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Wilhelm C. Hueper: Pioneer of Environmental Carcinogenesis

Robert N. Proctor, University Park, Pennsylvania

For three or four decades in the middle of the present century, Wilhelm C. Hueper was the most powerful American champion of the view that increasing exposure to industrial carcinogens was producing unprecedented levels of cancer. He was one of the first to study radiation-induced leukemia,¹ and the first to document lung cancer among workers in the chromium industry. He directed the National Cancer Institute's (NCI) Environmental Cancer Section from 1948 to 1964, and he provided the decisive testimony at the Congressional Hearings that led to the 1958 Delaney Amendment of the Food and Drug Act, barring carcinogens from foods.² Rachel Carson praised his 1942 *Occupational Tumors and Allied Diseases* as the "bible" on the topic;³ a whole chapter of *Silent Spring* is devoted to environmental cancer, drawing heavily from Hueper.⁴ Cancer theorists often cite a 1964 statement by the World Health Organization that "the majority" of human cancer is traceable to environmental exposures and is therefore potentially preventable;⁵ yet the role Hueper played in establishing that consensus is often not appreciated.

Hueper, as one can easily imagine, was not an uncontroversial figure. The Ford Motor Company accused him of being a Nazi in the 1940s and a communist in the 1950s - neither of which was true. He was a student of industrial duplicity as well as of chemical carcinogenicity, and he once described his method as "one piece of leading to another".⁶ Historians of medicine have paid little attention to him, but according to an archivist at the National Library of Medicine, his papers deposited there are the single most widely used collection in the manuscript division of that library. Two groups apparently find him fascinating: tobacco industry attorneys, like his repeated denunciations of "the cigarette theory of cancer"; and asbestos-

industry attorneys chastened by his early advertisement of the asbestos-lung cancer hazard.⁷

Wilhelm Hueper emigrated to the United States from Germany in 1923 after serving on the front in the First World War, where his duties included delivering poison gas canisters to the front to be launched against the French. He became interested in cancer soon after the war, and in 1923 published his first of more than 300 scientific papers linking the growing incidence of cancer to the production of synthetic chemicals.⁸ The problem for many cancer theorists, then as now, was how to explain the apparent growth of lung cancer rates in Europe. At the time the leading theories centered around the role of tobacco, infectious agents, and artifacts of diagnosis. Smoking had become popular during the First World War, when cigarettes were distributed with K-rations, and this had led to suggestions that tobacco might be the cause of the increase. Others suspected the delayed effects of the influenza epidemic of 1919, and a few die-hards suggested the phenomenon was an artifact of diagnostic imperfections. Hueper argued that none of these was right: the increase in smoking was too recent to explain the observed rise in cancer rates; he also pointed out that other historical flu epidemics were not followed by increased cancers. The more likely cause of the increase, in his view, was the inhalation of coal tar fumes and automobile exhaust, along with asphalt dust from roads and soot-laden smoke from furnaces and chimneys.⁹

Hueper was not, of course, the first to link cancer with the growth of industrial production: efforts of this sort date back at least to the 1890s, and the view of cancer as a "disease of civilization" was a fairly common one even early in the nineteenth century.¹⁰ Hueper, though, was certainly the most important mid-twentieth century advocate of the view, and no-one had a broader grasp of the evidence for such a claim. His passion for tracking down occupational carcinogens led to some interesting and rather egregious forms of myopia: most notably his dismissal of what he called the "cigarette theory" of cancer. Hueper always thought that cigarettes were being used as a smokescreen to deflect attention from general hazards - like

A more extensive discussion of the life and career of Wilhelm Hueper is presented in my book *Cancer Wars: The Politics Behind What We Know and Don't Know About Cancers and Their Causes* (New York, 1995).

Hueper, Wilhelm C. "Environmental and Endocrine Conditions in White Mice with Mammary Carcinoma," *Journal of Pathology* 52 (1934), pp. 147-173.

U.S. Congress, House Committee on Commerce, 85th Congress, 1st Sess. (1958), pp. 10-11.

Carson, Rachel. *Silent Spring* (Boston, 1962).

World Health Organization. *Prevention of Cancer* (Geneva, 1964), p. 1.

Hueper, W. C. "The Cigarette Theory of Lung Cancer," in *Journal of Medical Research* (October 1937), pp. 35-49. Reprinted in *Wilhelm Hueper and Cancer* (New York, 1964), pp. 1-14. Reprinted in *Environmental Health Perspectives* 10 (1973), pp. 1-14.

Hueper, Wilhelm C. *Occupational Tumors and Allied Diseases* (Springfield, Illinois, 1942), pp. 403-406; also his "Silicosis, Asbestosis, and Cancer of the Lung," *American Journal of Clinical Pathology* 25 (1955), pp. 1355-1369. The Asbestos Toxicity Institute in 1956 entertained a proposal to mount a public relations campaign "to counteract the unfavorable publicity presently directed to the asbestos industries as a result of the work of Dr. Hueper." See Castleman, Barry F. *Asbestos: Medical and Legal Aspects*, 3rd ed. (New York, 1966), pp. 160-63.

Hueper, Wilhelm C. "Ueber die histopathologischen Veränderungen im menschlichen Gewebe nach Inhalation von Paraffin, Frankfurter Zeitschrift für Pathologie" 27 (1923), S. 268-286.

Hueper, Wilhelm C. "Primary Cylindrical Ciliated Cell Carcinoma of the Lung," *American Journal of Pathology* 2 (1925), pp. 41-71; also his "Carcinoma of the Lung," *Illinois Medical Journal* 52 (1927), pp. 296-301.

Leuchow, Stanislas. "Sur la fréquence croissante des cancers," in *Comptes rendus hebdomadaires des séances de l'Académie des Sciences* 12 (1843), pp. 878-883. Reprinted in *Comptes rendus de l'Académie des Sciences* (New York, 1966).

Hueper, Wilhelm C.

industrial chemicals - and he was not entirely alone in this view (the chemist H. A. Fischer, for example, and Joseph Berison of the Mayo Clinic both disputed the smoking-cancer link). It is also interesting, I might add, that the asphalt dust theory of cancer has disappeared, though probably not for any sound scientific reasons. The suggestion has apparently not been followed up by epidemiological research, and would probably be difficult to do so.

1. Du Pont and Bladder Cancer

Hueper's big career break came in the 1930s, when he discovered the bladder cancer hazard at Du Pont's dye works in New Jersey. He had been hired as a pathologist at the company's Haskell Laboratory of Toxicology in November of 1934, after several months of unsuccessful job hunting in Nazi Germany. Nazi health leaders were interested in environmental carcinogenesis, and Hueper had hoped he might find employment there. He was never a member of the Nazi party or an anti-Semite, though he did originally consider himself a German patriot and fought faithfully for the fatherland in the First World War. Du Pont had begun to manufacture synthetic dyes in 1917, when war conditions had made it difficult to obtain German supplies. Hueper was already familiar with German medical literature showing that workers often suffered high rates of bladder cancer: the first German report on the topic had been published as early as 1895.¹¹ Hueper did some creative historical sleuthing and found that, in each of the five or six countries producing synthetic dyes, all had published medical reports of increased bladder cancers - and that the first papers on this topic were invariably published ten or twenty years after the onset of production in that country. This was clear evidence, to him, that there was a time lag of some 10-20 years between the beginning of exposures and the onset of cancers; Hueper is often credited with being one of the first to discuss systematically the importance of such a time lag.

Hueper eventually studied the health effects of a broad range of Du Pont products, including seed grain vermicides (dimethyl and diethyl mercuric compounds), carbon disulfide, glycols and related solvents, refrigerant gases, Freon, and Teflon coatings for kitchen utensils. Prior to the Japanese attack on Pearl Harbor, Du Pont made large deliveries of explosives to the Japanese (who were then

fighting in China); Hueper was assigned to investigate why a number of young workers had died from acute heart death after handling "safety dynamite" containing ethylene glycol dinitrate. Hueper found that many of the workers showed evidence of chronic nitrite poisoning after inhaling vapor from the treated dynamite. German dynamite makers were invited to the U. S. to discuss this new occupational disease, and even though the Europeans's findings made their way into print, Du Pont officials barred publication of the company's own in-house findings.¹²

Hueper was disappointed from the outset by the restrictions Du Pont placed on the conduct of his research. Research projects were determined not by the institute's scientific staff but rather by the various departments of the Du Pont Company, which asked for specific investigations and provided the funds. Hueper and his colleagues were originally able to publish their work freely, but eventually even this was disallowed, allegedly because other companies might gain free medical information from the practice. Hueper was also bothered by the fact that the Laboratory was not allowed to carry out long-term studies (more than a year or two) that might reveal delayed biological effects of exposures, such as cancer. The only exception was a study where he showed that benzanaphthylamine given orally to dogs for a period of three years could cause bladder cancer - a contribution which earned him both international acclaim and corporate notoriety.¹³ Hueper concluded from this that, by virtue of the company's failure to conduct long term studies, the carcinogenic effects of many substances (notably hydrazine derivatives and hepatotoxic chloroprene) were missed. He also concluded that industrial laboratories were "unwarrantable media to be entrusted with safeguarding the health of their employees and of the general population".¹⁴

Industrial secrecy was a perennial problem: even as chief pathologist of the Du Pont lab, Hueper was often barred from learning about what kinds of chemicals the company's own employees were being exposed to. One day, when he noticed that his experimental animals were suffering from what appeared to be heavy metal poisoning, he asked a company chemist whether this might be the case, and the

11. Hueper, R. C. *Advances of a Physician in Occupational Cancer: A Medical Cassandra's Tale*, 1976, unpublished autobiography. Hueper papers, National Library of Medicine, pp. 154-155. I'd like to thank David Reuser for drawing my attention to Hueper's autobiography.

12. Hueper, R. C. et al. Experimental Production of Bladder Tumors in Dogs by Administration of Benzanaphthylamine. *Journal of Industrial Hygiene and Toxicology* 20 (1938), pp. 46-84. David Michaels notes that at least 30 articles on occupational bladder cancer had appeared in German-language medical literature prior to Du Pont's recognition of the hazard, see Michaels, David. *Waiting for the Bomb: Corporate Deception Making and Bladder Cancer in the U. S. Dye Industry*, *Medical Anthropology Quarterly*, N. S. 2 (1988), pp. 215-231. Hueper in a 1969 book discussed an administrative trend of industry's reluctance to concede a hazard; see his *Occupational and Environmental Causes of the Chronic System*, New Haven 1969, chapter 5. Yale University Press agreed to publish this book only on the condition that he remove all references to his own work, so Hueper wrote in the *For Postscript and Afterword* (Hueper to Harold Stewart, October 15 1968, box 11, New Haven Regional Library, 44-10-100).

13. Hueper, pp. 154-155.

11. In 1924, Hueper attended a speech of his on the racial specificity of cancer to be published in the German's leading racial journal, ed. by the physician Hans J. K. Guericke. Hueper argued that different races did suffer different rates of cancer and other diseases, but he also noted that it was difficult to separate out the contributions of heritable racial traits, "because this is not possible, more plastic contributions of habit, climate and hygiene. He did not, though, as he wrote in his Nazi rhetoric, that it was dangerous for a race with inferior biological qualities to come into contact with a greater incident of diseased traits, see his *Rassenkunde und Rassenhygiene* (1936), pp. 67-68.

12. Reuser, David. *Bladder Cancer in the German Empire*, *Annals of the New York Academy of Sciences* (1985), pp. 588-593.

colleague confirmed that they had been adding lead to several batches of "synthetic silk" (nylon). When Hueper asked his research chief whether he could include this information in his report, the chief became upset that Hueper had discovered one of the company's closely-guarded manufacturing secrets and refused to help. On another occasion, Hueper asked to visit the company's famous Chambers Works in Salem County, New Jersey, to determine how seriously workers were being exposed to betanaphthylamine vapors and dust. The Chambers Works were already notorious as the site where, in the 1920s, hundreds of workers were injured and several killed in the course of the manufacture of tetraethyl lead as an antiknock compound for gasoline. (The site had acquired the nickname "*House of Deaths*" in reference to the fact that many of the lead-poisoned workers developed severe hallucinations.)¹⁶ Hueper was taken to the plant floor with several colleagues and was surprised to find that the plant was very clean. He mentioned this to a Du Pont worker who told him that he and his men had worked all night to clean it up for him. Hueper realized that what he had seen was a well-staged performance; he then asked to see the benzidine operation in a separate building, for which management had not been forewarned. There he found the powdery white benzidine dust everywhere: "on the road, the loading platform, the window sills, on the floor." He wrote a memo to Mr. Du Pont describing his experience, but he never received an answer and was never again allowed to visit the Chambers Works.¹⁷

In November 1937 Hueper was fired from his job at Du Pont, effective at the end of January 1938. The excuse given was economic, but Hueper had also had trouble when he protested the efforts of two of his Du Pont superiors - the company medical director and the head of the Haskell Lab - to claim credit for his experimental demonstration of the naphthylamine bladder cancer hazard. Hueper was informed at the time that he was contractually obligated never to publish his Du Pont work without the company's consent, but he refused to comply and, as a result, was hounded by company officials for much of the rest of his life. Although Du Pont company attitudes softened somewhat: a 1984 essay by a Du Pont official cited Hueper's record with the company as evidence of its longstanding concern for worker health and safety.¹⁸ In 1974 the Occupational Safety and Health Administration had adopted national standards to limit occupational exposures to benzidine and betanaphthylamine, and in 1976 the company finally admitted that 2,000 dye workers exposed to betanaphthylamine between 1919 and 1935 had

fallen victim to bladder cancer.¹⁹ Hueper must have felt a certain vindication for having sounded the alarm so early.

2. Occupational Tumors and Allied Diseases

In the summer of 1938, Hueper began work on his 896-page magnum opus, published in 1942 as *Occupational Tumors and Allied Diseases*. The book presents the first major review of world literature on occupational causes of cancer, but Hueper for a time had difficulty finding a publisher. C. C. Thomas of Springfield, Illinois, finally agreed to print the manuscript, but only after Hueper's new employer, the pharmaceutical firm William R. Warner, agreed to furnish \$1,000 to offset printing costs. Hueper had worked for Warner since the summer of 1938, and had been given freedom to work on scientific projects of his own choosing. Much of his time was spent preparing his manuscript, during which time he also studied the carcinogenic effects of sunlight, hormones, coal tar, arsenic, asbestos, and ionizing radiation.

Hueper began his book by suggesting that "the gigantic growth of modern industry" had turned both its creators and beneficiaries into victims of a host of chronic and insidious diseases never observed before. The chemical industry had "flooded us with 'new synthetic substances in never-ending number and for ever-increasing purposes', including

dyes, mordants, explosives, plastics, fertilizers, insecticides, fungicides, solvents, rubbers, resins, lacquers, pigments, paints, finishes, textile fibers, fuel and lubricants for motors and machines, refrigerants, building materials, radioactive substances, food components, drugs, toilet articles, pharmaceuticals, household supplies, and innumerable other articles"

Metallurgical industries were exposing people to arsenic, lead, mercury, and strontium, while chemical insecticides had introduced lead, arsenic, copper, and parathion into foods. New mining technologies had introduced novel threats into the workplace (pneumatic tools, for example, raising unprecedented levels of dust), as had new medical diagnostic tools (roentgen-, radium-, and ultraviolet rays) and new chemicals for preserving and coloring foods. Workers exposed to aromatic compounds alone included

coal-tar makers, artificial-leather makers, calico printers, camphor makers, cord-tar makers, copolymers, copolymers (rubber), dye makers, dyers, explosive workers, gunpowder workers, gunpowder makers, lithographers, millinery workers, mica workers, nitro-cellulose workers, painters, paint makers, pencil (colored) makers

¹⁶ Michaels (note 13), p. 117.

¹⁷ Hueper (note 13), pp. 256-157.

¹⁸ Keith Bruce W. An Illustration of Voluntary Action to Reduce Carcinogen Risk to Workers in the Chemical Industry, *Environmental Health Perspectives*, New York, 1984, pp. 1-11.

¹⁹ The New York History of Cancer Council in the United States, 1971, vol. 1, Washington, 1975, pp. 1-111.

perfume makers, photographic-plate workers, varnish makers, vulcanizers, shoe dyers, ink makers, soap makers, floorpolish manufacturers, pharmaceutical and industrial chemists, cosmetic workers, workers employed in food industry using dyes for coloring foodstuffs (jams, fruit, candy, preserves), textile workers, garment makers, furriers, fur dyers, hatters and manufacturers of certain insecticides, leather and shoe workers, and manufacturers of colored rubber goods."

All were living within what Hueper called the "new artificial environment", all were exposed to one degree or another to cancer-causing substances.²⁰

Hueper went on to note, though, that most occupational cancers were preventable, and that the key in most cases was to alter the design of the production process. The hand cancers formerly suffered by radiologists had been largely stopped by the introduction of safety procedures and protective clothing; the closing of the copper smelting works and hot-burning houses of Cornwall and Wales had ended the rash of cancers associated with those regions. Hueper predicted that the epidemic of arsenical keratoses and epitheliomas in towns such as Reichenstein (in Germany) would probably end, since the water had been cleaned of its arsenic. German mill spinners did not suffer from scrotal cancers, unlike their English counterparts, because the spindles in German cotton mills revolved more slowly, throwing off less oil. An earlier shift from mule spinning to ring spinning prevented an epidemic of scrotal cancer in the United States, where treatment of the lubricating oils with sulfuric acid apparently further reduced the oil-cancer hazard. Scrotal cancer appears to have become common earlier in England than in Germany because the shift from mule spinning to ring spinning took place earlier in England and because English fireplaces burned at lower temperatures with a relatively weak draft, encouraging the accumulation of soot.²¹ English flues were often tortuously narrow, combining both horizontal and vertical segments, requiring one to crawl through the chimney to clean them; they were only seven inches in diameter, hence the practice of employing four or five year old "climbing boys" sometimes stolen for the purpose or sold by their parents for a few pounds.²² German chimneys, by contrast, were generally straight and therefore easier and safer to clean.

Cancer, in other words, could be prevented, but Hueper was not very optimistic about the willingness of society to take the necessary steps. Chimney sweeps had been found to suffer from high rates of scrotal cancer as early as 1775.²³

much heralded laws (of 1788) designed to bar children from engaging in labor of this sort only applied to children under the age of 8, and even after these laws were strengthened cancer rates remained high. An epidemiological survey of 1861-1890 showed that chimney-sweeps still had far and away the highest cancer mortality of any occupation,²⁴ and even as late as 1911-12, one in four English chimney-sweeps was still dying of cancer of the scrotum, compared with 1 in 360 for the general population. Similar results, only slightly improved, were found in a survey of 1931-1935. Other occupations showed equally appalling neglect. Hueper denounced the "utter disregard" for occupational health and safety among the dusters and sprayers of arsenic insecticides - as the irresponsible release of 26 tons of arsenic dust from the stacks of the Anaconda copper mines in Montana. Substances such as these did not easily disappear from the environment, and future generations would have to reckon with the 80,000,000 pounds of lead and other arsenates estimated (conservatively) to have been applied as insecticides on American farms. Hueper lamented the fact that as late as 1937 there were only two states - Colorado and Michigan - with laws fixing an upper limit for arsenic contamination of foods. The only long-term solution, he suggested, was to replace arsenic insecticides by agents which spontaneously degrade into harmless substances.²⁵

Hueper's suggestion that environmental chemicals are important causes of human cancer was a heterodoxy for which he was ostracized by the cancer establishment and lionized by its critics. His book was almost totally neglected, though, when it first appeared. Not a single cancer journal published a review, and the only medical review of any note was in the *Archives of Pathology*. One explanation for the neglect may lie in the fact that the United States had just entered the war. Japanese planes attacked Pearl Harbor in December of 1941. Hueper's book appeared early in the spring of 1942. Occupational carcinogenesis was hardly a priority of a society mobilizing for war; physicians were far more concerned about keeping people at work than about the longterm effects of industrial pollutants. The fact that Hueper came in dragée with a pronounced German accent certainly didn't help his case; nor did the fact that, only eight years previously, he had returned to Germany to seek employment in the early years of Hitler's Third Reich.

Some people did, of course, read and appreciate the book - most notably Morris Fishbein, editor of the *Journal of the American Medical Association*. Fishbein apparently so liked the work that he invited Hueper to address the question of occupational and environmental carcinogenesis on the journal's editorial page. Several of Hueper's editorials did appear - unsigned, as was the practice - until 1949.

20 Hueper (note 6), pp. 4-6.

21 *Ibid.*, pp. 154, 162, 193-207.

22 The historian Donald Hunter notes that children employed in the coal mines were often found "in clumps by masses of a hundred or more and all together in the same position and in the same attitude, as if they had been killed by a single blow." Hunter, *Probably Lost to the World: The Children of the Coal Mines* (London, 1942), 114.

23 *Ibid.*, *Practical Chimney Sweeping*, 1-2.

24 See, for example, *The Statistician's Survey of the Fraction of the Population*, p. 194.

25 *The physician*, pp. 12, 50 and 103-105.

in Fubbin was replaced as editor and the journal stopped publishing editorial occupational and environmental cancer hazards."

Hueper's Censorship

Star's well-known book on *The Social Transformation of American Medicine* argues that American scientists in the early post-war years "enjoyed autonomy with constraints of professional compulsion." This was indeed the position of officials in charge of the NIH Division of Research Grants, who in 1951 wrote:

"The investigator works on problems of his own choosing and is not obliged to adhere to a preconceived plan. He is free to publish as he sees fit and to change his research without clearance if he feels new and more promising leads. He has complete budget freedom as long as he uses the funds for research purposes and spends them in accordance with local institutional rules."¹¹

The NCI may well have enjoyed greater autonomy than other branches of the NIH until 1944, for example, it was the only institute authorized to provide outside investigators. Hueper's own experience shows, though, that pressures were not entirely foreign to the setting. Shortly after joining the NCI, for example, Hueper received a letter from the Federal Loyalty Commission informing him that he was under investigation for disloyalty to the United States. Hermann Du Pont's medical director, had denounced him as a Nazi, a trumped-up charge that was dismissed when Hueper was able to show that it had come from a former colleague jealous of the acclaim Hueper had won for his work. Hueper wrote to the director of the NCI accusing Hueper of harboring "anti-American tendencies", though this, too, was shown to have no more substance than the first charge. Hueper was not necessarily even pro-union; he abhorred strikes and employed a kind of paternalistic, one could say Germanic, attitude toward management relations. On at least one occasion he helped to avoid a strike by routing health engineering concessions from management.¹²

Political pressures also came from the Public Health Service's own *Division of Industrial Hygiene* (DIH), which on several occasions forced Hueper to limit or even to terminate projects involving chemical or nuclear hazards. In one instance, the DIH director forced Hueper to remove his name from a study identifying cancer as an occupational hazard in the chromate industry; the paper eventually appeared under the sole authorship of Thomas Mancuso, then at the *Ohio Health Department*,¹³ even though Hueper had been documenting the hazard, as a consultant for the *Mutual Chemical Company* in Baltimore, since 1946. On another occasion Hueper learned, to his astonishment, that carbon copies of his prepublication papers, submitted to the editorial board of the NCI for clearance, were being routinely submitted to the Du Pont company management for commentary and appraisal. Hueper was startled by what he considered evidence of an "objectionable collusion between some members of the Public Health Service with an industrial private party which had been engaged for years in my persecution."¹⁴

Hueper summarized these and other infringements in a 13-page memo to John R. Heller, Director of the *National Cancer Institute*, chronicling "*The Dark and Somewhat Shady History of the Environmental Cancer Section at the National Cancer Institute*". Hueper complained that pressures had been exerted on him by the NCI's Chief of Research, G. Burroughs Milder, to restrict his travel to industrial sites, his appearance as an expert witness at compensation trials, and his speaking engagements at medical schools and schools of public health. On several occasions he was ordered to delete from papers submitted for publication the names of manufacturers of specific products containing carcinogens. Scientific papers of his were purportedly held up for approval - in one instance, until he resigned as a consultant to the Department of Labor on matters of occupational carcinogenesis. He cancelled a contract to publish a second edition of his *Occupational Tumors and Allied Diseases*, fearing that the book would be "mutilated and perverted by arbitrary censorship" by the Institute's editorial board (chaired by Michael B. Brinkin) and the "politically spirited" information officers at the Surgeon General's Office. Hueper protested restrictions such as these on the grounds that they obstructed his research but also on the grounds that they worked, indirectly, to

Hueper (note 11) p. 269. *Environmental Cancer*, *Journal of the American Medical Association* (1944), p. 846.
Star, *Pass*, *The Social Transformation of American Medicine* (New York 1982), pp. 147-148.
On one research trip to San Francisco, Hueper spoke with several members of the oil industry who wanted to go on strike to protest their exposure to carcinogens in the etching process. He tried "to persuade them not to do such a foolish thing, by pointing out that the oil industry should give them an ultimatum when the company would do as they were asked for. All the company would need after such a strike would be a year's time." On another occasion, inspecting a limestone cracking plant, he was asked the union to permit a strike by the manager to spend \$5,000 on safety checks for the oil cracking plant. He told them that *National Cancer Institute* was apparently worried to send someone to staff jobs with an attitude being the chairman of which he had been exposed to the same

"to help them obtain cooperation from the NCI should they ever develop cancer." Hueper (note 11) pp. 271-272, 280-281.

"Mancuso, Thomas E. *Occupational Tumors and Other Health Hazards in Chromate Plant: A Clinical Appraisal for Public Medicine and Surgery*, in (1951), pp. 371-407, from Mancuso, Thomas E. and Whittier, C. Hueper, *Occupational Cancer and Other Health Hazards in a Chromate Plant: A Medical Appraisal*, in ibid. (1951), pp. 178-183.

Hueper (note 11) p. 269.

grave occupational cancer victims of the legal evidence they might need to file compensation claims.¹¹

The most consequential act of censorship against Hueper, though, was a decision to bar him from investigating the lung cancers among the uranium ore miners and millers of the Colorado plateau. Hueper had begun this project in April of 1948, well aware of the fact that European uranium miners had long suffered from very high rates of lung cancer. His efforts in this area were stymied, however, by the fact that all NIH papers dealing with radiation had to be cleared by the Atomic Energy Commission (AEC). When Hueper sought to present evidence of the threat at a meeting of the Colorado State Medical Society, the AEC's Director of Biology and Medicine, Shields Warren, ordered the head of the NCI to instruct Hueper to delete all references in his paper to the hazards of uranium mining. Hueper initially refused on the grounds that he had not joined the Institute to become a "scientific censor," but acquiesced with the demand, though, he felt he had no alternative but to withdraw from the conference. He did send a copy of his paper to the Society's president, explaining his decision. When word got around that he was not silently accepting censorship, Warren again wrote the director of the NCI, this time asking for Hueper's dismissal. Hueper continued on at the Institute, but was soon thereafter barred from all epidemiological work on occupational cancer. The order came from the Surgeon General. Hueper was henceforth allowed to do only experimental work on animals and was prohibited from further investigations into "the causation of cancer as related to environmental exposures to carcinogenic chemical, physical, and biological agents."¹² As Victor Archer recalls the incident, Hueper was essentially barred from research travel west of the Mississippi.¹³ Hueper later complained that government censorship of studies on the health effects of uranium mining had delayed and worsened the situation, leaving countless men to die who otherwise could have been saved. It would be ten years before a comprehensive report identified lung cancer as a hazard for this occupation, and this only after the governor of the state of Colorado had urged its writing.¹⁴

Out of Step With the Times

When Hueper finally retired in 1964, he was disappointed with what he had achieved at the NCI. As he later wrote, he had "not succeeded in laying a foundation

which others might erect a solid building." His Environmental Cancer Section was abolished on the day of his retirement, and the library he had worked hard to assemble was dispersed.¹⁵ Hueper lived long enough to see a dramatic rebirth of interest in environmental carcinogenesis, but this never allayed the bitterness he felt toward those who resented his one-man cancer crusade. In his 1976 autobiography he predicted a steady increase in cancer as a result of the nation's every increasing arsenal of environmental and occupational carcinogens - "biological death bombs . . . which may prove to be, in the long run, as dangerous to the existence of mankind as the arsenal of atom bombs prepared for future action."¹⁶

Blame for this condition he laid at the doors of both industry and government. Industrial managers had devised a comprehensive set of strategies to avoid moral and legal responsibility for their actions, including: evasion by silence or delay; employing workers for too short a time to cover the latent period; suppressing or delaying publication of evidence of carcinogenicity; "manufacture of statistically negative evidence by packing the studied population with a majority of individuals having no exposure and thereby diluting any positive evidence to the vanishing point"; and locating "flexible exerts" to testify that minimal evidence of carcinogenicity is insignificant. Industrial authorities had been known to simply ignore or extenuate diseases to avoid responsibility for compensation. Hueper cited one case where, until about 1935, an Ohio health commissioner had faithfully reported all cases of scrotal cancers among wax workers in oil refineries. After this time, however, reporting of such cases ceased. Hueper visited one such refinery in the early 1950s and found that, while scrotal cancers had not actually disappeared, they were now classified as "venereal warts" which were not compensable. It took another ten years for industrial hygienists to publicize the problem, by which time technological changes had rendered many of the wax-pressing operations obsolete.¹⁷

Hueper had very little tolerance for such activities. In an unpublished interview shortly before his death, the aging pathologist railed against the manufacturers of carcinogens:

We have to put those guys who think they are cleverer than we are, they are smarter, they can cheat us, in jail. Not money, just jail. For instance, I would put the president of a company which produces cancer-producing material . . . for 10 years . . . in order to in a hospital for mental cancer patients. Then he will know what he is doing!¹⁸

¹¹ Hueper's June 8, 1959, memo to John R. Heller was published in *Drug Research Bulletin* (Blue Water), September 13, 1961, pp. 234-51, 160-8, and reprinted in *The Paper on Cancer*, pp. 244-265. Several key names are deleted from the published version.
¹² Hueper memo 13a, pp. 170-179, 160-165.
¹³ Telephone interview with Victor F. Archer, April 16, 1990.
¹⁴ Hueper memo 14a, pp. 115-26. The "Lung Cancer" section actually is composed of letters from 1960 and 1961, and 1962-1969. Almost all of them are dated with the date they were written, but the failure to copy them out in chronological order is obvious.
¹⁵ Hueper memo 15a, pp. 170-179, 160-165.

¹⁶ Hueper, p. 233.
¹⁷ Hueper, p. 300.
¹⁸ Hueper, pp. 221-222.
¹⁹ Hueper, pp. 211-212.

Public health authorities, though, were also culpable, insofar as they had allowed themselves to be captured by industry interests. Valuable work was accomplished, but often not until political pressure had been brought to bear from groups outside the government's medical establishment. Hueper was always fond of pointing out areas of needed inquiry, and in 1976 he produced one last list. There was inadequate study of the hazards posed to people living in homes built on the radioactive slag of phosphate mines, and there were insufficient studies of the risks from metal dust, chrome dust and fumes in foundries and metal shops. More needed to be known about the effects of acid mists in chrome-plating operations, chromite ore dust in brick manufacture, and chrome pigments used in various industries. Studies were needed of migrant laborers handling pesticides, and of the nickel refiners of New Virginia. Evidence of a bladder cancer risk among chemical workers handling aromatic amines (in rubber factories, for example) had been around for decades, but where were the studies of the effects of these substances on dyers, painters, or printers using colored inks? More needed to be known about whether the hormones given to women as contraceptives or during menopause increase the risk of breast or uterine cancer, and whether carcinogens in the "maternal organism" may be transferred through the placenta to the fetus to cause cancer.

Hueper complained that, with a few important exceptions, public health authorities had been slow to study problems such as these. Why was the liver cancer hazard of vinyl chloride discovered only in the 1970s, when animal studies had been demonstrating the induction of sarcomas from implanted plastics had been around for 20 years? Where were the epidemiological studies exploring whether mechanics or service station attendants working in grease pits show increased cancers of the lung or other organs? Why had there never been long-term studies of the effects of feeding irradiated foods to "a considerable number of young soldiers" in the 1940s-1950s?

Hueper's relentless campaign to track down industrial carcinogens earned him a reputation as something of a maverick in the health profession. John H. Pearson attributed to him "an uncanny facility for observance", and even Harold Stewart, one of his closest friends at the NCI, described him as someone with a unique ability "to shock and alarm".¹¹ His dry and rather Germanic prose suggests that he was not particularly precise over readability, but he was also not above appealing to popular sentiments, especially towards the end of his life. On one occasion, Hueper was rebuffed at a National Research Council meeting when a representative of the industry stormed in waving a copy of the *Police Gazette* in which Hueper had an article "wedged in among the pictures of security officer bathing beauties".¹² Harold Stewart later recalled the fact that a prominent cancer researcher

publish in such a journal appeared to his rather staid colleagues "like waving a red flag in the face of a bull".¹³

Hueper's main problem, though, was that he was out of step with the political currents of his time. Environmental carcinogenesis was generally regarded with suspicion in the 1950s and early 1960s. In his emphasis on chemical irritants Hueper could even be regarded as "old-fashioned": his 1942 treatise stressed the importance of generalized trauma or chronic irritation as a cause of cancer, a viewpoint that flourished from the middle of the nineteenth century to the early decades of the twentieth (Rudolf Virchow, the nineteenth century pioneer of modern cell theory, is commonly cited as its author). This view came under criticism in the 1950s, as the emphasis shifted to nonchemical carcinogens - especially viruses and genetic factors - as keys to the disease. Conventional cancer wisdom now held that chemicals worked at most to "trigger" cancer viruses already present in cells, or perhaps to stimulate predetermined cancer genes or misplaced embryonic cells. Hueper in his autobiography denounced the "purely assumptive character" of such allegations, the net effect of which was, in his view, to diminish the role of chemical hazards, radiation, and other irritants. Hueper never did believe that viruses or genetic factors play an important role in carcinogenesis.¹⁴ In the post-war conservatism of the 1950s, his pro-labor emphasis on cleaning up the environment - and especially the workplace - set him apart from many of his peers. Indeed he is often said to have boasted that he "had no peers".

Hueper did, of course, have his supporters. In 1959 he won the *Anne Frankel Rosenthal Memorial Award for Cancer Research*, presented to him by the *American Association for the Advancement of Science*. In 1962 he received the *United Nations Award for Outstanding Research in the Cause and Control of Cancer*; the World Health Organization presented the award at a plenary session of the United Nations - though again he was disappointed that his employers at the Public Health Service never sent him a note of congratulations. The next year the editors of *Modern Medicine* voted to grant him their *Distinguished Achievement Award* in recognition of his "unflinching courage in effecting control of noxious environmental agents in industry"; this was followed by the *Humanitarian Award* of the *National Health Federation* (in 1965) and the *Gold Medal of the Cancer Prevention Center* in Rome

11 Stewart, Harold I. Spoken on the Occasion of the National Institutes of Health Director's Award to Dr. Wilhelm C. Hueper on Friday, September 1, 1978. *Journal of the National Cancer Institute* 62 (1979) p. 719.

12 Hueper (note 1), p. 214. Hueper derided the viral theory of the origins of cancer as "a supposition based on circumstantial evidence, but not a scientific fact" (p. 215). To those who suggested that the cancer among Europe's munition workers might be due to "inbreeding", he pointed out that deaths in which such a theory occurred had fallen to "zero", "a fact which should make inbreeding cancer difficult to deny" (p. 215). Compare also his earlier assertion that "there is no concrete and valid evidence to indicate that a certain hereditary predisposition plays any important role in the production and maintenance of neoplasms" (p. 10). Hueper, "The Significance of Industrial Cancer in the Cancer Problem," *Cancer Research* 1 (1941) p. 1.

13 Hueper (note 1), pp. 229-230, 300-301.

14 Pearson, Richard M. Wilhelm Hueper, *Portrait of an Industrial Cancer Fighter*, (New York: Washington Post Company, 1977) p. 17. Pearson (note 1), p. 17.

1968). In 1975 he was granted the *First Annual Award* of the Society for Occupational and Environmental Health. Finally, in 1978, more than a dozen years after his retirement and only months before his death, the *National Institutes of Health* honored him with its *Director's Award* on the recommendation of Arthur H. Hays Sulzberg, Jr., the Cancer administration's newly appointed head of the *National Cancer Institute*. Hueper must have been pleased to have his former employer recognize his work; the *NIH* award cited his work on radiation-induced leukemia, his exposure to the cancer hazard posed by water-soluble chromate chemicals, and his 1942 book on occupational tumors. The April 1979 issue of the *Journal of the National Cancer Institute* was dedicated to the memory of this "old soldier of the war against cancer", who died of a heart attack at age 84 on December 28, 1978.

Wilhelm Hueper was not what one can call a folk hero. Most of his writings on chemical and cancer were technical; he was an effective expert witness at public hearings but he rarely made an effort to write for a popular audience. His 1942 treatise, only 1,500 copies, and few people outside the specialty he pioneered will have heard his name. He is probably best known to the wider public through the work of Rachel Carson, whose chapter on cancer in her 1962 *Silent Spring* (originally titled *One in Every Four*) relied heavily on the work of the émigré pathologist Hueper and helped arrange a collaborative project with the Fish and Wildlife Service to report on fish with tumors in waste hatcheries, a 1961 epidemic of liver cancer in trout hatcheries alerted both Hueper and Carson to the "disaster" that could come if humans continued to drink contaminated water. Hueper was Carson's ally in the view that DDT was a carcinogen. Hueper may well have been the source of Carson's conviction that we are living in a "sea of carcinogens".¹ Carson's comparison of the present cancer epidemic with the situation at the end of the nineteenth century, when common killers such as cholera were recognized to originate from tainted water. In both cases - chemically-induced cancer and infectious epidemics - prevention of exposure to the offending agent would prove to be the most humane and effective response.

Hueper was an activist scientist, and was therefore aware that chemical carcinogens might prove more intractable than biological germs. Germs, after all, were not the direct and intentional product of industry. No one felt about germs the way Monsanto felt about pesticides. John Muir felt about acid rain, the Atomic Energy Commission felt about radiation. There was much more to convincing people with scientific and political power that chemical carcinogenesis was something to be taken seriously. When such recognition was finally institutionalized with the founding of the *Occupational Safety and Health*

Administration (OSHA) and the *Environmental Protection Agency* in 1970, Hueper could be seen as having helped to clear the path.

Hueper's contribution to what we, today, might call the "political epistemology of medicine" must also not be forgotten. Hueper was aware that cancer research is a political process, and that much of what we know or don't know is the product of political opportunity and struggle. Ignorance about what causes cancer and to what degree is therefore not just a natural consequence of the shifting boundary between the known and the unknown, but a political consequence of decisions concerning how to approach (or neglect) what can and should be done. Ignorance is socially constructed by outright censorship (admittedly rare), by failures to fund, by the absence or neglect of interested parties, and by efforts to jam the scientific airwaves with noise. Hueper was aware of such things, but it is up to us to ensure that our memory of his labors does not fade with the passage of time.

¹ Carson 1962, 11, 107-108, 110.
² Carson 1962, 11, 110.