Industrial Crisis

Bhopal. Anatomy of a Crisis. PAUL SHRIVASTAVA. Ballinger, Cambridge, MA, 1987. xvi, 185 pp., illus. $19.95. Ballinger Series in Business in a Global Environment.

3 December 1984. Cries of "Run!" "Gas!" "Death!" awakened Ganga Bai. Fleeing a "slum hut," she carried her two-year-old daughter several miles past "death in its most bizarre forms. . . . She thought she had escaped death. But actually she had been carrying it in her arms all along. She looked down into the glazed, open eyes of her still daughter and fell unconscious" (pp. 1–2). The horrendous effects of the leak of methyl isocyanate gas (MIC) from the Union Carbide India Limited pesticide plant in Bhopal were beginning to emerge.

The MIC leak at Bhopal has been called the worst industrial accident in history. Estimates of human casualties vary: government and corporate figures suggest 1,700 deaths; activist and public sources suggest up to 10,000 deaths and 300,000 injuries. And the crisis initiated by the leak continues, according to Shrivastava. Victims have received little compensation, legal battles still rage, and conditions exist for other major industrial accidents. "These crises are universal" (p. xv), and long-term solutions are urgently needed.

The book describes and analyzes the Bhopal accident from a managerial perspective, using the case to establish a conceptual framework for understanding industrial crises. The book is well written and accessible and serves as an excellent introduction to industrial crisis management. Thick descriptions of the events at Bhopal maintain the pace of the book. And the conceptual analysis elucidates social factors that seldom are, but should be, integrated into analyses of risks and impacts of hazardous chemicals.

The book establishes that "there is nothing natural about industrial crises" (p. xvi); they are socially constructed and produced and emerge as the result of political choices. The technology that failed was produced by humans, and the transformation of the leak into a crisis involved interactions among the technological failures and other human and organizational factors.

Accidents are distinguished from crises; crises emerge when events and actions interact unpredictably to threaten the general social structure. Industrial crises have increased significantly in rate in this century. Triggers of crises include industrial accidents, product injuries, sabotage, and pollution. The triggers themselves are frequently caused by unplanned releases of hazardous substances.

The Bhopal crisis was caused, according to the author, by the interaction of HOT (human, organizational, and technological) factors. Human factors identified include operator and managerial errors, lack of safety training and policies, limited staff size, insufficient information on the hazardousness of MIC, and failure to investigate or appreciate preliminary technological troubles. Organizational factors include pressures on operations and productivity in the plant (at the time of the accident, the unprofitable plant was up for sale), high managerial turnover, and inadequate safety procedures. One technical precondition was problematic plant design. This interacted with other technical problems including water entering the MIC tank and causing a reaction, metallic impurities in the water that accelerated the reaction, and safety devices that were disconnected. These factors were insufficient to cause a large-scale crisis; the environment, a highly populated slum neighborhood surrounding the plant, was crucial, and the location caused thousands of people to be exposed to the toxic gas.

The author describes the divergent views of various stakeholders in the accident (government, Union Carbide, victims) concerning important issues such as types of data that will be accepted, crisis effects, and appropriate responses. These different and highly inconsistent views produced conflicting and contradictory responses to events. The author argues that each group must appreciate the frames of reference of others and must develop an integrated perspective. The utility of a broader perspective can be readily accepted, but the author is perhaps optimistic in implying that this will solve or prevent crises.

Preventing and coping with industrial crises require (i) will to change on the part of stakeholders, (ii) alternative ways of resolving disputes and compensating victims, and (iii) initiatives by each stakeholder, according to the author. The strategies for crisis response that are discussed warrant serious consideration. However, the author argues for public activism to motivate corporate and governmental change. State suppression of public demonstrations by Bhopal victims seeking compensation, as described by the author, clearly indicates the substantial difficulties the public has in pressuring governments and corporations.

This book offers an insightful analysis of the causes and adverse effects of the Bhopal accident and suggests managerial and technological alternatives to present industrial practices. Such analyses and alternatives are necessary if we are to influence the will of organizational elites and encourage more effective management of industrial hazards.

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Radiation Damage: Early Assessments

The Dragon's Tail. Radiation Safety in the Manhattan Project, 1942–1946. BARTON C. HACKER. University of California Press, Berkeley, CA, 1987. x, 259 pp.

The Dragon's Tail is an aptly titled account of an important era in the development of guidelines for protection against ionizing radiation. In the manner of the tale of the Manhattan Engineer District told by Richard Hewlett and Oscar Anderson in *The New World* under the auspices of the Atomic Energy Commission, *The Dragon's Tail* was written under contract with the Nevada Operations Office of the Department of Energy, the successor agency to the AEC. And like *The New World*, this volume is authoritative, scholarly, highly readable, and often spellbinding.

Hacker begins his narrative by summarizing the development up to 1941 of standards for protection for exposure to x-rays and gamma rays, for body levels of radium, and for concentrations of radon. With the organization of the Metallurgical Laboratory and the successful experiment with controlled nuclear fission at the University of Chicago in 1942, a new Health Division was created that laid the groundwork for radiation safety studies in the Manhattan Project. As the bomb program expanded, developing new kinds of production facilities, laboratories, and field tests for the weapon, questions of health and risk in handling operations involving enriched uranium, plutonium, and polonium became the paramount concern of the Health Division. Hacker takes the reader from Chicago to Los Alamos and to the Trinity test at Alamogordo, tracing the basic and applied work of the scientists responsible for safety in the project. There are neither heroes nor villains in Hacker's narrative. Throughout, however, it is made clear that the military aspects of the project always came first, notwithstanding that new knowledge about tolerances and dosages gave grounds for concern.

After Hiroshima and Nagasaki, Manhattan District scientists used the Japanese sites as a source of evidence about the effects of nuclear bomb radiation on humans. The