



Fig. 12. Los Angeles County pollution control lab studies automotive exhaust problem in a novel way. Cars are driven in traffic and engine operating variables are tape recorded. Tapes are then used to program engine dynamometer in test and simulation studies.

which have been operated since 1953 on an intermittently scheduled basis that has yielded some 4500 samples a year. A little closer approach to the kind of assault that's needed has been provided by a recently activated PHS system of highly automated, computer integrated monitoring stations which provide continuous 24-hr-a-day, every day, measurements of CO, SO₂, NO, NO₂, O₃, total oxidants, and total hydrocarbons—at one location in each of nine cities.

Society, or somebody, must call the shots

Technical needs in pollution research and control activities are in many ways obvious. They can and will be met as soon as sufficient resources are devoted to them. The problems of setting quality criteria for air, and seeing to it that they are enforced, are much more difficult. Solving them requires not only scientific, technical, and medical data and decisions but social and moral ones as well. There's nothing new about this. Society requires many such decisions.

In the field of nuclear energy for example, the Federal Radiation Council was established to assess social benefits versus risks in face of the current overwhelming scientific judgement that there is no threshold or limiting value below which adverse biological effects do not occur—there is no "safe" level of exposure to radioactivity other than zero. There are comparable problems in the air-pollution field, especially in the case of polycyclic hydrocarbons like 3-4 benz-pyrene which are potent carcinogenic agents in experimental animals. Vernon MacKenzie of PHS notes that polycyclic hydrocarbons in air appear to come mostly from coal combustion, whether in furnaces or engines, from burning waste materials, and from some industrial processes. They cannot be practically eliminated from the air unless the total economic and technical fabric of society is altered. Yet there

is no safe exposure other than zero to chemicals such as these.

What should the attitude of an agency like the Public Health Service be in setting allowable limits for substances such as these, charged as it is with a vested interest and proper bias on the side of public health and safety? Should PHS do the job of setting criteria, or should it be delegated instead to a cabinet-level body like the Federal Radiation Council, or to some other august body like the National Academy of Sciences, which can juggle benefits versus risks through less safety-tinted glasses?

As one who has breathed for some time and hopes to continue doing so for a long time to come, I hope that someone with a more health-biased viewpoint will do the job, as it is now in the process of doing it. Soon.

A cosmic joker in the deck?

Even complete success in controlling pollution of the kinds we have been discussing may prove to be a Pyrrhic victory in the not very long distant end. There is inconclusive evidence that the atmosphere's total content of carbon dioxide has increased by some 13% due to man's increasingly industrial way of life since the 19th century. CO₂ is not usually thought of as a pollutant since it is not harmful. Indeed it and water are the ideal non-toxic end products of all fuel combustion and metabolic processes. The observed increase agrees strikingly well with estimates of the CO₂ increase that could be expected since the 19th century on the basis of sharp rises in fossil fuel use. Projecting such estimates into the future, it appears that CO₂ in the atmosphere may be 50% higher by the year 2000 than in pre-industrial days, assuming that atomic power doesn't replace power from fossil fuels to any significant degree.

This increase in itself shouldn't bother anybody's breathing or other activities, but it might have larger-scale effects on the climate of the entire earth. CO₂ is an important absorber of the longer wave infrared energy that the earth's surface reradiates as it cools through the nights and the seasons. If all of the extra CO₂ remains in the atmosphere, instead of being taken up by plants or dissolved in sea water, and nobody knows exactly how much is removable in these ways, it seems likely that the earth's average temperature could go up several degrees. Some provocative though largely speculative estimates suggest that this increase might be enough to melt all or most of the glacial ice on earth. In turn this would raise sea level everywhere by a few hundred feet—enough to put most of smoggy Manhattan and the Los Angeles Basin under water, for example. Which is indeed one long-range solution to the problem of polluted urban air.