to the development of more effective control measures and further improvement of working conditions.

4. Further investigation of silicosis hazards and other dust exposures to provide more meaningful methods for distinguishing between hazardous and nuisance dusts and to give more meaning to occupational history as an essential aid in the diagnosis of chest x-ray films.

Industry-wide Studies

Of especial interest in our report last year was the number of projects undertaken on an industry-wide basis. Investigations of this type account for an even larger portion of the work this year. The procedure is entirely in keeping with the underlying function of the Foundation, which is to promote industrial health through the joint effort of its members. Furthermore, the returns are greater when investigations are planned and undertaken on the broader base of a joint undertaking. An outstanding feature of an industry-wide study is the advisory technical committee from the industry which is set up to take part in the planning of the investigation, selecting the plants for study, reviewing the data and collecting detailed information from the several plants in the group. There is greater utilization of the accumulated experience within industry in respect to a common problem. In a single investigation there is little opportunity to utilize this experience. What is more important, it is not possible to bring the varied experiences of different plants together for comparison and critical evaluation when plant studies are conducted separately.

The significance of these joint undertakings extends far beyond the enhanced value of the studies themselves. The free exchange of experiences, chemical and engineering data, and even details of manufacturing processes which has taken place in each case is a tribute to the sound policy and the high objectivity of the companies involved.

Mention has been made previously of the extensive studies conducted in potteries during the past three years. This year the Foundation was invited to visit all of the companies in the U.S. Potters' Association for the purpose of correlating the dust control work in that industry. Recently the Association conducted a Clinic on dust problems here at the Mellon Institute, the primary purpose of which was to discuss in considerable detail the dust control practices throughout the industry. Other industries may find this a worth while procedure and the Foundation will welcome the opportunity to assist in such meetings.

Expenditures for Greatest Good

Industrial hygiene is concerned with relationships between the health of the worker and the stresses of his job and of the industrial environment. The actual practices of industrial hygiene are based upon the assumption, borne out by research and experience, that these relationships can be expressed in quantitative terms. That is to say, the effects of the industrial environment upon the workers' health can be determined from quantitative measurements of the levels of exposure to offending substances or other

deleterious forces present in the environment. The factual and objective basis of industrial hygiene not only justifies its existence as a technical specialty, but is of the greatest practical value, since, so far as possible, it aims to substitute facts for opinions. By means of quantitative analysis, major health problems are distinguished from minor ones. Important sources of trouble are identified so that, in the health program, money and effort can be expended for the greatest good.

A formidable array of instruments and analytical techniques have been developed which are capable of measuring environmental factors with considerable precision. An equally extensive list of standards of permissible exposure have been proposed which make it possible, in the appraisal of working conditions, to determine whether or not health hazards exist. These developments are the result of many years of research in the laboratory and in industrial plants. The record of accomplishments in the practical solution of health problems in industry, through the use of quantitative methods, speaks for itself and accounts for the increasing numbers of industrial hygiene services being set up within industry.

Because of the excellent record of accomplishment, there is danger that industrial hygiene methods may become too standardized and acquire a degree of scientific sanctity not justified by the researches upon which they are based. This can be avoided only by constant, critical review of the procedures and standards and continuing research. Only in this way can the practical usefulness of industrial hygiene be extended and strengthened.

Research Needs

Research needs are emphasized by our day-to-day plant experiences where situations are repeatedly encountered which differ in many ways from those considered in the original studies upon which existing standards are based. The question constantly arises, therefore, as to the universal applicability of standards and procedures. The following examples may be taken from the work this year:

1. Shaver's disease—this is a pulmonary disease caused by fumes from the fusing of bauxite in electric furnaces for the production of synthetic abrasive. The causative ingredient in the fume is not known. Fume particles are sub-microscopic in size and cannot be studied properly by analytical methods in common use.

2. Asbestos dust exposures—a preliminary study of asbestos dust exposures, using the electron microscope and other advanced techniques, indicates the need for considerable further study of this problem and the development of new analytical techniques.

3. Silicosis—despite the many years of study of this disease much remains to be learned. Present criteria of the silicosis hazard are limited to the simple determination of dust concentrations and percentage of free silica in the dust. Little is understood about the importance of sub-microscopic particles not revealed by present analytical methods; no consideration is given to the possible influence of ingredients other than silica in a mixed dust; variation in the physical state of the air-borne dust which may alter the fate of the dust in the respiratory system is not now taken into consideration. Experienced roentgenologists emphasize