(b) toxic dusts, which are poisonous to body organs and body tissues (beryllium, arsenic, lead, mercury, radon, thorium, and others); (c) radio-active dusts, which are injurious because of their radiations (ores of uranium, thorium, etc.); (d) explosive dusts, which are combustible in airborne suspension (coal dusts, sulphide dusts, and the like); and (e) inert dusts, which allegedly have no harmful effects. Some dusts have multiple ratings and, as our experience grows, more and more dusts are being added to the harmful lists; there is, in fact, increasing reason to doubt whether any dust is really inert or pathologically harmless.

Dusts can vary in their injuriousness when associated with gaseous contaminants which, in their own field can have adverse physiological effects through asphyxiation, toxicity, or radio-activity. As with oxygen depletion, the physiological effect of a gas varies with the exposure time and the individual. Radon, because of its decay products, gives rise to particular problems of surveying and assessment. A vast amount of work has yet to be done on the sources of radon, its migration in mine waters, and the mechanisms of its release into the working atmosphere. Can its solubility differential in water and oily liquids be put to beneficial control use? Its disastrous assimilation in the blood stream is based upon this marked solubility differential.

Generally, in our assessment of the harmfulness of industrial dusts, several factors emerge as important. Mineral composition is probably more important than chemical composition, and the physio-chemical properties are probably more important than the physical properties. The surface activity of particles is important. Permissible concentrations vary from dust to dust. Radio-active and other toxic dusts can be harmful at concentrations less than one-fifth that of a traditionally accepted harmful dust, such as silica. Exposure times are found to vary enormously. In some cases, silicosis has been diagnosed after less than one year of exposure; in other cases, only after 15 or 20 years or even longer. Radiation damage generally does not make itself obvious until after several years. Even in a single mine, are there variations in the silicosis-producing properties of quartz at various depths? This would appear to be so. For example, at Kolar in India, with shallow depths, classical silicosis was rare even in miners with a lifetime of underground employment; as depths increased, silicosis began to appear after 15-20 years and now, with depths of the order of 11,000 feet, silicosis is reported to be a serious hazard after less than five years of underground working exposure. The behavior of particles, whose surfaces have been coated with highly active films of parasitic dusts, has yet to be fully investigated.

In any case, the mere presence of dust and/or radiations has an adverse psychological effect upon miners. From this viewpoint alone, their abatement is important. All dusts have nuisance value, in that they decrease visibility, create uncomfortable environmental conditions, and result in labor inefficiency and dissatisfaction.

The subject of abatement still remains inadequately studied. Water has been the universally applied medium, but its efficiency is open to question and it has limitations; for example, in certain winter-time open cut activities, wet drilling is virtually impossible. Newer methods of abatement must be investigated. Efforts have been made to apply electrostatic concentration to airborne dusts, but with only partial success.

Some are of the opinion that other methods should be investigated. Should we be applying to airborne minerallic-particle suspensions the same sort of principles that we apply to water-borne suspensions in ore dressing processes? Is it possible to introduce dust surface activators which would render the dust particles more amenable to collection and, therefore, abatement, by the use of froths and foams? This is one field of minerallic surface chemistry that could be important. It might offer new solutions to this age-old problem.

Mine Illumination.

Inadequate attention has been given to mine lighting. Although spectacular advances have been made in illumination engineering, our industry has been slow to take advantage of the new developments. In almost any handbook on illumination it is possible to find tables which list optimum illuminating conditions for every form of industrial activity, with the single exception of mining.

To say that lighting has always been a problem underground, where illumination leaves much to be desired, is a serious understatement. A new approach is necessary. Any new application must take into account