of a Nazi bomb. Compounding the oddity is the fact that J. Robert Oppenheimer, the man chosen to coordinate the Manhattan Project (and "father of the atomic bomb"), had actually written his senior thesis at the Ethical Culture School in New York on the mines at Joachimthal. Joachimsthal had monopolized the world's supply of radium prior to the First World War—and still had at least a century's supply left, according to a German cancer journal report of 1938[107]—making it strange indeed that U.S. authorities missed the atomic potential of the region. USSR officials were more astute: Soviet geologists were sent to Schneeberg to prospect for uranium in June of 1945, prior even to the end of the war in Asia. The Soviets did not assume control over the region until the end of that summer, when American armies retreated in exchange for a Soviet withdrawal from West Berlin. Recognition of the presence of uranium in the area may even have been a factor in the Soviet willingness to make the exchange. By January of 1946 the Soviets had completed their survey of the region, and by the summer of that year plans were in place to begin extracting uranium.[108] American military officials must have eventually regretted the oversight: in 1953, AEC chairman Gordon Dean wrote that the Joachimsthal mines alone "could support a sizeable atomic energy program."[109]

Arsenic, Chromium, Quartz, and Other Kinds of Dusts

X-rays, radium, and uranium were not the only areas where German health leaders took early steps to combat an occupational hazard. German factory physicians had long been warning against the dangers of dust inhalation: by the end of the nineteenth century, for example, there were already concerns about sanding and inhaling lead-based paint, and awareness of silicosis—caused by inhalation of very fine particles of quartz—followed shortly thereafter. Labor activism was important in the new generation of concerns, but improved drilling, grinding, and cutting technologies were the root material cause of the problem, exposing workers to unprecedented levels of dust. Pneumatic drills and hammers, along with

new electrically powered cutting and grinding tools of endless variety, raised much more dust than hand-powered tools, resulting in dust diseases (from asthma and TB to lung cancer) on a scale never seen before.

The most notorious early dust diseases had nothing to do with cancer. Acute toxic poisonings were the more immediate problem, given the absence of effective sanitary regulations and the willingness of many laborers to accept dangerous work. Cancer was only one of dozens of hazards that a nineteenth-century miner, grinder, or dye-mixer might face, and many did not live long enough to contract a malignancy.

Carcinogens were also obscured, however, by the long time lag—or "latency"—between exposure and the appearance of malignancy. Time delays of this sort had been observed in the nineteenth century, in the context of investigating chimney sweeps' cancer,[110] but it was not until the twentieth century that we find discussions of latency as a general feature of carcinogenesis. Rostoski, Saupe, and Schmorl in the 1920s recognized that miners in Schneeberg or Joachimsthal would generally work for ten or twenty years in the mines before coming down with lung cancer; they also noted that at least one of the victims had not worked underground for twenty-two years prior to being diagnosed.[111] Latencies were eventually recognized for many other kinds of cancer: Cecil W. Rowntree in England in 1922, for example, said that it could take up to seventeen years for cancer to develop after X-ray exposure. The conclusion drawn from this and other reports—from petroleum and chromate factories, for example—was that cancers generally do not appear until years or even decades after exposure.[112]

Chromium was one of the first metallic dusts to be designated a carcinogen, following the 1911 observation that chromate workers were falling ill and dying from lung cancer.[113] Chrome plating was becoming fashionable, and chromium salts and oxides were also beginning to be used in many popular dyes and paints. Injured workers began to be noticed toward the end of the nineteenth century, and by 1911 an entire book could be written about the perils of the industry.[114] A 1936 study showed that in the preceeding ten