

Pliny the Elder, in the first century A.D., in his encyclopedia of natural science, refers to the use of bladders that "minium refiners" wore over their faces in an effort to avoid inhaling dust. "Minium" is the Latin word for cinnabar (red mercuric sulfide).

Medical history includes other brief references to occupational exposures, by such ancient authorities as Galen, Celsus, and others. However, it was not until the fifteenth century that further significant progress was recorded. In 1473 Ellenbog recognized that the vapors of some metals were dangerous, described the symptoms of industrial poisoning from lead and mercury, and suggested preventive measures. Agricola, a physician and mineralogist, in his *De re metallica* (1556) recognized "asthma" and ulceration of the lungs caused by the inhalation of certain kinds of dust. He stated that among the miners in the Carpathian Mountains some women married as many as seven husbands, each of whom succumbed to this disease.

Philippus Paracelsus (1493-1541), a Swiss chemist, physician, and professor of physics and surgery, with no academic degree, who was thoroughly disliked by the physicians of his time, was credited with being an independent thinker and investigator. He worked in Tyrol as a mining and smelting laborer for ten years, and then several years later returned to the mines to get material for his treatise on occupational diseases, in which he described various "miners' diseases," disturbances of the lungs, stomach, and intestines, that resulted from digging, smelting, and washing gold, silver, salt, alum, sulfur, lead, copper, zinc, iron, and mercury. He described chronic lung trouble of miners as "lung consumption, asthma, and dyspnea." He attributed the cause to vapors and emanations from the metals and advised that contact with them be avoided, as the condition was incurable.

Paracelsus pointed out fallacies of many medical theories then current, opposed the humoral theory of disease, and taught the use of specific remedies instead of indiscriminate bleeding and purging. Even though he introduced many new medicines, which are still in use today, he was regarded as a charlatan by physicians of his time—and still is in some circles. He died at the age of forty-eight. His untimely death has been variously attributed to "drunken debauchery," to his being thrown down a steep incline by assailants hired by his enemies, and to his contracting one of the occupational diseases he had described—perhaps the most plausible cause. His book was not published until 1567, twenty-six years after his death.

Ramazzini, in 1700, published the first book that could be considered a complete treatise on occupational diseases, *De morbis artificum diatriba*. A second and expanded edition appeared in 1717 in which he discussed not only diseases resulting from exposure to dusts and metal fumes, but also those due to several chemicals. He accurately described, from personal observations, scores of occupations with their attendant hazards and emphasized the necessity for the physician to inquire into the occupation of the patient. So logical were many of his observations that they remain substantiated today. In the majority of instances, however,

the measures he advocated for the control of occupational diseases were therapeutic and curative rather than preventive, a methodology that persists to a certain extent today, albeit in the more progressive circles the control of industrial health is preventive, through hygiene, sanitation, and periodic health examinations.

K. B. Lehmann, in his experiments on the toxic effects of gases upon animals, instituted a form of research about 1884 that has given us much of the information that serves as a guide for the control of industrial atmospheres today. A French pharmacist and chemist, Jean Baptiste Alphonse Chevallier (1793-1879), contributed liberally to the literature of industrial hygiene.

Many books on the medical and legal aspects of occupational diseases have been published in the last one hundred years, but few deal with industrial toxicology, and even fewer with the preventive engineering aspects of occupational disease control. A list of the more recent and better known books that include some of these subjects is given below:

- Health of the Industrial Worker*, E. L. Collis and Greenwood (1919).
- Industrial Health*, G. M. Kober and E. R. Hayhurst (1924).
- Industrial Poisons in the United States*, Alice Hamilton (1925).
- Schädliche Gase*, F. Flury and F. Zernik (1931).
- Industrial Hygiene for Engineers and Managers*, C. P. McCord and F. P. Allen (1931).
- The Dermatogoses or Occupational Affections of the Skin*, 4th ed., R. Prosser White (1934).
- Occupation and Health*, International Labor Office (1934).
- Industrial Toxicology*, Wm. N. McNally (1937).
- Carbon-Monoxide-Asphyxia*, G. K. Drinker (1938).
- Toxicology and Hygiene of the Technical Solvents*, K. B. Lehmann and F. Flury (1938).
- Essentials of Industrial Health*, C. O. Sappington (1943).
- Industrial Medicine*, F. J. Wampler (1943).
- Manual of Industrial Hygiene*, National Institutes of Health (1943).
- Noxious Gases*, Y. Henderson and H. W. Haggard (1943).
- A Manual of Pharmacology*, T. Sollman (1944).
- Introduction to Industrial Medicine*, T. Lyle Hazlett (1946).
- The Industrial Environment and Its Control*, J. M. DallaValle (1947).
- Industrial Health Engineering*, A. D. Brandt (1947).
- Occupational Diseases of the Skin*, 2nd ed., L. Schwartz, L. Tulipan, and S. M. Peck (1947).
- Occupational Medicine and Industrial Hygiene*, R. T. Johnstone (1948).
- Analytical Chemistry of Industrial Poisons, Hazards, and Solvents*, 2nd ed., M. B. Jacobs (1949).
- Industrial Toxicology*, L. T. Fairhall (1949).
- Industrial Toxicology*, 2nd ed., Alice Hamilton and H. L. Hardy (1949).
- The Chemistry of Industrial Toxicology*, H. B. Elkins (1950).
- Handbook on Aerosols*, Atomic Energy Commission (1950).
- Handbook on Air Cleaning*, S. K. Friedlander, L. Silverman, P. Drinker, and M. W. First (1952).
- Noise*, University of Michigan School of Public Health (1952).
- Toxicity of Industrial Organic Solvents*, rev. ed., E. Browning (1953).
- General Handbook for Radiation Monitoring*, Robert F. Barker (1954).
- Industrial Dust*, 2nd ed., P. Drinker and T. F. Hatch (1954).
- Plant and Process Ventilation*, W. C. L. Hemeon (1955).
- Rosenau, Preventive Medicine and Public Health*, 8th ed., K. F. Maxcy (1956).