the user of respiratory protective devices. The second candle is dedicated to the regulatory authorities, especially to the U. S. Department of the Interior, Bureau of Mines. The third candle is respectfully dedicated to the manufacturers, in the hope they will communicate a little more effectively, and inform us more adequately, as to the limitations, as well as advantages, of their products.

As a result of all this light — three candle power — perhaps we will begin to understand more completely the complex problem of respiratory protection.

The American Chemical Society estimates 4½ million chemicals are known today, a million of which are referenced in chemical abstracts. In 1965, 3.28 billion people inhabited planet Earth, at least a third of whom were classified as illiterate (according to one United Nations study). Hence, even the best standards in the world on any subject will not be read by a third of the people. There are real barriers to knowledge, but we must find ways to use it more effectively if we and our descendants are to survive.

All is not hopeless, however. We do have at least some information on the potential hazards of several hundred, or at most a thousand or so chemicals. The National Safety Council currently has 60 or 70 chemical data sheets (and active work is underway by the Chemical Section on dozens more); the Manufacturing Chemists' Association has developed approximately a hundred chemical data sheets; the American Industrial Hygiene Association has prepared 150 hygienic guides. The National Fire Protection Association lists some data on perhaps 2,000 substances or combinations at most in 491M and 704M. Many substances — in fact, most — are still inadequately known insofar as safety aspects are concerned. Misleading references and incompleteness confuse even the knowledge which is available.

Several thousand chemicals are in everyday use or commerce. The system I mentioned previously deserves repeating for emphasis: man; environment; control. Man (or woman) alone contains thousands of variables about which we really know little. For example, a recently published paper shows that a group of several hundred persons may vary a thousand-fold in their ability to smell a natural gas odorant. Yet odor is one of the criteria still used in fitting face pieces for tightness against leakage, and odor is still the criteria used to determine when an industrial-type canister or chemical respirator has been expended in ability to absorb.

The environment is complex too, and full of unknowns. We really know little about the effects of environments on man. Even the A.C.G.I.H. tabulation of threshold limit values, which in the 1969 edition gives criteria for about 250 substances, admits in the preamble it should not be considered foolproof for prevention of injury to all workers, and must be used with intelligence by competent personnel. For short term exposure to higher concentrations, the Commonwealth of Pennsylvania and the National Academy of Sciences-National Research Council Committee on Toxicology have each attempted to establish short term exposure limits for several substances.

Beyond that, little real data or judgment is available. For example, no public limits have been established useful to someone who must evacuate an area in case of an accidental release, an emergency condition which is occurring with increasing frequency. The National Air Pollution Control Administration is understood to be considering the issuance of air quality criteria for short term exposures of the public to atmospheric contaminants under the authority of the Clean Air Act.

Changes in processes, materials, or other measures should be considered first when one begins to study environments. No standard is any better than the understanding and application of how it fits into the system, for it is intended to be a part of a whole, not an isolated piece of literature.

We next consider respiratory protection. We must know what is involved and in what concentration. We must select the correct device, we must train wearers in its use and carefully explain why. We must continually insure it is being properly maintained and cleaned and defective parts replaced. Finally, we must medically monitor the wearer to insure the device is, in fact, preventing the injurious substance from contact with the body — the real test of the success or failure of the system.