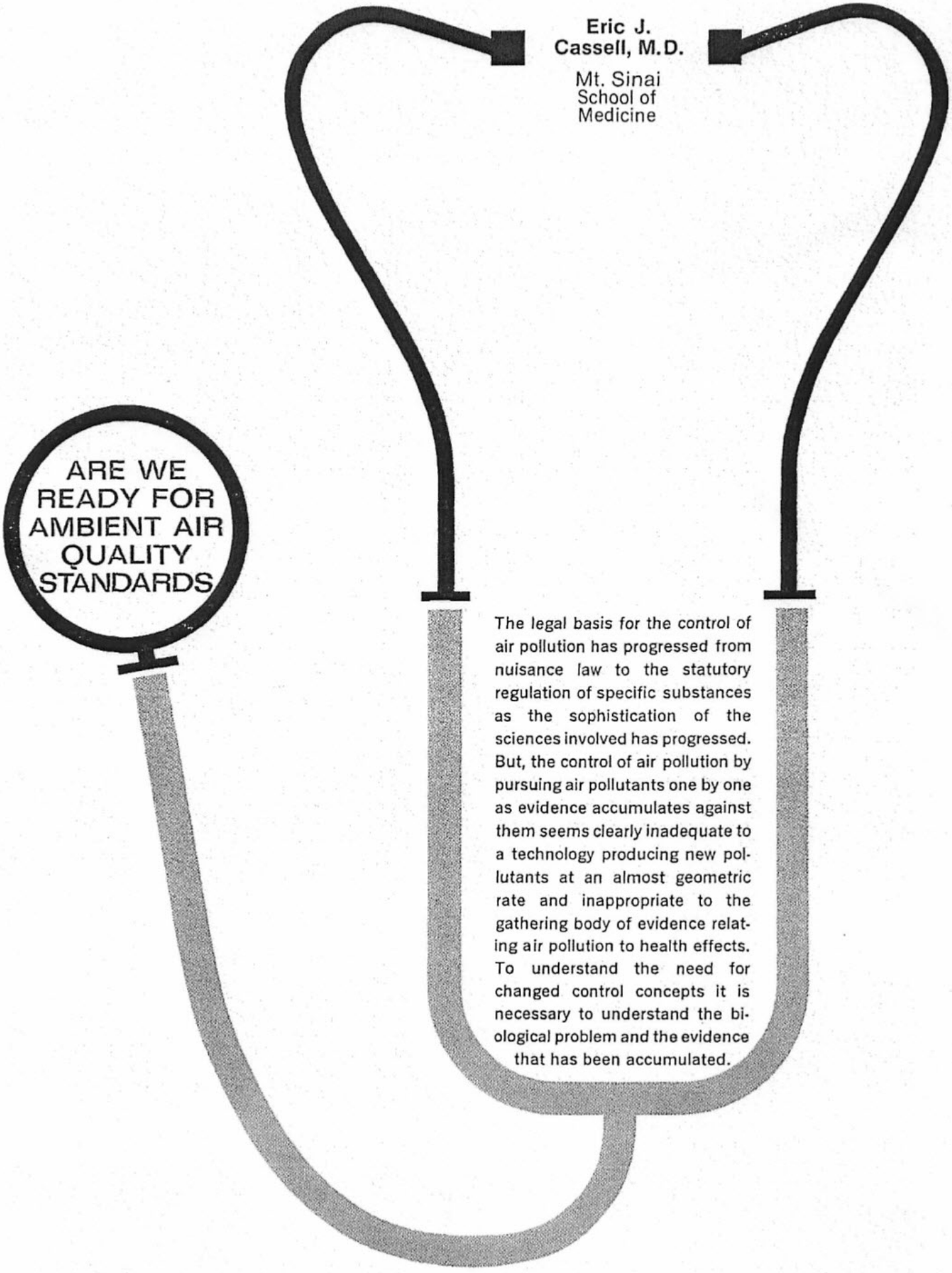
Eric J. Cassell, M.D.
Mt. Sinai School of Medicine

ARE WE READY FOR AMBIENT AIR QUALITY STANDARDS



The legal basis for the control of air pollution has progressed from nuisance law to the statutory regulation of specific substances as the sophistication of the sciences involved has progressed. But, the control of air pollution by pursuing air pollutants one by one as evidence accumulates against them seems clearly inadequate to a technology producing new pollutants at an almost geometric rate and inappropriate to the gathering body of evidence relating air pollution to health effects. To understand the need for changed control concepts it is necessary to understand the biological problem and the evidence that has been accumulated.

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The philosophy of the health professions in the twentieth century, and increasingly the philosophy of our whole society is that a clean environment contributes to health and well being. From this philosophy and from the scientific evidence that has fathered it, it is not necessary any longer to prove harm to health from air pollution in order to insist upon its control. But control is a joint effort of the public, industry, the academic and other research institutions, and government. When air pollution control is not a joint effort, but rather a battle between opposing forces the ultimate aims are delayed and the final solutions frequently poor and costly.

The air quality standards that have been proposed or enacted into legislation in varying parts of the United States clearly represent the desire of the people to have air that is as clean as can be obtained in our industrialized society.

The paramount question is whether these standards, written into law, will be effective in cleaning the air. And even more, the question might be, will they possibly delay effective air pollution control? It is my opinion that the setting of fixed standards for individual pollutants, one at a time, through the range of known pollutants may signify the desire of a community for clean air but does not rest upon sound evidence nor promote effective air pollution control.

We use the research on the health effects of air pollution to do two things. First, to make us aware of the dangers of fouling our environment and second, to provide a basis for effective control legislation. The precision of the information required for these two aims is quite different and it is important not to confuse the two when legislation is drawn.

It is sometimes difficult to realize how much progress has been made toward the goal of air pollution control in the past decade. An aroused public, an increasingly responsible industry, and responsive government have marked this progress. These changes have been brought about largely through an awareness of the dangers to health of uncontrolled pollution. If these dangers have been overstated on occasion no harm was done, since the purpose of the statement of dangers was to produce a supportive and aware public. If undue emphasis has been given to some pollutants over others in the statements of danger, o · the mechanisms of action that were portrayed were inaccurate, again, no harm was done in making the public aware of the need for action. However, if legislation is based on overstated, oversimplified, or inappropriate statements of the evidence then the legislation stands a very good chance of being equally oversimplified and inappropriate. Note clearly that the problem is not should there be air pollution control — but rather, what is the most effective way of achieving control.

The evidence on the health effects of air pollution strongly supports the view that the health effects are not due to a single pollutant acting alone, but rather from the complex interactions of air pollutants and weather in the atmosphere. I would like to discuss at some length the nature of the research problem of determining the effects of air pollution on man. This is a problem in toxicology, determining for humans, the relationship between the dose of the noxious agent in the atmosphere, and the adverse response in man.

Several important factors complicate the research. The examples that follow are based primarily on sulfur dioxide but the generalizations are true of the other pollutants as well. First of all, the dose, sulfur dioxide, except under the most bizarre and rare circumstances is present in the urban atmosphere in very low concentrations and over a very narrow range. The peaks are rarely ten times the daily averages. The peaks themselves, are usually not above one part per million. One part per million is about the bottom of the range frequently used in the laboratory. The highest level to which populations are exposed therefore, are so low that they are seldom used in the laboratory. Second, sulfur dioxide or any other pollutant, does not exist alone in the atmosphere. When it is present, numerous other substances which may or may not have an effect on man are also present. Concentrations of the other substances will be increased at the same time that the sulfur compounds are increased. It is difficult, therefore, for the scientist to know whether an effect he has observed was caused by the sulfur compounds or by the other materials present.

The third, and related complication of such studies is that all the various substances do not coexist without interaction. We are now well aware that the atmosphere is a dynamically active chemical retort in which substances change themselves and react with other materials to produce new and sometimes unknown substances, with this atmospheric chemical factory variously affected by wind, sun and humidity. Fourth, how do we really know what is in the atmo phere? We know about sulfur dioxide, for example, because we have instruments to measure it, and have had for some time. But we all know that there are substances in the atmosphere of whose nature and presence we know nothing, and that the number of such substances probably is increasing as our technology expands. For example, what happens to a plastic bag when incinerated; and what is the effect in the atmosphere of the catalytic metals used as gasoline additives?

The fifth complication is the meaning of what pollution measuring instruments say. When a study reports that the population was exposed to, for example, 0.25 parts per million of sulfur dioxide, what does that really mean? Generally the instrument did not even really measure sulfur dioxide. If it was of the conductivity type commonly in use, the instrument only reflects sulfur dioxide when that gas exists alone — but that ideal is rarely met in the atmosphere. The measurement is interfered with in numerous ways that cast serious doubt on any interpretation of experimental results that are presented as though the exposure were really to sulfur dioxide. In our studies, at one point, we had two instruments side by side, one measuring "true" sulfur dioxide (by