serious concern. It said that if the National Academy of Sciences confirmed the scientific aspects, we should consider regulation. The NAS did confirm them and though it did not fix a time for the ban on aerosols, it indicated one was inevitable. Russell Peterson, chairman of the President's Council on Environmental Quality, and the federal task force have now both called for immediate action on restricting the use of fluorocarbons.

*Why no action when so many scientific studies and hearings have confirmed the danger?*

The value of this industry in the U.S. is more than \$9 billion a year and that buys a lot of advertising and lobbying.

*Are the scientists within the industry biased?*

I don't want to say that. I will say that I once read a statement in the paper by a Du Pont spokesman who said, "We welcome the scientific interest to develop hard experimental facts about fluorocarbons and the atmosphere. We believe that when this data is in hand it will exonerate fluorocarbons." I'm happier when people do experiments and then reach conclusions, rather than vice versa.

*Are there still any solid arguments against the Rowland-Molina hypothesis?*

There have been several popular ones. The industry at first said there were no real measurements of fluorocarbons in the stratosphere, that we were only guessing they were there. But now we have hundreds of measurements proving they're there.

*The disagreement at this point, then, is not with your hypothesis but with the need for a ban on aerosols?*

I think so. There is general scientific agreement on the dangers—if not their precise severity—but no one wants to be responsible for a decision to ban. The NAS confirmation of our findings, however, may be persuasive.

*Industry is still calling for "additional studies." Are they necessary?*

The call for two or three years' more study has been customary since the

beginning. It's always true we'll know more about the problem in the year 2000 than we do now, but I don't recommend waiting till the year 2000 to order the ban.

*Is there a point of no return when it will be too late?*

That's incalculable because the effects are delayed: not only do fluorocarbons take time to rise into the stratosphere, but some of the potential harm comes after the ozone depletion. Once a ban is ordered, the ozone depletion will continue to worsen for about a decade as the fluorocarbons already in the air slowly rise.

*Could the ozone replenish itself?*

Ozone is being removed and renewed by natural means constantly. But in the presence of fluorocarbons, it's removed faster and the natural balance is disturbed. The amount of ozone will come back to normal only when the fluorocarbons are gone. Even if we stop using them now, that will take more than a century.

*Who is ultimately responsible for the decision to stop using fluorocarbons?*

There are various levels of responsibility. Consumers en masse can certainly have an effect, since so many of the products using fluorocarbons

## Words CONTINUED

are for personal use, and the companies involved will be sensitive to public opinion. It's hard to conceive of manufacturers putting much effort into marketing aerosol products that could be illegal in three years. State and federal regulations can establish restrictions on usage, selective or total.

The greatest advantage in federal regulation would be its exemplary effect on other countries, which produce half the total fluorocarbons.

*Has voluntary action—in the face of no regulation—had any effect here yet?*

The consumer has obviously been using his vote. Sales of aerosols substantially decreased in 1975, while sales of alternative products—roll-on and pump-valve deodorants, for example—have increased rapidly. Manufacturers are also switching to propellants like hydrocarbons, which are already used in shaving creams and paints.

*Has your own family stopped using aerosols?*

Very early on, my wife, Joan, went through and cleaned out the house. We counted 15 different aerosol cans. Most people have even more; an estimate of 3 billion cans sold in the U.S. in 1973 comes out to 15 per person. As a family of four, we should have had 60 for the year. Aerosol deodorants, hair sprays, room fresheners and oven cleaners are not exactly essentials of life, and replacing them with alternative products is no great strain. □



At U.C.—Riverside 100 professors and graduate students turn up to hear Rowland guest-lecture on the stratosphere.


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