of chemical agents are capable, in the experimental animal at least, of influencing the occurrence, incidence, or biological character, of pulmonary neoplasia.

### c. Physical Agents

Physical agents which have been incriminated in the production of occupational tumors of the respiratory system are either of a specific type (radiating energy, radioactive substances) or they are of nonspecific character (mechanical trauma).

#### I. PHYSICAL AGENTS OF DEFINED TYPE

*a) Radioactive Substances; Lung Cancer of the Schneeberg Miners, Joachimsthal Miners and Workers in Radium Laboratories*

*Historical Aspects.* The occupational cancer of the organs of the lower respiratory tract is one of the oldest occupational tumors known. These neoplasms affect mainly the workers employed in certain mines from which radioactive ores are recovered and which have been worked for many centuries. It is only very recently that isolated cases of this type of occupational tumor have been observed among chemists, technical assistants and workers engaged in the purification and commercial handling of radioactive substances.

The oldest known source of occupational pulmonary malignancy resulting from the exposure to radioactive ores is represented by the cobalt mines of the Schneeberg district in Saxony, Germany. The symptoms of this disease, prevalent among the miners of this region, were described by Theophrastus Bombastus von Hohenheim, called Paracelsus, who termed this ailment "mala metallorum" (1531). This disease of the miners of the Erzgebirge also was mentioned by Agricola (1521-1527 and 1546), Matthesius (1559), Pansa (1614), Engelschall (1725), Henckel (1729), Scheffler (1770) and Kuchenmeister (1869), who referred to it as "Bergkrankheit" (mountain sickness). The true nature of this fatal condition, however, was not recognized at that time and this miner's disease often was mistaken for tuberculosis of the lung (phthisis of the miners). It was not until 1879 that this occupational illness of the lungs was diagnosed properly as a malignant tumor (Härting and Hesse), but even then the correct histogenetic character was not determined until many years later (Schmorl 1926). Following the report of Härting and Hesse, an appreciable number of investigations have dealt with this important occupational disease (Cohnheim (1882); Aucke (1884); Arnstein (1913); Uhlig (1920); Risel (1921); Schmorl (1923); Beyreuther (1924); Rostoski, Saupe and Schmorl (1926); Weber (1926); Rostoski (1928); Schmorl (1928); Rostoski and Saupe (1930); Schmidtmann (1930); Lange (1935); Neitzel (1935); Döhnert (1938)).

Among the miners, working in the uranium mines of Joachimsthal, located on the southern slope of the Erzgebirge, in the Sudetenland, it had been