

# Drawing a bead on air pollution

**Sulfur oxides are singled out for the first of a series of five-year depollution plans**

The oxides of sulfur are the second largest component of air pollution after carbon monoxide. Together the two pollutants account for approximately 80 percent, by weight, of all the pollution in the air over the United States.

Of the two, carbon monoxide is by far the most amenable to control. Ninety-five percent of all carbon monoxide comes from motor vehicles. Thus, control of this pollutant takes the rather straight-forward approach of limiting the emissions from vehicles. Essentially, the Federal Government tells automobile and truck manufacturers the maximum amount of carbon monoxide that can be emitted from new vehicles and all new cars are built to the standard.

**Controlling sulfur** oxides, however, is far more complex. Sulfur oxide pollution comes from such diverse sources as power plants, factories, apartment houses and private homes. The only common denominator in sulfur oxides pollution is that 85 percent of it results from the combustion of fossil fuels (oil, coal and gas), with coal being responsible for 60 percent of the total. But the multiplicity of sources of fossil fuel burning, combined with the wide variety of combustion equipment used, complicates control.

Further, methods of control which are good for large sources of sulfur oxides, such as power plants, are not economically justifiable for small sources, such as medium-sized or smaller apartment buildings. A good example of this incompatibility is the technique of reducing sulfur oxides from stack gases. It is feasible for large-scale combustion units, but costs too much for small and intermediate units. Smaller units do not generate sufficient sulfur oxides to make sulfur recovery economically attractive.



Salt Lake City Tribune  
*Smog over capital at Salt Lake City threatens health of man and plant.*

It is for reasons like these that the National Center for Air Pollution Control of the Department of Health, Education and Welfare, which is responsible for coordinating the country's air pollution control efforts, has singled out sulfur oxides as the first of a series of pollutants for which five-year programs are being designed.

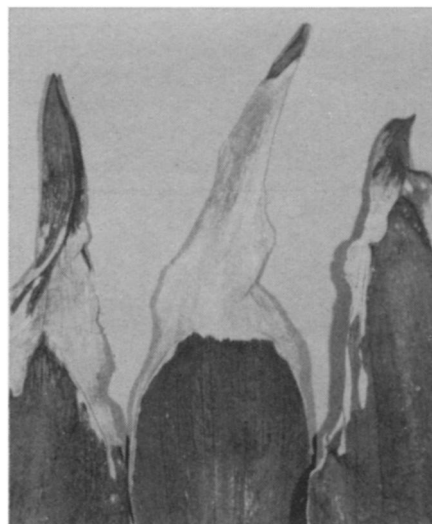
**The sulfur plan** outlines how \$255.6 million would be spent during the next five years on Government-funded projects for controlling sulfur oxide pollution. Similar plans for other pollutants will be issued over the next few years.

Assistant HEW Secretary Philip R. Lee says, "Nearly 30 million tons of sulfur oxides will be released into the nation's atmosphere this year," and this figure "will double by 1980 unless effective control methods are used." Lee told a Congressional subcommittee investigating pollution control programs that sulfur oxide pollution "contributes to the occurrence and worsening of such diseases as bronchial asthma, bronchitis, and emphysema," as well as damaging property and vegetation.

Dr. Lee and other Government and industry specialists agree that little progress had been made in controlling sulfur oxides pollution. But in testimony before the committee they agreed that the solution was massive spending and better coordination of government and industry efforts.

Speaking of air pollution control in general, Ron M. Linton, a management consultant retained by HEW said, "We have to be thinking of research and development spending at the level of hundreds of millions of dollars for air pollution control and abatement."

The five-year plan of HEW divides



Rutgers University  
*Sulfur dioxide injury to tulips.*

the methods of controlling sulfur oxide pollution into six broad categories: reducing the sulfur content of the fuel before it is burned; removing the sulfur oxides during the combustion process; removing the sulfur oxides from gases while they pass up the smoke stack; mitigating the effects of sulfur oxides by the use of tall stacks which will enable the sulfur oxides to be dispersed by winds over a wider area; conversion of coal to liquid, gaseous or modified solid fuels, and of oil to gaseous fuel which will reduce sulfur content, and the development of processes for the control of sulfur oxides from specific industries.

Says Lee, "To cope effectively with the sulfur pollution problem, the nation must have available a variety of techniques," for controlling sulfur oxides within the categories of methods outlined in the plan.

The development and implementation of these techniques takes time and money. Presumably, more money would mean less time.

Low cost nuclear power is a long-range solution to sulfur oxides pollution. But, says Lee, the rate of increase in nuclear power plants is such that they will not halt the increase in sulfur oxides emissions until late in this century. ◇

## CRACKED EGGS

### The case of the tip-toeing hens

Far too many hens, these days, are drawing themselves up to their full height and standing on tiptoe when in the act of laying an egg. An egg thus fecklessly laid has a fall of about seven inches to the floor of the nesting box. So hundreds of millions of eggs every year are cracked on touch-down, have to be downgraded, and cost Britain's egg and poultry industry something over \$5 million.

**This is one** of the conclusions emerging from the observations at the Agricultural Research Council's Poultry Research Center, at Edinburgh, Scotland, where 1,000 hens in individual cages have been having their production lines plotted over the past few months.

The center's director, Dr. Thomas Harper, explains that it had been discovered that certain individual hens lay a high proportion of cracked eggs; one had a personal tally of 56 percent damaged eggs.

"We have an interesting character of a hen here," he continues, "which will lay only when standing at full stretch, with its head over the barrier into its neighbor's cage. Other curious behavioral patterns have emerged—birds, for example, that will lay only when facing in a certain direction, or put their eggs down in exactly the same spot each time."

**The causes** are being studied. What of the cure? "Well, by keeping detailed records of egg production for one month, the poultry farmer could detect the sinners and wring their necks. However, I've already been criticized for suggesting this.

"Another possibility is that hens could be disciplined and put into smaller boxes which would not allow them to stand up fully. But then the animal welfare people would be right on top of us."

And so for the moment the team's thinking is following this line: make the hens lay eggs with stronger shells, so that they can tip-toe around to their heart's content. Meanwhile, the mass of research data is to be fed into the inevitable computer.

## RARITY AND TRAGEDY

### To the limits of the knowable

It is rare, in scientific investigation of the past, for anyone to discover a limit. There is always the chance that something older, deeper, bigger, smaller or more basic will be turned up in the next spadeful of dirt. Recently, however, rock samples chipped from the mountains of Rhodesia have revealed traces of what may be not only the oldest life forms ever found, but the oldest that ever will be found.

**The samples** were collected from an exposed edge of a layer of rock called the Onverwacht, which dates back more than 3.2 billion years and is believed to contain the oldest exposed, well-preserved sedimentary rock beds on earth. They were gathered to provide raw material for a training project to aid researchers at the University of Arizona's department of geochronology, who plan to apply similar life-hunting methods to pieces of lunar rock brought back from the moon by Apollo astronauts.

**The investigators** hoped to find fossilized remnants of primitive one-celled algae. Because some of the objects were expected to be as small as one ten-thousandth of an inch, the processing of the samples was done in clean rooms designed to keep out even the tiniest forms of contamination.

After being cleaned with high-frequency sound waves, some of the samples were sliced into layers so thin they were transparent, then fastened to glass microscope slides, while others were powdered and cooked in hot acid to remove the surrounding material.

Examination revealed thousands of tiny objects, some of them spherical, some filament-like, some cup-shaped.

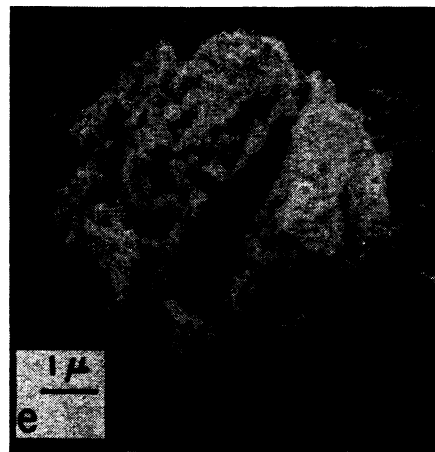
Physically, they appear indeed to be microfossils, the oldest surviving remains of earth's earliest creatures. Preliminary chemical analysis has added evidence by revealing compounds that are commonly found in the presence of life. But the conclusion is far from foregone.

## AFTER FALSE ALARM

### Galactic magnetism proved

When Dr. Karl G. Jansky discovered radio waves from the Milky Way in the early 1930's, the suggestion was that their polarization was due to electrons in the intervening magnetic field. The observed polarization of light waves due to the alignment of dust particles by interstellar magnetic fields is another method by which the existence of a galactic magnetic field has been inferred. But the field itself had

"There is no assurance at all that life had evolved by the Onverwacht time," says Dr. Bartholomew Nagy of the University of Arizona. The filaments, for example, could have resulted from deposits of sediment along planes and fissures in the rock, while the other shapes could have had similarly nonbiological origins. Also, the fact that chemical compounds in the samples have been associated with life does not necessarily mean that life was required to produce them.



Science

*The oldest creature ever to be found.*

If the traces are the remnants of life, however, they may mean that man will never be able to reach back to the very first signs of life on the planet. Finding life signs in the ancient Onverwacht would mean that the origins of life presumably occurred in still older rocks, which, the researchers believe, have been destroyed by millions of years of heat, pressure and upheaval from the evolving earth.

That the tiny objects were once life forms has in no way been established. If they were, however, and if the limit of man's discovery has indeed been reached, it is at once a rarity and a tragedy.

never been measured directly, although upper limits had been set for it.

In the early 1950's, Dr. J. P. Wild, an Australian radio astronomer, and I. S. Shklovsky of the Sternberg Institute for Astrophysics in Moscow independently suggested that the splitting of radio waves from regions of the Milky Way containing huge clouds of cold, rarefied hydrogen would provide a way of pinning down the existence