

Public Misconceptions
of Air Quality
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*Air quality interest and demands
have surged ahead
of facts, feasibility and technology*

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PLAINTIFF'S
EXHIBIT

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DURING the past decade there has been an extraordinary increase in newspaper and magazine articles concerning air pollution. It is fair to say that the subject has been one of the half-dozen favorites for public discussion.

In 1967 a bothersome smog in Los Angeles rates newspaper headlines, whereas in 1957 that ventilation-deprived city's peculiar photochemical smog was hardly known to the rest of the country except via TV comedians' jokes. Today everybody talks about air pollution—and they're serious.

One may speculate whether the heightened public interest is caused by a real and alarming increase in air pollution or whether the interest is more the result of a public information campaign that has been enormously effective. If publicity caused the interest, one could say that the press has created more pollution than any real sources. But to be fair, it would have to be said that the press has created more pressure for controls, and has thereby accomplished more control, than much legislation and expensive research. Public pressure can indeed be effective. For example, one small plant installed a several hundred thousand dollar device to eliminate a harmless but conspicuous stack plume mainly to get relief from finger-pointing and telephone calls. Whatever the genuine reasons for the mounting public interest in air quality, it is clear to those who work in environmental science that interest and demands have surged ahead of facts, feasibility and technology. Many people have mistaken ideas about our air situation and what can be done toward improvement.

Air pollution cannot be measured by sight

Probably the most common fallacy among the public is that the degree of air pollution of an area can be judged accurately by sight. If this were true, everyone could be an expert in measuring air quality and in identifying the principal pollution sources. But it is not possible to do so.

Consider the suspended particulates in the air. These may be dusts from the mechanical disintegration of matter, such as the crushing and grinding of rock. Or they may be soil particles lifted from the ground by

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wind or by the passage of motor vehicles. Or they may be particles abraded from rubber tires.

Particulates may be fume from the vaporization and oxidation of metals, as in arc welding. They may be particles formed by interreaction of gaseous compounds in bright sunlight—photochemical smog is an example. They may be smokes from the condensation of vapors to either liquid or solid particles of very small size—about five microns to less than 0.1 micron. Cigarette smoke, incidentally, has a median particle diameter of 0.16 micron and a maximum size slightly above 0.5 micron. Effective filtration, as one would expect, is somewhat difficult.

Then there are the mists, classed as liquid droplets of 10 microns and up. If mist becomes sufficiently concentrated, it is called fog.

It is apparent that particulates alone are a mixture of widely different aerosols. They give optical effects that depend on their chemical composition, their sizes and shapes, as well as on their concentration. They may serve as condensation nuclei for moisture and their sizes will vary with the relative humidity.

The intensity and wavelength of incident light will alter their appearance as will a view by transmitted light rather than reflected light.

Beautiful sunsets occur because normally airborne particulates scatter blue light from the sun's spectrum and transmit yellow and red. On rare occasions, however, the reverse has happened because particulates were of the right size, and blue sunsets have occurred. The complete absence of air pollution would result in colorless sunsets. No doubt there are some who would prefer pollution.

There are many examples of misleading impressions of air quality based on observation alone. The air in homes, for example, seems pure in diffuse light, but dust is obvious when a shaft of sunlight enters a darkened room or when the furnace filter is checked after a few weeks of service.

At a hearing of the Senate Subcommittee on Air and Water Pollution held in Los Angeles last February in the city's Hall of Administration, there was excellent ventilation. The air was clear. Yet an instrument I had with me consistently recorded a count of five to seven million particles per cubic foot of air. This is roughly 50 times the count one would obtain out in the country.

It is difficult to notice pollution in the middle of a city where vision is restricted by surrounding buildings. But from a top floor office window a view of dis-

tant mountains may be completely obscured by smog. The point is that through a distance of 20 miles or more a minute concentration of airborne particles hampers visibility. The actual pollution is negligibly small; the effect is pronounced.

The eye, then, provides only a rough estimate of particulate pollution—and no estimate at all for invisible gases such as carbon monoxide. It is evident that sophisticated methods of air sampling and analysis must be used to get true measurements of air quality.

Panic legislation not justified

Whether fostered by newspaper articles or by conservation, there is widespread belief that air pollution is rapidly getting worse, that unless we take prompt and precipitous action, we shall be smothered in atmospheric wastes. Surgeon General Stewart and John Middleton, director of the National Center for Air Pollution Control, both so indicated in testimony before the Senate Subcommittee on Air and Water Pollution last April. Their assertions are not supported by data collected by their own employees—members of the staff of the National Center.

According to the Department of Health, Education and Welfare publication, "Air Quality Data from the National Air Sampling Networks," the annual geometric mean concentration of suspended particulate in all cities sampled in 1957 was 120 micrograms per cubic meter of air. (This is approximately the weight of one-in. length of human hair.) Concentrations were somewhat lower in 1958, 1959 and 1960 and barely over 100 in 1961, continuing at that level in 1962 and 1963. There was a rise to 107 in 1964, 106 in 1965.

In 1962 through 1965, concentrations of gaseous pollutants were measured continuously by HEW in seven major cities—Denver, Philadelphia, Chicago, San Francisco, St. Louis, Cincinnati and Washington. Concentrations of carbon monoxide, nitrogen oxides, sulfur dioxide, hydrocarbons and total oxidants were fairly uniform overall. There were no signs whatever of significant trends upward. All average concentrations were well below levels known to affect health.

An article in the *Scientific American* for August reported that the U.S. Weather Bureau recently studied records of visibility at major municipal airports for the years 1945 through 1965. Contrary to expectations, it was found that smoke reduced horizontal visibility at those airports fewer times in 1965 than it did in 1945.

I submit that the record does not show an alarming trend to air pollution that would justify panic legislation, extravagant spending, impractical air quality standards, and crash programs. Present air quality at many locations is not satisfactory and progress must be made toward improvement. But it can be made in time to do it in an orderly and sound way.

Health risk of SO₂, debatable

In several areas of the country it has been decreed that only low sulfur fuels may be used. High sulfur coal and oil are banned. The inference is, and the public

seems to believe, that sulfur dioxide from fuel combustion is the dangerous compound among the innumerable pollutants, and that, regardless of cost, SO₂ levels in ambient air must be reduced.

Sulfur dioxide is indeed a common pollutant and it has been present for hundreds of years. There is sharp disagreement among authorities, however, that sulfur dioxide, in the low concentrations in which it is found in cities, offers any kind of a health risk to humans. Dr. Patrick J. Lawther, director of the Air Pollution Research Unit of England's Medical Research Council, says flatly that SO₂ is highly overrated as an air pollutant. Lawther and his colleagues have for the past 13 years been conducting studies—soon to be published—on human responses to SO₂. In sum, their research has failed completely to identify SO₂ as the cause, or as a contributing cause, of the excess deaths recorded in London during the severe pollution episodes of 1952 and 1962.

A few weeks ago I visited with Dr. Lawther and asked him whether any very recent findings had changed his opinion on SO₂ and its effect on city dwellers. He said there had been no new discoveries to change his views. Further, he expressed some regret that SO₂ had proved not to be the lethal agent in London pea-soupers, for if it had, he said, his tedious search would be ended.

Why the emphasis on sulfur dioxide? Probably because it has long been known to injure vegetation exposed to sufficient concentrations under the right con-

ditions, and, more probably, because it is the easiest pollutant to measure continuously, accurately, and inexpensively. An automatic SO₂ analyzer invented by Dr. M. D. Thomas, has been available since 1928. All air pollution studies conducted in the last 40 years have begun with SO₂ measurements. Some studies relied on SO₂ data almost exclusively as indicators of air pollution.

So SO₂ became an accepted yardstick of pollution, but it is completely wrong to credit the yardstick with effects that may be caused by hundreds of accompanying pollutants. Inversions and calms which cause periods of heavy urban pollution permit the accumulation of all pollutants, not just SO₂.

No less a person than the Surgeon General fell into the common trap in testifying before a Senate subcommittee on April 19. He commented that a peak of deaths in New York City on December 5, 1966 "was related to a big increase in sulfur dioxide." He did not mention concurrent pollutants. The truth is that no cause and effect relationship between sulfur oxides and increased mortality has been established. Nobody knows what pollutants, or combinations of them, or what other environmental factors—temperature, pressure, humidity—might have been involved.

It is interesting to compare London's severe pollution episodes of 1952 and 1962. In 1952 there were apparently 4000 excess deaths; in 1962 the number was 400. Sulfur dioxide levels, though, were higher in the latter episode. Particulate levels were substantially

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- Spec. Distribution Publication 34. "A Symposium on Industrial Mineral Exploration and Development." University of Kansas, State Geological Survey, Lawrence, Kansas. 181 pp.
- "The Preliminary Geologic Map of Maine 1967." State Geological Survey of Economic Development, State House, Augusta, Me. Price: \$5.00.
- "Anatomy of the Western Phosphorite Field." 103 Utah Geological Survey Bldg., University of Utah, Salt Lake City. Price: \$12.50.

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higher in 1952. These facts implicate particulates and other factors rather than SO₂.

Little evidence to indicate long-term health effects

The public has been led to believe that air pollution not only causes acute disease and death, but that it has subtle effects which may produce disease over the long term. The strategy of the promoters of hasty legislation and control programs has been to frighten people in order to gain their support. In a recent television program, "Take a Deep, Deadly Breath," the tragedy of a young father with emphysema was portrayed at length. It was implied that polluted air caused the emphysema. The fact is that the true cause of emphysema is unknown. The disease has been related to heavy cigarette-smoking, to chronic bronchitis, and to hay fever and asthma. But there is no evidence that a single case of emphysema has been caused by urban air pollution! There is but little, controversial evidence that urban pollution causes any significant long-term health effects.

Pollution alarmists, through ignorance or intent, fail to mention the body's magnificent natural defenses against airborne contaminants. Everyone is born with a nose and throat which help clean and condition inhaled air. We have in a mucous blanket lining our air passages which traps foreign substances. We have ciliated cells which move the mucous blanket upward to be expelled. We have the cough reflex to forcefully rid ourselves of an irritant. Unless they are overwhelmed by gross amounts of harmful pollutants or are injured by infectious disease, these defenses last all our lives. If we did not have these defenses, our ancestors could not have survived natural dust storms and the smoke of their campfires.

Air pollution control efforts are pushed in the name of health rather than esthetics or just plain desirability. It is strange then, that little attention is focused on an air pollution problem that doesn't rate headlines but that causes more misery and ill-health than pollution from any of man's activities. I refer to the pollens of ragweed, Russian thistle and a host of other plants which affect directly, and in some cases very seriously, the health of an estimated 12 million people in the United States. I am one of the victims of pollenosis, or hay fever. Some of us who do not receive desensitization treatment, or who do not respond to treatment, will develop more serious breathing problems such as asthma and emphysema. If health is truly so important in the air pollution picture, why not urge weed elimination campaigns of the same intensity and urgency as pollution control campaigns? There is cause for doubt about the sincerity of some advocates of better health through air pollution control.

"The job will be done"

Because I take to task the control enthusiasts who stretch the truth and use fright propaganda to achieve their ends, I do not wish to be counted as one who favors

air pollution. On the contrary I have spent 25 years working toward better control, both of plant effluents to the neighborhood and of smaller scale process effluents within plants. The public is generally unaware of these activities within industry and believes that industry is responsible for most air pollution and is against control. This is a badly mistaken idea.

The company which employs me has been continuously engaged in air pollution research since 1914. As have most other industries, it has installed and improved controls routinely as feasible methods have been developed. Pollution potential has been an important consideration in planning and building new facilities. Admittedly, industry's record has not been perfect. But if it had been there would still be a pall over the larger cities because of high concentrations of automobiles. Transportation, studies have shown, accounts for 60 percent of urban pollution; domestic and miscellaneous sources—such as city garbage dumps—account for 20 percent; and the remaining 20 percent is ascribed to industry. Legislation and publicity appear to be directed disproportionately toward industry! Industry is the whipping boy and shall continue to be for some time. For even if industry were able, technologically and with bearable costs, to get its houses completely in order, it should not expect any substantial improvement in the appearance of urban atmospheres until automobiles with built-in emission controls have replaced those currently on the roads. California cities are ahead of the rest of the nation in this respect. A leveling off and a downward trend in pollution levels have been observed in Los Angeles and San Francisco since the advent there of compulsory crankcase ventilation and exhaust-control devices.

The six to ten years which must elapse before the present auto population is largely replaced by low-emission models will disappoint many people who believe that newly enacted air quality laws in our states will quickly clear the air over our population centers. Laws, boards and commissions will not accomplish improved air quality as much as will technological advances. There are problems for which no feasible solutions are in sight. One of the pressing and universal problems will be how to maintain the low-emission features of the new cars; another is a simple device to measure auto emissions so that inspection systems can be set up to check performance.

Ingenious engineers and scientists eventually will solve these and other problems, but even so city air will not be as clean as that over the oceans or on lonely mountain peaks. Where people live and move, some dusts and smokes must be dispersed, some pollution is inescapable. But fears about long-term, subtle health effects will be laid to rest and acute episodes causing accelerated deaths will be unthinkable. Either through fear or just through a very human desire for a more pleasant world, the people have decided that our city atmospheres need improvement. The job will be done.

A booklet entitled "Public Misconceptions of Air Quality" is available from the American Mining Congress, 1100 Ring Building, Washington, D. C. 20036