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Title: Manufactured Science - The Attorneys' Handmaiden: The Influence of Industry in Occupational Disease Research during the Twentieth Century

Abstract approved:

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Since the early twentieth century, manufacturers of toxic products have attempted to discredit research linking their product with disease. At the same time they have manufactured their own science designed to minimize risks associated with their products. Much of this activity has been conducted by or through corporate attorneys, endeavors that are the subject of this thesis.

Although attorney involvement has often been shielded by the attorney privileges, information disclosed in silica and asbestos lawsuits demonstrates the full range of legal activities, including identifying and hiring experts, preparing contracts for research that limited public disclosure, editing final research papers, harassing opposing experts, and manipulating regulations and workers' compensation laws. These efforts were successful in limiting victims' recovery for silicosis and keeping it out of the public eye. At first, asbestos manufacturers were similarly successful. However, a growing number of public health advocates and plaintiff attorneys have brought the controversy into the public legal

arena by suing third party manufacturers, bankrupting numerous companies in the process.

Companies have now turned to “Litigation Support Firms” who work hand in hand with attorneys to transform the peer review literature by publishing carefully structured research (and reviews of past research) in peer-reviewed, but often industry controlled, journals. These articles invariably find no or little hazard and are often published in slightly altered forms in two to four publications, thus slanting the entire balance of the peer review literature. This attorney involvement in medical research is a vital issue in the production of knowledge, having delayed recognition of hazards such as silica and asbestos by many decades. It continues to skew the understanding of occupational diseases.

Manufactured Science - The Attorneys' Handmaiden: The Influence of Industry in Occupational Disease Research during the Twentieth Century

by

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Chair of the Department of History

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Craig A. Biegel, Author

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Chapter 1 – Introduction

This thesis is about scientific controversy – more specifically about the changing nature of scientific controversy in the field of medical research during the twentieth century. Scientific controversy is not new to the twentieth century. It likely was present with the astronomers of Mesopotamia and the doctors of Egypt. As the concept of scientific theory developed in ancient Greece, opposing theories arose as to the nature of matter. Even the greatest controversy of the Scientific Revolution, the opposing views of an earth-centric and heliocentric solar system, actually first arose in Hellenistic times with the competing views of the Ptolemaic solar system and the heliocentric solar system of Aristarchus of Samos.[1]

Throughout the twentieth century, historians and philosophers of science have increasingly investigated these scientific controversies, examining their nature, causes and resolution. More than sixty years ago, Columbia University professor Robert K.

[1] Few of Aristarchus' writings have survived. These are supplemented by references in an additional few ancient texts. For those interested in this controversy, there are numerous secondary sources. The following provide but an entry into the fascinating account of this ancient Greek scientist: B. E. Wall, "Anatomy of a Precursor: The Historiography of Aristarchus of Samos," *Studies in History and Philosophy of Science* 6, no. 3 (1975): 201-28; J. L. E. Dreyer, *History of the Planetary Systems from Thales to Kepler* (Cambridge, 1906); reprinted as *A History of Astronomy from Thales to Kepler* (New York, 1953); T. L. Heath, *Aristarchus of Samos: The Ancient Copernicus* (Oxford: The Clarendon Press, 1913); and Christianidis, Jean, Dialetis, Dimitris, and Gavroglu, Kostas. "Having a Knack for the Non-Intuitive: Aristarchus's Heliocentrism Through Archimedes's Geocentrism," *History of Science*, xl (2002): 147-168.

Merton, perhaps the best known American sociologist of science, set forth a theory of how science and its controversies operate. During the 1930s he gradually came to believe that science is a social institution with a normative framework. His 1938 classic paper, "Science and the Social Order" laid the theoretical groundwork for the modern study of the history of science.[2] He came to believe that the scientific "ethos," or traditional values and norms of scientific research, included four imperatives, which he described as universalism, communalism, disinterestedness, and organized skepticism. Universalism is that knowledge which transcends cultural boundaries. Communalism refers to the common ownership of the results of scientific investigation. Disinterestedness requires that scientists conduct research without consideration of personal gain or bias. Finally, organized skepticism results from applying socially established rules of enquiry that require independent critical examination.[3]

To Merton, good science required public disclosure. The secrecy found in totalitarian regimes such as Nazi Germany was inimical to his norms of science. Science could not flourish under a totalitarian regime since researchers could not receive credit for discoveries and their work could not be scrutinized and either validated or falsified.[4]

Another prominent mid century philosopher of science, Sir Karl Popper, noted a sharp contrast between facts as gathered by scientists and in judicial proceedings. To

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[2] Robert K. Merton, "Science and the Social Order," *Philosophy of Science* 5 (1938): 321-337;

[3] Reprinted as Merton, "The Normative Structure of Science," in *The Sociology of Science: Theoretical and empirical Investigation*, ed. Norman W. Stoner (Chicago, Illinois: University of Chicago Press, 1973), 267-278: For a further discussion of these concepts, see Sheldon Krimsky, *Science in the Private Interest: Has the Lure of Profits Corrupted Biomedical Research* (Lanham, Maryland: Rowman & Littlefield Publishers, Inc., 2003), 75-79.

[4] Michael Aaron Dennis, "Secrecy and Science Revisited: From Politics to Historical Practice," in *The Historiography of Contemporary Science, Technology, and Medicine: Writing Recent Science,* ed. Ronald Edmund Doel and Thomas Söderqvist (New York: Routledge, 2006), 172-184: see especially 173-174.

Popper, the important trait of science was its falsibility. He argued that scientists should not be seeking to gather supporting evidence for their hypothesis, as occurs in a court of law, but rather should rigorously test their theories to expose any flaws. Scientists should actually go to war with their own theories. Hypotheses and theories should not be held "dogmatically." "On the contrary, we try to overthrow them… we try to prove that our anticipations are false."[5] In furtherance of this, scientists should advance their work in the public forum, allowing it to be fully scrutinized by fellow scientists. "The advance of science is not due to the fact that more and more perpetual experiences accumulate in the course of time … bold ideas, unjustified anticipations, and speculative thought are our only means of interpreting nature: our only organon, our only instrument, for grasping her. And we must hazard them to win our prize. Those among us who are unwilling to expose their ideas to the hazard of refutation do not take part in the scientific game."[6] Thus, like most sociologists and philosophers of science of the mid twentieth century, both of these individuals naturally assumed numerous controversies accompanied the progression of science.

As the latter half of the twentieth century advanced, attention focused more closely on the manner in which factors outside of strict science can also influence these controversies. Historians of science now recognize that many, perhaps most controversies of science, have a strong component of social, political, and other outside influences. Perhaps the archetypal book in this area is Steven Shapin and Simon Schaffer's

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[5] Sir Karl Popper, *The Logic of Scientific Discovery* (New York: Harper & Row, Publishers, Inc., 1968), 280.
[6] Sir Karl Popper, *The Logic of Scientific Discovery*, 279.

Leviathan and the Air Pump. In the medical research area, Bruno Latour similarly demonstrated that numerous external factors influenced the acceptance of Louis Pasteur's theories.[7]

By the latter decades of the twentieth century, historians recognized not only the outside influences in these earlier events, but also the rapid changes in scientific controversy being brought about by the emerging phenomena of big science and big business, with the profit motive entering more and more into the picture of scientific controversies. Legislation, regulations and Supreme Court decisions during the 1980s provided new impetus for this trend. Scientific research became more and more commercialized. Secrecy of research has become more the norm than communitarian values. As a result, examinations of scientific controversies have started probing how conflicts of interest affect scientific controversies, peer review, and publication of scientific articles.[8] At least two sociologists have proposed a detailed and complex protocol for analyzing these controversies.[9]

Consequently, investigation of scientific controversies has become much more complex and detailed. Ernan McMullin, John Cardinal O'Hara Professor of Philosophy (Emeritus), at the University of Notre Dame, has focused much of his research on these very issues of contemporary philosophy of science. Rather than the standard description

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[7] Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: Princeton University Press, 1985); Bruno Latour, *The Pasteurization of France* (Cambridge: Harvard University Press, 1988). Latour's work has, of course, been criticized, yet it remains important in demonstrating the influence of external factors in all branches of science, as well as the post-modernist disapproval of unquestioning reliance on science.

[8] Sheldon Krimsky, "The Funding Effect in Science and its Implications for the Judiciary," *Journal of Law and Policy* 17 (2005): 43, 45.

[9] Sheldon Krimsky, "The Funding Effect," 43, 45; Gerald E. Markle and James C. Petersen, "Controversies in Science and Technology: A Protocol for Comparative Research," *Science, Technology, & Human Values* 6, no. 34 (Spring, 19891), 25-29.

of internal versus external considerations in scientific debates, McMullin prefers explaining such issues by the epistemic, nonstandard epistemic, and non-epistemic factors embodied within the disagreements.[10]

Epistemic factors are those necessary for the specific quest for knowledge. They include facts, theories, scientific principles, methodological principles, and even philosophical positions, such as in the Einstein-Bohr debate of the 1930s. In certain cases these positions can even include theological considerations. McMullin deals with this very broad palette by dividing epistemic factors into standard and nonstandard categories. The distinctions between standard and nonstandard epistemic factors can, at times be vague and flexible. “The decision as to whether a particular factor is standard or not thus depends on the notion of science employed by the person using the distinction. The boundary between standard and nonstandard will vary, then, as notions of scientific rationality vary. It is an evaluative distinction, either imposed on the grounds of present usage or proposed as a reconstruction of what it is that made the history of science develop in precisely the way it did.” One such nonstandard factor is the question of the role of the precautionary principle in regulations, particularly public health and occupational disease regulations. Non-epistemic factors include everything else that affects scientific controversies, for example, personality traits, monetary considerations, institutional pressures, political influences, and personal hostilities, among others.[11]

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[10] Ernan McMullin, “Scientific Controversy and its Termination,” In H. Tristram Engelhardt Jr. and Arthur L. Caplan, eds., 49-92.

[11] The quote is from Ernan McMullin, “Scientific Controversy,” 62. Other scholars who discuss the distinctions between epistemic and non-epistemic factors include Maria Purnari, “The Distinction Between Epistemic and Non-Epistemic Values in the Natural Sciences,” *Science and Education* 17 (2008): 669-676; and Phyllis Rooney, “On Values in Science: Is the Epistemic/Non-Epistemic Distinction Useful?,” *PSA:*

Scientific controversies occur over questions of fact, theory, or principle. When the principle involves nonstandard or non-epistemic factors such as moral or political principles, McMullin characterizes the controversy as mixed. Given the broad and complex nature of these controversies, they can be the most difficult to resolve. This is particularly the case when corporate profits collide with the chronic, long term health of its workers.[12]

Thus it is not unusual for me to claim that external influences have had dramatic impacts on medical research and regulation of occupational diseases in the twentieth century. As the next chapter and the remainder of this thesis will demonstrate, since the early 1990s numerous articles and books have demonstrated a wide range of such influences. The distinction with this thesis is the specific nature of the influences. The fundamental reason for these influences is a non-epistemic factor, profits.

Since shortly before the new millennium a growing body of literature began lamenting the erosion of integrity in public health science. This literature pointed to two causes of the erosion, political pressure and a growing willingness of industry to challenge the scientific basis of health regulations. As one 2006 article stated, "Industries themselves are also increasingly active in influencing scientific research, through challenges to the scientific basis of health regulations, targeted funding of research

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Proceedings of the Biennial Meeting of the Philosophy of Science Association 1992, volume 1: Contributed Papers (1992): 13-22.
[12] Ernan McMullin, "Scientific Controversy," 75.

designed to answer particular questions and not to answer others, and participation on research and decision making panels."[13]

By the early twentieth century, increasingly larger businesses and corporations played prominent roles in the economy and politics. In virtually every case, they sought to maximize their profits. To accomplish this they not only had to sell more products but also limit costs, including labor and costly regulatory requirements. Where these corporations intersected with the public and occupational health spheres two opposing philosophies competed for supremacy: the precautionary principle of "first do no harm" and the principle that there should be no regulation without "sound science." The precautionary principle is best known for its use in the field of environmental science. The Rio Declaration of 1992 and the Wingspread Statement of 1998 describe it as follows: "when an activity raises threat of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."[14] Industry, on the other hand, has consistently argued that "sound science" is the only legitimate basis for public health science. Yet sound science can mean many things, especially for public health.

A good example of this is the area of drug regulations where pharmaceutical companies argue that their studies provide a sufficient basis to demonstrate both the safety and effectiveness of their products. On the other hand, in the regulatory sphere industry often argues that studies demonstrating a harm caused by their product are not

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[13] R Clapp, P. Hoppin, and D. Kriebel, "Erosion of the Integrity of Public Health Science in the USA," *Occupational and Environmental Medicine* 63 (2006): 367.
[14] David Kriebel and Joel Tickner, "Reenergizing Public Health Through Precaution," *American Journal of Public Health* 91, no. 9 (September, 2001): 1351.

sufficient to require regulation or increased precautions without further study. While these tactics might seem at odds with one another, they have one thing in common. In both cases industry is following the course of action which means greater profits. Yet, in both cases medical research and diagnosis are fraught with uncertainties. Thus, with the appropriate incentive, it is relatively easy to influence the outcome of a medical study in one direction or the other. One commentary has succinctly described the problem.

> "Regulated parties who sponsor research that informs regulation of their products or activities have incentives to influence the research in ways that ensure favorable outcomes. Yet since research design and reporting is inherently layered with discretionary judgments that are difficult to discern without replicating the research directly, systemic biases in these judgments are difficult to detect from the outside. As long as sponsors control the research at some or all points in the research process, adverse results can be suppressed and the design and reporting of experiments can be biased in ways that produce results that support the sponsor's interests, rather than offer a disinterested examination of potential harms."[15]

Occupational disease research can take many forms. At its heart, however, is the most critical and devastating occupational disease possible, cancer. Thus cancer provides both the most important aspect of research being conducted in occupational diseases, as well as a good microcosm in how occupational diseases are researched. Simply put, the driving force of cancer research is profits.

Devra Davis is the director of the Center for Environmental Oncology at the University of Pittsburgh Cancer Center and a Professor in the Department of Epidemiology at its Graduate School of Public Health. In her family she has first-hand

[15] Wendy Wagner and David Michaels, "Equal Treatment for Regulatory Science: Extending the Controls Governing the Quality of Public Research to Private Research," *American Journal of Law & Medicine* 30 (2004): 120.

experiences with the heartache of cancer. In *The Secret History of the War on Cancer* she argues that for decades the United States has taken the wrong approach to this war. Virtually all of the research money is being spent on finding cures, when the real effort should be in finding the causes. Davis believes that environmental causes, from tobacco and asbestos to chemicals and drugs, have fueled the dramatic increase of cancer during the twentieth century. She presents dozens of examples of these causes, as well as industry's continuing efforts to block or slow research into the consequences of their products and processes.[16]

One factor is evident in both of these research alternatives, the profit motivation. In developing cures, or even partial cures or life lengthening therapies, pharmaceutical companies stand to make vast profits. On the other hand, identifying causes of cancer does not enhance profits in the short run, rather it decreases them. It does this in two ways. First, most of the causes are toxic substances produced by industry. Eliminating the substance will eliminate the company's profit for that substance. Second, and just as important, eliminating the substance will also frequently eliminate the cheapest way for other companies to produce their products, thus increasing the overall cost of production.

Since most medical research is conducted with private rather than public funding, it is unsurprising that the profit motive prevails. Given the overall lack of public funding for medical research, in many ways the United States is fortunate that the profit motive is so strong. As *JAMA* editor Catherine DeAngelis emphasized in her 2000 editorial, private research is vitally important to medical research. "Balance must be maintained between

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[16] Devra Davis, *The Secret History of the War on Cancer* (New York: Basic Books, 2007).

the need for research projects to be reasonably funded and performed by the best possible investigators and the relative paucity of public funds for clinical research. In 1999, the National Institutes of Health (NIH) provided $17.8 billion for research, and the major proportion was expended for basic research; the top 10 pharmaceutical companies spent $22.7 billion, primarily on clinical research…"[17]

In a subsequent 2006 editorial DeAngelis also emphasized the essential nature of commercial research. "The influence of commercial interests on medical science is far-reaching but, to a great degree, essential," she wrote. "The discovery of new medications, devices, and techniques is funded primarily by for-profit companies; testing new modalities of treatment is funded primarily by for-profit companies…Ideally the products discovered, tested, and produced will be beneficial to many individuals for whom the products will be prescribed and who will purchase them, returning a healthy profit for the company." But she then brought in a note of caution. "Now comes the potential problem. In some instances, the marketing goal of a company dominates the scientific aspect of the company-funded research."[18]

Since private pharmaceutical companies obviously have an interest in finding cures rather than causes of cancer, the allocation of the public and nonprofit funding is perhaps even more important than the preponderance of private funding in medical research. In 1988 the American Cancer Society allocated substantially less than one percent of its budget to the study of environmental causes of cancer.[19]

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[17] Catherine DeAngelis, "Conflict of Interest and the Public Trust," *JAMA* 284 (November 1, 2000): 2237.
[18] Catherine DeAngelis, "The Influence of Money on Medical Science," *JAMA* 296 (August 23/30, 2006): 996.
[19] Sheldon Krimsky, *Science in the Private Interest*, 88, fn 21.

While there are, in some circumstances, regulations requiring a certain amount of research by private corporations to determine the effects of their products, private industry has limited—and certainly no short term financial interest in developing studies to determine either if their product has long term toxic effects or if a non-toxic substance is more effective. For example, in a study of articles published in *Weed Science* from 1983 until 1993, Sheldon Krimsky, professor of Urban & Environmental Policy & Planning at Tufts University, found that articles on herbicides vastly outnumbered articles on nonchemical weed control.[20]

Public reviews of chemicals are, if anything, even lower on the priority list. Public funding for chemical reviews is very limited. The EPA commonly relies on industry data for its regulations. The General Accounting Office (GAO) concluded in 2001 that the EPA's Science Advisory Board (SAB) had neither the information nor the procedures to ensure its committees were properly independent and balanced.[21]

This is not to say that the courts and regulatory bodies have not been active in this field. As the twentieth century progressed, medical controversies received increasing attention in the courts and regulatory bodies. Commentators have remarked about this, attributing it, at least in part, to the increased interest in the control and prevention of illness as well as human research and experimentation. Generally law and public policy intrude on occupational disease and medical research when they attempt to deal with

[20] Ibid.
[21] Jon P. Devine, "Has There Been a Corporate Takeover of EPA Science?" *Risk Policy Report* 8 (2001): 35.

causal relationships between illnesses and their causes while establishing responsibility and accountability in cases of injury or death.

This issue highlights the heart of this thesis, the effects of attorneys on medical research, since as one commentator has noted, "it often appears that law and medicine are making appeals to quite different notions of causality or causation."[22] Yet, as attorneys obtain evidence to defend their lawsuits or fight regulatory actions in courts, it can dramatically affect the medical or scientific notion of causality. As will be seen in this thesis, there can be no doubt that attorneys are deeply imbedded in the formulation of medical research and medical efforts to determine the causation of diseases.

What is missing from most examinations of corporate medical practice, occupational disease, and public health research, is a close analysis of key components of industry's efforts to forestall regulation and the public's outcry against health and safety issues in the workplace – the attorneys who lobbied governments, defended lawsuits, and, yes, even coordinated and managed research designed to demonstrate the corporate position of the lack of harm from the company's products and processes. The introduction of biases caused by financial interests is made easier when a cloak of secrecy surrounds the formulation of scientific studies and any results that do not conform to a

[22] H. Tristram Engelhardt, Jr., Joseph M. Healey, Jr., Stuart F. Spicker, "Introduction," Stuart F. Spicker, Joseph M. Healey, Jr., H. Tristram Engelhardt, Jr., eds. *The Law-Medicine Relation: A Philosophical Exploration* (Proceedings of the Eighth Trans-Disciplinary Symposium on Philosophy and Medicine Held at Farmington, Connecticut, November 9-11, 1978) (Boston: D. Reidel Publishing Company, 1981). Even when specifically dealing with issues such as these, neither this symposium, nor most writings concerning the intersection of medical research and the law, specifically consider the effect attorneys have on the construction of medical knowledge.

desired conclusion can be hidden. This is the case when attorneys become involved in decision-making with regard to medical research.[23]

Over the past twenty years several public health historians and advocates have begun cataloguing numerous instances of public perception and regulation of toxic products and practices being influenced by corporate attorneys. This system of attorneys enabling corporate practices by working behind the scenes in matters of medical research and policy is not new. Release of tobacco litigation documents over the past fifteen years provides a chilling example of how attorneys were able to influence the public's perception, litigation, and governmental regulation of tobacco. Documents contained in tobacco discovery disclosures imply that attorneys were deeply involved in limiting acknowledgement of the industry's funding of research as well as deciding which special projects should be funded. As one British scholar has written about the differences in tobacco regulation in Great Britain and the United States; "In the United States, [corporate] lawyers appear to have been dominant almost from the start…"[24]

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[23] This is not to say that CEOs and other management personnel do not also have a role in this story. However, as discussed in Chapter 2 and the following case studies, their activities have been well discussed in numerous other monographs and articles, whereas the attorneys' roles as enablers have often gone unnoticed or given only fleeting attention in this same literature.

[24] Deborah E. Barnes, Peter Hanauer, John Slade, Lisa A. Bero, and Stanton Glantz, "Environmental Tobacco Smoke: The Brown and Williamson Documents," *JAMA* 274, no. 3 (July 19, 1995): 249, 250; Peter Hanauer, John Slade, Deborah E. Barnes, Lisa A. Bero, and Stanton Glantz, "Lawyer Control of Internal Scientific Research to Protect Against Products Liability Lawsuits: The Brown and Williamson Documents," *JAMA* 274, no. 3 (July 19, 1995): 234-40; Lisa A. Bero, Deborah E. Barnes, Peter Hanauer, John Slade, and Stanton Glantz, "Lawyer Control of the Tobacco Industry's External Research Program: The Brown and Williamson Documents," *JAMA* 274, no. 3 (July 19, 1995): 241-47; Elissa K. Ong and Stanton A. Glantz, "Constructing 'Sound Science' and 'Good Epidemiology': Tobacco, Lawyers, and Public Relations Firms," *American Journal of Public Health*, 91, no. 11 (November, 2001): 1749-1757; the quote is from Virginia Berridge, "Why Have Attitudes to Industry Funding of Research changed?," *Addiction* 92, no. 8 (1997): 966.

However, even this effort relied and expanded on prior ground work by corporate attorneys in the field of occupational disease and workmen's compensation. The influence of attorneys goes back at least to the early twentieth century and the then growing recognition of occupational lung disease. It is, however, a difficult topic to research and relate, due to the nature of attorney activities and court allowed privileges.

In order that attorneys may effectively represent and have the full cooperation of their clients, the judicial system provides them with certain privileges that give them the ability to act in secret. Two of these privileges are called the attorney-client privilege and the attorney work product privilege.[25] These two privileges protect the confidentiality of attorney-client communications and materials prepared in anticipation of litigation or for trial. Thus discussions concerning corporate practices, studies, and concerns can often be kept private so long as litigation is foreseen and an attorney is included in the meeting as an advisor. In addition, research conducted by experts is also protected, so long as it is prepared for attorneys "in anticipation or for trial." It is my thesis that through these two privileges attorneys can and frequently have worked behind the scenes to influence medical opinion and regulation of occupational disease issues that dramatically affect the bottom line of corporate profits. This veil of secrecy also permits attorneys to have numerous research studies conducted, only disclosing those which support the corporate position.

This is not to say that attorneys employed or paid by corporate defendants are the only attorneys who attempt to construct science. Commentators have written numerous

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[25] Federal Rules of Evidence , Rule 502, cited at http://www.law.cornell.edu/rules/fre/rules.htm, last accessed on August 27, 2010.

articles and books about purported plaintiff counsel malfeasance and attempts to influence science.[26] However, plaintiff counsels involved in occupational disease litigation have sponsored only limited new research or publication of reviews/reanalysis of old research. Although a few have become very wealthy on such cases, as a group and except for a very few cases, individually, they have not had the resources or the time to hire experts to conduct extensive new research. This was especially true prior to the development of asbestos mass litigation in the 1970s and 1980s.

If we are going to see how attorneys can both construct science and use it as their handmaiden, we must look to the attorneys who have at their disposal the resources of large companies, corporations, and trade groups, the corporate and litigation counsel who are involved in defending occupational disease lawsuits and seeking to limit regulation of their clients. However, given the enormous expense of most studies and the disparate financial backing of the two sides, in this thesis I will focus on the influence of corporate attorneys. As mentioned above, given the secrecy of attorney activities, even this is very difficult. Few records provide more than a hint of attorney involvement in occupational disease research and corporate policy formulation. It is only during the litigation

[26] Most, but not all, of these writings are by conservative commentators, industry consultants, or individuals writing on commission. One example of plaintiff attorney involvement in manufacturing science is contained in a letter to the editor of *Environmental Health Perspectives*. The correspondents criticized a recent article in which the authors had not disclosed their funding by plaintiff attorneys. The correspondents also alleged that the plaintiff counsels were "actively involved in the design and administration of this study. . ." The correspondent's complaints were somewhat muted by their own failure to mention that at least one of themselves also testified for defense attorneys in industrial cases. Philip Edelman, Patricial Sparks, and Thomas Starr, "Litigation-related Research," *Environmental Health Perspectives* 102, no. 6-7 (June/July 1994): 512-514; McDaniel v. CSX Transportation Inc., Supreme Court of Tennessee, September 29, 1997, accessed on November 10, 2010 at http://caselaw.findlaw.com/tn-supreme-court/1012825.html. One of the best examples of a non ideological writing concerning plaintiff counsel attempting to use and construct science in litigation is by Marcia Angell, M.D., former editor of *The New England Journal of Medicine*. Marcia Angell, *Science on Trial: the Clash of Medical Evidence and the Law in the Breast Implant Case* (New York: W. W. Norton & Company, Inc., 1996).

discovery process and corporate bankruptcy proceedings that attorney activities are on occasion disclosed.

This thesis focuses on industry attorneys' involvement in public and occupational health research when product safety is at issue. Although corporate management held the final power of approval, attorneys were and are the enablers in most corporate practices relating to occupational health. Attorneys accomplish this enabling by keeping litigation costs low, a process requiring close attention to the relevant medical science. This thesis therefore first examines methods that can be used to influence studies designed to determine if a product is safe and whether it should be regulated. I then closely examine one area of concern in public health, industrial dust diseases, to trace industry methods of influencing research and medical opinion through the twentieth century. I want to understand the nature of attorney's usage of medical science and their efforts to manufacture scientific knowledge in support of their legal stances. The questions that I ask include:

How do attorneys use scientific knowledge?

What methods are used to create new scientific knowledge?

What, if any, methods are used to hide scientific knowledge?

What effects do these practices have on scientific knowledge?

Like Shapin and Schaffer in their exploration of the importance of experimentation to scientific knowledge in *Leviathan and the Air Pump*, my intent is for the answers to be historical in character. As they used the events surrounding the institutionalization of experimentation to examine their questions, I believe the events surrounding medical research relating to occupational disease in the twentieth century can show how attorneys have used and manufactured science for legal purposes, for it is in the lawsuits involving occupational diseases that the veil of secrecy behind attorney activities has on occasion been pierced.[27]

Accordingly, after discussing the techniques used to influence medical research and opinions, I have chosen two occupational diseases that have been subject to extended mass litigation as case studies to illustrate the influence of attorneys in the manufacture of medical science. They both involve natural substances that, when used in industrial and related settings, can cause severe disease and, frequently, even death. They also involve the substances exposing the largest numbers of workers, in each case well over a million. The first is crystalline silica—in its most common form, simple sand—which caused the first occupational disease litigation crisis of the twentieth century. The second is asbestos, the most litigated occupation disease causing substance in the twentieth century.

The chapters that follow describe how attorneys have been deeply entrenched in occupational, pharmaceutical, and public health research throughout the twentieth century. By operating within a veil of secrecy that is actively promoted by legal ethics, they have influenced both the direction and the results of medical science with little oversight or knowledge by the public. Chapter one examines the historiography of occupational health history. Initially histories of this area wrote in the manner of "the great man," describing how occupational health doctors strove to improve working conditions in the early twentieth century. By the 1960s public health advocates began

[27] Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump*, 3.

describing the disasters and heartache of working conditions and public health in America. Finally, as litigation became more of a force in occupational health, both plaintiff and defense experts began writing histories of events as viewed from their respective sides. Most of this writing paid little attention to the pervasive presence of attorneys and their, at times, virtual management of the science. Chapter two provides background on the manner in which scientific studies, reports, and reviews can be manipulated, from the question being asked, to the facts gathered and analyzed, to the interpretation given.

The next two chapters contain the heart of this thesis: the first details the original occupational health litigation crisis in the United States—silicosis in the nineteen twenties and thirties; the second examines the most extensive mass tort litigation in the United States—asbestos diseases. Both chapters initially examine the chronology of public knowledge concerning the substances' health risks. They then scrutinize attorney involvement in medical research and their manufacture of medical knowledge.[28]

As noted above, silica, in its most visible form, is simply sand. It also is a major component of most sedimentary rocks. In its basic form, sand crystals are too big to enter the lungs, but when abraded or heated they can become small enough to enter into the upper lungs and on occasion even deeper. Silica causes silicosis, a fibrosis of the lungs,

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[28] A wide variety of books contain information about the diseases associated with silica and asbestos. Some of the better known volumes include: Linda Rosenstock and Mark R. Cullen, *Textbook of Clinical Occupational and Environmental* Medicine (Philadelphia: Saunders, 1994); Anthony J. Lanza, *Silicosis and Asbestosis* (London: Oxford University Press, 1938); W. Keith Morgan and Anthony Seaton, eds., *Occupational Lung Diseases* (Philadelphia: Harcourt Brace & Company, 1995); W. Raymond Parkes, *Occupational Lung Disorders* (Boston: Butterworth-Heinemann, 1994); Irving J. Selikoff, and Douglas H. K. Lee, *Asbestos and Disease* (New York: Academic Press, 1978); and Paul F. Holt, *Inhaled Dust and Disease* (Chichester: John Wiley & Sons, 1987).

with each crystal causing scarring in a characteristic circular pattern. In its moderate forms, this scarring causes severe emphysema, similar to that caused by heavy smoking. Silicosis also makes an individual more susceptible to tuberculosis and other diseases of the lung. Silica also appears to be a mild carcinogen with some studies showing a higher rate of lung cancer among silica workers. Exposure to silica dust comes primarily from sandblasting, mining and grinding of sand. The silicosis crisis occurred in the late nineteen twenties and early nineteen thirties. Although silicosis is still prevalent in certain industries, since the National Conference on Silicosis in the mid nineteen thirties, it has rarely been in the news.

Similar to silica, asbestos is a natural material. It is a fibrous mineral found in many serpentine or amphibole rocks. There are three commercially viable forms of asbestos: amosite and crocidolite come from amphibole rock, chrysotile from serpentine rock. Chrysotile also normally contains a small amount of tremolite, an amphibole form of asbestos. Amphibole fibers are straighter than chrysotile and also last in the lung somewhat longer. Asbestos causes both nonmalignant and malignant diseases, with most research showing that the amphiboles are usually more carcinogenic. The non-malignant disease, asbestosis, is a fibrosis of the interior of the lungs, caused by the mechanical scarring of the deep lung tissues by the fibers. Pleural thickening and calcification of the lining of the lungs can also occur. The malignant diseases include lung cancer and mesothelioma. Mesothelioma is a cancer of the lining of the lungs which usually causes death by suffocation. Asbestos works synergistically with smoking to greatly multiply the risk of lung cancer above the risk of either individual cause. During the twentieth century (especially in the middle decades), thousands of products contained asbestos, including insulation, construction materials, gaskets, brakes, cloth, paper, drilling mud, plastics, and even kindergarten modeling clay.

The picture that emerges from these two case studies is not unique. As the twentieth century closed, attorneys were increasingly involved in the science of medical research. By examining two case studies, it is possible to understand how such engagement affects the nature of medical research and the public's perception of such knowledge. This is a significant, yet until now little-examined, issue in the history of recent science.

Chapter 2 - Occupational Lung Disease Research: Placing This Issue in Historical and Historiographical Context

The nineteenth and twentieth centuries witnessed dramatic increases in both industrialization and accompanying occupational health consequences. During the twentieth century, in particular, new techniques and materials imperiled workers' health. Yet during the much of the twentieth century, the historiography of occupational medicine did not follow the pattern of the more established fields in the history of science or medicine. These typically began with "heroic" histories, developed into internal histories of advancement, then histories of ideas, the understanding of the sometimes disjointed nature of science advancement, then the postmodernist views of the construction of science, influence of external factors and ways of viewing science through many lenses.[29]

In occupational health, this sequence was condensed. Through much of the twentieth century, historians ignored the history of occupational health, both in America and in Britain. Short synopses in medical articles and grand odes to the field's accomplishments by company doctors and hygienists provided the only histories of the field. From the 1970s onward, with the enhanced availability of information through lawsuits and the new emerging environmental consciousness, professional historians

[29] Peter J. Bowler and Iwan Rhys Morus, *Making Modern Science: A Historical Survey* (Chicago: University of Chicago Press, 2005); Gert H. Brieger, "The Historiography of Medicine," in *Companion Encyclopedia of the History of Medicine* ed. W. F. Bynum and Roy Porter (London: Routledge, 1993), 24-44.

became more engaged in this issue. By the 1980s occupational health and occupational lung disease in particular supported an extremely diverse literature.[30]

Recognition that certain dusts cause disease did not originate in the twentieth century. As Frederick Hoffman, chief statistician for Prudential Insurance Company, wrote in 1918: "[t]he importance of dust as a factor in occupational mortality has attracted the attention of every authority on occupational diseases from Rammazini to Sir Thomas Oliver." In fact, even ancient writers such as Hippocrates and Pliny the elder had noted its hazards.[31] As a more recent author stated in the 1930s, "Tuberculosis has long been recognized as one of the major diseases among industrial workers. Despite the rapid decline during recent years in deaths from pulmonary tuberculosis in the United States, it is still one of the chief causes of death among those of working age."[32]

The first book-length treatment of occupational disease, including those caused by dust, may have been British occupational health expert Thomas Oliver's *Dangerous Trades*, published in 1902.[33] By the third decade of the twentieth century, even insurance company data documented the epidemic of respiratory disease. Metropolitan Life Insurance Company data showed mortality from respiratory diseases was significantly

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30 This is not to suggest that historians have been negligent. Rather, through much of the twentieth century historians concentrated their attention on what they considered more important and certainly more fashionable topics. See Peter J. Bowler and Iwan Rhys Morus, *Making Modern Science: A Historical Review* (Chicago: University of Chicago Press, 2005), 1-19.

31 Emery R. Hayhurst, "Health Hazards of Non-Poisonous Dusts – A Resume of Some Recent Investigations," *The American Journal of Public Health* 10 (August 1920): 60.

32 Rosamond W. Goldberg, *Occupational Diseases in Relation to Compensation and Health Insurance* (New York: Columbia University Press, 1931) reprinted (New York: AMS Press, 1968), 195.

33 Thomas Oliver, *Dangerous Trades* (London: E. P. Dutton, 1902).

higher for persons exposed to silica, whether or not they had silicosis. Between ages 45 and 54 it was more than three times higher.[34]

By the 1930s, numerous published medical case reports also documented cases of silicosis after only short exposures. For example, in 1932 Boston physician E. M. Chapman published an article entitled "Acute Silicosis" in the *Journal of the American Medical Association* (*JAMA*). Even today authors cite this article to substantiate the ability of high doses of silica to cause severe disease after even short exposures. Similarly, a 1937 pathology report from Saranac Laboratory, a noted tuberculosis research institution, detailed the case history of a silicotic black foundry worker. For fourteen months he worked as sandblaster. At that point, shortness of breath forced him to quit his job. He then deteriorated rapidly, dying of silico-tuberculosis fourteen months later.[35]

Throughout this period, neither doctors nor historians focused on the history of occupational disease research or recognition. Most medical case reports and other articles on occupational lung disease provided a short history of the relevant medical knowledge as their authors understood it. Researchers in related fields, such as industrial hygiene, similarly provided a short professional history about the topic being examined, but rarely went into detail concerning the current significant disease issues of the day. On occasion, occupational health professionals wrote short articles dedicated to the history of industrial

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[34] Philip Drinker and Theodore Hatch, *Industrial Dust, Hygienic Significance, Measurement and Control* (New York, McGraw-Hill Book Company, Inc., 1936), 29.

[35] Thomas H. Milby, “Pneumoconioses,” in W. M. Gafafer, *Occupational Diseases: A Guide to Their Recognition* (Washington: U.S. Government Printing Office, 1964), 47-48; David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 78.

health or hygiene. These articles typically dwelled on the enormous gains the field had made in the twentieth century. Even federal Public Health Service employees such as J. J. Bloomfield—the very individuals designated to protect the health of the American populace—ignored the problem of silicosis in their histories of industrial hygiene.[36]

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An event during the early 1930s provided the opportunity for a closer examination of occupational lung disease. The occasion arose because a Union Carbide subsidiary in West Virginia needed additional power for its production of ferrosilicon. They decided to obtain this power by diverting water from the nearby New River through a new three mile long tunnel.

Construction on the tunnel—known as the Gauley Bridge or Hawk's Nest tunnel—began on March 31, 1930 and lasted for approximately twenty months. During this period almost 1500 men worked exclusively in the tunnel, most of them African Americans. Due to ill health from the dust created from the tunneling process, most

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[36] See for example Emery R. Hayhurst, "Health Hazards," 61; R. R. Sayers, Emery R. Hayhurst, and A. J. Lanza, "Effect of Dust on the Lungs," *American Journal of Public Health*, 20 (1930): 368-379; Leroy U. Gardner, "Pathology of So-Called Acute Silicosis," *American Journal of Public Health* 23 (1933): 1241; O. A. Sander, "Lung Findings in Foundry Workers A Four Year Study," *American Journal of Public Health* 28 (May 1938): 601-609; and R. R. Sayers and R. R. Jones, "Silicosis and Similar Dust Diseases: Medical Aspects and Control," *Public Health Reports (1896-1970)* 53, no. 33 (Aug. 19, 1938): 1453-1472. For a public health official's history that also ignored the contemporary occupational disease risks, see J. J. Bloomfield, "Development of Industrial Hygiene in the United States," *American Journal of Public Health* 28 (December 1938): 1388-1397. The practice of including histories in medical writings continues today, with most monographs and articles on inhaled dust diseases providing at least a short section on historical aspects. For example see Paul F. Holt, *Inhaled Dust and Disease*, 46, 86-87, 92-99, and 167.

workers did not remain on the job for the entire period. Even industry occupational doctor consultants characterized the conditions in the tunnel as horrific. [37]

Subsequent autopsies confirmed the speed at which silicosis can form under these conditions, with hundreds of workers dying from the disease.[38]

Although this disaster caused a sensation in the media across the country, for almost a year there was little follow up to the initial coverage. By the mid-thirties, the National Silicosis Conference, convened by the federal government but controlled by industrial interests, declared the crisis over. Historians of this period ignored the entire history of silicosis in America leading up to the disaster. It did not fit into the mold of then-current practices in the field of the history of science and medicine, where researchers were primarily interested in examining the theoretical and experimental advances of science in the centuries preceding the 20th century.

Labor and public health histories only appeared in the 1940s, but these virtually ignored the Gauley Bridge tunnel disaster. The only book to deeply explore the incident in the 1940s was cast as a novel.[39] During this period, industrial health doctors continued preparing the few histories of occupational health then available, whether in book form, articles or lectures. These histories remained adulations to the glories of science or at least catalogs of the accomplishments in industrial medicine. Books written or edited by

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[37] Martin Cherniack, *The Hawk's Nest Incident: America's Worst Industrial Disaster* (New Haven, Connecticut: Yale University Press, 1986), 1-2, 16-18, 24-51; and Leroy Gardner, "Pathology of So-Called Acute Silicosis," 1241. This event and the subsequent activities are discussed further in Chapter 4.

[38] Clayton S. Smith and Helen L. Wikoff, "The Silica Content of the Lungs of a Group of Tunnel Workers," *American Journal of Public Health* 12 (1933): 1250; and Martin Cherniack, *The Hawk's Nest Incident*, 112-170.

[39] Hubert Skidmore, *Hawk's Nest*, 2nd ed. (Knoxville, Tennessee: The University of Tennessee Press, 2004). The first edition was published in 1941 by Doubleday, Doran and Company, Inc; Bernard J. Stern, *Medicine in Industry* (New York: The Commonwealth Fund, 1946).

doctors about silicosis continued to have matter-of-fact reports of the history of knowledge concerning the disease and its diagnosis. Most provided minimal, if any, attention to occupational health disasters that occurred throughout the early twentieth century. Physician and historian of medicine George Rosen's book about mining in the nineteenth century—perhaps because it examined a prior century—did at least allude to the negligence or even callousness of many mine owners. As Rosen states in the preface, through the 1940s medical historians ignored the historical study of twentieth century occupational disease. Alice Hamilton, a public health industrial medicine physician, wrote the one exception to these histories. Although her autobiography about her career in public occupational medicine normally gives individuals the benefit of the doubt concerning their knowledge and motives, it does provide several accounts of industry indifference to occupational health or preoccupation with profit.[40]

Hamilton's book highlights a critical topic that has not received the attention it deserves. During most of the twentieth century, female occupation health specialists appeared to be more sympathetic to the worker than their male counterparts. For example, in a 1975 interview, public health physician Harriet Hardy called an occupational health insurance company "really naughty in all sorts of ways."[41] In 1958 Public Health Service physician Victoria M. Trasko reviewed the history of silicosis in the twentieth century. Unlike most male doctors of her time she noted that this disease

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[40] Ludwig Teleky, *History of Factory and Mine Hygiene* (New York: Columbia University Press, 1948); Leroy Gardner, Leroy, Ed. *Industrial Tuberculosis Silicosis and Compensation* (New York: National Tuberculosis Association, 1945); George Rosen, *The History of Miner's Disease* (New York: Schuman's, 1943); and Alice Hamilton, *Exploring the Dangerous Trades: The Autobiography of Alice Hamilton* (Boston: Little, Brown and Company, 1943).
[41] Mary Elizabeth Fouse, "Interview of Harriet Hardy of September 17, 1975," *Annals of the American Conference of Industrial Hygienists* 7 (1984), 73-82, 75.

had not been eliminated in the 1930s, but presented a continuing problem. Is this seeming greater concern due to the female socialization—or is it because most male doctors worked for a while in public health, then either obtained employment or consulted extensively with industry?[42]

From the late 1960s and through the 1970s, as asbestos disease became pervasive throughout the asbestos related industry, and lawsuits increased, doctors, journalists, and individuals involved in asbestos litigation commenced setting down on paper the story of asbestos, both as a manufacturing material and as a pathogen. By 1970, medical doctors associated with the United Mine Workers began publicizing the continuing danger of pneumoconiosis among miners. In 1979, physician Irving Selikoff, celebrated for his 1964 study demonstrating the breadth of asbestos disease—both in the number of people it affected and its capacity to act synergistically with cigarettes to cause lung cancer—co-wrote a monograph discussing asbestos and disease. In it, unusual for a book authored by a doctor, he devoted over thirty pages to a history of the usage of asbestos and the knowledge of its hazardous nature. This book set forth a time-line of the knowledge concerning asbestos, knowledge that was even then being augmented by legal discovery of asbestos manufacturing companies.[43]

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[42] Victoria M. Trasko, "Silicosis, a Continuing Problem," *Public Health Reports (1896-1970)* 73, no. 9 (September 1958): 839-846. For those interested in the similar historical context of women in science, see for example Lilli S. Hornig, *Equal Rites, Unequal Outcomes: Women in American Research Universities* (New York: Kluwer Academic/Plenum Publishers, 2003); and Carolyn Merchant, "Isis' Consciousness Raised," *Isis* 73, no. 3 (September 1982): 398-409.

[43] Lorin E. Kerr, "Coal Workers' Pneumoconiosis in an Affluent Society," *Public Health Reports (1896-1970)* 85, no. 10 (Oct., 1970): 847-852; Irving J. Selikoff, and Douglas H. K. Lee. *Asbestos and Disease* (New York: Academic Press, 1978).

As litigation intensified, this chronology expanded, as one investigative journalist examined the history of the first successful lawsuits. In his two books, Paul Brodeur provided a chilling exposé of regulatory agencies' failure and the manipulation of legal forums by corporate defendants in asbestos lawsuits.[44]

As litigation discovery practices brought forth more information in the early 1990s, numerous books and articles examined histories of corporate malfeasance among asbestos manufacturers, many aimed specifically at assisting the litigation. In one particularly pointed account, public health advocate and plaintiff litigation expert Barry Castleman developed his environmental science Ph.D. dissertation into a book, providing a history of asbestos manufacturers' failure to provide for the health of their employees and other individuals who worked with their products.[45]

Serious analysis of occupational health by public health and labor historians only began in the 1970s. Much of this delay resulted directly from industry's silence. Corporate representatives had withheld industry-sponsored research, wrested control of the 1930s National Silica Conference to declare the silica problem solved, and harassed any doctors willing to question the hazards of asbestos or silica. Thus much of the information was not available for study by historians. During the 1940s and 1950s only a small number of doctors, such as environmental cancer physician and researcher Wilhelm Heuper, strove to publicize the history of asbestos disease. In his 1955 monograph on

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[44] Paul Brodeur, *Expendable Americans* (New York: Vintage Books, 1974) and Paul Brodeur, *Outrageous Misconduct: the Asbestos Industry on Trial* (New York: Pantheon Books, 1985).

[45] Barry I. Castleman, *Asbestos: Medical and Legal Aspects*, 4th Ed. (Frederick, Maryland: Aspen Publishers, Inc., 1990); David Lillienfield, "The Silence: the Asbestos Industry and Early Occupational Cancer Research-a Case Study," *American Journal of Public Health* 81, no. 6 (1991): 791-800; and H. L. Hardy and David Egilman, "Corruption of Occupational Medicine Literature: the Asbestos Example," *American Journal of Industrial Medicine* 20, no. 1 (1991):127-29.

environmental causes of lung cancer, Hueper called attention to the hazards of asbestos, specifically noting the sustained case reporting of lung cancer in asbestotic patients during the 1930s through the 1940s.[46]

However, this type of reporting was unusual. Through the early 1960s, industry doctors continued to trumpet their great historic successes in the field of occupational hygiene. In these histories, the main story was the great work accomplished by occupational hygienists and doctors in both discovering occupational disease and enacting measures to eliminate it. In one typical 1962 volume, sponsored by the Industrial Medical Association, two authors provided a history of the fight against occupational disease in the twentieth century. Except for their limited descriptions of company lawyers circumventing workmen's compensation law and companies being reluctant to allow inspections, they did not describe examples of industry delaying or thwarting research. Indeed, they barely acknowledged the numerous cases of silicosis resulting from the 1930s Gauley Bridge tunnel project in West Virginia. On the other hand, they spent numerous pages providing a scathing indictment of the "silicosis racket"

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[46] W. C. Hueper, "Cancer in its Relation to Occupation and Environment." *Bulletin of the American Society for the Control of Cancer* 25 (1943): 63-69; W. C. Hueper, "Occupational Cancer Hazards in American Industries," *A.M.A. Archives of Industrial Hygiene and Occupational Medicine* 5 (March 1952): 204-208; W. C. Hueper, *A Quest into the Environmental Causes of Cancer of the Lung*, Public Health Monograph No. 36. Washington, D. C.: U.S. Department of Health, Education and Welfare, 1955; W. C. Hueper, "Environmental Causes of Cancer of the Lung Other than Tobacco Smoke," *Diseases of the Chest* 30 issue 2 (1956): 141-159; and W. C. Hueper, "Occupational and Environmental Exposures to Asbestos," *Annals of the New York Academy of Sciences* 132 (December 31, 1965): 184-192. For a short, but excellent article illuminating Hueper's role and place within the history of occupational lung disease see Christopher Sellers, "Discovering Environmental Cancer: Wilhelm Hueper, Post-World War II Epidemiology, and the Vanishing Clinician's Eye," *American Journal of Public Health* 87, no. 11 (November 1997); 1824-1835.

brought about by the Gauley Bridge incident, even though the government documented many more workers with silicosis than ever became part of lawsuits.[47]

An emerging public health advocacy viewpoint in the 1970s provided an extreme contrast to these earlier works. The 1980s brought forth an outpouring of such scholarly studies, some from professional historians.[48] Many of these monographs examined mining and pneumoconiosis. Some of the most in-depth books in this area included historian William Graebner's look at the Progressive Era mine safety, western historians Mark Wyman and Alan Derickson's examinations of late nineteenth century western mining, and epidemiologist Martin Cherniack's account of the Gauley Bridge silicosis tragedy.[49]

Other authors pursued a wider theme, demonstrating that mining was not the sole area of concern for silicosis - nor was silicosis the sole area of concern in occupational disease. Beginning in the 1980s, historians David Rosner and Gerald Markowitz co-wrote and edited numerous books revealing the breadth and depth of silicosis and other occupational disease problems in the twentieth century. These books covered the ongoing saga of occupational silicosis from its beginnings into the twenty-first century.[50] In 1988

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[47] Henry B. Selleck and Alfred H. Whitaker, *Occupational Health in America* (Detroit: Wayne State University, 1962). See in particular 50, 139, 233-243, 263, and 288.
[48] See for example Barth, Peter, S., with Hunt, H. Allan, *Workers' Compensation and Work-Related Illnesses and Disease* (Cambridge, Massachusetts: The MIT Press, 1982); and Paul Brodeur, *Outrageous Misconduct*.
[49] William Graebner, *Coal-Mining Safety in the Progressive Period: The Political Economy of Reform* (Lexington: University Press of Kentucky 1976): Mark Wyman, *Hard Rock Epic: Western Mines and the Industrial Revolution, 1860-1910* (Berkeley: University of California Press, 1979): Alan Derickson, *Workers' Health, Workers' Democracy: The Western Miners' Struggle, 1891-1925* (Ithaca: Cornell University Press, 1988); and Martin Cherniack, *The Hawk's Nest Incident*.
[50] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics;* David Rosner and Gerald Markowitz, eds., *Dying for Work: Workers' Safety and Health in Twentieth Century America* (Bloomington: Indiana University Press, 1987); Gerald Markowitz and David Rosner, "The Illusion of

ethicist and public health historian Ronald Bayer edited a collection of articles dedicated to examining the history of the health and safety of workers. Interestingly, out of six articles, four of them covered occupational lung disease, two on coal mining and two on asbestos.[51]

By the early 1990s, ever more public health historians began seriously considering the role of industry in the long delayed acknowledgement of occupational causes of cancer. Between 1993 and 1995 environmental cancer expert Samuel Epstein, epidemiologist David Michael (currently Assistant Secretary of Labor for Occupational Health and Safety), and historian of science Robert Proctor all argued that politics and economics have shaped much of our approach to cancer in the twentieth century.[52]

The 1980s and 1990s also saw an almost explosive widening of the approaches used to study occupational lung disease, as well as a widening in the journals providing

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Medical Certainty: Silicosis and the Politics of Industrial Disability, 1930-1960" *The Milbank Quarterly* 67, Supplement 2 (Part 1 - "Disability Policy: Restoring Socioeconomic Independence") (1989): 228-253; David Rosner and Gerald Markowitz, "Workers, Industry, and the Control of Information: Silicosis and the Industrial Hygiene Foundation," *Journal of Public Health Policy* 16, no. 1 (Spring, 1995): 29-58; Gerald Markowitz and David Rosner, "The Reawakening of National Concern about Silicosis," *Public Health Reports (1974-)* 113, no. 4 (Jul. - Aug., 1998): 302-311; and David Rosner and Gerald Markowitz *Deadly Dust: Silicosis and the On-going Struggle to Protect Workers' Health*, Rev. ed. (Ann Arbor: The University of Michigan Press, 2006).

[51] David Ozonoff, David, "Failed Warnings: Asbestos-Related Disease and Industrial Medicine," in *The Health and Safety of Workers*, ed. Ronald Bayer (New York: Oxford University Press, 1988), 139-218; Arthur L. Donovan, "Health and Safety in Underground Coal Mining, 1900-1969: Professional Conduct in a Peripheral Industry," In *The Health and Safety of Workers*, ed. Ronald Bayer, 72-138; Curtis Seltzer, "Moral Dimensions of Occupational Health: The Case of the 1969 Coal Mine Health and Safety Act," 242-270; and Thomas H. Murray, "Regulating Asbestos: Ethics, Politics, and the Values of Science," in *The Health and Safety of Worker*, ed. Ronald Bayer, 271-292.

[52] Samuel Epstein, "Evaluation of the National Cancer Programs and Proposed Reforms," *American Journal of Industrial Medicine* 24 (1993): 109-133; David Michaels, "Colorfast Cancer: The Legacy of Corporate Malfeasance in the U. S. Dye Industry," in *Toxic Circles: Environmental Hazards from the Workplace into the Community*, ed. Helen Sheehan and Richard Wedeen (New Bruswick, N.J.: Rutgers University Press, 1993), 81-112: and Robert Proctor, *Cancer Wars: How Politics Shapes What We Know and Don't Know About Cancer* (New York: Basic Books, 1995). Other scholars are also examining an increasing number of similar incidents. Many of them have included sections on asbestos. See for example Devra Davis, *The Secret History*.

space for such articles. In a 1981 article examining class struggles, British economic historian Jane Humphries wrote of an early intersection of workers and capitalism in the Mine Regulation Act of 1842. Sociologist Bennett Judkins expanded this examination to consider the occupational health of all workers in his 1986 book. [53] In another approach, environmental and legal historian Arthur J. McEvoy called for an ecological analysis of the workplace environment as it relates to worker safety and health.[54] Other historians began studying how technology had changed the occupational health landscape.[55] Ethicist and public historian Thomas Murray examined the history of asbestos research from the viewpoint of ethics and scientific values.[56] In 1995 Jacqueline Karnell Corn, Professor of Environmental Health Sciences at The Johns Hopkins University, examined occupational health as public history, setting forth the activities of both Federal and some state agencies in the areas of occupational health, including asbestos and silica, without casting blame anywhere.[57]

Still others looked at the asbestos controversy as socio-legal history. In one such article, British legal historian Nick Wikeley reviewed the British asbestos regulations of 1931 in light of the knowledge of the time. He then turned his attention to asbestos

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[53] Jane Humphries, "Protective Legislation, The Capitalist State, and Working Class Men: The Case of the 1842 Mines Regulation Cat," *Feminist Review* no. 7 (Spring 1981): 1-33; and Bennett M. Judkins, *We Offer Ourselves as Evidence: Toward Workers' Control of Occupational Health* (New York: Greenwood Press, 1986) (Class History); also see, inter alia, Janet Siskind, "An Axe to Grind: Class Relations and Silicosis in a 19th-Century Factory," *Medical Anthropology Quarterly*, New Series 2, no. 3 (Sep., 1988): 199-214.

[54] Arthur J. McEvoy, "Working Environments: An Ecological Approach to Industrial Health and Safety," *Technology and Culture* 36, supplement (April 1995): S450.

[55] Claudia Clark, *Radium Girls: Women and Industrial Health Reform, 1910-1935* (Chapel Hill, N.C., 1997).

[56] Thomas H. Murray, "Regulating Asbestos: Ethics, Politics, and Scientific Values," *Science, Technology, & Human Values* 11, no. 3 (Summer 1986): 1-13.

[57] Jacqueline K. Corn, *Response to Occupational Health Hazards: a Historical Perspective* (New York: Van Nostrand Reinhold, 1992).

product manufacturer Turner and Newall's response to one of the first asbestos lawsuits in 1950.[58] By the late nineties specialized studies provided the basis for works involving both research and synthesis, such as historian Christopher C. Seller's chronicle of industrial hygiene.[59]

However, even at this late date, a few articles still harkened back to the "heroic histories" of the early twentieth century. In 1994 public health expert Herbert Abrams wrote a history of occupational health. In it, he noted the trials and tribulations of occupational health advancement in the United States in areas such as asbestos and silica. He paid tribute to those occupational health pioneers, including Alice Hamilton, Harriet Hardy, Wilhelm Hueper, and Irving Selikoff, who persevered in the face of adversity. However, he spent little time on the nature of the adversities.[60]

Since 2000, Geoffrey Tweedale, alone and with coauthors, has written several articles on the controversies surrounding the history of asbestos disease knowledge. These articles examined the controversy surrounding whether or not chrysotile asbestos causes cancer, the emergence of that knowledge, and the roles played by both government and industry in recognizing and delaying that knowledge. In an event highlighting the asbestos controversy's increasing impact in the nation, the official

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[58] Nick Wikeley, "The Asbestos Regulations 1931: A License to Kill?" *Journal of Law and Society* 19, no. 3 (Autumn 1992): 365-378; and Nick Wikeley, "Turner & Newall: Early Organizational Responses to Litigation Risk," *Journal of Law and Society* 24, no. 2 (June 1997): 252-275.
[59] Christopher C. Sellers, *Hazards of the Job: From Industrial Disease to Environmental Health Science* (Chapel Hill: University of North Carolina Press, 1997).
[60] Herbert K. Abrams, "A Short History of Occupational Health," *Advances in Modern Environmental Toxicology* 22 (1994): 33-71. Hamilton, Hardy, Hueper, and Selikoff and their work will all be further discussed in Chapters 4 and 5 of this thesis.

journal of the History of Science Society, *Isis*, made a rare foray into occupational health science by publishing one of his articles.[61]

As the twenty-first century began, industry increased its proactive research in assistance of lawsuits. This research even extended into the field of history, since one of the elements of negligent lawsuits requires evidence of "who knew what and when," known in legal parlance as the "state of the art" of medical knowledge. In one typical book—partially paid for by a contracting company defending asbestos lawsuits—historian Ronald Bartrip expressed pleasure at helping to fill the gap in the inadequately covered "history of asbestos, health, and disease in the USA…" He expressed regret that the unions did not reply to his request to review their files, but believed he had still been able to tell the union story "in very considerable detail."[62]

Books and articles authored by occupational health historians used as experts by plaintiff counsel have kept pace with these industry contract histories. Since his first book, Castleman has continued writing a steady number of articles examining the history of corporate malfeasance and historical knowledge.[63] David Egilman, Professor of Public

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[61] Geoffrey Tweedale, "Asbestos and its Lethal Legacy," *Nature Reviews: Cancer* 2 (April, 2003): 1-5; and Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes: The White Asbestos Controversy, 1950s-2004," *Isis* 95 (June 2004): 239-259. This article is one of the first of its type in such a leading journal. Although until recently, the history of science and medicine have been very separate and distinct fields, as the leading journal for the history of science, since the 1950s, the History of Science Society and its publication *Isis* have taken an increasingly broad view of historical science writings and the complex nature of "science." The supplement to Volume 90 of *Isis* has numerous articles explaining and illustrating this change in both the society and historical writings: see for example I. Bernard Cohen, "The *Isis* Crisis and the History of Science Society," *Isis* 90 supplement (1999): S28-S42; and Michael M. Sokal, "The History of Science Society, 1970-1999: From Subscription Agency to Professional Society," *Isis* 90 supplement (1999): S135-S181.

[62] Ronald Bartrip, *Beyond the Factory Gates: Asbestos and Health in Twentieth Century America* (London: Continuum, 2006), Preface.

[63] Among others, Barry Castleman has written the following: Barry Castleman, "The WTO Asbestos Case and its Health and Trade Implications," *New Solutions* 9 no. 4 (1999): 371-4; Barry Castleman, "Asbestos Products, Hazards, and Regulations," *International Journal of Health Services* 36, no. 2 (2006): 295-307;

Health and plaintiff historical medicine expert, has been even more prolific. As is further discussed in Chapter 5, his recent work concentrates on scientific research aspects of corporate knowledge and influence, from studies gone wrong, to hidden studies, to industry influence in the creation of governmental standards.[64] One Australian historian, who has provided very modest assistance to plaintiff counsel, conducts considerable research into industry's use of experts. His article describing asbestos insulation manufacturer Owens Illinois' use of world-renowned doctor and asbestos cancer researcher Christopher Wagner as an expert witness provides a chilling insight into the lengths that industry has gone to manage their lawsuits.[65]

With the coming of the new century, the historiography of occupational lung disease has joined the mainstream of writings about the history of science and medicine, although it has its own special emphasis directed toward litigation. Much like the recent sociological studies of Bruno Latour—but without clear philosophical or sociological underpinnings—writers engaged in the litigation sphere of occupational health as plaintiffs' experts examine the manner in which scientific research is not always objective, but rather influenced by profit.[66] They have not been alone in lamenting the

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Barry Castleman, "Controlled Use of Asbestos," *International Journal of Occupational and Environmental Health* 9, no. 3 (Jul-Sep, 2003): 294-8; and Barry Castleman, "Heroism in Occupational Health," *International Journal of Health Services* 31, no. 3 (2001): 669-72.

[64] David Egilman and Alexander A. Reinert, "The Origin and Development of the Asbestos Threshold Limit Value: Scientific Indifference and Corporate Influence," *International Journal of Health Services* 25, no. 4 (1995): 667-696; David Egilman and Marion Billings, "Abuse of Epidemiology: Automobile Manufacturers Manufacture a Defense to Asbestos Liability," *International Journal of Industrial Hygiene* 11, no. 4 (October/December 2006): 360-371.

[65] Jock McCulloch, "Saving the Asbestos Industry, 1960 to 2006," *Public Health Reports (1974-)* 121, no. 5 (September/October 2006): 609-614. Owens Illinois' use of Wagner is further explored in Chapter 5.

[66] Compare the manner in which Bruno Latour describes external factors in scientific laboratories or in the discovery of pasteurization to Castleman's, Egilman's, and Lemen's critiques of industry studies that have predetermined goals. Bruno Latour and Steve Woolgar, *Laboratory Life: the Social Construction of*

influence of corporate "science." In her book *The Secret History of the War on Cancer*, epidemiologist and environmental cancer expert Devra Davis argued that for decades the United States took the wrong approach to the war on cancer. Virtually all of the research money was spent on finding cures, when the real effort should be directed toward finding the causes. Similar to Hueper's arguments in the 1940s, Davis today contends that environmental toxins, from tobacco and asbestos to chemicals and drugs, have fueled the dramatic increase of cancer during the twentieth century. Her book, *The Secret History of the War on Cancer*, presented dozens of examples of these causes and documented industry's continuing effort to block or slow research into the consequences of their products and processes.[67]

Among public health historians, David Michaels, now head of the Occupation, Safety and Health Administration (hereinafter cited as OSHA), remains both the most prolific author and the most pointed in his criticisms of industry. His articles have spanned the range of corporate malfeasance in occupational health from asbestos to historic chemical problems in dyes and chromium VI. On at least one occasion he also editorialized about the problems of results-directed research when used to influence regulatory policy. This article detailed the process by which the chromium industry, its

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Scientific Facts (Beverly Hills: Sage Publications, 1979); Bruno Latour, *The Pasteurization of France* (Cambridge: Harvard University Press, 1993); Barry Castleman, "Asbestos Products, Hazards, and Regulations," *International Journal of Health Services* 36, no. 2 (2006): 295-307; David S. Egilman and Alexander A. Reinert, "The Origin and Development," 667-696; and Richard Lemen, "Asbestos in Brakes: Exposure and Risk of Disease," *American Journal of Industrial Medicine* 45, no. 3 (March 2004): 229-237.

[67] Devra Davis, *The Secret History.* Since the new millennium there have been a growing number of books that investigate non-epistemic values and factors in public science and health. Two books that look at how politics and industry sponsored scientists (but with little mention of attorneys) influence science are: Roger A. Pielke, Jr., *The Honest Broker: Making Sense of Science in Policy and Politics* (Cambridge: Cambridge University Press, 2007); and Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury Press, 2010).

attorneys, and consultants sought to forestall and limit any standard for hexavalent chromium.[68]

Clearly, occupational and environmental health histories are now part of the mainstream of research and writing about medical history. Much of the information that made this possible during the past thirty years either came from litigation[69] or regulatory documents released through Freedom of Information Act requests.[70] As a result, the past nine years occupational and biomedical research histories have used increasingly vitriolic language. It is difficult to find a book or article that authors from the opposing viewpoint accept as unbiased or fair.

Thus, the future of narratives covering the history of occupational health remains extremely clouded and uncertain. To a large extent, political and ideological viewpoints are progressively shaping the histories being written about occupational health. With increasingly large sums of money at stake, manufactured contract histories may become even more prevalent. Still, as with science itself, manufactured histories, in the end, must come up against the hard facts. So long as lawsuits continue to provide fodder and disclosure of events normally hidden from public view, public health historians will likely have a continual stream of new material.

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[68] David Michaels, "Editorial: Scientific Evidence and Public Policy," *American Journal of Public Health* 95, no. S1 (2005): S5-S7; David Michaels and Celeste Monforton, "How Litigation Shapes the Scientific Literature: Asbestos Disease Among Automobile Mechanics," *Journal of Law and Policy* 15 (2007): 1137-1169; and David Michaels, Celeste Monforton, and Peter Lurie, "Selected Science: an Industry Campaign to Undermine an OSHA Hexavalent Chromium Standard," *Environmental Health: A Global Access Science Source* 5 (23 February 2006): 1-8.

[69] See for example David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*; Barry I. Castleman, *Asbestos: Medical and Legal Aspects*; Paul Brodeur, *Outrageous Misconduct*; Robert Proctor, *Cancer Wars*; David Lilienfield, "The Silence: the Asbestos Industry"; and Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes."

[70] All of Michaels' works make tremendous use of regulatory materials, as well as documents disclosed during litigation.

Chapter 3 - Manufacturing Science: Methods Used to Influence Medical, Legal, and Public Opinion

Introduction

Before turning to the case studies, it is important to consider how medical science can be influenced and even manufactured in support of litigation and regulatory positions. For the past quarter of a century, science ethicists have expressed increasing concerns about corporate medical science research being conducted to further litigation, regulatory or corporate profit goals. Public health advocates have attacked what they call the increasing hold that industry has on public health research. In one recent example of their "call for public awareness" public health historians David Rosner and Gerald Markowitz wrote an article condemning industry's role in undermining evidence and regulations for lead. The article points to three methods used by industry to limit lead regulations: first, the industry sought to control research by sponsoring and funding university research; second, through public relations it sought to portray lead as necessary for everyday public life; and third, it sought to quiet and even intimidate researchers who reported or identified lead as a hazard.[71]

In a commentary published in the *Journal of Clinical Investigation* shortly after it instituted a new conflict-of-interest policy, noted ethicist Arthur L. Caplan considered this question of scientific bias. He noted that "[m]oney is an important source of conflict: study after study has shown the power that money can have on the publication of

[71] David Rosner and Gerald Markowitz, "The Politics of Lead Toxicity and the Devastating Consequences for Children," *American Journal of Industrial Medicine* 50 (2007): 740-756.

scientific findings." While noting that there are other areas of conflict of interest in addition to money, he praised the editors for showing "themselves willing not to shy away in the face of the most miserable aspect of the problem: money." [72]

Other doctors and scientists agree that the quest for profits can dominate over medical science accuracy. As Marcia Angel, former editor of *The New England Journal of Medicine*, commented at the 2000 National Institute of Health Conference plenary presentation, "papers submitted by authors with financial conflicts of interest [impressed her as] far more likely to be biased in both design and interpretation."[73]

The problem is that financial interests are often surreptitious. In addition, the passion to make a fortune does not in itself drive the advancement of science but it can drive a desire to influence and corrupt scientific research. Frank Davidoff, former editor of *The Annals of Internal Medicine*, has discussed the irony of this issue as leading medical journals' work to ensure their articles are first-rate:

> Here is the irony indeed: Over the years we editors had become hawks about transparency in the reporting of study methodology – the technical side of things. Yet we have been willing to leave readers in the dark about the key nontechnical factors (including the role of outside sponsors) that lie behind the way the project is carried out. These same factors can affect a study's conduct and reporting as much if not more than it's purely technical aspects can.[74]

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[72] Arthur L. Caplan, "Halfway There: the Struggle to Manage Conflicts of Interest," *The Journal of Clinical Investigation* 117 (March 2007): 509-510.
[73] Sheldon Krimsky, *Science in the Private Interest*, 158.
[74] Frank Davidoff, "Between the Lines: Navigating the Uncharted Territory of Industry-Sponsored Research," *Health Affairs* 21 (2002): 236.

Corporate and conservative writers have strongly disputed these claims of harm from industry research and funding. One of the most extensively researched articles in defense of industry funding came from Ronald Bailey, a contractual writer for (in his words) "the non-profit, non-partisan libertarian magazine *Reason*." His monograph defended the pharmaceutical industry and critiqued "conflict of interest activists" who "view the conflicts of interest campaign as another tool to attack an enterprise which they already despise on other grounds."[75] In the introduction Bailey stated that the "report concludes that the conflicts of interest campaign against industry/academic collaboration research has shown: no evidence of patient harm; no evidence of loss of faith in scientific research; no evidence that integrity of science is being threatened by commercial influences; no evidence that collaboration boosts the overall costs of medical care or of consumer products; little evidence that industry unduly influences decisions of government agencies; and no evidence that environmental regulations routinely err on the side of industry."[76]

Yet, in the new millennium, even the editors of *JAMA* have criticized industry's influence of public health and medical research. At least four editorials have been written about the problem of financial interests in medical science research by the editor-in-chief of the *Journal of the American Medical Association*, in 2000, 2005, 2006 and 2008. [77] The first one also emphasized the importance of for-profit company research. Still, only

[75] Ronald Bailey, *Scrutinizing Industry-Funded Science: The Crusade Against Conflicts of Interest* (New York: American Council on Science and Health, March 2008), 5.
[76] Ronald Bailey, *Scrutinizing Industry-Funded Science*, 8.
[77] Catherine DeAngelis, "Conflict of Interest and the Public Trust," *JAMA* 284 (November 1, 2000): 2237-2238; Catherine DeAngelis, "The Influence of Money," 996-998; and Catherine D. DeAngelis and Phil B. Fontanarosa, "Impugning the Integrity of Medical Science: The Adverse Effects of Industry Influence," *JAMA* 299 (April 16, 2008): 1833-1835.

one year later *JAMA*, along with eleven other leading medical journals, agreed not to "review or publish articles based on studies that are conducted under conditions that allow the sponsor to have sole control of the data or to withhold publication."[78]

Even though the JAMA editorials decrying conflict-of-interest received sharp criticism from industry representatives, they still became increasingly strident in their tone. For example, following the 2005 editorial, a spokesperson for the Pharmaceutical Research and Manufacturers of America responded to by disagreeing "with the implication that industry-sponsored studies are at higher risk of bias and fraud than other types of studies and thus require special scrutiny." *JAMA* executive deputy editor Phil B. Fontanarosa replied: "Dr. Loew and PhRMA contend that industry-sponsored studies are not at higher risk of bias and thus do not require 'special scrutiny' and that 'vigorous government oversight … ensures the integrity of data and results.' Despite these assurances, scientific and ethical lapses involving industry and industry-sponsored studies strongly indicate otherwise …"[79]

The following year's editorial provided an even harsher assessment of the state of industry influence. As De Angelis noted in her scathing indictment, "[i]n some instances, the marketing goal of a company dominates the scientific aspect of the company-funded research." She continued, "There have been a number of high-profile examples of such research irregularities involving for-profit companies, such as the refusal to provide all study data to the study team, reporting only 6 months of data in a trial designed to have

[78] Frank Davidoff, "Between the Lines: Navigating the Uncharted Territory of Industry-Sponsored Research," 241.
[79] Phil B. Fontanarosa, "Executive Deputy Editor Reply to Letter to the Editor," *JAMA* 294 (November 23/30, 2005): 2575-76.

12 months of data as the primary outcome; incomplete reporting of serious adverse events; and concealing clinical trial data showing harm." She also noted that one company withdrew its publication after *JAMA* indicated that it would not publish the paper without an independent analysis.[80]

The third *JAMA* editorial, published in the August 23/30, 2006 issue, further castigated the pharmaceutical and medical device industry for its improper and "profound influence in every aspect of the profession of medicine." The editor specifically called attention to two articles in that issue which "provide a glimpse of one company's apparent misrepresentation of research data and its manipulation of clinical research articles and clinical reviews." Documentation of the manipulation only became public because of a lawsuit involving one of the company's products.[81] With editorials and disputes such as these, there can be little doubt that medical research today is facing a severe crisis.

This thesis is not intended to take sides in this controversy, but rather to examine the nature of industry's historical involvement in medical research leading up to the current crisis. As noted in the 2008 JAMA editorial, litigation is involved in much of the controversy. This chapter explores the various methods of influencing occupational disease research and opinion that are currently being criticized by public health advocates. I provide the broader historical perspective in the following two chapters, revealing how attorneys have used these methods throughout the twentieth century.

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[80] Catherine DeAngelis, "The Influence of Money," 996.
[81] Catherine D. DeAngelis and Phil B. Fontanarosa, "Impugning the Integrity," 1833.

Methods of Influence

Numerous means of improperly influencing occupational disease research and regulation are available to any interested party. Below, I examine three broad areas of influence: controlling/influencing the *agenda*, controlling/influencing the *experts*, and controlling/influencing the *research*.

The Agenda

Controlling the public health policy agenda can be vital to influencing scientific research relevant to potentially toxic products or substances. Similarly, the importance of scientific research can hardly be overestimated in determining the success of marketing of potentially toxic products, as well as the regulation and the potential of lawsuits and workers' compensation claims.

There are various potential means for controlling the agenda, including influencing the regulatory process and reducing the spotlight of lawsuits and workers' compensation claims. One basic method of influencing regulations is by controlling their formulation. This can be accomplished in two manners. First, As a National Cancer Institute (NCI) funded report examining the beginnings of the war on cancer during the 1970s demonstrated: regulators know there are jobs waiting for them in industry. The report discovered a "revolving door of industrial and government experts had operated since the earliest efforts to deal with cancer nationwide."[82]

[82] Devra Davis, *The Secret History*, 14.

A second approach is by inserting corporate representatives into the regulatory process. The NCI can again provide an example. Throughout the 1980s the NCI's advisory board was chaired by Armand Hammer, CEO of Occidental Petroleum. During the same period, this firm had produced over 100 billion tons of toxic chemicals, including the ones found in Love Canal.[83]

In the later decades of the twentieth century, critics noted similar activities in numerous federal agencies. For example, in 1985 the EPA's internal peer review committee concluded that daminozide, the primary ingredient in the pesticide Alar, should be classified as a probable human carcinogen. The report was then submitted to the agency's Scientific Advisory Committee for review. This committee criticized the report and concluded the current science did not justify removing the pesticide from the market. Following congressional hearings, a House member learned that seven of the eight members of the Scientific Advisory Panel had current or prior consulting relationships with the manufacturer of Alar. [84]

During the first decade of the twenty-first century, cozy industry-regulatory connections have been encouraged by the Federal government. The George W. Bush administration increased industry representation on scientific advisory boards and diluted government regulation through several different new plans and proposals.[85] Critics of the new connections have cited to numerous examples where these actions have damaged public health. For example, in a review of the recent history of vinyl chloride (VC)

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[83] Devra Davis, *The Secret History*, 10.
[84] Sheldon Krimsky, *Science in the Private Interest*, 102; Also see Rudi H. Nussbaum, "Manipulating Public Health Research: The Nuclear and Radiation Health Establishments," *International Journal of Occupational and Environmental Health* 13 (July/September 2007): 328-330.
[85] David Michaels, "Doubt is Their Product," *Scientific American* 292, issue 6 (June 2005), 96-101.

regulation, three public health advocates pointed to industry suppression and withholding of evidence in arguing against the EPA's trend to accept industry data in its risk assessments. They also noted that "at least 7 of the 19 external peer reviewers of the VC assessment were chemical industry employees and consultants and 4 were administrative representatives - none represented unions or public interest groups." Yet, even with these alerts, during 2000-2008 both OSHA and the EPA began implementing an increasing number of voluntary and self regulatory schemes for industry.[86]

However, perhaps the greatest assistance to controlling the agenda came from a late twentieth century change to the way in which courts consider scientific evidence. In June 1993, the United States Supreme Court handed down a decision in *Daubert v Merrell Dow Pharmaceuticals, Inc*. which required federal judges to be gatekeepers for the admission of scientific evidence in their court room. In particular, the court required judges to be more proactive in their responses to motions seeking exclusion of expert witnesses. To assist trial judges, the Supreme Court provided a legally based scientific standard to be used by judges in determining whether scientific experts should be allowed to testify at court. Thus, in accordance with the Court's decision, trial judges only allow testimony that meets the guidelines comprising the judicially based scientific standard. Although the Court emphasized that these criteria should not be regarded as "a definitive checklist or test"—thus allowing judges wide discretion in determining what counts as

[86] Jennifer Beth Sass, Barry Castleman, and David Wallinga, "Vinyl Chloride: A Case Study of Data Suppression and Misrepresentation," *Environmental Health Perspectives* 113, no. 7 (July 2005): 809-812, quoted on 811. David Michaels and Celeste Monforton, "Scientific Evidence in the Regulatory System: Manufacturing Uncertainty and the Demise of the Formal Regulatory System," *Journal of Law and Policy* 13, issue 1 (2005), 29.

science in the court room—they did form a characterization of what the high court considers "the scientific method." The guidelines established by the Court are as follows:

1) Is the evidence based upon a testable theory?

2) Has the theory and/or methods used been peer reviewed?

3) Does the methodology have a known error rate?

4) Is the underlying science generally accepted?[87]

Other than capturing the Supreme Court's limited lay understanding of the scientific process, the *Daubert* decision provided little philosophical help in assisting judges to determine "good science." A majority of the members of the Court apparently believed that there is a distinct, widely accepted, and well defined "scientific method" of comparing facts by clearly identified criteria that can be objectively applied. Apparently, they further assumed that, in essence, all science is experimental. As Sheila Jasanoff, Professor of Science and Technology Studies at the John F. Kennedy School of Government at Harvard University, put it, "in an ironic turn, the 'science' that the Court officially embraced remained profoundly a creation of the court's own biases, needs, and misconceptions concerning scientific inquiry; while urging judges to defer to scientific authority, the Court gave judges new resources for writing their preconceptions regarding science into law." With the Supreme Court's decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, the federal courts have come to worship scientific uncertainty as a method of excluding science from the courtroom. One study has even found that some

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[87] *Daubert v. Merrell Dow Pharmaceuticals, Inc*. 113 S. Ct. 2786 (1993).

courts are requiring doctors who testify as experts to meet standards that exceed those used in diagnosing patients.[88]

Public Health advocates have been consistent in their opposition to this ruling. Michaels has described the decision as "an amalgam of two incompatible philosophies of science, Popper's and Hempel's—neither of which is capable of supplying the criterion of reliability the Court seeks."[89] Michaels is arguing that the Court ignored the inherent uncertainty in science and the skepticism that accompanies all scientific advancements, instead requiring it to fit within legal norms. Notwithstanding the Supreme Court's pronouncement, scientific uncertainty is inevitable in matters concerning the human

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[88] Paradoxically, courts hearing criminal trials—with their higher standard of proof making it the very type of trial where the right to challenge expert opinions would seem most useful—have rarely allowed these challenges. On the other hand, civil trials—which only require a proof of more probable than not—have frequently excluded plaintiff experts. Sheila Jasanoff, "Law's Knowledge: Science for Justice in Legal Settings," *American Journal of Public Health* 95, no. S1 (2005): S50 contains an excellent critique of the Daubert opinion. Also see Jean Macchiaroli Eggen, "Toxic Torts, Causation, and Scientific Evidence After Daubert," *University of Pittsburgh Law Review* 55 (1994): 889, 896; and Michael H. Gottesman, "From Barefoot to Daubert to Joiner: Triple Play or Double Error," *Arizona Law Review* 40 (1998): 753,-780, 761 (discussing plaintiff difficulties in meeting the standard). For a discussion of the complexities of epidemiologic methodology that has not been considered by the Supreme Court see Richard W. Clapp and David Ozonoff, "Environment and Health: Vital Intersection or Contested Territory?," *American Journal of Law & Medicine* 30, no. 2 & 3 (2004): 189-215, especially 199-212 (The authors discuss both the methods that can be used to pre-determine the outcome of a study and how easy it is to criticize past studies. Both techniques have been consistently used by industry litigation consultants; in particular see the discussion of industry brake articles in chapter 5 of this thesis.). For additional background, see Steve Wing, "Objectivity and Ethics in Environmental Health Science," *Environmental Health Perspectives* 111, no. 14 (November 2003): 1813-1817, especially 1814 (the Daubert criteria leads to rejection of new studies that challenge normative science); Jerome P. Kassirer and Joe S. Cecil, "Inconsistency in Evidentiary Standards for Medical Testimony: Disorder in the Courts," 288 *JAMA* (2002): 1382-1387 (1382 discusses legal standards exceeding diagnostic standards); and David Michaels and Celeste Monforton, "Scientific Evidence in the Regulatory," 34, 39.

[89] George Washington University Faculty Profiles, http://www.gwumc.edu/sphhs/faculty/index.cfm?employeeID=76, accessed on April 22, 2010; David Michaels, "Editorial: Scientific Evidence and Public Policy," *American Journal of Public Health* 95 no. S1 (2005): S5. Robert Merton, the noted sociologist of science, highlighted this norm of "organized skepticism" in his 1957 book of essays, *Social Theory and Social Structure*. Merton defined "organized skepticism" as "a latent questioning of certain bases of established routine, authority, vested procedures and the realm of the 'sacred' generally … Most institutions demand unqualified faith; but the institution of science makes skepticism a virtue." Robert Merton, "Science in the Social Order," in *Social Theory and Social Structure* (Glencoe, Ill.: Free Press, 1957), 547.

body's reaction to substances, especially when there is a long latency period, as there is with most cancers and fibrotic diseases of the lung. Through its strait-jacketed approach, *Daubert* has allowed industry attorneys to exclude plaintiff expert opinions on many occasions because of the inherent uncertainty of medical science.

The Experts

As described in the above section, controlling the experts in the field provides one of the most effective methods of influencing medical science. According to New York University nutritionist Marion Nestle, in her field of nutrition science "co-opting experts—especially academic experts—is an explicit corporate strategy".[90] In the late 1970s, Tufts University professor Sheldon Krimsky was appointed to the National Institute of Health's Recombinant DNA Molecule Advisory committee. After serving for two years, he learned that several of the members had financial interests in biotechnology companies. This information had not been made available to the committee. In 2000 *USA Today* studied eighteen expert advisory committees of the FDA's Center for Drug Evaluation and Research. Of meetings held between 1998 and June, 2000, its journalists found that in 146 of the 159 meetings, at least one committee member had a financial stake in the topic being discussed. At least half of the members had a financial stake in 88 of the meetings. At the meetings where broad policy issues were discussed, 92% of the members had financial stakes. Even at meetings in which specific drug applications were at issue, 33% of the experts had a conflict of interest. The report also found that 54% of

[90] Sheldon Krimsky, *Science in the Private Interest*, 101.

the time, advisors to the FDA have a direct financial interest in the outcome of the drug they are asked to evaluate.[91]

Experts under contract also provide a ready source of expert witnesses for the defense of lawsuits and workers' compensation claims, as well as in testimony before Congress and regulatory bodies. In addition, as noted before, under *Daubert* an expert's opinion must be based upon accepted science. If the majority of the scientific journal articles concerning a product were prepared under contract to the product's manufacturer, the "accepted" science can be skewed, especially if the articles were prepared to assist in the defense of lawsuits. Furthermore, with control of publication, as has been seen in the tobacco litigation, studies that do not provide the desired result can be hidden.

The tobacco industry is especially adept at hiring experts. In 1993, Eugene F. Knopf resigned his position as chief Pennsylvania lobbyist for the American Cancer Society (ACS) because he was being retained by the "American Tobacco Institute." He left this position shortly after persuading the ACS to support a law which prevented localities from limiting smoking in public places.[92]

The tobacco companies are not unique in this respect. Many companies that manufacture hazardous materials are hiring experts to dispute and reanalyze data that show adverse health consequences. As stated in 2005 by the current head of OSHA, David Michaels: "It is now unusual for the science behind any proposed public health or environmental regulation *not* to be challenged, no matter how powerful the evidence."[93]

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91 Sheldon Krimsky, *Science in the Private Interest*, 91, 96.
92 Devra Davis, *The Secret History*, 166.
93 David Michaels, "Doubt is Their Product," 98-99.

Even Government officials are often co-opted. In 1996 Warner-Lambert's drug Rezulin was selected to take part in one of the largest diabetes studies in the United States. In its press release, the drug company quoted a director of the diabetes division of the National Institute of Health as saying that Rezulin "corrects the underlying cause of diabetes." Two years later a *Los Angeles Times* investigative report revealed that the director, Dr. Richard Eastman, first became a paid consultant to Warner-Lambert in 1995. The doctor subsequently admitted that he had participated in a number of deliberations concerning Rezulin while he was consulting for the company. The *LA* Times report found that at least twelve of the twenty-two scientists who played critical roles in the diabetes study had received research funding or compensation from Warner-Lambert. Although we may never know the extent of Eastman's knowledge of the drug's deficiencies prior to the study—and we can only speculate if Eastman's consultancy with Warner-Lambert caused it to be included in the study—his involvement may very well have put the participants in the study at serious risk. In 1998 the NIH called a halt to the Rezulin study due to reports of liver failure. Its registration was finally cancelled in 2000.[94]

Another means by which medical science can be manipulated is by controlling contracted experts' right of publication. In a 1999 study of university-industry research centers, half of the centers reported that industry funders could require a delay in publication of scientific research, with more than a third indicating that industry could delete information from papers.[95] A 2004 survey similarly ascertained that a relatively large proportion of clinical trial investigators are willing to cede considerable control

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94 Sheldon Krimsky, *Science in the Private Interest*, 20-22.
95 Sheldon Krimsky, *Science in the Private Interest*, 83.

over the dissemination of research results to industry sponsors. These controls included allowing the sponsor to write the manuscript, allowing the sponsor to insert its own statistical analysis, and prohibiting independent publication. Furthermore, researchers with high levels of industry support were more willing to release control than those with less support.[96]

In another example of sponsorship control of manuscripts, The *Annals of Internal Medicine* changed its policy concerning conflict of interest after an incident involving a 1995 proposed industry sponsored article. After reading the initial draft of the proposed article, journal editors and statistician believed in this case "the authors had gone well beyond the data in stating the drug's efficacy and safety." They sent the article back twice with suggested changes. Each time it came back with the wording unchanged. When the lead author was called he revealed that the sponsoring company had the right to review the manuscript and its opinions "did very likely influence the report's language."[97]

The problems with these types of controls were succinctly summed up in an editorial in the 2006 issue of the American Medical Association's primary journal, *JAMA*. In it the editor described how control of publication can dramatically influence medical science:

> "For profit companies also can exert inappropriate influence in research via control of study data and statistical analysis, ghostwriting, managing all or most aspects of manuscript preparation, and dictating to investigators the journals to which they should submit their manuscripts. For example, I have been told that in response to *JAMA*'s policy requiring an independent statistical

[96] Michelle M. Mello, Brian R. Clarridge, and David M. Studdert, "Researchers' Views of the Acceptability of Restrictive Provisions in Clinical Trial Agreements with Industry Sponsors," *Accountability in Research* 12 (2005): 163-191.
[97] Frank Davidoff, "Between the Lines," 236, 238.

> analysis by an academician for industry-sponsored studies in which the only statistician who analyzed the data is employed by the study sponsor, some companies are insisting that the researchers not submit those studies to *JAMA*."[98]

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As noted above, hiring experts is not the only strategy available to influence medical scientists. For scientists who refuse to be hired or publish a study which is contrary to the desired position, harassment can be an effective tool. Scientific harassment can take many forms, including complaints to a scientist's superiors, threats of lawsuits, and scientific misconduct complaints addressed to funding agencies.[99]

Harassment is easiest when a scientist is under contract. The case of phenylpropanolamine (PPA), the over-the-counter drug used as decongestant and appetite suppressant, provides a clear example of this. Reports of hemorrhagic strokes in young women using PPA first appeared in the 1970s. Eventually the drug's manufacturers agreed to select an investigator and fund a study. They chose Yale University. In 1999 that study confirmed that PPA causes hemorrhagic stroke. The manufacturers then hired the Weinberg Group, a product-defense consulting firm, to attack the study. Manufacturer attorneys also deposed the Yale researchers. While the FDA did advise manufacturers to stop making PPA in November 2000, David A. Kessler, the former head of the FDA who later became dean of the University of California at San Francisco School of Medicine,

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[98] Catherine DeAngelis, "The Influence of Money," 996.
[99] Thomas O. McGarity, "Defending Clean Science from Dirty Attacks by Special Interests," In *Rescuing Science from Politics*, ed. Wendy Wagner (Baltimore: University of Maryland, 2006), 30.

stated, "With the amount of hassle and harassment that [the Yale scientists] had to endure, I'm sure the next time they're asked to undertake something like this, they'll wonder if it's worth the cost."[100]

The case of Synthroid, a synthetic thyroid hormone manufactured by Flint Laboratories, provides an even starker example of how studies can be influenced, hidden, or downplayed. In 1988 it funded a study testing its bioequivalence to one other name brand and two generic drugs. In 1990 the researcher determined that all of the drugs were bioequivalent. Boots Pharmaceuticals, to whom Flint had been sold, then notified university officials that the study was flawed. In 1992 the school determined that any flaws were minor and easily correctible. But, when the researcher attempted to publish her work the pharmaceutical company threatened to sue, citing a restrictive covenant in the research contract. In the meantime the pharmaceutical company published its own interpretation of the data which found that Synthroid was superior.[101]

Even scientists who work for federal agencies can be subject to severe harassment. At the time she first began writing *The Secret History of the War on Cancer*, Devra Davis, Professor of Epidemiology at the University of Pittsburgh's Graduate School of Public Health, received "friendly advice" from the man who was temporarily running the National Institutes of Health. He suggested that she should carefully consider whether she wanted to risk her career by writing the book. In describing why he had never pursued a similar study, he related the experience of Wilhelm Hueper (1894 - 1977), a major figure in environmental cancer research. Davis recollects the advice as

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[100] David Michaels, "Doubt is Their Product," 99.
[101] Sheldon Krimsky, *Science in the Private Interest*, 15-17.

follows: "Hueper started out like you. Lots of good ideas about the environment. He thought the exclusive focus on smoking would lead us away from other causes of cancer that were far more deadly. He was railroaded out of here. He wasn't the easiest fellow to work with and rubbed lots of people the wrong way, but not necessarily for the wrong reasons. I decided after seeing what happened to him that I was better off sticking to basic research."[102]

Hueper's story provides a classic example of scientific harassment. After obtaining his medical degree, he immigrated to the United States in 1923 in the wake of Germany's economic collapse. While working for the University of Pennsylvania in 1930, Hueper became interested in industrial hygiene. After a visit to a DuPont plant he advised its management of a potential danger of bladder cancer from the dyes. As a result Du Pont hired him in 1934 as its chief pathologist for the new Haskell Laboratory of Industrial Toxicology. In this capacity he performed a number of research and management functions, while also learning how businesses operate. [103]

Hueper found that the supervisory staff and upper management at DuPont paid, at best, only lip service to good occupational hygiene procedures. In his autobiography, Hueper described one visit to a factory building in which he remarked how clean it was.

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[102] Devra Davis, *The Secret History*, xi.

[103] Wilhelm C. Hueper, "Unpublished Autobiography Draft," National Library of Medicine, Hueper Papers Collection, MSC 341 Archives of the National Library of Medicine; 122-124; Wilhelm C. Hueper Deposition on June 16, 1977 in *Eleanore Miller vs. Raybestos-Manhattan, Inc.,* Civil Action No. 76-899, U.S.D.C., W. D. Pa., 3, Hueper Papers collection, MSC 341, Archives of the National Library of Medicine; Robert N. Proctor, *Cancer Wars*, 37-8. Hueper's own writings revealed he could be difficult to get along with. He had strong opinions and did not trust most companies. During his tenure at the NCI he had a running feud with the federal government's Division of Industrial Hygiene—many of his own superiors in the NCI—who he believed were too close to industry. However, as we will see in Chapter 5, most of Hueper's primary opinions about asbestos, as well as his concerns and complaints about companies and government officials, have been either supported by similar allegations of others or by other evidence.

The foreman described how they had been up all night to clean the facility. Hueper then asked to visit an adjoining building used for benzidine operations where management did not have advanced notice of his visit. At the building he found "white powdery benzidine on the road, the loading platform, the window sills, on the floor, etc." Although he wrote a memo to Mr. DuPont about the incident, Hueper never received an answer—and was never permitted back into plant buildings.

Unsurprisingly, by 1937 Hueper found himself laid off for "economic" reasons and was informed that none of his "observations made during [his] time of employment could be published without their [DuPont's] consent." In November of that year, Hueper was threatened with legal action if he attempted to talk about or publish any of his findings regarding worker health dangers. DuPont enforced Hueper's employment contract less than a year later when a Du Pont official wrote to Hueper, informing him the company was "looking with disfavor on [his] acceptance of an invitation . . . to present a paper on the experimental production of bladder cancer in dogs. . ." from benzidine.[104] For twenty years after Hueper left Du Pont, Chambers Works—the site responsible for dye production—did not report any new cases of bladder cancer. Then, in 1980 they finally disclosed that 364 cases of bladder cancer had occurred at this one factory since its opening.[105]

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[104] Wilhelm C. Hueper, "Unpublished Autobiography Draft," 123-125. As will be described in Chapters 4 and 5, this lack of concern was not unusual among many industrial companies. The autobiography of Alice Hamilton, a renowned public health industrial medicine doctor, also provides several similar accounts of industry indifference or preoccupation with profit, although she normally gave individuals the benefit of the doubt. See Alice Hamilton, *Exploring the Dangerous Trades: The Autobiography of Alice Hamilton* (Boston: Little, Brown and Company, 1943); see also Jim Wolfe, "OSHA: A Short Story," *Labor Studies Journal* 3, no. 2 (Fall, 1978): 150.

[105] Devra Davis, *The Secret History*, 77, 102, 96.

While Hueper was at the NCI, government officials routinely provided Du Pont management with pre publication copies of articles he had submitted to his superiors for review. He also experienced almost constant attacks from many industrial concerns. For example, during the early years of his tenure, DuPont officials first accused him of being a Nazi, and then a communist.[106]

The Research

The importance of *Daubert* to medical research relates not just to its scientific failings, but also to the further openings it provides for litigation attorneys to control the agenda by manufacturing science. Although even before *Daubert* a conclusion desired in a medical study could be relatively easily manufactured, since then, litigation and regulatory initiated science has become an industry of its own. As Chapter 5 of this thesis will explore, asbestos defense attorneys have used *Daubert* to not only limit plaintiff expert opinions, but have also used the vast monetary resources of industry to reshape the "peer reviewed" topography of occupational health science. They accomplished this by hiring specialty consultant firms to conduct studies, reanalyze data, and deconstruct prior studies in industry friendly "peer reviewed" journals, often publishing two to four very similar articles from a single study or review. In large measure—due to their privilege of secrecy—they have accomplished this feat below the radar of historians.

Until the later part of the twentieth century, mainstream journals and the federal government rarely questioned sponsored research in public health. For example, the

[106] Wilhelm Hueper, "Unpublished Autobiography Draft," 135; Robert N. Proctor, *Cancer Wars*, 41-43.

federal government did not begin questioning industry reports on the safety of chemicals until 1978. That year, officials discovered that the company responsible for one third of the testing for industry, Industrial Bio-Test, could not find or account for the animals it had allegedly tested.[107] Since then numerous authors have examined techniques available and being used to influence medical research. While most of these authors focus on slightly different aspects of this issue, they all arrive at the same general parameters of the problem.

Litigation or regulatory action provides a common thread to the various activities. Swedish scientist Lennart Hardell has studied numerous cases of industry and expert ties in cancer research and litigation. In legal cases and regulatory hearings involving Dioxin, Roundup, herbicides, cellular phones, and tobacco, large corporations have used noted experts, frequently without acknowledgement of their prior connections to the corporation, as their face before the jury or agency. Often, the information about the prior connection only became known through litigation discovery.[108]

Industry has become adept at steering medical research attention away from occupational diseases. In his autobiography, Hueper detailed four methods industry can use in this regard. They can feign blindness or not report cases. They can create negative evidence by counting disease in short-term workers but not those now dead or retired. They can pack the study population with those not exposed. Finally, they can suppress or

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[107] Devra Davis, *The Secret History*, 8-9.

[108] Lennart Hardell, Martin J. Walker, Bo Walhjalt, Lee S. Friedman, and Elihu D. Richter, "Secret Ties to Industry and Confliction Interests in Cancer Research," *American Journal of Industrial Medicine* 50 (2007): 231.

delay the results.[109] A study funded by the Cigarette and Tobacco Surtax Fund of the State of California also examined the means by which sponsorship can influence the direction and results of health research. It listed several methods by which the sponsor can influence the investigator: 1) the sponsor can recommend a study design that is more likely to favor its product; 2) the sponsor can encourage the investigator to emphasize certain conclusions; or 3) investigators can feel consciously or subconsciously compelled to present findings that are not damaging to the sponsor. This is especially true in cases where the two have an ongoing relationship.[110]

Other authors have described similar methods of creating bias in health studies. In his 2003 book, Krimsky described five such methods: 1) choose a sample population that is not random or representative; 2) ask questions which predispose toward certain answers; 3) choose a design that is less likely to show effects; 4) choose interpretive statistics that are more likely to support the null hypothesis; or 5) in weighing evidence of multiple studies choose and weigh studies in a manner that supports the researcher's position.[111] In his article describing how to distort the scientific record without actually lying, University of Chicago Professor Emeritus and statistician John C. Bailar listed yet another short catalog of some of the general points in research where distortions can be introduced: 1) choice of topic; 2) framing the question(s); 3) protocol decisions; 4) study performance; 5) data reduction; 6) analysis; 7) findings and conclusions; and 8)

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[109] Devra Davis, *The Secret History*, 97.
[110] Deborah E. Barnes and Lisa A. Bero, "Industry-Funded Research and Conflict of Interest: An Analysis of Research Sponsored by the Tobacco Industry through the Center for Indoor Air Research," *Journal of Health Politics, Policy and Law* 21 (Fall 1996): 516-17.
[111] Sheldon Krimsky, *Science in the Private Interest*, 142-43.

presentation. In effect, Professor Bailar, like the other three authors, is noting that distortion can be introduced into research at almost any step of the process.

These areas of potential distortion can be divided into four broad areas, roughly corresponding to their position in the sequence of research: 1) the topic of the research and the specific question asked; 2) the study design which includes numerous subcategories, such as the population studied, the period studied, and the controls used; 3) data representation and statistics; and 4) the interpretation and presentation. Examples of these areas of potential distortion are found throughout the medical and scientific literature. The following provide just a few examples of how the distortions are manufactured.

The research topic and specific questions being asked provide the first and perhaps easiest way to influence the outcome of the study. One of the general principles important in the design of randomized studies is the "uncertainty principle." If researchers design their study to prove a specific position, then there is no real advancement to the science. Studies of this nature, however, can be used to provide public relations support to a company's product or to contend that the science concerning a product's hazardous nature is contested, even when they are not answering the same questions as studies that found a hazard. Pharmaceutical companies apparently frequently use this technique. One independent review of multiple myeloma studies determined "that this important principle [the uncertainty principle] can be violated, particularly when randomized trials are sponsored by or conducted on behalf of the pharmaceutical industry."[112]

The appearance of a study's results can often be easily modified by simply asking a question more likely to be answered favorably. These "tricks of the trade" include testing a product against another that does not work well or testing a drug against a too high or low dose of another drug. In addition, they include publishing the results of a single trial in many forms in several publications or publishing only favorable studies and burying the rest. The problem also appears in review articles and meta-analyses (combining several studies to improve the power of the analysis); the author simply selects certain papers favorable to his or her position and synthesizes a pattern, while ignoring or disqualifying difficult papers.[113]

Because corporate and legal records concerning the reasoning behind research design decisions are rarely part of the research record, information about the design process is not often available to researchers and historians. However, since company sponsored research often occurs while companies are in litigation concerning the product or process, relevant corporate documents are sometimes disclosed and preserved through the legal discovery process. Documents uncovered during the silicone-breast implant litigation provide one example of this, as well as several other methods of distorting the science. In this case, the company established four conditions before any research could be funded. The following quotation describes those conditions. I have embedded

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[112] Benjamin Djulbegovic, Mensura Lacevic, Alan Cantor, Karen K. Fields, Charles L. Bennett, Jared R. Adams, Nicole M. Kuderer, and Gary H. Lyman, "The Uncertainty Principle and Industry-Sponsored Research," *The Lancet* 356 (August 19, 2000): 637.

[113] David Michaels, "It's Not the Answers that are Biased, It's the Questions," *The Washington Post*, July 15, 2008, page HE03.

emboldened comments concerning how the conditions relate to the above described methods of influencing research.

> First, studies should look at traditional connective tissue diseases and not the atypical symptoms reported by clinicians in the literature. [**Ask a question with a known, but not relevant answer]** Second, studies should include saline as well as silicone implants … [**Design the study to dilute the population]** Third, the studies should use a test of significance (two-tailed) that considered both the positive and negative impacts of having silicone-breast implants, even though there were no hypotheses that silicone implants improved women's health. **[Select the most favorable method of statistical analysis]** Fourth, all women who exhibited symptoms after 1991 should be excluded from the study. **[Design/select a study period shorter than the disease latency period]**[114]

Thus, the company not only ensured that the appropriate questions would not be asked during the research, but also guaranteed that the study would be designed in such a way that it studied a diluted population and was far too short in duration. Finally, the statistical test utilized made any significant positive result less likely.

Pharmaceutical studies of multiple myeloma, a cancer of the blood plasma cells, demonstrate another method of ensuring that the design is skewed toward obtaining the desired result—many studies picked an inappropriate control group. One independent analysis of multiple myeloma randomized trials determined that

> a greater proportion of industry-sponsored studies compared innovative treatment to either placebo or no therapy than did studies sponsored by public sources (60% vs 21%...). Equipose was seen in the studies in which innovative treatments were compared with active standard therapies irrespective of the source of funding (innovative vs active standard 59% vs 41% … in public sponsored studies and 50% vs 50% … in industry-sponsored trials). However, innovative treatments were favoured when the standard comparative

[114] Sheldon Krimsky, *Science in the Private Interest*, 156-57.

> treatment was placebo or no therapy (90% vs 10% … in commercially supported trials, and 70% vs 30% … in research sponsored by public funds).[115]

Thus, the industry studies were often designed to test the product in a manner to provide the best chance for favorable results, even though the results were not always meaningful or relevant.

Even when a study is properly designed, its author can still relatively easily write an article which appears to buttress the sponsor's initial position, even if the facts do not support that position, simply by manipulating the data. This type of manipulation occurred at a presentation before the November 2000 meeting of the Dioxin Review Panel of the EPA Scientific Advisory Board. At that time, industry representatives offered an analysis of dioxin studies which suggested that dioxin is a threshold carcinogen. If true, then low dose exposures did not need to be regulated. This testimony stalled action on dioxin for months. Subsequently the analysis was reexamined by an independent group from Princeton University. They found that the industry group, including Dr. Dennis Paustenbach (further discussed in Chapter 5), had incorrectly weighted the data by cohort size. Without the improper weighting, the threshold effect disappeared.[116]

One of the easiest ways to influence the outcome of an occupational disease study is by tweaking the exposure data. Small changes in the population or control group's exposure data, or even eliminating certain exposure categories, can have large impacts on

[115] Benjamin Djulbegovic, Mensura Lacevic, Alan Cantor, Karen K Fields, Charles L Bennett, Jared R. Adams, Nicole M Kuderer, and Gary H Lyman, "The Uncertainty Principle," 637.
[116] David Mackie, Junfeng Liu, Yeong-Shang Loh, and Valerie Thomas, "No Evidence of Dioxin Cancer Threshold," *Environmental Health Perspectives* 111 (July 2003): 1145-1147.

the results. An article in the *American Journal of Industrial Medicine* noted the importance of this issue to epidemiology:

> "We believe of the two of the major methodologic issues raised in epidemiologic studies of occupational exposures, that is, confounding and exposure misclassification, the latter is of far greater concern. It is rare to find substantial confounding in occupational studies (or in other epidemiologic studies for that matter), even by risk factors that are strongly related to the outcome of interest. On the other hand, exposure misclassification probably occurs in nearly every epidemiologic study. For nondifferential misclassification, the type of misclassification most likely in cohort studies, the direction of the bias is largely predictable, that is, a bias of relative risks toward the null. In addition, the magnitude from relatively small amounts of misclassification can be sufficient to lead to an interpretation of no effect."[117]

Finally, data presentation can always put a proper spin on ambivalent or even doubtful data. Suspect data can be made more credible by the inclusion of a well-known expert as author or an author who is not commonly thought of as being biased. Certain companies have thus included an expert as one of an article's authors, even when the expert had little, or nothing, to do with the article. This type of influence is not limited to the United States. Following *The New Zealand Medical Journal's* decision to require listing of sponsorship, one doctor complained about the medical communication media companies that ghostwrite medical articles and ensure articles have the "proper spin."[118] As will be discussed later, this ghostwriting can even rise to the level of fraud.

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[117] Aaron Blair, Patricia Stewart, Jay H. Lubin, and Francesco Forastiere, "Methodological Issues Regarding Confounding and Exposure Misclassification in Epidemiological Studies of Occupational Exposures," *American Journal of Industrial Medicine* 50 (2007): 205.
[118] Laurence Landow, "Letter to the Editor," *New Zealand Medical Journal* 114 (14 December 2001): 558.

The manufacture of medical research is of especial importance to attorneys when claims are made that their client's products have caused disease. Casting doubt upon any scientific evidence supporting such a claim becomes of paramount importance. The current Administrator of OSHA, the epidemiologist David Michaels, has been especially critical of industry's role in this type of scientific research. Michaels argues that numerous industry trade groups and companies are conducting scientific research with the specific objective of casting doubt on studies that demonstrate the deleterious health effects of their products. In his words, "polluters and manufacturers of dangerous products have waged sophisticated campaigns to manufacture uncertainty about the scientific evidence used to support public health protection and victim compensation."[119] As Michaels explains in his provocatively titled article "Doubt is their Product," uncertainty is an inherent problem of science—but manufactured uncertainty is another matter entirely. Over the past three decades, industry trade groups have frequently become involved in the scientific investigative process when their interests are threatened. If, for example, studies show that a company is exposing its workers to dangerous levels of a certain chemical, the business typically responds by hiring its own researchers to cast doubt on the studies…The vilification of threatening research as "junk science" and the corresponding sanctification of industry-commissioned research as "sound science" has become nothing less than standard operating procedure in some elements of corporate America.[120]

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[119] David Michaels, "Doubt is Their Product," 96-101; David Michaels and Celeste Monforton, "Scientific Evidence in the Regulatory," 17-41.
[120] David Michaels, "Doubt is Their Product," 96.

Attorney Thomas O. McGarity has described two primary means by which "risk-producing" industries cast doubt on research that does not comport with their position: 1) "attack science" involves various techniques of casting doubt on specific studies so they can be portrayed as "fatally flawed;" and 2) the "corpuscular approach" focuses on persuading courts and agencies from relying upon "fatally flawed" studies.
McGarity argues that these attacks take many forms. Upon learning of a planned publication, a company might provide negative peer reviews or attempt to convince the journal not to publish the "fatally flawed" study. Once the article is published, the companies often hire experts to write letters to the journal critiquing the study. This allows the companies to later make the case that the study was "highly controversial." They will sometimes appoint a panel to re-evaluate the study. This panel will then conclude there are aspects of the study that need to be improved before it is accepted.[121] One prime example McGarity uses is that of the drug ephedra. When an article published in the *New England Journal of Medicine* concluded that Fen-Phen, a diet drug, caused a serious heart valve disease, the manufacturer created a panel of cardiologists from Harvard and Georgetown universities to evaluate the cases. Unsurprisingly, the reanalysis conducted by these industry hired experts determined that there was no reasonable medical risk. They determined that any adverse event reports were instead due to the misuse of ephedra.[122] Regulation of ephedra was thus delayed by four years, with a resultant large increase in both those adversely affected and subsequent lawsuits.

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[121] Thomas O. McGarity, "Defending Clean Science," 25-29.
[122] Thomas O. McGarity, "Defending Clean Science," 29, 34.

Numerous other examples of "attack" science populate the literature. For example, when the CDC issued an alert for Reye's syndrome in children who took aspirin, the aspirin industry raised 17 specific "flaws" in the studies and insisted more reliable studies were needed to establish a causal link. The government public educational program was thus delayed for two years and mandatory labels for an additional four years.[123]

Pharmaceutical companies are not alone in their use of this tactic. Chemical manufacturers and other industries involved in toxic substances readily use expert testimony to cast doubt on adverse reports. In fact, during the latter years of the twentieth century, self-professed litigation support firms such as ChemRisk, Environ, and Exponent began to market their attack science capabilities to corporations. One of these firms, Exponent, even hired scientific experts for undisclosed clients to present evidence at conferences and prepare papers for presentation to the EPA while at the same time having its vice president sit on the EPA Science Advisory Board.[124]

ChemRisk's support is best illustrated by examining its role in the 1990s Chromium VI controversy. The movie *Erin Brokovich* brought the drama of chromium VI to the public's attention. This movie described the efforts of one plaintiff lawyer's paralegal to track down the cause of a concentration of illness in a local community. The full story of industry's manufacture of science in the case of chromium VI regulations is more complex. In 1993 the public interest group Public Citizen, along with the Oil,

[123] David Michaels and Celeste Monforton, "Manufacturing Uncertainty: Contested Science and the Protection of the Public's Health and Environment," *American Journal of Public Health* 95 Supplement 1 (2005): 39.
[124] Lennart Hardell, Martin J. Walker, Bo Walhjalt, Lee S. Friedman, and Elihu D. Richter, "Secret Ties to Industry," 231.

Chemical, and Atomic Workers International Union (OCAW) (now part of the United Steelworkers) petitioned OSHA to promulgate a stronger standard for chromium VI based upon the findings of a study by the former Chief, Division of Industrial Hygiene, Ohio Department of Health, Thomas F. Mancuso. They subsequently sued OSHA for "unreasonable delay" in promulgating a new standard.

Initially the chrome industry, through its trade group known as the Chrome Coalition, did not respond to the petition, instead waiting for the completion of an EPA-funded study by The Johns Hopkins University, which they hoped would bolster the industry's position that current standards should suffice.[125] However, upon completion of the Hopkins study, the Chrome Coalition grew "concerned about how OSHA will interpret [the] information" contained in it. The Chrome Coalition therefore "felt that it was necessary to contract with a well regarded consultant in epidemieology (sic) and risk assessment to review all of the information that OSHA might use, determine the limitations and organize and develop a proper scientific basis (model) for predicting the impact of Hexavalent chromium on lung cancer in the workplace." Subsequently, they hired ChemRisk and Environmental Risk Analysis, two self-avowed "litigation support" and "product defense" firms, to assist in limiting changes to the regulations. ChemRisk scientists outlined a strategy to reanalyze raw data from the yet-to-be published Johns Hopkins study "to forestall the [OSHA] rulemaking." The Chrome Association's attorneys, Collier, Shannon, Rill & Scott, PLLC, paid for the services of both ChemRisk

[125] David Michaels, Celeste Monforton, and Peter Lurie, "Selected Science: an Industry Campaign to Undermine an OSHA Hexavalent Chromium Standard," *Environmental Health: A Global Access Science Source* 5 (23 February 2006): 1, doi:10.1186/1476-069X-5-5; accessed on April 1, 2010 at http://www.ehjournal.net/content/5/1/5.

and Environmental Risk Assessment, with the contract being administered by the Industrial Health Foundation (the successor to the industry sponsored Industrial Hygiene Foundation, and which is further discussed in Chapters 4 and 5). This enabled the companies to "…preserve the confidentiality of information, opinion, and data to the extent provided for under the attorney-client privilege and attorney work product privilege."

The parties agreed to "full public disclosure of scientific information contained in the CSR&S-accepted final report." However, as intimated by that sentence, the report was not "final" until completion, receipt, and **approval** [author's emphasis] by the law firm. Thus, the attorneys fully controlled the publication and disclosure of the report. In the unlikely event that the report was not satisfactory, the attorney work product privilege allowed it to be kept hidden form public view. The Chrome Coalition also used the Industrial Hygiene Foundation to hire Environ—another litigation support firm—for the preparation of a new study of four plants which used lower-exposure processes. These lower-exposures made it much more likely that the report would not have sufficient power to have a positive result.[126]

These activities culminated early in the new millennium. First, the consultants challenged the validity of the now-published EPA study. After extensive analysis, OSHA

[126] The quotes "concerned about how" and "felt that it was necessary" are from Chrome Coalition and Ad Hoc PEL Committee memorandum of February 13, 1996, attached as an additional file 1 in David Michaels, Celeste Monforton, and Peter Lurie, "Selected Science:" the quote "to forestall the [OSHA] rulemaking" is from Chrome Coalition Ad Hoc PEL Committee Memorandum of February 13, 1996, attached as additional File 2 in David Michaels, Celeste Monforton, and Peter Lurie, "Selected Science:" and the quotes "Full public disclosure" and "Completion, and receipt" are from Paragraph 11., Agreement: Chrome Coalition, attached as an additional File 3 to David Michaels, Celeste Monforton, and Peter Lurie, "Selected Science."

rejected those critiques. In 2004 OSHA published its proposed new regulations and conducted hearings. At the hearings, industry representatives did not mention that they had hired Environ to undertake a new epidemiologic study concerning the use of chromium in United States facilities. Then, just weeks before the close of post-hearing comments, Environ employees published an article about the relevant United States plants in the *Journal of Occupational and Environmental Medicine*. Given the limited time involved, the analysis had little statistical power, but the authors offered a "preliminary conclusion" that the lower exposures may have resulted in no elevated lung cancer risk. In its post hearing comments, the trade group Specialty Steel Industry of North America, who had been represented at the 1996 Chrome Coalition meetings, claimed it had recently learned of the study and warned OSHA that it would be "arbitrary and capricious"—a regulatory legal term—to ignore this study. The group also published a separate article on German chromate plants, which concluded that only an earlier and higher exposure group had any increased risk of cancer.[127]

A close analysis of the Environ study demonstrates how it both hid and manipulated medical science to arrive at the conclusions contained in the two published articles. The original report to industry looked at all four United States and German plants. When examined in this fashion, the study confirmed an elevated cancer risk for many of the workers. Even alone, the German plant final report showed risk elevated at

[127] R. S. Luippold, K. A. Mundt, L. D. Bell, and T. Birk, "Low Level Hexavalent Chromium Exposure and Rate of Mortality Among U. S. Chromate Production Employees," *Journal of Occupational and Environmental Medicine* 47 (2005): 381-385; T. Birk, K. A. Mundt, L. D. Dell, R. S. Luippold, L. Miksche, W. Steinman-Steiner-Haldenstaett, and D. J. Mundt, "Lung Cancer Mortality in the German Chromate Industry, 1958-1998," *Journal of Occupational and Environmental Medicine* 48, no. 4 (April 2006): 426-433; David Michaels, Celeste Monforton, and Peter Lurie, "Selected Science," 3-4.

the current regulatory allowed exposure level. However, the authors of the German paper arbitrarily combined two exposure categories that had been included in the final report, thereby resulting in the disappearance of elevated risk for those individuals right at the current allowed exposure level. Only with the division of the report into separate articles on the United States and German plants—contrary to the protocol of the study which repeatedly emphasized the strength of a combined cohort—and the arbitrary combination of the German categories allowed the authors to assert that only the high exposure cohort had increased risk. This strategy of data reanalysis is now standard operating procedure for these litigation-support firms.[128]

The industrial giant Brush Wellman's hiring of another consulting and research firm specializing in product defense, Exponent, provides an illustration of another method that can be used to cast doubt on research—suggest an alternative hypothesis that has not been considered in current research. Brush Wellman is perhaps the world's leading miner of the metal beryllium, vitally necessary in nuclear weapons, and perhaps the most toxic substance to humans. When OSHA attempted to reduce beryllium exposure limits, Exponent and Brush Wellman employees wrote a series of articles suggesting that current research does not adequately take into account the size and surface area of beryllium particles. They also suggested that skin exposure could play a larger role. The net result of these hypotheses is that if they are correct, the current standards might be sufficient. Brush Wellman subsequently argued that further research

[128] David Michaels, Celeste Monforton, and Peter Lurie, "Selected Science: an Industry Campaign to Undermine an OSHA Hexavalent Chromium Standard," 4-5; Richard W. Clapp, P. Hoppin, and D. Kriebel, "Erosion of the Integrity of Public Health Science in the USA," *Occupational and Environmental Medicine* 63 (2006): 367.

in this area is necessary before any changes are made in the regulations. During the 1990s DOE issued a new standard which lowered allowable exposures by a factor of ten despite this research. However, under the George W. Bush administration, OSHA has followed Wellman's lead and called for more research before taking a position.[129]

As President and cofounder of ChemRisk, Inc., and former Vice President of Exponent, Dennis J. Paustenbach has made a career of similar industry assistance. In 1990 he developed a proposal to the American Petroleum Institute which he described as follows:

> McLaren/ChemRisk is pleased to provide this proposal to develop an alternative cancer potency estimate for benzene. It is our understanding that API would like us to develop a succinct, yet scientifically compelling, integrated position statement to be used in comments to the state of North Carolina and as a possible springboard for future analyses that could be presented to US EPA and the State of California.[130]

The proposal went on to explain what the conclusion of the paper would be and stated that comments from API member companies and other API consultants would be incorporated into the paper. The paper was eventually published in *Environmental Health Perspectives* without disclosure that it had been designed around the conclusion and had been edited by industry representatives.[131]

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[129] David Michaels, "Doubt is Their Product," 98.

[130] Dennis J. Paustenbach, "Revised Proposal to Develop an Alternative Cancer Potency Factor for Benzene," API, July 5, 1990 cited in Susanna Rankin Bohme, John Zorbadian, and David S. Egilman, "Maximizing Profit and Endangering Health: Corporate Strategies to Avoid Litigation and Regulation," *International Journal of Occupational and Environmental Health* 11 (2005): 341.

[131] Susanna Rankin Bohme, John Zorbadian, and David S. Egilman, "Maximizing Profit and Endangering Health," 341; Dennis J. Paustenbach, R. D. Bass, and P. Price, "Benzene Toxicity and Risk Assessment, 1972-1992; Implications for Future Regulation," *Environmental Health Perspectives* 101, Suppl. 6 (1993): 177-200; and P. R. Williams and D. J. Paustenbach, "Reconstruction of Benzene Exposure for the Pliofilm

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These activities can also cross the line to become outright fraud. Until recently, fraud in scientific research was considered rare—most scientists "insisted that science was honest and virtually fraud proof."[132] However, during the past twenty years, with increasing disclosure of corporate documents through lawsuits, there have been several examples of fraud for profit in medical science research.

During its efforts to forestall chromium regulations, ChemRisk was accused of overstepping this boundary. In addition to their other work, ChemRisk employees also ghost-wrote an article for a Chinese scientist who had previously studied chromium. This article was then published in the *Journal of Occupational and Environmental Medicine*. The article significantly altered the Chinese scientist's original findings. When this information became public, Paul Brandt-Rauf, editor *of the Journal of Occupational and Environmental Medicine*, took the unusual step of formally retracting the article. He

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Cohort (1936-1976) Using Monte Carlo Techniques," *Journal of Toxicology and Environmental Health A* 66 (1993): 677-781.

[132] Lawrence K. Altman, and Laurie A. Melcher, "Fraud in Science," *British Medical Journal (Clinical Research Edition)* 286, no. 6383 (June 25, 1983): 2004; also see Catherine DeAngelis, "Conflict of Interest," 2237-2238; Catherine DeAngelis, "The Influence of Money," 996-998; and Catherine D. DeAngelis and Phil B. Fontanarosa, "Impugning the Integrity," 1833-1835. Historians have also addressed accusations of fraud against scientists in other fields; see for instance Daniel J. Kevles, *The Baltimore Case: A Trial of Politics, Science, and Character* (New York: W.W. Norton, 1998) and Jan Sapp, *Where the Truth Lies: Franz Moewus and the Origins of Molecular Biology* (NY: Cambridge University Press, 1990).

justified the retraction of the article by noting that "financial and intellectual input to the paper by outside parties had not been disclosed."[133]

This may not be an isolated incident. Four doctors who consulted as expert witnesses for plaintiff attorneys in litigation concerning Merck & Co.'s drug "rofecoxib" reviewed Merck internal documents to determine who actually wrote many of the articles published concerning the rofecoxib. They found that academically affiliated authors were frequently contacted only after the article was in preparation. Many nearly complete drafts of review articles were ghost-written by medical publishing companies.[134]

Another fraudulent method that can be used is the creation and funding of an allegedly "independent" research organization which then funds medical research relevant to the company's product. In 1954 U. S. tobacco companies created such an organization in the Tobacco Industry Research Committee. Unsurprisingly, this Committee sponsored research that found little harm in smoking. In 1988, three United States tobacco companies created another organization which, by its name, appeared less tied to tobacco companies, the Center for Indoor Air Research (CIAR). Its stated purpose was to fund high-quality, objective research related to indoor air and environmental tobacco smoke.[135]

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[133] Peter Waldman, "Toxic Traces: New Questions about Old Chemicals," *Wall Street Journal* (December 23, 2005): A.1, obtained at http://www.familiesabainstcancer.org/?id=319 on April 17, 2009; Paul Brandt-Rauf, "Editorial Retraction," *Journal of Occupational and Environmental Medicine* 48, no. 7 (July 2006): 749.

[134] Joseph S. Ross, Kevin P. Hill, David S. Egilman, and Harlan M. Krumholz, "Guest Authorship and Ghostwriting in Publications Related to Rofecoxib," *JAMA* 299 (April 16, 2008): 1800-1812.

[135] Deborah E. Barnes and Lisa A. Bero, "Industry-Funded Research," 516-517. As will be seen in Chapters 4 and 5, the Industrial Hygiene Foundation has, at times, played a similar role for industry.

These two tobacco research organizations funded peer reviewed research but also sponsored what were called "special projects." These studies were designed to assist in developing scientific data to defend litigation. The organizations also cultivated private research relationships with scientists who would then be called to testify at trial or before governmental committees and agencies. Their research was designed to direct attention away from tobacco and toward other causes of cancer. The study designs were also structured to produce other results that would support the industry's position concerning tobacco.[136]

These types of fraud do not stand alone. The editors of the United State's leading medical journal report that even the peer review system might be suspect.

> "Another source that may contribute to the manipulation of research studies involves peer reviewers who have relationships with industry. Such reviewers may provide biased reviews that favor products of companies with which they have strong financial relationships, may fail to disclose their conflicts of interest to journal editors, or may even provide for-profit companies with confidential information obtained during the peer review process. For example, it was recently reported that a peer reviewer for the *New England Journal of Medicine* sent a confidential manuscript that he was invited to review and that demonstrated an increased mortality risk associated with rosiglitazone to the manufacturer of this drug weeks ahead of publication."[137]

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As demonstrated above, vast arrays of techniques are available to manipulate medical science. They range from a subtly nuanced influence to the blunt bludgeoning of

[136] Deborah E. Barnes and Lisa A. Bero, "Industry-Funded Research," 518.
[137] Catherine D. DeAngelis and Phil B. Fontanarosa, "Impugning the Integrity," 1834.

fraud. Yet none of these practices is new. Attorneys have used them throughout the twentieth century to manufacture the science they needed to reflect their litigation position. The following two chapters on silica and asbestos follow these activities throughout the twentieth century and explore how the actions of attorneys to manufacture science evolved over time—but remained true to attorneys' desire to have the evidence necessary for a successful outcome in their case or regulatory activity.

Chapter 4 – Silicosis: The Disappearing Disease

The Chronology of Silicosis Public Knowledge

The Early Years

The recognition that certain dusts cause lung disease was not a new development of the twentieth century. Even ancient writers such as Hippocrates and Pliny the elder and noted the hazards of certain types of mineral dust. During the Renaissance Georg Bauer of Saxony (better known by his Latin name Georgius Agricola) combined his interests in geology and medicine in his work *De Re Metallica*, which discusses metal mining and includes a section on the diseases of miners including those that "attack the lungs." He stated that dryness in the mine created great harm:

> …for the dust which is stirred and beaten up by digging penetrates into the windpipe and lungs, and produces difficulty in breathing, and the disease which the Greeks calls asthma. If the dust has corrosive qualities, it eats away the lungs and implants consumption in the body.

The 1700s brought even more complete descriptions about the dangers inherent in mineral dusts. Both Italian physician Bernardino Ramazzini, often considered the father of occupational medicine, and English physician Thomas Beddoes noted that stone workers often develop pulmonary consumption from the dust entering their lungs. As Ramazzini noted, the effects of dust on stone cutters lungs could be quite dramatic:

> oftentimes suck in by inspiration the sharp, tough small splinters or particles which fly off so that they are usually troubled with a cough and some of them turn asthmatic and consumptive. In dissecting the corpses of such artificers, the lungs have been found stuffed with little stones. Several stone cutters who died

> from asthma were opened and in their lungs were found such heaps of sand that in running the knife through the pulmonary vesicles it seemed that one was cutting some sandy body.[138]

As Frederick Hoffman, chief statistician for Prudential Insurance Company, could confidently state in 1918: "The importance of dust as a factor in occupational mortality has attracted the attention of every authority on occupational diseases from Ramazzini to Sir Thomas Oliver."[139]

Late nineteenth and early twentieth century doctors fully recognized both silicosis as a specific dust disease caused by exposure to crystalline silica (sand or quartz dust, for example), as well as its link to tuberculosis, a debilitating and deadly consumptive disease of the lungs. In 1887 an autopsy of a stove foundry worker described the cause of death from a condition now known as silicosis. That same year a report described a chronic air passage condition in 34 workers in a cutlery factory that resulted in the deaths of at least 23 men.[140] Over a period of five years during the 1890s in Nevada quartz dust created by milling killed ten percent of quartzite miners. In 1889 New York Board of

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[138] The quotes about Agricola and Ramazzini are from Rosamond W. Goldberg, *Occupational Diseases,* 14 and 37, respectively. While ancient knowledge is often not relevant to modern science, in this case it clearly demonstrates how easily recognized such diseases have always been to companies that are knowledgeable about mining and related activities.

[139] For a complete historical study of miners' diseases from prehistoric times through the nineteenth century see George Rosen, *The History of Miner's Disease* (New York: Schuman's, 1943). Many medical practitioners specializing in occupational disease have noted the long history of knowledge concerning lung disease from dusts. One of the best examples is Emery Hayhurst, "Health Hazards of Non-Poisonous Dusts – A Resume of Some Recent Investigations," *The American Journal of Public Health* 10 (August 1920): 60-65. The Hoffman quote is at 60. Histories produced by industry oriented associations, such as the Industrial Medical Association, also acknowledge that experts have known for centuries that silicosis type diseases are caused by rock dusts and sand. Henry B. Selleck and Alfred H. Whitaker, *Occupational Health in America*. See in particular 133, 142, and 203.

[140] Victoria M. Trasko, "Silicosis, a Continuing Problem," *Public Health Reports* 73, no. 9 (September 1958): 839.

Health pathologist Doctor T. M. Prudden emphasized the importance of a dusty atmosphere to the spread of tuberculosis. [141]

Yet, as recognition of the dangers of silica grew, so did the number of workers exposed to the hazard. During the opening decades of the twentieth century foundry operations grew in both size and number. By 1914 there were 18,000 foundries in the United States, employing 660,000 workers. The concomitant growth of mechanization and technology in foundry operations was of even greater significance for the spread of both silicosis and tuberculosis. As new power and pneumatic tools with their dramatically increased abrasive actions became standard, dust increased.[142]

Three processes primarily accounted for the intensification of dust. In most foundry operations binders were initially mixed with sand for the molding process. As the new century progressed, power mixing, screening, and cutting machines increasingly replaced handwork in this process. After the molding process and upon partial cooling of the poured metal, the mold was taken off in what was called the shakeout process. Newly developed pneumatic tools were then used to remove the remaining sand from the casting. The increased abrasion caused both increased dust and finer dust particles. During the final process the casting was freed of all sand and polished. Modern foundries cut costs and improved the final product by using tumbling machines with sand as well as

[141] Information about Nevada quartz miners is from Martin Cherniack, *The Hawk's Nest Incident*, 38. Pruden information is from *New York Times* (June 9, 1889) http://query.nytimes.com/mem/archive-free/pdf?res=F30A13FE385E15738DDDA00894DE405B8984F0D3, last accessed on November 28, 2010.
[142] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the On-going Struggle*, 51-57.

sandblasting in this final procedure. Both of these methods increased dust and decreased airborne particle sizes.[143]

Similar mechanization also occurred in most other industries using silica, including mining, stone work, sandblasting, etching, and brick making. The twentieth century advances in technology provided numerous new mechanical tools for mining and manufacture, resulting in faster and more efficient practices. Unfortunately, when used on dry materials, these tools often created excessive amounts of dust. At times workers could not see across their work room. While some dusts merely caused discomfort, others, particularly silica dust, resulted in long term progressive fibrosis of the lungs. Thus, dust diseases dramatically increased in a wide variety of industries.

In addition, the new equipment reduced both the level of worker expertise necessary in many industries and the stability of the work force. By 1918 these molding machines and tools had enabled foundry owners to reduce their skilled long-term labor force. Unskilled or semiskilled labor took up an increasing percentage of the work force. Frequently they only stayed for a few months or years. This turnover, often caused by increasing ill health, dramatically increased the numbers of the most exposed workers.[144]

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[143] Ibid.

[144] Numerous authors have catalogued the increased industrial use of power tools in the early twentieth-century, as well as their effects. See for example David Rosner and Gerald Markowitz, "Consumption, Silicosis, and the Social Construction of Industrial Disease," *The Yale Journal of Biology and Medicine* 64 (1991): 481-498; David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the On-going Struggle*, 51-57; Rosamond W. Goldberg, *Occupational Diseases*, 41; Gerald Markowitz and David Rosner, "The Illusion of Medical Certainty, 230; and Victoria M. Trasko, "Silicosis, a Continuing Problem," 839. Histories produced by industry oriented associations, such as the Industrial Medical Association, also noted that the increased employment and use of pneumatic rock drills in the early twentieth century made new preventive measures imperative: see Henry B. Selleck and Alfred H. Whitaker, *Occupational Health in America*, in particular 133, 142, and 203.

Concern about the growing problem of tuberculosis in dusty work led the Public Health Service and the Bureau of Mines to conduct the first systematic investigations of dust diseases in 1913-1915. Anthony J. Lanza led the investigations. He had joined the Public Health Service in 1907, as a young physician, becoming Chief Surgeon to the Bureau of Mines in 1914. The landmark report of the investigations, issued in 1917, established Lanza as one of the foremost experts on pneumoconioses (dust diseases involving fibrosis of the lungs).[145]

These investigations established silicosis and other diseases of the lung as ubiquitous in the American mining industry. Over sixty percent of miners had some form of lung fibrosis. Of 720 miners examined, only 179 were free of lung disease; sixty-nine had more fibrosis of the lungs than normal; 330 had silicosis; 105 had silicosis and tuberculosis; and thirty-nine had uncomplicated tuberculosis. Lanza and his coworkers also established that silicosis at any stage caused breathing difficulties: "The first stage [was] characterized with slight or moderate dyspnea on exertion," even if the individual "looked robust." A similar study of Butte, Montana miners found similar disease; of 1,018 miners 194 had early silicosis, 128 had moderate silicosis, and 110 had severe silicosis, with 63 of these severe cases being complicated with tuberculosis.[146]

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145 David H. Goldstein, “Tribute: Anthony J. Lanza, MD, 1884-1964,” *Archives of Environmental Health* 9, no. 2 (August 1964): 271-3; and David E. Lilienfeld, “The Silence: The Asbestos Industry,” 791.

146 A. J. Lanza and S. B. Childs, “I. Miners’ Consumption: A Study of 433 Cases of the Disease among Zinc Miners in Southwestern Missouri; II. Roentgen-ray Findings in Miners’ Consumption,” *Public Health Bulletin*, no. 85 (Washington, D.C.: U.S. Government Printing Office, 1917) (Lanza would become one of the leading United States figures in occupational disease medicine. In 1930 he left the Federal government to become director of the Metropolitan Life Insurance Company’s Division of Occupational Health.); R. R. Sayers, E. R. Hayhurst, and A. J. Lanza, “Status of Silicosis,” *American Journal of Public Health* 19, no. 6 (1929): 635-640; and David Rosner and Gerald Markowitz, “Workers, Industry, and the Control,” 32.

By the early 1920s industry doctors were also noting the early onset of breathing problems in dusty industrial and stone work environments. P. H. Hourigan, the medical director of a Buffalo business, stated in 1924 that the first sign of the disease was dyspnea. He went on "It comes on so gradually and insidiously, and the patient so unconsciously avoids efforts which increase this difficulty, that you marvel at the objective evidence of increasing difficulty of breathing developed before the person afflicted with silicosis recognizes the lessened capacity of his lungs."[147]

By this time, Federal government, academic and industry experts all recognized that miners were not the only workers at risk for silicosis and tuberculosis. The 1918 U.S. Bureau of Labor Statistics Bulletin list of workers exposed to harmful mineral dusts included asbestos workers, molders, brick makers, stone workers, plasterers, and most miners among many others. One year later Emery R. Hayhurst, Assistant Professor of Hygiene at Ohio State University, estimated that 5,000,000 people were being exposed to hazardous industrial dust. While not certain about the specific causal connection, Hayhurst noted the over twofold increase of tuberculosis in individuals exposed to industrial dusts. Tuberculosis, long recognized as a major disease of industrial workers, was one of chief causes of death among those of working age. C. -E.A. Winslow, a prominent industrial medicine expert and Yale Professor, who would shortly become president of the American Public Health Association, also argued that silica was responsible for this high tuberculosis rate among industrial workers. Nor was this

[147] P. H. Hourigan, "Silicosis: An Occupational Disease," in New York State Department of Labor, *Proceedings of the Eighth Annual New York State Industrial Conference*, December 2-4, 1924, 222, cited in David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics,* 89.

recognition limited to the United States. In 1921 Thomas Oliver, one of the foremost specialists in occupational medicine in the United Kingdom, also sounded the alarm about the connection between dust and tuberculosis. "[T]he tendency of modern pathology is to look upon all pulmonary phthisis or consumption as tuberculosis, but the fact remains that phthisis can be caused by dust." He particularly noted the dangers of four dust diseases, or pneumoconioses, including silicosis, writing that sufferers of pneumoconiosis were more likely to get tuberculosis. [148]

Other reports during the 1920s documented the rapid rise of mortality from tuberculosis in workers exposed to silica after introduction of powered equipment. For example, in 1920 one study of 427 granite cutters determined that practically every worker had silicosis, tuberculosis, or a combination of them. A follow up study of the Vermont granite industry by the Public Health Service established that practically all workers exposed to high concentrations of silica dust developed silicosis with a substantial number also contracting tuberculosis. Consequently, in the early 1920s the Bureau of Mines issued warnings on the dangers of dust being created by high velocity drills.[149] The excavation of tunnels for the New York subways provided a similar stark scenario. In 1929 occupational health specialists studied these excavation workers. They found that 57% of the workers had silicosis and 9% had tuberculosis. Examination of the union member death certificates was even grimmer; of twenty-one natural deaths due to

[148]David Rosner, and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*; Rosamond W. Goldberg, *Occupational Diseases*, 36 and 195; Hayhurst, Emery R., “Health Hazards of Non-Poisonous Dusts – A Resume of Some Recent Investigations,” 60-1; and Thomas Oliver, *Dangerous Trades*, 272.

[149] Victoria M. Trasko, “Silicosis, a Continuing Problem”; and A. E. Russell, R. H. Britten, L. R. Thompson, and J. J. Bloomfield, “I. The Health of Workers in Dusty Trades and II. Exposures to Silicosis Dust (Granite Industry),” *Public Health Bulletin*, no. 187 (Washington, D. C.: U.S. Government Printing Office, 1929). Bureau of Mines information is from Martin Cherniack, *The Hawk’s Nest Incident*, 38.

disease, ten were due to tuberculosis and seven to lobar pneumonia. Although this was abnormally higher than the general population, these figures were in line with other miners of high silica content rock.[150]

At an October 1929 presentation before the Industrial Hygiene Section of the American Public Health Association, members of the Committee on Silicosis documented numerous similar extraordinary rates of disease among silica workers in the United States and Great Britain. The report also commented about the increasing number of studies on dust in the lungs. The studies included silicosis in mining, the sandstone industry, the granite industry, grinding, sandblasting, etching, and pottery. Committee members further observed both that "[g]round silica is used in many industries, and, in the crushing and grinding of the silica and in the industries in which ground silica is used, silicosis, sometimes of an acute type, occurs" and "the mining in Cornwall has had a high mortality rate from tuberculosis, and it has been shown that this is associated with silicosis." The report finally cautioned practitioners not to rely upon the moderate levels of silicosis in some studies. Levels of silicosis might be much higher "[s]ince the men were all examined at work, any case so far advanced as third stage, and also many in the second stage, would not be found at work."[151] A portion of the included information came from Metropolitan Life, the employer of Lanza, the committee chairman. Metropolitan Life's and other insurance research data showed that mortality from

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[150] Rosamond W. Goldberg, *Occupational Diseases*, 41-42.

[151] The report also asserted that the suggested industry standards of between 5 and 10 million particles per cubic foot of airborne silica dust in the workplace did not prevent silicosis. The authors emphasized that the standards had been developed, in part, because they "could be reached by the use of economically practicable ventilating systems." R. R. Sayers, Emery R. Hayhurst, and A. J. Lanza, "Effect of Dust on the Lungs," *American Journal of Public Health* 20 (1930): 368, and the quote is at 372.

respiratory diseases was significantly higher for persons exposed to silica, whether or not they had silicosis; between ages 45 and 54 it was more than three times higher.[152]

Thus, by the Great Depression, although the mechanism producing the characteristic changes was not known, occupational doctors fully understood both that silicosis is caused by crystalline silica such as sand and is correlated (indeed, historic articles point to even a stronger relationship) to tuberculosis. At that time, as it remains today, diagnosis of silicosis was based primarily on data from three sources: an occupational history, a physical examination, and a lung X-ray. Other respiratory diseases, including tuberculosis and pneumonia, frequently cause complications.[153]

The late 1920s and early thirties also saw numerous reports documenting cases of silicosis after only short exposures. For example, in 1932 Earle M. Chapman, a doctor at the Medical Clinic of the Massachusetts General Hospital, authored an article in the

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[152] Philip Drinker, Philip and Theodore Hatch, *Industrial Dust*, 29. Lanza left the Public Health Service in 1920. The Metropolitan Life Insurance Company hired him in 1926 to "provide industrial medicine and industrial hygiene services to companies." David E. Lilienfeld, "The Silence: The Asbestos Industry," 792.

[153] Smith, Clayton S. Smith and Helen L. Wikoff, "The Silica Content of the Lungs of a Group of Tunnel Workers," *American Journal of Public Health* 12 (1933): 1250. As defined in the 1930s by Doctor Leroy Gardner, prominent industrial medicine expert and director of the respected Saranac Laboratories, "[s]ilicosis means a disease of the lungs due to breathing air containing uncombined silicon dioxide dust, characterized anatomically by generalized nodular fibrotic changes throughout both lungs, which are demonstrable by x-ray examination and by autopsy, and resulting from any process of occupation involving inhalation of silicon dioxide dust." Leroy Gardner personal communication cited in L. E. Hamlin, M.D., "Review of Silicosis for the Industrial Hygienist and Medical Practitioner," Leroy U. Gardner, M.D., Ed. *Industrial Tuberculosis Silicosis and Compensation* (New York: National Tuberculosis Association, 1945), 45. The x-ray is by far the most important aspect of the diagnosis. In a moderate case of silicosis, even knowledgeable laymen (such as myself) can, in most cases, correctly diagnose the disease. As stated by Doctor Gardner, "[W]hile there are other conditions which may simulate the roentgenographic picture of silicosis, the shadow pattern described when taken in conjunction with the clinical story and a history of adequate exposure to free silica dust constitutes strong evidence for a positive diagnosis." Leroy U. Gardner, "Elements of Diagnosis and Prognosis in Pneumoconiosis," Leroy U. Gardner, M.D., Ed. *Industrial Tuberculosis Silicosis and Compensation*, (New York: National Tuberculosis Association, 1945), 76. In the 1930s, as today, the disease was normally diagnosed as one of three stages. While today this diagnosis relies primarily on the x-ray and objective breathing tests, in the 1930s the diagnosis relied more on the doctor's subjective opinions concerning breathing problems: see Philip Drinker and Theodore Hatch, *Industrial Dust*.

prestigious and selective *Journal of the American Medical Association* about several cases of acute silicosis. In the article, Chapman reported on three individuals who he diagnosed with severe silicosis. At the time of the diagnosis they had been working in the area of silica and soap being dry mixed for between eight to twenty nine months. The patient's X-rays exhibited severe fibrosis that obliterated most of the lung fields. Lung biopsies of two individuals revealed lung silica content that was about 10% of that associated with chronic silicosis, but ten times the amount found in normal lungs. Chapman also observed that in addition to his cases there were two additional new cases of probable silicosis. Chapman provided citations to several other similar reports in Britain and the United States. This landmark article provided strong evidence of silicosis from even short exposures to silica.[154]

Two years later in a study of pottery workers, Paul A. Quintance, Associate Medical Director of Golden State Hospital in Los Angeles, examined acute and chronic forms of silicosis. His review of the literature listed Chapman's study, other published reports, and additional reports Quintance had obtained through personal correspondence. He noted that the acute form is somewhat different from chronic silicosis and death usually came from pneumonia or tuberculosis. In his study of 106 pottery employees, he took x-rays of fifty-eight employees who had an average exposure period of seven and a half years. 8.6% had the highest stage of silicosis. 38% had moderate silicosis. The remainder all had a demonstration of at least slight fibrosis.[155] In 1937 Saranac

[154] Earle M. Chapman, "Acute Silicosis," *Journal of the American Medical Association* 98, no. 17 (1932): 1439-1441.
[155] Paul A. Quaintance, "Silicosis: A Study of 106 Pottery Workers," *American Journal of Public Health* 24, no. 12 (1934): 1248.

Laboratory in upstate New York, a research facility associated with the Trudeau Foundation and a tuberculosis facility noted for its close work with industry, detailed a similar case history of a black foundry worker. He was employed as a sandblaster for fourteen months, at which time he had to give up his job due to shortness of breath. He then deteriorated rapidly and died of silico-tuberculosis fourteen months later.[156] One year earlier, in what became essentially the textbook of industrial hygiene, Doctor Philip Drinker, Professor of Industrial Hygiene at the Harvard School of Public Health, wrote "lesions of silicosis in a mild degree can be produced in an animal by thirty hours exposure to intense dust clouds." After reviewing the literature, he concluded that, in intense dust situations, the first stage of silicosis in humans can occur in as little as eight months.[157]

These increased levels of both chronic and acute disease were occurring in what should have been the healthiest segment of the population. In industrial workers there is a natural selection of the fittest; individuals who are most susceptible to dust do not apply. The general population is sicker. As one authority wrote,

> . . . if an industry involves no health hazards of consequence, the sickness rate among its employees should be lower than in the general population… In a hazardous industry this process of natural selection is of greater importance than in nonhazardous plants since it acts to remove those especially unfitted for exposure to the particular hazardous material involved.[158]

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[156] Thomas H. Milby, "Pneumoconioses," 47-48; and David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 78. Saranac Laboratory was founded in 1890 as a tuberculosis research center by Edward Livingston Trudeau, an early pioneer in tuberculosis treatment and research: see David Ozonoff, "Failed Warnings," 200.
[157] L. E. Hamlin, "Review of Silicosis," 49; and Philip Drinker and Theodore Hatch, *Industrial Dust*, 28, 77.
[158] Philip Drinker and Theodore Hatch, *Industrial Dust,* 78.

Gauley Bridge

Even with this growing recognition of the dangers, it took an extraordinary event to shock the nation into full awareness of the dangers of silicosis. This event, The Hawks Nest tunnel tragedy during the early 1930s, became the greatest single industrial tragedy in the history of the United States. For a short time, silicosis became a nationally recognized nightmare, far beyond the then normally accepted risks of life. Newspaper and magazine headlines across the country expressed shock at the "silicosis menace."[159]

About thirty-five miles east of Charleston, West Virginia, as U.S. 60 begins to descend into the New River gorge, a simple roadside marker memorializes the Hawk's Nest tunnel. The roadside marker describes the tunnel and its purpose without any indication of its cost in human lives. The three mile long tunnel was built to divert water from the New River, primarily to provide power to a Union Carbide subsidiary's plant.[160]

On March 13, 1930 the tunnel construction contract was awarded to Rinehart and Dennis, an experienced contractor. Ground breaking occurred on March 31, 1930, with the tunnel being completed in December, 1931. The tunnel went through more than a mile of high silica content rock. Over 5000 men worked on the tunnel, 65% of them African Americans brought in from other states. Only 738 whites worked in the tunnel for any portion of their employment. Of the 1494 men who worked exclusively in the

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[159] See for example "Silicosis Menace," *Business Week*, September, 1933, 19-20; and "Silicosis Menace," *Literary Digest*, December 15, 1934, 118.
[160] Martin Cherniack, *The Hawk's Nest Incident*, 1-2.

tunnel, 1115 were black. Most of the tunnel workers did not work for the entire construction period. In fact, the largest work force in the tunnel at one time was 600.[161]

Increasing ill health constituted the primary reason most workers did not remain for the entire construction period. Work conditions during tunneling were abysmal. Even occupational doctors closely associated with industry, such as Doctor Leroy Gardner of the Saranac Laboratories, recognized that the conditions were horrific. As described by Doctor Gardner, in the mine "[n]o atmospheric dust counts were available, but from all reports excessive amounts of extremely fine dust were generated… In the tunnel which was bored without effective ventilation, the men returned to the face immediately after blasting and were required to work with dry drills in an atmosphere so exhausted by gasoline engines that they must have breathed abnormally fast. Such conditions would obviously favor the inhalation of unusually large quantities of very fine dust." [162]

Subsequent autopsies confirmed the speed at which silicosis can form under these conditions. Leonidas Ryan Harless, M.D., the Gauley Bridge practitioner who first raised the alarm about the condition of the miners, sent lung material of nine miners to noted pathologist Clayton Smith for review. In his report of the results, Smith noted that a previous study had found that when SiO2 (silica) in the dried portion of the lung reached 1.6%, there were "practically no exceptions to the diagnosis of silicosis." In Harless' group, Smith found this type of strong evidence of silica in virtually all of the lung tissue.

[161] Martin Cherniack, *The Hawk's Nest Incident*, 16-18, 29.
[162] Martin Cherniack, *The Hawk's Nest Incident*, 24-51; and Leroy U. Gardner, "Pathology of So-Called Acute Silicosis," *American Journal of Public Health* 23 (1933): 1241. Philanthropic money for the Saranac Laboratories tuberculosis programs significantly decreased by the late 1920s. After becoming director in 1927, Gardner turned its focus to dust diseases rather than tuberculosis. With the onset of the 1930s silicosis crisis, business dramatically increased at the laboratories: see David Ozonoff, "Failed Warnings," 201.

As expected, he also found a strong correlation between the severity of silicosis and the amount of silica in the dried lung of the miners. Nor was extensive mining experience necessary for Gauley Bridge workers' silica lung content to reach 1.6%. One miner, with no previous mining experience, had approximately 2% SiO_2 in his lungs, even though he had worked only 40 weeks in the Gauley Bridge mine during 1931.[163]

Since most of the workers at the site were transient and left the area when they stopped working, the number who died as a result of work in the tunnel has remained controversial, with industry providing numbers in the low hundreds, in contrast to labor reports of deaths of over one thousand. While there were many lawsuits filed by workers and heirs, the cases were settled and all records turned over to Union Carbide. Through meticulous research of surviving data and sophisticated epidemiological techniques, Martin Cherniack was able to arrive at a conservative number of deaths in excess of 700, thus making Gauley Bridge tunnel the greatest industrial health disaster in United States history.[164]

Media coverage of this tragedy brought the problem of silicosis to the attention of the general public. As a result, occupational medicine experts, Federal Officials, and industrial management all agreed that something needed to be done about the silicosis problem, only differing in their descriptions of the nature of the problem. In January, 1932 a small group of experts representing the Federal Government, academia, and industry, met to discuss and coordinate research on silicosis. At this meeting, Doctor

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[163] Clayton S. Smith and Helen L. Wikoff, "The Silica Content of the Lungs of a Group of Tunnel Workers," *American Journal of Public Health* 12 (1933): 1250.
[164] Cherniack, *The Hawk's Nest Incident*, 112-170.

Drinker suggested that they continue meeting and call themselves the "Konicide Club," which can be loosely translated as the killer dust club. By the end of the decade the club members had emerged as the dominant experts on silicosis. Most, including Drinker, Lanza, representing Metropolitan Life Insurance Company, R. R. Sayers of the United States Public Health Service, Eugene Pendergrass, Professor of Radiology at the University of Pennsylvania, and William P. Yant, of the United States Bureau of Mines, also played important roles in a new industry occupational health association formed shortly thereafter.[165]

Three years after the Konicide Club's first meeting, at the height of the silicosis crisis and following broad publicity of the Hawk's Nest disaster, numerous companies sought to solve this "dust problem" by establishing a new occupational health research and coordinating agency. This agency had its conception on January 15, 1935, at the "Symposium on Dust Problems" held in Pittsburgh, Pennsylvania. The Symposium, presided over by William P. Yant, and attended by nearly 200 industrial representatives, included addresses by, among other silicosis experts, R. R. Sayers, A. J. Lanza, Eugene Pendergrass, and Philip Drinker. Symposium attendees appointed a Temporary Organization Committee to develop plans and make recommendations for further activities. The Temporary Committee then held its own meeting at which the committee members decided to recommend the formation of a permanent confidential organization devoted to occupational health. The organization would include within its areas of

[165]Theodore F. Hatch and Eugene P. Pendergrass, "The Konicide Club (1932-1940): A Brief History," *Journal of Occupational and Environmental Medicine* 19, no. 5 (1977): 351-2; and David Rosner and Gerald Markowitz, "Workers, Industry, and the Control," 32-33.

interest "…medical, preventive, legal, legislative and publicity features of the industrial dust problem…" The Committee determined that the organization "must have a broad outlook, a sympathetic understanding of the problem, and wide contacts with all cooperating agencies; and it must have the confidence of the industries, and of the physicians, engineers and all institutions, groups or individuals who might cooperate to advantage." The new organization could determine which specialists "may not be properly qualified and whose results might, therefore, not be entirely acceptable… to be in position to make reasonable grants to qualified individuals and agencies to study special problems or phases of problems." Within a year the Air Hygiene Foundation had attracted numerous companies to its membership and had a full program of industrial hygiene concerns.[166]

The National Silicosis Conference

By late 1935 the publicity surrounding the silicosis epidemic, particularly of the Hawk's Nest Tunnel, was causing national outrage. Papers throughout the country headlined silicosis claims. A search for the word 'silicosis' in one online newspaper archive shows five front page headlines in its nationwide newspapers for the ten year period of 1921 and 1930, but one hundred seventy seven front page headlines for the six year period of 1931 to 1936. These headlines appeared in newspapers as diverse as the *New York Times*, *Washington Post*, *Ironwood*, Michigan *Daily Globe*, Charleston West

[166] Roger A. Hitchens, *Report and Recommendation of the Temporary Organization Committee Which Was Elected at the "Symposium on Dust Problems" Held at Pittsburgh, Pa., January 15, 1935* (Philadelphia: Temporary Organization Committee Industrial Dust Problem, February 5th, 1935, in author's personal collection); David Rosner and Gerald Markowitz, "Workers, Industry, and the Control," 34-6.

Virginia *Daily Gazette*, *Raleigh Register*, Montana *Daily News*, El Paso *Herald-Post*, and the Hagerstown *Daily Mail*. National magazines, such as *Business Week* and *Time* also carried stories about the silicosis crisis. [167]

With the mounting publicity the Labor Department of the new Democratic administration became increasingly concerned with the disparate points of view about the social, scientific, economic and political implications of the silicosis crisis. Thus, a little over one year following industry's "Symposium on Dust Problems" the United States Department of Labor's Division of Labor Standards organized its own National Silicosis Conference. The conference convened in Washington on April 14, 1936. Half of the attendees "were … representatives of employers in the dusty trades," twenty five percent were Federal and state officials, insurance companies employed ten percent, with the remaining five percent representing labor interests.[168]

Following an initial day long meeting the Secretary of Labor appointed four committees to carry out investigations and make recommendations. These Committees studied four issues relating to the crisis: 1) Prevention of Silicosis Through Medical Control; 2) Prevention of Silicosis Through Engineering Control; 3) Economic, Legal, and Insurance Phases of the Silicosis Problem; and 4) Regulatory and Administrative Phases of the Silicosis Problem. The subsequent majority reports prepared by the committees suggested that industry had the necessary knowledge and was taking the actions required to control the problem. They recommended that any future silicosis cases

[167] *Newspaper Archive* at http://newspaperarchive.com, accessed on July 10, 2009, http://newspaperarchive.com/SearchResultsV3.aspx; "Silicosis Menace," *Business Week*, September, 1933, 19-20; "Silicosis Menace," *Literary Digest*, December 15, 1934, 118; and "Silicosis," *Time*, January 6, 1936, 27.

[168] David Rosner and Gerald Markowitz, "Workers, Industry, and the Control," 38.

be handled through the states' workmen's compensation system. In his transmittal of the reports to the Secretary of Labor, The Director of Labor urged consideration of labor's minority positions, which differed dramatically from the majority reports, but still thanked the numerous individuals and organizations for their efforts and called the "cooperative undertaking" a success. No further federal action was taken on the minority positions.[169]

The Demise of Silicosis?

Thus, in the late 1930s, with the seeming approval of the Federal government, most industry and government occupational health experts considered silicosis to be a disease of the past. At the fourth annual Saranac Laboratory Symposium on Silicosis, held in the late 1930s, one state official lauded the technical innovations that had made possible the eradication of the disease. "The most important accomplishment of these preventive measures is that silicosis is becoming a negligible factor, and that in the future it will largely be stamped out by preventive measures that have been instituted."[170]

By the end of World War II all industry experts, almost all government representatives and academic experts, and most union officials accepted the position that silicosis had become a disease of the past. What few cases might remain could be readily handled by the workmen's compensation system. If there continued to be cases diagnosed, then the diagnoses must be wrong, possibly the result of "racketeering"

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[169] United States Department of Labor, *National Silicosis Conference Report on Economic, Legal, and Insurance Phases*, Bulletin no. 21, part 3 (Washington: United States Government Printing Office, 1938), vii; and United States Department of Labor, *National Silicosis Conference Report on Regulatory and Administrative Phases*, Bulletin no. 21, part 4 (Washington: United States Government Printing Office, 1938), v-viii.

[170] Voyta Wrabitz presentation entitled "Silicosis Legislation: Administration," cited in David Rosner and Gerald Markowitz, "Workers, Industry, and the Control," 46.

plaintiff lawyers. Gardner, Director of the Trudeau Foundation, a well known tuberculosis research facility in the Adirondacks, was so sure of this position in 1946 that at an Industrial Hygiene Foundation Annual Meeting he apologized for discussing "such a trite and hackneyed subject." His talk on "Accurate Diagnosis of Silicosis" at the Medical and Engineering Session was only necessary because far too many doctors and technicians were improperly diagnosing silicosis. During the discussion portion of the session, O. A. Sander, occupational medicine specialist and frequent consultant to industry, went even further, contending that the apparent continuing problem of silicosis diagnosis was one of semantics. The term pneumoconiosis should be redefined because it was so "widely misunderstood" to imply pathology. It should simply mean "dust added to the lungs without any implication of fibrosis or disability." [171]

By 1946 journals and popular magazines also began reporting the demise of silicosis. In an article entitled "Silicosis is Not a Threat to Worker's Health," *Science News Letter* reported that experts announced at the Industrial Hygiene Foundation's annual meeting that "the dangerous trades of our fathers has [sic] all but disappeared." The experts also asserted that while "dust control continues to occupy the major place" in industrial health problems, in the post war period "the more common nuisance dust exposures [are] more injurious to the mechanical equipment than to workmen." *Business Week* reported that silica was only a problem to hypersensitive workers. It suggested that one mill with a silicosis problem should

[171] Gerald Markowitz and David Rosner, "The Illusion of Medical Certainty," 229; Leroy U. Gardner, "Accurate Diagnosis of Silicosis- Possible Sources of Error," *Transactions, Medical and Engineering Session, 10th Annual Meeting, November 14-15, 1945* (Pittsburgh, PA.: Industrial Hygiene Foundation, 1946), 10-12; O. A. Sander, "Discussion," *Transactions, Medical and Engineering Session, 10th Annual Meeting, November 14-15, 1945* (Pittsburgh, PA.: Industrial Hygiene Foundation, 1946), 12-23.

avoid hiring blond workers. “Brunettes, who generally have more hair on the body, naturally have more hair in the nostrils, which tends to keep silica dust from reaching the lungs.”[172]

The Industrial Hygiene Foundation (IHF) fully supported all of these pronouncements. In 1955 Andrew Fletcher, the Board Chairman of the IHF declared the end to almost all occupational diseases. That year he told the annual meeting “both industry and the Industrial Hygiene Foundation can look back proudly on their accomplishments. Occupational diseases are for the most part eliminated.”[173]

Yet, pronouncements do not make it so. As early as 1937 the Air Hygiene Foundation, later named the Industrial Hygiene Foundation (in 1941), had notified its members that then current efforts might not be sufficient to eliminate silicosis. That year the Air Hygiene Foundation’s Medical Committee, chaired by Lanza, published its first medical *Bulletin*. The committee suggested a standard of 5 million particles per cubic foot of air for granite and other high-silica containing dusts. "It is desirable to avoid concentrations of more than 5,000,000 particles of dust containing a high percentage of free silica in working places.”[174] Yet the committee raised serious questions about the efficacy of the proposed standard for protecting workers’ lungs. They admitted that they did not have "the knowledge upon which to base such thresholds [of dustiness]." The only data available were "bench marks ... to indicate to the engineer the result to which he

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172 “Silicosis is Not Threat to Workers’ Health,” *Science News Letter* 50 (November 30, 1946): 345; “Lung Lab Pays Off Quickly,” *Business Week* (July 20, 1946): 54.

173 Andrew Fletcher, “Changing Concepts of Industrial Health,” *Transactions, 20th Annual Meeting*, (Pittsburgh, Pa.: Industrial Hygiene Foundation, 1955): 8.

174 David Rosner and Gerald Markowitz, “Workers, Industry, and the Control,” 40; and David Ozonoff, “Failed Warnings,” 197.

should strive." They then reiterated that "[c]oncentrations to which the dust must be reduced in order to be safe have not been absolutely determined."[175].

In his seminal book, Professor Drinker agreed with the medical committee's conclusion about the limited usefulness of the standards: "[t]he idea of adopting standards of permissible dustiness for each harmful dust has a medicolegal appeal that is not at all justified by the data available today… In none of the original studies was there a single suggestion that the threshold figures were useable as legal standards." Drinker emphasized that one study determined that "the variations in dustiness were so great as to make unpractical an attempt to study the sickness rate in relation to dosage except in a general way."[176]

Professor Drinker was correct about the limitations of the data. One U.S. Public Health Service study of granite-cutting industry provided the primary source for the Medical Committee's adoption of "safe" maximum levels of dustiness. This study provided, at best, only limited support for the Committee's standard. That study determined that a maximum dust concentration of between 10 and 20 million particles per cubic foot of air was a "desirable" limit for dust. This conclusion was based upon the fact that this limit could be reached with the use of economically practicable ventilating devices. "It should be noted that the limit established was not found to prevent the occurrence of silicosis."[177]

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[175] *Silicosis and Allied Disorders, History and Industrial Importance*, Medical Series, *Bulletin* no. I (Pittsburgh, PA: Air Hygiene Foundation of America, Inc., April 15, 1937), 169.
[176] Philip Drinker and Theodore Hatch, *Industrial Dust*, 78.
[177] R. R. Sayers, Emery R. Hayhurst, and A. J. Lanza, "Effect of Dust on the Lungs," 372.

The following decades brought disturbing indications that Lanza and Drinker were justified in their concerns and cautions. Following World War II, company doctors and medical directors occasionally spoke out about how the recommended levels of silica exposure were too high. For example, Doctor Emmet Kelly, Medical director of Monsanto Chemical Company, stated in a presentation before the Industrial Hygiene Section of the American Public Health Association on October 7, 1947 that "…workers who have been employed in atmospheres well under the maximum allowable concentration of silica appear in some cases to be developing silicosis."[178] New studies in the 1950s provided further confirmation of the continued prevalence of silicosis. In 1955 the Occupational Health Program of the Public Health Service began a review of data concerning the prevalence of silicosis. Through piecemeal information they initially determined that between 1950 and 1954 twenty-two states had 10,362 cases of silicosis. Additional information increased this number to 12,763 cases in twenty-six states between 1950 and 1955. Of these, at least 3,455 of the cases occurred in men who were not employed until after 1935. This continued incidence of silicosis briefly caught the government's attention. In 1956 Congress held a series of hearings on health and safety in metal mines.[179]

However, these reports and hearings did little to affect either public discourse or reconsideration of the standard. Neither the Federal government nor the voluntary standards association, the American Conference of Governmental Industrial Hygienists,

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[178] R. Emmet Kelly, "Health Problems Resulting from Newer Technological Developments," *American Journal of Public Health* 38, no. 6 (June, 1948): 837.
[179] Victoria M. Trasko, "Silicosis, a Continuing Problem," 841.

undertook a serious reassessment of silica threshold limit values. In 1958, Victoria M. Trasko, Industrial Hygienist with the United States Public Health Service, lamented that "[t]he continuance of silicosis in the United States reflects the cumulative effect on society of a preventable but still prevalent occupational disease. After more than 35 years of definitive research and almost as many years of application of controls in some measure, hazardous exposures still exist and new cases of silicosis are developing."[180]

The voluntary standard remained fixed until the creation of the Occupational Safety and Health Administration (OSHA) and the National Institute of Occupational Safety and Health (NIOSH) by the Occupational Safety and Health Act of 1970. With these new mandates, the Federal government became more actively involved in both standard setting and research into silicosis.[181] In one of the first studies contracted under the new law, examination of sandblast operations cast doubt on the usefulness of respirators to protect against silicosis. Researchers with Tulane University examining shipyard workers reported at least 100 cases of silicosis. Studies of steel fabricators found additional cases of silicosis.

Thus, by 1974 both government and industry recognized that silicosis had not disappeared. Many believed it continued to claim the most victims of any pneumoconiosis. Insurance companies in California documented over 1,000 deaths from silicosis. J. P. O'Neill, chief of OSHA's Division of Health Standards Development

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[180] Victoria M. Trasko, "Silicosis, a Continuing Problem," 839.

[181] "History of NIOSH," at http://www.cdc.gov/niosh/about.html, accessed on July 18, 2009. A short history of the enactment and first years of OSHA can be found in Thomas O. McGarity and Sidney A. Shapiro, *Workers at Risk: The Failed Promise of the Occupational Safety and Health Administration* (Westport, Connecticut: Praeger Publishers, 1993), 33-38. The establishment of OSHA and NIOSH are examined in more detail in the Chapter 5.

wrote “the prevalence of silicosis has not dropped at all. We have much better methods of control, but we need a standard that would be much more effective…” In 1974, following a series of studies sponsored by the National Institute of Occupational Safety and Health that detailed deaths in Texas, NIOSH called for the banning of sand in abrasive blasting and the lowering of the exposure standard by one-half in other silica industries. Although OSHA subsequently sought to ban the use of sand in abrasive blasting, with the election of Ronald Reagan in 1980 the proposed new standard was relegated to a low level priority, thus guaranteeing that it would never be finalized.[182]

Unlike the regulation, the disease’s effect on workers did not take a low priority. In the late 1980s, the New Jersey Department of Health determined that over four hundred cases of silicosis had occurred in the state between 1979 and 1987. During the 1990s agencies continued reporting substantial exposures to silica. In 1991 at least 1.7 million workers were potentially exposed to substantial amounts of silica dust. In 1993 a report estimated 121,000 workers were exposed to levels of silica dust equal to or greater than recommended exposure limits. Some of these involved substantial overexposures. These exposures continued to result in substantial numbers of silicosis cases. In the early 1990s numerous cases of silicosis occurred in West Texas oil fields among Hispanic sandblasters hired to clean pipes and storage tanks. In 1992 NIOSH once again issued a silicosis alert, calling for a ban of sand in abrasive blasting and a reduction in allowable maximum dust in the work place. In 1994 the National Institute of Health identified

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[182] Gerald Markowitz and David Rosner, “The Limits of Thresholds: Silica and the Politics of Science, 1935 to 1990,” *American Journal of Public Health* 85, no. 2 (February 1995): 258-60; David Rosner and Gerald Markowitz, “Workers, Industry, and the Control,”40; and J. P. O’Neill, “Silica Standard Implications,” *Proceedings of the Symposium on Silicosis, March 12-13, 1975*, (Pittsburgh, Pa.: Industrial Health Foundation, 1976), 30.

hundreds of new silicosis cases in just four states conducting surveillance of the disease. A special screening of Pennsylvania surface coal miners found 8% with silicosis.[183] The following year a study in the *American Journal of Public Health* reported that gold miners who had been exposed over the course of their working life to silica dust at OSHA's reduced Permissible Exposure Limit still had a 35 to 47 percent chance of developing silicosis.[184] Although there has been a downward trend in silicosis death rates between 1981 and 2000—due to increased inspection after 1970 and the decrease in industrial jobs—Ki Moon Bang of the Division of Respiratory Disease Studies at NIOSH believes that this long term downward trend may have ceased as of 2000. The author calls for "renewed emphasis on education and enforcement." Although industry has repeatedly pronounced the demise of silicosis it continues to rise again like a Phoenix.[185]

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[183]David Rosner and Gerald Markowitz, "Workers, Industry, and the Control," 50. Pennsylvania data is from Gregory R. Wagner, "Editorial: The Inexcusable Persistence of Silicosis," *American Journal of Public Health* 85, no. 10 (October 1995): 1346. Exposure data is from Ki Moon Bang, Michael D. Attfield, John M. Wood, and Girija Syamlal, "National Trends in Silicosis Mortality in the United States, 1981-2004," *American Journal of Industrial Medicine* 51 (2008): 637.

[184] In 1970 351 individuals died from silicosis. K. Steenland and D. Brown, "Silicosis among Gold Miners: Exposure-Response Analysis and Risk Assessment," *American Journal of Public Health* 85, no. 10 (1995): 1372-77.

[185] Ki Moon Bang, Michael D. Attfield, John M. Wood, and Girija Syamlal, "National Trends in Silicosis Mortality in the United States, 1981-2004," 637. Although by 1996 the number of deaths from silicosis had decreased to 95 per year, the number of asbestosis deaths, which likely also included individuals with both silicosis and asbestosis, dramatically rose during the same period; see Robin Herbert and Philip J. Landrigan, "Work-related Death: A Continuing Epidemic," *American Journal of Industrial Medicine* 90 (April, 2000): 541. A 2004 study warned of a new silicosis threat to highway workers. This review of silicosis case data in highway construction suggested that many highway workers are at risk of developing silicosis; for details see David J. Valiante, "Highway Repair: A New Silicosis Threat," *American Journal of Public Health* 94, no. 5 (May 2004): 876-880.

This chilling chronology raises numerous questions about the structure and advancement of medical science in the field of occupational health. First, and most fundamental, why has it taken so long to eradicate a known industrial health hazard? Why did the allowable dose remain at the same level for so long? Why was there for decades so little research into the appropriate safe level of exposure for silica dust? Why did doctors in the 1930s change their definition of the disease and its very characteristics with no new data? Why for decades did many repeatedly claim the disease was conquered when it still remains with us today? To answer these questions we must turn to the activities which underlay most of the pronouncements, conferences, research, articles, and preventive actions relating to silicosis– the threat of legal action by workers claiming to have silicosis and the counter actions of corporate attorneys.

Silica Science, Litigation's Handmaiden

Prelude to Crisis

As the twentieth century opened, larger corporations began supporting the new fields of occupational health and safety, especially with regards to safety and acute illnesses. Corporate medical and safety programs could protect the firm against false workmen's compensation claims, could act as a form of "welfare" to demonstrate enlightened capitalism and forestall union entry, and could provide a means of firing troublesome or inefficient workers.[186]

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[186] Christopher Sellers, "Factory as Environment: Industrial Hygiene, Professional Collaboration and the Modern Sciences of Pollution," *Environmental History Review* 18, no. 1 (Spring 1994): 64.

During the second decade of the new century a few states began encouraging corporations to provide a safe work place by means of workers' compensation laws. At that time, they typically covered only workplace injuries. These initial workers' compensation programs paid for employees' on-site injuries without regard to who was at fault. The payment depended upon the severity of the injury rather than the amount of income which was lost or whether the worker could remain at work. While payment schedules differed by state, the principle of set awards for predictable events became the universal basis of the programs. During the 1920s compensation boards commonly held that an employee "may become permanently partially disabled by the loss of some member of his body without suffering a loss in earning capacity."[187]

The practice of industry attorneys finding methods to circumvent provisions of compensation laws started with the very first 1911 compensation law in Illinois. As the 1962 History of Occupational Health prepared by the History Committee of the Industrial Medicine Association, an association primarily composed of industrial doctors, stated with regard to the 1911 legislation: "Company attorneys found ways of circumventing many provisions of the first law, and the battle for more decisive legislation dragged on for nearly three decades."[188]

However, even this flawed system remained limited to safety and acute diseases. Although the new academic and governmental fields of occupational medicine and industrial hygiene documented the rise of silicosis and accompanying respiratory diseases and began exploring measures to limit dust in industry, industry showed little interest.

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[187] Gerald Markowitz and David Rosner, "The Illusion of Medical Certainty," 231.
[188] Henry B. Selleck and Alfred H. Whitaker, *Occupational Health in America*, 50.

One National Founders' Association book actually claimed that mechanization had decreased the health hazard. The annual meetings of the association of industry doctors, the American Association of Industrial Physicians & Surgeons, (AAIP&S), provide a succinct record of this lack of focus. Between 1920 and 1930 nearly 150 speakers are listed in the annual meeting programs. Forty percent of the speakers spoke about trauma and related topics. Only two presented papers about silicosis and dust diseases.[189]

Most companies paid little notice to the growing problem of chronic and long term lung fibrosis and tuberculosis (Later, they claimed they did not know about the problem). Companies could initially ignore silicosis since it did not cause a problem on a daily basis, as did accidents. Unlike accidents, it was not highly visible. Rather than an individual being taken to the infirmary in front of all of his colleagues as happened with accidents, over the months and years a worker simply became more and more tired until finally he was fired or quit because he could not handle the work. Furthermore, for diseases such as silicosis most industrial concerns saw little need to provide increasing protection when the workers most affected were easily replaceable unskilled labor. Some

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[189] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 63. The audience at the AAIP&S meetings consisted primarily of doctors responsible for health care in American industrial plants. In contrast to the prior decade, between 1932 and 1935 at least twenty five speakers presented papers at the AAIP&S meetings on "medical and **legal** phases of the silicosis problem" (emphasis added). By then industry attorneys had set an industrial medicine agenda of assistance to the increasing lawsuits. Silicosis was simply redefined to fit the requirements of legal defenses. As Dr. Sappington, consultant editor to the industry journal, *Industrial Medicine*, wrote about the then increasing lawsuits: "In many instances silicosis is claimed on clinical evidence which in no way differs from that of normal persons who are symptomless and without disability." By this he meant that when initially diagnosed, silicosis has often not yet progressed to the stage where it noticeably affects an individual's breathing. See Henry B. Selleck and Alfred H. Whitaker, *Occupational Health in America*, 207, 232, 233.

foundries did their shakeout work at night, when their highly skilled labor force was typically replaced with recent unskilled immigrants.[190]

Although by 1915 at least a few states workmen's compensation laws provided implicit coverage for silicosis—and plaintiff attorneys began representing workers with silicosis—in most cases the number of claims remained small. Throughout the war and Prohibition boom years, workers fired due to mild silicosis could find other work. When they were eventually struck with severe tuberculosis or extreme breathing problems, they usually did not attribute it to the work they did years before. Workers with more advanced cases or tuberculosis often were not told their disease was work-related.[191]

Conditions became worse with the stock market crash of 1929. The decade of the 1930s saw the worst economic depression in this country's history. During this decade much of American industry faced huge economic and financial difficulties. Profits shrank. For many companies they became nonexistent. Companies took whatever measures they could to reduce costs, including cutting many corners. These corners included increasing the use of unprotected power tools and cutting back on the work force. New studies began demonstrating both the high levels of exposure and the increasing levels of silicosis in America's workforce; but labor was cheap. If one worker quit, became ill or died, another applicant immediately took his place. Silica workers with lung problems knew they were one step from the unemployment line. One example of such a worker is Michael Farina, sandblaster for GE in New York. He was laid off after a

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[190] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 63-64, 72-73, 89. As noted previously, companies were aware of this gradual onset of the disease, with a gradual accompanying loss of breathing ability and concomitant productivity, at least as early as 1924.
[191] Martin Cherniack, *The Hawk's Nest Incident*, 38.

company doctor diagnosed him with silicosis. He was told there would be another job but it never appeared. His case was typical. Industry was pressed by insurance companies to fire anybody found with silicosis.[192]

Studies that did not comport with industry's views and interests were suppressed whenever possible. C.-E.A. Winslow and Leonard Greenburg's study of sandblasters and foundries provides perhaps the best example of how industry tried to eliminate the "problem" by suppression, propaganda and "expert" opinions. In 1931 the National Safety Council, a large industry trade group, hired Winslow, a noted industrial medicine authority, and Greenburg, an assistant professor at Yale and in the Public Health Service, to prepare a report on sandblasting and the danger of silicosis in foundries. The submitted report acknowledged the danger in foundries from silica dust. The authors indicated that dust-collecting equipment could keep the dust to the voluntary standards, but concluded that in actuality the standards were rarely met. "The air of the workroom generally contains a highly hazardous dust concentration...such an atmosphere cannot fail to predispose in a high degree to silicosis." Upon receipt of the report, National Safety Council officials expressed dismay, informing the authors that the foundry industry, then burdened with a large number of lawsuits, would not like the findings. Winslow initially hoped to convince both the National Safety Council and foundry owners that the findings were accurate. He believed, in retrospect perhaps naively, that the industry and Council would recognize that his report was accurate and "stand for the criticism involved." Winslow opined that the foundry owners were concerned "that any mention of the fact

[192] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the* Politics, 74, 79.

that there is a hazard in sandblasting will stir up legislation and litigation, and, like the ostrich, they want to hide their heads in the sand and pretend that nothing is going on." In effect Winslow recognized that the foundry owners wanted science to play handmaiden to the needs of their ongoing litigation.

The National Safety Council officials' concerns and Winslow's opinion about the factory owners proved correct. The report caused an uproar when it was leaked to member companies. Some corporate letters to the Council even claimed that workers could be rotated in and out of jobs with little harmful effects. In light of this furor, the Council shelved the report until it could be rewritten. Winslow subsequently wrote a letter to the council denouncing its suppression.

> The basic issue is that they [industry spokesmen] do not want any publication from the Council to imply that silica dust is hazardous under any conditions. They know that it is, but they don't want any authoritative body to say so. Now you cannot very well discuss protection against silica dust without the implication that silica dust is undesirable.

Two versions of the report were finally published. The first was published in a German periodical in late 1932. It followed the lines of the original report. The second was published in the *American Journal of Industrial Hygiene*. It represented the results of negotiations with the Council by Winslow's coauthor, Greenburg. Winslow was not listed as an author. This version of the report never explicitly said silicosis was a problem. The article drew absolutely no conclusions about hazards.[193]

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[193] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the On-Going Struggle*, 67-69; The quote is from Gerald Markowitz, "C.-E. A. Winslow: Scientist, Activist, and Theoretician of the American Public Health Movement Throughout the First Half of the Twentieth Century: Commentary," *Journal of Public Health* 19, no. 2 (1998): 155-156. Winslow correctly noted that what the foundries were really

Winslow was fortunate in this case that he was able to separately publish the original report. Research contracts, especially when they involve issues concerning litigation, then gave—and even on occasion still now give—the funder complete control over publication. This type of control pervaded the entire industry. That same year the Saranac Laboratory was scolded by Lanza for its unauthorized release of information, resulting in a Wisconsin Industrial Commission report that was critical of the industry. Although a few such reports have surfaced (either inadvertently or through various litigation or bankruptcy discovery), we may never know the full extent of similar reports concerning silicosis, or in fact, any other hazardous substance prepared for industry.[194]

In the case of silicosis, there is documentation of at least one other similar report in the early 1930s. In January I933, M. D. Harbaugh, the Secretary of the Tri-State Zinc and Lead Ore Producers Association (an industry trade group in Missouri, Kansas and Oklahoma), wrote to Donald Cummings, a research scientist at the Saranac Laboratory, about a study Cummings had prepared for the Association entitled "Silicosis Occurring in the Lead and Zinc Mines of Ottawa County, Oklahoma." Harbaugh informed Cummings that the Association would not allow publication of his study since it detailed the prevalence of disabling and often life-threatening silicosis among the area's miners. The Association refused to publish the study even though both Metropolitan Life Insurance Company and the U.S. Bureau of Mines had participated in the organization of the study and decided which of the mine owner clinics would be used to collect the data.

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worried about was that the mention of hazards would "stir up legislation and litigation, and, like the ostrich, they want to hide they heads in the sand and pretend that nothing is going on."

[194] Letter from Lanza to Cummings, April 11, 1933, Exhibit 24 in *Laura Bialy, Administrator of the Estate of Theodore Bialy v. Johns Manville Corp. et al.* Civil Action C/AN 79-1336 (D. N.J.) (1986) (cited hereinafter as *Laura Bialy*).

In denying publication rights, Harbaugh made one simple point: the results were "potentially damaging to the lead and zinc mine operators of this district." Harbaugh went on to inform Cummings that "[t]here are now pending suits for hundreds of claims for total disability for occupational diseases." If juries returned plaintiff verdicts "the mining companies now in existence here would have to bear the burden of paying for disabilities." Surely Cummings could "see what a brief your paper would be." "The industry would be entirely wrecked if it were saddled with the care of everyone who might be persuaded to take action against it on the grounds of disability from silicosis.”[195]

Harbaugh had good cause for concern. As the 1930s progressed, workers such as Farina increasingly sought recourse for their disease by retaining lawyers to file lawsuits claiming occupational illness caused by the conditions at their work. These civil actions and their considerable financial expenses for companies and their insurance carriers finally led to significant industry attention being directed toward the problem of silicosis. This began the long and intimate involvement of attorneys in the public perception of silicosis and research about the disease .[196]

By 1932 attention focused on the increasing lawsuits. For example, the head of New York State's Division of Industrial Hygiene wrote in a New York state *Bulletin* that silicosis "would continue to exist unnoticed in the community were it not for the fact that workers suffering from the disease, or relatives of people who had died from the disease,

[195] M. D. Harbaugh to Donald E. Cummings, Jan. 21, I933 cited in David Rosner and Gerald Markowitz , “Workers, Industry, and the Control,” 29.
[196]David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 75-77, 79-80.

have recently taken civil action against employers and have recovered considerable sums of money therefore."[197]

The burgeoning level of lawsuits in the 1930s unquestionably caught the attention of industry. In the first issue of *Industrial Medicine* Andrew J. Ferrell, head of the claims department of a major Chicago insurance company, argued that the problem was not from worker silicosis-caused disability, but from worker unemployment which caused them to use the legal system as a welfare system. Farrell contended that this had led to a broad liability crisis threatening the "closing of industrial plants and a vast economic loss." Farrell specifically complained about the "racket" of Illinois plaintiff attorneys who had nearly 200 pending silicosis lawsuits. In his mind, the lawsuits were especially egregious because they were not from the "steady, consistent worker[s]s" but from "the worker who has been discharged for inefficiency." By this means Farrell placed the focus upon the lazy, money grubbing—and the now unemployed worker—rather than the cause of much of the inefficiency, silica dust. Industry experts provided ready support to Ferrell's charges by denigrating the medical backing for the suits. For example, shortly after Ferrell's charge, George Davis, a clinical professor, was quoted in the journal *Industrial Medicine*, "What is the problem of the pneumoconioses in industry? … The problem of the pneumoconioses in industry today is the medicolegal jurisprudential aspect." He believed too many doctors were willing to appear as experts about lung X-rays with little or no training. Through similar repeated loud proclamations of a "racket," industry attorneys and consultants turned the nation's attention away from the devastating

[197] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 75-80.

consequences of silicosis to the lawsuits being generated by the disease. Industry doctors and lawyers began work on establishing codes that redefined silicosis in a manner that protected industry from lawsuits in which the disease was only minor or moderate. Research and case reports focused on establishing that many individuals with the initial stages of silicosis were clinically asymptomatic. This fit very agreeably with many employers' position that they did not have a problem if doctors could not show that their current workers suffering with physically debilitating disease. Little mention was made of the fact that few, if any, current workers would be debilitated if the employer fired all "inefficient" workers.[198]

Gauley Bridge Revisited

But for the nationwide publicity surrounding the disaster at Hawk's Nest Tunnel by Gauley Bridge, West Virginia, industry might have successfully weathered the lawsuits of the early 1930s. The Hawk's Nest incident, however, spurred even greater involvement by plaintiff attorneys. Between July and December, 1932 plaintiff attorneys filed eighty claims involving the Hawk's Nest tunnel work with the West Virginia Compensation Commission. On the chance that the contractor might not be covered

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[198] Andrew J. Farrell, "Silicosis in Certain of Its Legal Aspects," *Industrial Medicine* 1 (October, 1932): 35; David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the* Politics, 78-9. The use of the words "racket" or "quack" became almost mandatory in industry articles and headlines after Farrell, a Chicago insurance lawyer, made this charge. Soon similar headlines and statements appeared everywhere. Some examples include "Cement Plants Fight Silicosis Racket;" "Missouri is a paradise for this type of racketeering;" and "eliminate as far as possible the ambulance-chasing and quack lawyer." Seemingly, even though the Gauley Bridge incident was tragic, it could be ignored by industry since "a great many of the workers had died" before inquires were made. Thus, evidence brought forth in court about conditions "was of questionable validity." Besides, it was just one small incident that was meaningless to the larger issues of industrial hygiene. See Henry B. Selleck and Alfred H. Whitaker, *Occupational Health in America* , 232, 233-242, 288; George Davis, "The Pneumoconiosis Problem in Industry," *Industrial Medicine* 5 (1936): 111-112, cited in Christopher C. Sellers, *Hazards of the Job*, 204.

under West Virginia Workmen's compensation laws, the attorneys also filed several lawsuits in the Fayette County Circuit Court. In February, 1933 the West Virginia Supreme Court denied the defendant's motion to dismiss one of the first cases. Plaintiff counsel filed an additional 111 suits within two weeks of the ruling. By the time the first trial ended and the two sides had negotiated settlement agreements, 336 tunnel workers or their survivors had sued the power company or its contractor.[199]

Both the plaintiffs and defendants utilized medical experts in their presentations at the trials. The trial of Raymond Johnson, a silicotic tunnel worker who later died, provides a representative example. The plaintiffs used three local doctors, the most prominent of whom was Doctor Leroy Harless. Harless had conducted approximately 175 of the initial exams identifying silicosis even before plaintiff attorneys became involved. He also testified for the plaintiffs during most of the series of trials in 1932-1933. When asked how many of the many that he examined suffered from acute silicosis, he replied "I think I am safe in saying that perhaps those that I have a record of, practically ninety-five per cent." Plaintiffs also presented the testimony of Doctor Elmer Hayhurst, a nationally renowned industrial medicine expert. Doctor Hayhurst had been first contacted by defense attorneys but he refused their offer to retain his services. Given this attempt and subsequent actions of defense attorneys, it appears likely that throughout the Hawk's Nest Tunnel trials the attorneys for defendants attempted to hire or retain as many of the limited number of national experts as possible, thus precluding their use by plaintiffs. For

[199] Martin Cherniack, *The Hawk's Nest Incident*, 55-57, 72. The settlements required that the plaintiff attorneys turn over all legal papers and not take any more cases, thus ensuring the events would not be brought again to the public's attention.

the Johnson trial the defendants hired two nationally renowned experts, James A. Britton from Chicago and Doctor Henry Pancoast, the foremost authority on x-rays. Doctor Pancoast testified that the x-rays did not fit the normal pattern of silicosis.[200]

Pancoast was not alone in his efforts to support defense attorneys in their litigation practice. Experts on the stand then as now must support their opinion with recognized research or the support of other experts. Since Pancoast was a recognized expert, his opinion by itself may have been enough. However it is quite possible that defense counsel ensured Pancoast's opinion was believable by encouraging other medical experts to submit articles to journals concerning "acute" silicosis. Two articles in particular concerning the Gauley Bridge cases read like they were proposed by defense attorneys. The first article was by Leroy Gardner, M.D., Director of the Saranac Laboratory of the Trudeau Foundation; "Pathology of So-Called Acute Silicosis." In this article Gardner began with the comment that silicosis usually requires "at least" ten to twelve years to develop and under the worst of conditions three or four years. He did agree however, that this opinion was not absolute since studies and case reports had already appeared about fast or acute silicosis among sand pulverizers and other factories.

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[200] During this trial defense attorneys apparently left nothing to chance. One black tunnel worker who had testified for the defense subsequently changed his testimony, swearing that although the defense had threatened and bribed him, his conscience required him to tell the truth. The judge also issued a contempt of court citation against one of the jurors who had been chauffeured to and from the court house by defendant employees; see Martin Cherniack, *The Hawk's Nest Incident*, 60-63. Doctor Pancoast was correct that the x-rays did not fit the normal pattern of chronic silicosis. However, he apparently ignored the fact that they did fit the normal pattern of acute silicosis that had been described in several articles by 1933. Interestingly, in an earlier article, Pancoast had described the x-ray of the first stage of pneumoconiosis as showing fine linear markings, similar to those described by others in acute silicosis. In the same article he also agreed with a fellow physician's statement that early pneumoconiosis is often mistaken for tuberculosis. See Henry K. Pancoast, T. Greer Miller, and Henry R. M. Landis, "A Roentgenologic Study of the Effects of Dust Inhalation upon the Lungs," *Transactions of the Association of American Physicians* 32 (1917): 101).

However, since dust counts were not available in those studies Gardner believed that the question remained open as to when and under what conditions this could occur.[201]

Gardner then considered the tissue samples he was studying. He first described the conditions to which the lungs were exposed. In describing the conditions at Gauley Bridge, Gardner wrote of “excessive amounts of extremely fine powder,” in the tunnel “without effective ventilation,” in an atmosphere “exhausted by gasoline engines” such that the men “must have breathed abnormally fast.” Later in the article he also characterized the exposure as “high concentrations of silica dust.” Curiously—or perhaps as should be expected if he were trying to please a defense counsel—Gardner questioned whether it was worth providing a report because "information as to the exact character and duration of the dust exposure is so limited, the justification for this presentation might be questioned." Then, seemingly unconvinced by his own description of the conditions in the tunnel, in the conclusion—the section of most importance to industry attorneys—Gardner characterized the exposure simply as “allegedly heavy exposures of silica.”[202]

Throughout the article, Gardner never mentioned the company’s failure to provide air sampling or safe conditions. Nor did he attempt to make any estimate of the exposure levels. He did, however, portray the sick workers as liars, stating that the occupational histories had to be treated with suspicion since claims for compensation were pending, even though he recognized that the age of the workers and the conditions under which they were hired "precluded any prolonged exposure to silica in previous occupations."

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201 Leroy U. Gardner, “Pathology of So-Called Acute Silicosis,” 1240.
202 Leroy U. Gardner, “Pathology of So-Called Acute Silicosis,” 1241, 1245, and 1249.

Based upon other published articles of the time, some of which he cited, Gardner's clinical findings appeared to demonstrate that these individuals had acute silicosis. "It is indisputable that this group of workmen exposed …to high concentrations of silica dust had developed the histological lesions of silicosis at the time of their death." In one of the samples from an individual he did not believe had silicosis he found microscopically "definite microscopic evidence of silicosis consisting of characteristic hyaline fibrous nodules." While he found the nodules smaller than typically found with silicosis, the nodules were "appreciably more abundant than those encountered in the usual run of silicosis cases...In many of the sections they are extremely numerous." His findings also included one sample where "silicotic nodules were embedded in areas of massive fibrosis from which most of the air spaces had disappeared or were represented by distorted slits." In spite of this evidence, he still distinguished these findings from silicosis because the character of the silicotic nodules different from those usually observed in three ways: 1) They were small and massed ("matted together in a mass of fibrous tissue"); 2) The lymph nodes were not affected as much; and 3) The lungs showed an appreciable thickening of the aveolar walls. Even though these findings comported with a fast-acting acute case of silicosis from overwhelming exposure as described in Chapman's case study published in the *Journal of the American Medical Association* the previous year, Gardner reported that the silicosis was *de minimus*—that is, minimal to the point of being unimportant. [203]

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[203] Leroy U. Gardner, "Pathology of So-Called Acute Silicosis," 1241, 1242, 1244, and 1246; Earle M. Chapman, "Acute Silicosis."

Instead, Gardner argued that “silicosis can develop under these conditions of exposure but the reaction is of microscopic proportions"—thus at best constituting a pre-silicotic condition. "Although there is histological evidence of silicosis, atypical in character, it seems doubtful whether there is justification for describing the process as 'acute.'” Furthermore, he concluded he had insufficient evidence to make the diagnosis. “At least this should be only done after serial roentgenograms together with post-mortem examinations have demonstrated the outcome of the allegedly heavy exposures to silica." Since he took the samples from an autopsy, this was clearly impossible to obtain. Therefore, he implicitly declared that a diagnosis could and should never be made when industry (as frequently occurred) had not conducted serial roentgenograms of its employees. [204]

In line with what industry needed for its court cases, Gardner found that the individuals had not died from silicosis, but rather the deaths were due to pulmonary infection: eleven from tuberculosis; two from pneumonia; and three probably from tuberculosis, although no bacteria were found. None of these conditions was due to the individual’s work. "Tubercle bacilli were rare in all instances, and in some of the obviously tuberculous lesions none could be found." He believes the group of "young adults, negroes in most cases" probably had little or no immunity to tubercle bacillus, so the infection ran an acute course to fatal termination in 15 months or less. Because of the acute nature, it could not have happened while they worked. "If they had become infected while their silicosis was in its formative stages they would not have been able to continue

[204] Leroy U. Gardner, “Pathology of So-Called Acute Silicosis,” 1245 and 1249.

so strenuous an employment and many would have died months earlier." He admitted that it would be tempting to say their "microscopic silicotic lesions" made them more susceptible to tubercle bacillus, but it was impossible to know if that was the case when there was not an "advanced" case of silicosis. He concluded: "For these reasons it is believed that the localization of the silicotic nodules in this group of cases was not materially influenced by the terminal tuberculosis."[205]

If ever there was a clear case to show how silicosis can arise from short heavy exposures and tuberculosis was associated with the very initial stages of lung damage, this was it. Instead, Gardner chose to be as conservative as possible, given the horrendous facts. Although evidence that industry representatives edited this article or that Gardner believed his funding would be cut off if he lambasted the mining industry has not surfaced, the language of the article and its strained logic clearly make this idea possible. When considered in conjunction with similar articles which are described in the next chapter, it is perhaps highly probable. Although this is a harsh allegation to make, industry lawyers' opinions of Gardner lend it substantial credence. During the 1940s Leroy Gardner became reluctant to testify in silicosis suits because he wanted to maintain his "neutrality." Industry lawyers scoffed at such sensitivity: "We did not agree with him that his refusal to testify would help maintain Saranac as an independent research organization because … all of the mining companies were associated with Saranac and

[205] Leroy U. Gardner, "Pathology of So-Called Acute Silicosis," 1243-1244, and 1246.

certainly, in the eyes of everyone, excepting Dr. Gardner, Saranac was a 'mining company institution.'"[206]

Other articles and incidents also support this judgment. An article by industry expert Homer L. Sampson, Director of the X-ray Laboratory at the Trudeau Sanitarium entitled, "The Roentgenogram in So-Called 'Acute' Silicosis," was even more in line with industry attorneys' trial requirements. He began the article by admitting that, given the infrequency that companies gave x-rays, he was unlikely to ever diagnose acute silicosis. "I believe until serial roentgenograms reveal rapidly progressive or retrogressive shadows, and also the stigma of an infection be satisfactorily excluded, one is not justified in interpreting the roentgenogram as rapid uncomplicated silicosis." He then confides that even then he would be unlikely to make such a diagnosis. "If the picture changes with extreme rapidity it is hard to conceive that these alterations are due only to the inhaled silica; it is more probable that one is dealing with a complicating infection."[207]

In the group included in his article, likely the same group as Gardner's, Doctor Sampson found two types of infection pictures: one very closely resembled the characteristic shadows of pulmonary tuberculosis, while another had the same shadows but also a diffuse nodulation. In other pictures he also saw diffuse nodulation of "a distinctly fluffy character-diffuse cotton ball appearance," unlike the longstanding nodulations of the non-infective group. While Sampson had no prior experience with this

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[206] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the* Politics, 126. The quote is from the Humphrey & Humphrey letter to Robert Downs, September 24, 1947, cited at 182-183.

[207] Homer L. Sampson, "The Roentgenogram in So-Called "Acute" Silicosis," *American Journal of Public Health*, 23 (1933): 1238-1239.

type of X-ray, without further consultation he inferred this to be an infective process, rather than the effects of silica. "There is reason to expect, in any acute process, shadows of a rather characteristic nature. In practically all cases the one outstanding feature of the roentgen shadow complex is its cottony or fluffy appearance and its ill-defined margins." Sampson added, "Undoubtedly there are persons exposed to heavy concentrations of silica for short periods who exhibit various symptoms of acute disease, but the serial roentgenograms which I have seen do not confirm the diagnosis of uncomplicated silicosis." (He did not indicate whether or not he had seen cases of acute silicosis complicated, as these are, with other respiratory diseases or if he had read Doctor Chapman's article.) He did admit, however, to one small problem that "needs to be cleared up" before excluding the possibility of acute silicosis in these cases, for "in many cases apparently suffering from silico-tuberculosis or tuberculo-silicosis, tubercle bacilli are not demonstrated."[208] Thus, while he could ignore clear nodular signs of silicosis, the absence of any necessary proof of tuberculosis presented but a small problem to his exclusion of silicosis.

One final incident illustrates just how closely the Saranac Laboratory was allied with the defense attorney community. In the late 1940s at the request of an industry client, the Trudeau Foundation and the Saranac Laboratory reviewed the medical records of a Finnish-born immigrant who worked as a miner from 1908 until his death in 1947 at the age of 61. His x-rays going back to 1933 confirmed a diagnosis of silicosis. During the period 1933 to 1936 the disease progressed from first degree in 1933 to third degree

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[208] Ibid.

in 1936. However, in 1947 the company sought to escape having to pay compensation, since the immediate cause of death was a cerebral hemorrhage. Upon learning of the cause of death, the manager of the Trudeau Foundation field office wrote to his research director, "It looks as if they may win this one as death was apparently caused by cerebral hemorrhage; if successful, a good sum of money will be saved."[209]

Even with these industry-oriented medical articles downplaying the effects of silicosis at Gauley Bridge and the sealed settlement agreements that ensured neither the documents or facts would be released, the publicity surrounding the trials experienced a life of its own through newspaper articles and, in 1936, congressional hearings. That year the Subcommittee on Labor in the House of Representatives held hearings on the dangers of silicosis, focusing narrowly on the cases from the Hawk's Nest Tunnel. These hearings also raise questions about the reach of defense counsel in stifling medical information concerning occupational health. Only fourteen persons testified before the committee. The trial defendants refused to appear. Doctor Harless, the M.D. who first diagnosed silicosis at the tunnel, agreed to appear—but three days prior to his testimony indicated he was now unwilling to participate. In a startling letter to William P. Connery, Jr., the chairman of the House Committee on Labor, Harless basically denied his prior testimony. "I examined a large number of these workmen, perhaps as many as 200, on most of whom I kept no record, who claimed to be affected by reason of their employment. I found very little impairment of their health which I could attribute to their work in the

[209] David Rosner and Gerald Markowitz , "Workers, Industry, and the Control," 47.

tunnel." He further cited only fifteen known cases of silicosis, the same number who were known to have died from silicosis in 1933.[210]

Although there is no direct evidence, such an abrupt turn-around in opinion and the letter's almost legalese writing style suggests that Harless had by now become one more expert retained by industry attorneys. The ethical standards of the trial attorneys involved in the case on both sides certainly do not warrant dismissal of such a possibility. As part of the global Hawk's Nest settlement agreement the defendants agreed to give an additional sum to the plaintiff attorneys in return for an agreement not to take on any similar cases. This is one of the earliest reported buyouts by which plaintiff lawyers received payments in return for secret agreements not to engage in any further legal action. The judge found out about the secret agreement and required that the money be included within the plaintiffs' settlement proceeds. While this activity tainted both plaintiff and defense attorneys, another incident demonstrated defendant's willingness to ignore ethical rules. During the trial of one of the Hawk's Nest plaintiffs the defendants were caught providing chauffeur service to at least one of the jurists.[211]

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[210] Martin Cherniack, *The Hawk's Nest Incident*, 76-77. While it is possible that the testimony and the subsequent letter can be reconciled as simply the distinctions between those with records versus those without records, Harless' refusal on the latter date to recognize the existence of any silicosis cases from the tunnel other than those that were publicly acknowledged deaths, and his short notice refusal to attend the Congressional hearings both raise the inference of a probable connection to and/or retention by defense attorneys or their agents.

[211] Martin Cherniack, *The Hawk's Nest Incident*, 63; Jack B. Weinstein, "Secrecy in Civil Trials: Some Tentative Views," *Journal of Law & Policy* 9 (2000): 64-65. Federal Judge Weinstein went on to provide his opinion of the "buyout": "These "buyouts" need to be supervised by the court in the same way as a settlement of a class action would be. The court has an obligation to the clients and to the community to see that the clients understand the arrangement and that it is fair. The court should also be able to veto any arrangement for secrecy under which files are returned to defendants, and plaintiffs' lawyers agree to take no future cases. The Hawk's Nest case was a shameful episode in American jurisprudence; without the judge's intervention it would have been even worse."

With the added stimulus of the national publicity surrounding the Hawk's Nest trials, by 1934 silicosis damage suits in other areas of the country had become big business. One writer has estimated that by 1934 "damage suits amounting to over 300 million dollars had originated in that period. Other articles in the early 1930s [told] of damage suits for silicosis for as much as 58 million dollars in one state, and against single companies for nine million dollars. Single awards by civil courts of $12,000.00—which is the maximum compensation benefit in many states today [1980]—were common, and some as high as $20,000.00 and $50,000.00." As Anthony J. Lanza, who began his career with the Public Health Service lamented, it was as if "out of a clear sky and with dramatic suddenness the insurance companies were faced with a situation that was ... terrifying."[212]

Lanza came to play a large role in industry's response to this terrifying situation. He had been hired by Metropolitan Life in 1926. Thereafter he began directing industrial hygiene surveys for asbestos companies as part of his duties. He appears to have been genuinely concerned about the effects of silica dust upon the working men of Metropolitan Life's clients. In early 1935 he wrote a memo in which he expressed such concern, specifically noting that "those exposed to silica dust have an extremely high tuberculosis death rate… There are over half a million industrial workers exposed to silica dust and… the problem of family infection due to incident tuberculosis is a serious one. . . Our motives are in accord with our general policy of being willing to help as far as practicable, in any undertaking that has to do with the conservation of life." However, near the beginning of the memo he also stressed the extent of litigation, "in excess of

[212] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 74, 78, 79; Peter, S. Barth with Allan H. Hunt, *Workers' Compensation and Work-Related Illnesses and Disease*, 3.

$100,000,000.00," with whole industries in turmoil. He also claimed later in the memo that he would not help in litigation matters, but as this study makes clear, when potential lawsuits could affect Metropolitan Life's profits, Lanza proved more than willing to assist in issues related to litigation in both silica and asbestos suits.[213]

Nor was Lanza alone in expressing concern and seeking to assist in the litigation crisis. Spokesmen of the insurance industry, such as Henry D. Sayer and F. Robertson Jones, both of the Association of Casualty and Surety Executives, also expressed deep concern about the impact of silicosis lawsuits on the insurance industry's stability.[214] The stone monument industry's experience in Wisconsin provides limited yet still striking support for such a concern. Upon introduction of full silicosis coverage in the state's worker's compensation program, "the insurance premium for monument workers… promptly soared higher than the payroll itself, with the result that the entire industry was closed." By the mid 1930s business and insurance representatives throughout the country, faced with increasing silicosis claims and verdicts, argued that silicosis lawsuit decisions were being dictated by sympathy for the victims rather than by "objective"

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[213] A. J. Lanza memoranda of February 27, 1935, to Dr. Armstrong, Third Vice President Metropolitan Life, obtained at Johns Manville Repository, Denver, Colorado and in author's personal collection.

[214] Gerald Markowitz and David Rosner, "The Illusion of Medical Certainty," 229. Prior to being an executive for the insurance industry Henry D. Sayer had been counsel and executive secretary of a New York state legislature committee concerning manufacturing and labor conditions: see Kheel Center for Labor-Management Documentation and Archives, Cornell University Library online archives accessed on July 7, 2009 at http://rmc.library.cornell.edu/ead/htmldocs/KCL05374.html. F. Robertson Jones also had close dealings with legal matters. As early as 1921 he had written a compilation of Workmen's Compensation laws: see F. Robertson Jones, *Digest of Workmens's Compensation Law in the United States and Territories, with Annotations* 7th Ed. (New York: F. Robertson Jones, 1921); Sayer, Henry D., "The Trend of Occupational Disease Legislation," 211-219, In *1938 Transactions of the National Safety Council*, Cleveland, Ohio: National Safety Council, 1939.

science and law. They called for both a standardization of diagnosis and incorporation of the disease within state workmen's compensation systems.[215]

The Industrial Hygiene Foundation to the Rescue

In the aftermath of the Hawks Nest tunnel disaster, with national press coverage expanding and the federal government under President Franklin D. Roosevelt becoming increasingly interested in intervention, segments of industry determined that a national strategy was necessary. Attorneys would play a large rule in this strategy. The "dust problem," as industry saw it was not silicosis, but the lawsuits threatening to bankrupt an entire industry. Led in many cases by such lawyers as Henry D. Sayer, representatives of insurance companies, foundries, metal mine owners, and glass industries sought ways to eliminate the silicosis litigation crisis. They recognized that an integrated approach to the problem was necessary. Alfred Hirth, outside counsel for the Owens-Illinois Glass Company in Toledo, Ohio played a prominent role in this effort. By September 1934 Hirth had spent the better part of two years devoted to silicosis litigation. That month he approached the Mellon Institute of Industrial Research at the University of Pittsburgh for help. The Institute, which had been organized in 1913 with funding from the Mellon steel and banking family, "sponsored field and laboratory research on its premises and also functioned as an umbrella for organizations directly involved in the politics of industrial

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[215] Wisconsin monument industry information from "Compensating Victims of Occupational Disease," *Harvard Law Review* 93, no. 5 (Mar., 1980), 916-937, 936, note 126; Gerald Markowitz and David Rosner, "The Illusion of Medical Certainty," 230.

and environmental health." At the time the Institute had a large measure of public credibility from its work on air pollution in Pittsburgh.[216]

On December 11, 1934 The Mellon Institute sent letters out to approximately 85 industries inviting them to attend a meeting on the dust problem. To the pleasant surprise of the Mellon Institute, almost two hundred industry executives met at the University Club in Pittsburgh for a "Symposium on Dust Problems." The attendees included representatives and attorneys from a wide variety of industries, as well as corporate and/or outside counsel to some of the industries. For example, Johns Manville sent its lead corporate attorney, Vandiver Brown. Admission was by invitation only, with no reporters present and no stenographic notes kept. The Symposium included addresses by numerous industry retained experts, including R. R. Sayers, Anthony J. Lanza , Eugene Pendergrass, Philip Drinker, Donald S. Cummings, Alfred C. Hirth, and F. Robertson Jones.[217]

In his memorandum concerning the "Symposium" Vandiver Brown listed four areas of common interest among the participants. Foremost among these was the "menace

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[216] David Rosner and Gerald Markowitz, "Industry Challenges to the Principle of Prevention in Public Health: The Precautionary Principle in Historical Perspective," *Public Health Reports* 117 (November-December 2002): 505; and David Rosner and Gerald Markowitz, "Workers, Industry, and the Control," 33-4. The quote is from William Graebner, "Hegemony Through Science: Information Engineering and Lead Toxicology, 1925-1965," 145 in *Dying for Work*, eds. David Rosner and Gerald Markowitz, 145.

[217] Although no official records were kept of the meetings and subsequent activities that established the Air Hygiene Foundation, four documents prepared at the time provide an outline of the activities: Roger A. Hitchins, "A Brief Outline of the Discussion and Action Taken by the Temporary Organization Committee at a Special Meeting Held at the Duquesne Club, Pittsburgh, Pa., on Friday, February 1, 1935," Hazard to Thompson, March 21, 1935, National Archives, Record Group 90, Records of the Public Health Service; Roger A. Hitchins, *Report and Recommendation of the Temporary Organization Committee Which was Elected at the 'Symposium on Dust Problems' Held at Pittsburgh, Pa. January 15, 1935*, National Archives, Record Group 90, Records of the Public Health Service; Vandiver Brown, "Memorandum Re: -Mellon Institute of Industrial Research Symposium on dust Problems – Pittsburgh – Jan. 15, 1935," author's private collection; and A. J. Lanza, "Memorandum to Dr. Armstrong, dated February 27, 1935 and attached list of Representatives at the Silicosis Meeting, author's private collection."

of ambulance chasing lawyers in combination with unscrupulous doctors." The "uncertainties surrounding diagnosis" of the pneumonoconioses meant that the jury must decide between plaintiff and defense expert witnesses and "is not likely to favor the opinions of the experts produced by the employer." The second area of general concern grew out of the first: "the desirability of making various dust diseases compensable under properly drawn workmen's compensation laws." Brown observed that the meeting attendees desired legislation that would "eliminate the jury and empower a Medical Board to pass upon the existence of the disease and the extent of the disability," while at the same time eliminating "the shyster lawyer and the quack doctor." Brown then needed only two lines to cover the attendees' other interests in the "problems of ventilation, dust collecting and elimination, and respiratory devices." Finally, Brown noted the group's concern about the need for "establishing of standards" for dust counting and particle size, the "taking of x-rays for diagnostic use," and interpretation of the x-ray film markings.[218]

The attendees appointed a Temporary Organization Committee to develop plans and make recommendations. The Temporary Committee then held its own meeting at which its members decided to recommend the formation of a permanent confidential organization. The organization would cover "…medical, preventive, legal, legislative and publicity features of the industrial dust problem…"[219] The legal issues were the core component of the proposal and, as we shall see, the subsequent program. The Medical,

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[218] Vandiver Brown, "Memorandum Re: - Mellon Institute of Industrial Research Symposium on dust Problems – Pittsburgh – Jan. 15, 1935." Brown apparently attended the meeting to ensure that asbestos hazards did not become part of the group's agenda.

[219] Roger A. Hitchens, *Report and Recommendation of the Temporary Organization Committee Which Was Elected at the "Symposium on Dust Problems" Held at Pittsburgh, Pa., January 15, 1935*.

Preventive Engineering, Legislative, and Publicity features were all tailored to provide supporting roles to the overwhelming problem of litigation defense.

The committee obtained a proposal from Mellon Institute for air industrial hygiene research. Given the importance of the legal issues involved, the Mellon representative, Dr. E. R. Weidlein, fully understood the necessity of both confidentiality and research structures to assist in litigation defense. In his initial proposal letter, Weidlein gave the assurance that "the work could be carried out in a most confidential manner as to who was supporting the research and no one would know what industries or individuals was [sic] contributing to the fund." He also acknowledged that the coordinating agency must have a "sympathetic understanding of the problem and wide contacts with all cooperating agencies…"

Weidlein suggested that a permanent research organization would provide industry with a measure of control over relevant information dissemination. He desired at the outset to collect data. Upon compilation of the data he proposed the preparation of a "comprehensive program designed to provide the industries concerned with legitimate protection." Weidlein then outlined six aspects of the research. He argued that understanding "[t]he pathological and psychological effects of dust of various kinds, alone and in combination" was necessary before any other action. Furthermore, "[f]or this a classification of dusts is necessary." He next acknowledged the critical impact this had for the companies' legal defense: "the preparation of court cases" was "important from both medical and legal standpoint." His next two research topics covered air sampling in plants and determining appropriate methods for minimizing dusts. The research topics concluded with recognition that the new agency must disseminate authoritative information, maintain close contact with other agencies in its research program, assist in the review and preparation of legislative proposals.

Weidlein's proposal then outlined a five point program that could control industry actions and set a nationwide silicosis agenda, including Medical, Preventive, Legal, Legislative, and Publicity programs. Each section included a number of legal-oriented activities. The Medical section proposed collecting information on diseases to focus attention on areas needing more research and, in an action that would assist legal defenses nationwide, enlisting the American Medical Association in setting approved standards of diagnosis. The Preventive section stressed the importance of air quality standards for litigation. He called for the setting of approved standards for the control of dusts such that they will "act as a defense against personal injury suits." In the pure legal area, the organization would seek the cooperation of the American Bar Association in stopping the lawsuit "racket" and serve as a clearing house of legal related information. The organization could also help in the legislative area by recommending laws to "properly protect the interest of industry and of enlisting the co-operation of the Federal Government in that direction." The interest of industry, of course, was to eliminate personal injury lawsuits against the companies. Finally, Weidlein proposed that the organization assume the role as industry's mouth piece, informing governments and the public of the actions industry was taking and what "should be taken in the direction of protecting both human life and property." It appears that the property he meant by this was the businesses of the owners that were being overwhelmed by lawsuits. This proposal constituted an integrated plan, designed to both shape the silicosis debate and reduce, if not eliminate, lawsuits by a collective defense effort; that effort being supported by intensive confidential research, legislative lobbying and a nationwide publicity program.[220]

The Temporary Committee took this proposal and prepared a tentative "Program of Initial Activities" which, while somewhat different then Weidlein's proposal, had his approval. The proposal included the same program elements as Weidlein's: Medical—enlisting the cooperation of the AMA in setting "authoritative standards of diagnosis…;" Preventive—"setting up authoritative and approved standards for the control of industrial dusts which, if complied with…will act as a defense against personal injury suits;" Legal—assembling data on all legal suits to go to the ABA about "rackets;" Legislative—obtaining information about all pending legislation and court decisions "affecting the dust hazard" in order to secure the enactment of laws that "will fairly and properly protect the interests of industry and of those engaged in industry and of enlisting the co-operation of the Federal Government in that direction;" and Publicity—recommending how governments and the public can be advised about "the measures which are being and should be taken in the direction of protecting both human life and property."

As an attorney, Hitchins would have well understood the wariness of industry to publicity about dust, particularly publicity that could resurface in a lawsuit. He thus

[220] Dr. E. R. Weidlein letter to Roger A. Hitchins of January 21, 1935 in Hitchins, *Report and Recommendation of the Temporary Organization Committee Which Was Elected at the "Symposium on Dust Problems" Held at Pittsburgh, Pa., January 15,* 1935, Enclosure (4).

promoted the idea that the "Industrial Dust Institute" would maintain strict confidentiality about membership and contributions. The proposals also implicitly recognized that any research or surveys would be confidential unless the industry found them useful for publicity or their defense of personal injury lawsuits or workmen's compensation claims.[221]

From this beginning was formed the Air Hygiene Foundation, subsequently renamed the Industrial Hygiene Foundation (IHF). Its mission was to limit the definition of dust diseases, conduct research favorable to industry, obtain "reasonable" state hygiene standards, limit lawsuits, and get out industry's story. It succeeded in all of these tasks. The IHF quickly demonstrated its worth to industry. The IHF immediately directed considerable attention to controlling lawsuits from airborne dusts. Section 4 of the Foundation's initial Code of Regulations clearly delineated these responsibilities:

> The functions and duties of the Committee on Legal Statistics shall be to secure from all affected industries their present experience as to personal injury suits and claims growing out of air pollution; to make a study of the assembled data and to report, from time to time, to the Board of Trustees as to losses suffered by industry in general and by classification from industrial air pollution; to make recommendations as to what concerted action should be taken with reference to those classes of claims which appear to be fraudulent; and to seek the cooperation of the American Bar Association and local bar associations in combating any and all unethical conduct of lawyers and others engaged in fraudulent practices against industry.

In seeking new members, the IHF understood that the quest to control litigation supplied the strongest enticement to potential new corporate members. In perhaps its first

[221] Hitchins, *Report and Recommendation of the Temporary Organization Committee Which Was Elected at the "Symposium on Dust Problems" Held at Pittsburgh, Pa., January 15, 1935,* Enclosure (5); Roger A. Hitchins, "A Brief Outline of the Discussion and Action Taken by the Temporary Organization Committee; and David Rosner and Gerald Markowitz, "Workers, Industry, and the Control," 37.

advertising brochure, the Air Hygiene Foundation explained both the purpose of the IHF and four reasons why companies should want to join. The motivations were listed in the following way: “For Dollar and Cents,” “For Legal Factors,” “For Industrial and Public Relations,” and “For Human Welfare.”[222] This first emphasis of profit, legal, and related issues continued to be the primary draw for the IHF even into the war years. In its 1940-41 annual "Report of [the] Membership Committee," C. E. Ralston, safety director of the Pittsburgh Plate Glass Company, provided his company’s reasons for joining the IHF. He saw the optional plant surveys as a major benefit to member companies because of its legal ramifications. "In case of claims, you have a record showing what the health conditions actually were at the time of alleged injury… The report you receive from the Foundation removes the 'guess work' and speculation as to whether there was or wasn't a hazard at the time in question. Further, as Mr. Fletcher pointed out here a year ago, a survey report from an outside, independent agency carries more weight in Court or before a compensation commission than does a report prepared by your own people. In other words, an outside party can talk with greater weight about you than you can talk about yourself.”[223] In the marketing of the IHF, as in most aspects of early twentieth century businesses, the control of costs, the reduction of lawsuits, and public relations, each an aspect of a business’s profits, all came before “human welfare.”

The IHF followed through on its commitment to support litigation efforts. The first informational tracts issued by the IHF, the Legal Bulletins, demonstrated the IHF’s

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[222] Air Hygiene Foundation, *What Why Where?* Informational Circular no. 3 (Pittsburgh: Air Hygiene Foundation, 1938).

[223] David Rosner and Gerald Markowitz , “Workers, Industry, and the Control,” 44-45; 60; and Ralston, C. E. "Report of Membership Committee," In *Fifth Annual Meeting of Members, Pittsburgh, PA, Nov. 12-13, 1940*, 6, Industrial Hygiene Foundation Archives, Carnegie Mellon University.

understanding of the focus of its mission. These tracts, designed to assist in the defense of occupational disease cases, provided details of the federal and state laws and court decisions related to occupational disease. Bulletin Number 1 of the Legal Series, published on April 1, 1936, provided a survey of existing pneumoconiosis relevant statutes. The following year the Foundation published two new Legal Bulletins and a supplement to the first Bulletin. The first 1937 Bulletin, published on January 2, provided a "Critical Study of Provisions for Occupational Disease Legislation." The second, published on December 27, 1937 provided a critical review of compensation legislation. Dissemination of medical information was slower. In contrast to the efforts put forth in the legal arena, during the same period only one medical bulletin was issued.

In addition to the Bulletins, the Legal Committee also presented programs during the scientific portion of the IHF's first annual meeting. Thereafter, legal programs became a regular feature of the annual conferences. For example, the 1950 annual meeting included a full day Legal Conference, running concurrently with other conferences, as well as a half day Medico-Legal Conference attended by both lawyers and doctors. This conference, co-chaired by Lanza, covered the administration of workmen's compensation laws. A similar Medico-Legal Conference in 1953 heard questions seeking to find methods of controlling the science and limiting lawsuits. Typical question included the following: "What steps should be taken to secure general cooperation among compensation attorneys, industrial physicians and commissions to eliminate the racketeering lawyer and the unethical medical witness?"[224]

National Silicosis Conference

As previously noted, the federally organized National Silicosis Conference followed less than sixteenth months after the first general industry symposium. Although the National Silicosis Conference of April 14, 1936 was convened by the U. S. Department of Labor through its Division of Labor Statistics, the actual Conference was controlled by industry. This is not surprising, given that for the last four years and in particular since the prior year's formation of the Air Hygiene Foundation, industry had been studiously courting medical experts in support of its litigation defense. By 1936, the AHF had attracted almost all of the top experts and institutions to its working groups and research programs. Although the Labor Department desired to help workers and recognized that most industrial health experts, including those in the Federal Government's employ, were biased toward industry, the difficulties of the depression and the fear of job losses if entire industries collapsed likely caused it to choose what it saw as the lesser of two evils—the lessened but continuing specter of silicosis deaths resulting from industry control of the Conference—rather than perhaps hundreds of thousands of

[224] Section 4 of the Code of Regulations, Daniel C. Braun and Jane F. Brislin Deposition on December 27, 1977 in *Esther Bailey, Executrix, Etc. v. Johns-Manville Corp., et al..,* C. P. No. 77-1, USDC (E. D. Va.), 27; Air Hygiene Foundation of America, Inc., "Report of Managing Director," *Special Meeting of Members*, Pittsburgh: Air Hygiene Foundation of America, Inc., November 30, 1937, 5-6; Theodore C. Waters, *Current Status of Compensation for Pneumoconioses*. Legal Series, Bulletin No. 4 (Pittsburgh: The Industrial Hygiene Foundation, 1967); Daniel C. Braun Deposition on September 5, 1980, 49; "Fifteen Years Later: The Fifteenth Annual Meeting of the Industrial Hygiene Foundation," *Industrial Medicine and Surgery* 20, no. 1 (1951): 40; "Industrial Hygiene Foundation: Eighteenth Annual Meeting – November 18-19, 1953," *Industrial Medicine and Surgery* 23, no. 1 (1954): 20.

additional workers out unemployed if the Conference failed. In addition, as was stated in the summary of the final reports of the conference, the Labor Department acknowledged that “a few incompetent [or perhaps too competent] attorneys and physicians, particularly in court cases, have further complicated the situation, so that today a condition exists that fully deserves thoughtful consideration and some definite declarations by those who are competent to speak.”[225]

The first session of the conference, held on April 14, 1936 was attended by more than 300 persons. They represented workers, employers, State and Federal agencies, industry trade associations, insurance companies, and others. Most, however, leaned heavily toward industry’s position. At least sixty percent represented a dusty industry or an insurance company that serviced such industries. A fair number of the twenty-five percent of the attendees representing state and Federal agencies also supported industry’s position. Several of these individuals also had a fiduciary interest in the outcome of the conference, since they were already consulting with the fledgling IHF. The approximate five percent of the attendees who were worker and trade union representatives must have felt mighty lonely through most of the Conference and Committee sessions.[226]

[225] “Broadly speaking, state and federal labor administrators generally believed that governmental medical and public health opinions regarding industrial disease was [sic] biased in favor of industry rather than the work force, despite its claim of scientific objectivity. New Deal administrators in the United States Department of Labor and some state departments saw themselves as allies of organized labor during the turbulent years of the 1930s and generally adopted labor's distrust of medicine.” Thus wrote Gerald Markowitz and David Rosner, “The Illusion of Medical Certainty,” 236; see also United States Department of Labor, Division of Labor Standards, *National Silicosis Conference Summary of Reports*, Final Draft, dated January 23. The Labor Department quote is from David Rosner and Gerald Markowitz, “Workers, Industry, and the Control,” 38.

[226] United States Department of Labor, Division of Labor Standards, *National Silicosis Conference Summary of Reports*, Final Draft, dated January 23.

The newly born IHF tied together an extraordinary number of the Conference's key participants. Three major papers were read during the fist day of the Conference; two were by IHF participants. In one paper Anthony C. Hirth, a litigation defense attorney and Chairman of the IHF's Legal Committee, presented industry's viewpoint of the crisis. He argued that through currently available engineering and technology, industry was achieving safe levels of dust exposure. In his words, "the existence of a dust hazard is already on its way out." The remaining small amounts of silica dust would result in minimal amounts of silica in the lungs. This should not disable or affect a worker during his work life. He left unsaid what would happen to the workers' health after retirement.[227] The second paper was presented by the medical doctor R. R. Sayers, employed by the United States Public Health Service but also a member of the IHF's Medical Committee. He delivered an address on the engineering and medical aspects of the silicosis hazard.

At some point during the day-long conference, federal officials recognized that smaller groups would have to work on actual solutions to the crisis. By the end of the day Zimmer had apparently allowed the participants to organize themselves into the four working groups of the Conference—the groups who would prepare the actual recommendations of the conference. Following the initial meeting an IHF report touted its influence in the groups: "Five trustees, three committee chairmen and six members of committees of Air Hygiene Foundation are members of one or other of Mr. Zimmer's committees; three of them are chairmen." The report continued "It is plain that the

[227] Alfred Hirth, "Proceedings of the National Conference on Silicosis and Similar Dust Diseases," April 14, 1936, National Archives, Record Group 100 (7-0-4(1), Pittsburgh, Pa.), 4-5, contained in Gerald Markowitz and David Rosner, "The Limits of Thresholds," 255.

Foundation is being extended an opportunity to collaborate fully, to aid especially in giving the views and attitude of the industries."[228]

The IHF did not exaggerate in this report. Industry representatives, attorneys and consultants heavily dominated the committees. Dr. R. R. Sayers chaired the medical committee. V. P. Ahearn, representing the National Industrial Sand Association, became the chairman of perhaps it's the most important and influential unit, the Economic, Legal, and Insurance Committee. While couched in objective scientific terms the subsequent committee discussions and reports were structured not around the disease, but rather around the social crisis of silicosis litigation and the technological and economic constraints on engineering methods to reduce silica exposures. The majority—that is all industry and insurance representatives and a fair portion of state and Federal agency representative—reached a consensus that economically feasible engineering methods could prevent silicosis from shortening a person's **work life** [author's emphasis]. Although the committees did address a few questions about the definition and prevalence of the disease, the reports almost exclusively examined issues critical to legal issues of industry liability. By specifying controls and exposure limits by which it was hoped most workers would not be physically disabled during their working life, the Committees hoped to control the crisis through a compensation system that provided assistance only to only those who experienced a disruption of wages, rather than to anyone who contracted the disease, or became debilitated upon retirement. Furthermore, by defining

[228] "National Silicosis Conference," *American Labor Legislation Review* z6 (1936): 60; M. B. Meller, "Silicosis: Program of United States Department of Labor, and Interest and Cooperation of Air Hygiene Foundation," 1936, IHF Archives, Carnegie-Mellon University.

the hazard as only being present in a few select industries and job classifications, all amenable to engineering controls, and calling for a workmen's compensation system of medical boards to provide for those few serious cases still arising, the reports sought to reassure the public and limit any adverse publicity.[229]

Even Sayers' medical committee broke no new ground, except in further limiting the definition of silicosis. The committee's definition of silicosis included the requirement of a diagnosis of a reduced capacity for work. Without any new evidence, it endorsed an exposure level of five million particles per cubic foot of silica dust which would be increased in direct proportion to any reduction in the percentage of free silica in the dust. They included this recommendation despite the recognition that "there is evidence [that] for prolonged exposure a concentration of more than five million particles per cubic foot of a highly siliceous dust is dangerous" and recognition that specific conditions in industry were so varied that "there can be no universal regulatory standard of permissible dust concentration at the present time." Thus, rather than being based solely on safety or health, the "arbitrary standard should be based upon what is believed to be within the limits of good engineering practice and that which, from a medical viewpoint, [even though no evidence supported it] it is judged will largely control the silicosis hazard for most industrial exposures."[230] Thus, through a slight of hand in the

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[229] The "work life" nature of the claim is an important distinction. By this time everyone recognized that silicosis is progressive. Most experts, including Lanza, also recognized that most workers in sandy trades had at least mild silicosis by the time they retired. The battle was over whether industry should pay for disabilities that occurred *after* an individual retired: see United States Department of Labor, "Abstracted Proceedings of Second National Silicosis Conference and Committee Draft Summary Reports," dated February 3, 1937.

[230] "Summary Report of the Committee on Prevention of Silicosis through Medical Control," 2-7, "Abstracted Proceedings of Second National Silicosis Conference and Committee Draft Summary

definition and a complete default on establishing a safe exposure level, the Committee provided significant support to industry's litigation defense. Industry attorneys could now argue that any individual still working did not have "silicosis" and that industry was reasonable in simply following exposure standards implicitly recognized by the Federal government. As Weidlein had originally proposed two years previously, the establishment of a 'safe' limit within easy technological and economic reach meant that companies could now be safe from negligence liability suits.

The Committee on the Economic, Legal, and Insurance Phases of the Silicosis Problem provides perhaps the best example of how industry controlled the committees. As previously noted, the committee chairman represented the Industrial Sand Association. The members of the committee included three members of the insurance industry, four members of industry (including one from Union Carbide), two members of labor, five members of state commissions and one member, attorney Theodore C. Waters, who was listed as a state commission representative, but who in fact provided very significant legal advice to the IHF and actively worked to assist industry. The subcommittees continued this trend. A representative of the Pennsylvania Self-Insurers Association chaired the Economic Subcommittee. This committee also included two other industry members, one state representative and one labor member. Theodore C. Waters chaired the Legal Subcommittee, which also included another industry representative, two state representatives, and one labor representative. The Insurance

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Reports." The complete definition is contained on page 2: "Silicosis may be defined as a chronic disease due to the breathing of air containing silica (SiO_2), characterized anatomically by generalized fibrotic changes and the development of military nodulation in both lungs, and clinically by shortness of breath, decreased chest expansion, lessened capacity for work, absence of fever, increased susceptibility to tuberculosis (some or all of which may be present), and by characteristic roentgenological findings."

subcommittee was chaired by an insurance representative and contained two other insurance reps, two state representatives and one labor representative.[231] The final report of this influential committee, similar to the other committees, is replete with industry prepared documents. Its recommendations follow the industry line, with union and labor representatives objecting to much of the report and writing a minority position report. The minority report was noted by the Labor Department, and then ignored by all.

When the conference met again on February 3, 1937, the Labor Department was faced with a fait accompli. The Committees had finished their work. They had arrived at general majority consensus. Most medical and technical experts at the conference accepted the positions in the reports. Given the problems of the depression the Labor Department could not simply start over. To raise questions about the efficacy of the reports meant the possible collapse of several industries, massive lawsuits, and the potential undermining of the United States Public Health Service. Thus Verne Zimmer, Director of the Labor Department Division of Labor Standards and "ceremonial" Conference Chairman, accepted the reports.[232]

In his largely forgotten "Foreword to the Committee Reports," Zimmer reiterated that the Federal Government had taken no part in, nor voiced any opinions about, the conclusions and recommendations of the committees. He also wrote about the controversies in the committees:

> It was recognized that certain phases of the subject were controversial, and because of the opposing interests involved it was

[231] United States Department of Labor, Division of Labor Standards, *National Silicosis Conference Summary of Reports*, Final Draft, January 23, 1937, National Archives, Record Group 90, ii, 12, 23 and 76.
[232] United States Department of Labor, *Abstracted Proceedings of Second National Silicosis Conference and Committee Draft Summary Reports,* dated February 3, 1937, National Archives, Record Group 90.

> not expected that there would be complete unanimity among the committees on all the findings and recommendations that would be made. Moreover, because of the highly technical factors involved in the problem, it was impracticable to attempt to balance the voting power of the various committees equally as between the major interests of management, labor, and the public, although each had definite representation in all discussions and deliberations. This fact should be kept in mind in appraising the committee report… [W]e wish to stress the need for giving careful consideration to labor's views, which in many fundamental respects are at variance with those expressed in the committee reports. Labor's position is indicated in the supplemental report and will probably be brought forward by the labor groups in the States in which legislation is under consideration.[233]

Experts Lend a Hand

Industry representatives left the National Silicosis Conference revitalized. With his reluctant approval of the reports, Zimmer, representing the U.S. Labor Department, implicitly admitted that the state of the depressed economy mandated that industry's position on this important social issue remain predominant. Industry and its attorneys wasted little time in consolidating its position. The National Safety Council used the conclusions of the committee reports to prepare its own report trivializing silicosis.[234] The committee reports provided the IHF with additional support for its continuing efforts to capture professional opinion and assist industry in their defense of silicosis litigation and workmen's compensation claims hearings.[235] The committee reports also supplied industry attorneys with a wealth of new opinions and quotes to present to civil litigation juries.

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[233] United States Department of Labor, Division of Labor Standards, *National Silicosis Conference Summary of Reports*, Final Draft, January 23, 1937, National Archives, Record Group 90, viii.
[234] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 127-128.
[235] Ibid.

While all of these activities provided important benefits to industry, the most important benefit of the Conference Report may have come from the ability of industry attorneys and lobbyists to place pressure on state legislatures to enact industry friendly workmen's compensation legislation. When seeking favorable hearings before state legislatures, industry lobbyists could now simply point to the recommendations of the National Silicosis Conference, conducted under the auspices of the "liberal" Federal Government and printed as a Department of Labor Bulletin.

The Conference Report was but the culmination of industry's efforts to obtain a broad coalition of support in lobbying state governments for "appropriate" workmen's compensation legislation. Throughout the 1930s industry representatives and attorneys strove for close cooperation from the various professional associations, such as the American Public Health Association, the American Medical Association, and the American Industrial Hygiene Association in advancing their program of silicosis minimization. They similarly sought to influence and co-opt governmental occupational and public health officials. At the same time they developed strategies to limit the influence of local doctors, the primary source of silicosis diagnoses and the resultant new silicosis cases and claims. Finally, the Foundation also coordinated closely with the American Bar Association to ensure proposed new workmen's compensation laws were not overly inclusive.

The efforts directed toward medical professional associations included working on committees, having IHF representatives and consultants elected to association offices, presenting speeches at association conferences, and proposing industry friendly resolutions and standards to the association membership. Industry representatives, consultants, and possibly attorneys had become closely involved with the American Public Health Association at least as early as 1930 when Lanza was one of three members on its Committee on Silicosis. That year the committee proposed a standard for airborne silica dust. Committee members recognized that it "was not found to prevent the occurrence of silicosis." However, it "could be reached by the use of economically practicable ventilating devices."[236]

In addition to recommending a silica exposure standard easily met by industry, the American Public Health Association also provided assistance in influencing workmen's compensation legislation. As early as 1933, in spite of the lack of medical consensus regarding the way in which silica affected the lungs or its speed in causing changes, the American Public Health Association announced its support for an expert medical panel for silicosis, a scheme that would take away the power of a jury to decide silicosis legal cases. They used cost savings as a justification. "Without some form of medical control, the management of compensation for a disease such as silicosis would be difficult." They did not mention the potential dual benefit to industry of fewer claims or the elimination of most family or worker doctors from the diagnosis. [237] Industry and the IHF were both grateful for this and subsequent assistance. In a speech before the

[236] R. R. Sayers, Emery R. Hayhurst, and A. J. Lanza, "Effect of Dust on the Lungs," 368-379.
[237] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 89. This willingness of the APHA to back industry's call for removal of silicosis cases from trial by jury demonstrates industry's firm control of the group. Given the state of knowledge concerning silicosis, such control provides the only reasonable explanation for the association's apparent belief that experts could agree better than a jury—for as physician Emery Hayhurst, one of the very few independent occupational medicine silicosis experts, wrote, silicosis "is today the most controversial as to cause, course, complications, and prognosis." See Emery Hayhurst, "Review of *Symposium on Silicosis*–Trudeau School of Tuberculosis, Saranac Lake, N.Y., June 18-22, 1934. Wausau, Wis.: Employers' Mutuals," *American Journal of Public Health* 24, no. 12 (1934): 1269.

association which was published in a 1939 issue of the association's journal Theodore Waters publicly thanked the association for its interests in industrial hygiene and assistance in the preparation of occupational disease laws. In this same speech he also reiterated industry's strong support for medical panels.[238]

Nor was the APHA the only medical association that experienced increasing lobbying from industry. Even before the inception of IHF industry doctors and researchers spoke at American Medical Association meetings. For example, at the June 1934 Convention of the American Medical Association, Doctor Leroy U. Gardner of Saranac Lake gave a featured presentation on silicosis. As previously discussed, the IHF considered the American Medical Association so important that its "Program of Initial Activities" prominently included enlisting the help of the American Medical Association in developing authoritative standards that would be of use at trial. Consultants, representatives and employees of the IHF and industry also sought elected office in all medically relevant associations, perhaps the most prominent being Theodore Hatch's election as President of the American Industrial Hygiene Association. That year, the Directors of the AIHA also included employees of Westinghouse and Owens Illinois, both prominent members of the IHF.[239]

Since any workmen's compensation scheme necessarily involved legal issues, the American Bar Association played a supporting role similar to those of the medical associations. Obtaining the American Bar Association's cooperation in these legislative

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[238] Theodore C. Waters, "Administration of Laws for the Prevention and Control of Occupational Diseases," *American Journal of Public Health* 29 (July 1939): 728-29, 733.
[239] "Medical Session Opens Tomorrow," *New York Times*, June 10, 1934, n2; and *Industrial Hygiene Newsletter* 7, no. 7 (July 1947): 6.

efforts occupied a prominent location not only in the Program of Initial Activities for the IHF but also in its initial code of Regulations. Once again the IHF had a direct connection with the “unbiased” American Bar Association to ensure cooperation.

Writing a letter to the IHF’s Board of Trustees, Hirth proposed that the IHF prepare a model workmen’s compensation law which could be provided to any interested state. However, recognizing that the IHF was “not the best organization to publicly sponsor the contemplated move" because it was "on last analysis, an employer organization," Hirth cautioned the Board that any direct "legislative proposal it may make is subject to the same scrutiny and criticism as is given proposals of organizations such as the National Manufacturers Association, United States Chamber of Commerce, etc." Hirth informed the Board that the Legal Committee agreed with his conclusion that an independent organization be asked to sponsor the proposed law. The committee suggested the "Committee on Legislation of the American Bar Association, who, because of their non-partisan character are ideally suited to appear publicly as the sponsor of this work." He further explained that the IHF was "rather fortunate in the fact that the present President of the American Bar Association has been associated with both Mr. [Theodore] Waters [partner in Mulliken, Stockbridge & Waters, of Baltimore, Maryland, frequent legal advisor to the Foundation, and member of the Foundation’s Legal Committee] and the writer in silicosis matters. He will therefore appreciate the importance of this work and we believe that we can rely upon him to give us his active personal assistance.”[240] Although there are no similar letters relating to the American Medical Association or the

[240] David Rosner and Gerald Markowitz, “Workers, Industry, and the Control,” 43.

American Industrial Hygiene Association, the same considerations and rationales suggest the possibility that the IHF pursued a similar approach with them.

In addition to direct activities within the professional associations, the IHF also sought to influence practitioners and government officials by sponsoring symposia and speakers at symposia. These 1930s silicosis conferences almost always included a section on the legal aspects of silicosis, including legislative control and compensation. Speakers at these conferences included most of the important names in the field. They also provided a ready venue for defense attorneys to meet, talk with, and retain the most notable experts in the field.[241]

The IHF and other industry agents and attorneys did not direct their activities exclusively toward professional associations. They also took the direct approach of hiring the experts. Occupational doctors and industrial hygiene engineers needed money to run their businesses, conduct research, or—in the case of academic and government employees—provide some additional income. Federal and state agency interested in conducting studies also required industry agreement before they proceeded. Industry attorneys and the newly established IHF supplied both the money and the cooperation to the experts and agencies. In return they expected to see reports that were optimistic and that industry could edit. The manner and extent of this cooperation is evident in a series of interviews with important pioneer figures in industrial hygiene that was published in the 1984 *Annals of the American Conference of Industrial Hygiene*. Readers of the

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[241] See for example Emery Hayhurst, "Review of Symposium," 1269 as well as Emery Hayhurst, "Review of B. E. Kuechle, ed. *Third Symposium on Silicosis*, Wausau, Wis.: Employers' Mutual Liability Insurance Co., 1937," *American Journal of Public Health* 28 (June 1938): 788-89.

interviews are struck by the number of individuals who during their career worked both in Federal or state agencies and in industry. The interviews also offer evidence that most of the interviewees who remained with a governmental agency closely cooperated with industry and, at a minimum, provided the benefit of the doubt to industry in its dealings with work place hazards.[242]

The interview of Henry F. Smyth, Jr. provides a good example of the industry perspective found in most of the interviews. Smyth was an engineer. He became a charter member of the American Industrial Hygiene Association and served on its Board of directors. During the 1960s he was an Administrative Fellow at the IHF's parent, the Mellon Institute. In his interview Smyth discussed his early work for his father providing industrial hygiene services to various companies. Some of this work involved investigations for litigation purposes, such as the silica investigations he and his father conducted in the 1930. "During this interium (sic), we did a lot of work in the then contemporary silicosis racket in south Jersey. Sand – oh, in the sand industry – much of it was ground for household cleansers, and we began to get more and more silicosis cases. So we went around the very unsatisfactory deal of making tests in the operation after a suit was brought. Nothing else could be done about it. We realized it was very unsatisfactory, even in those days, as far as evidence goes."[243]

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[242]Charles D. Yaffe, Ed., "Some Pioneers of Industrial Hygiene," *Annals of the American Conference of Governmental Industrial Hygienists* 7 (1984): 3-135.

[243] Charles D. Yaffe, "Interview of Henry F. Smyth, Jr. on May 18, 1976," *Annals of the American Conference of Governmental Industrial Hygienists* 7 (1984): 118; and Henry F. Smyth, Jr., "Toxicology of Industrial Chemicals," *Archives of Environmental Health* 8 (March, 1964): 384. This story also illustrates the methods some companies used then and even today in toxic litigation. Businesses using toxic substances such as silica or asbestos often do not sample to see if it is being released into the air or water unless required to do so by regulation. If a toxic hazard is not reported, short-term expenses will be lower.

By the time of the National Silicosis Conference, almost all experienced occupational doctors and industrial hygienists succumbed to this siren's call, even those in Federal service. Clara Beyer, confidential aide to Labor Secretary Frances Perkins, and back-room advisor on much New Deal social legislation, even remarked that if the Public Health Service was going to be an advocate for industry, then the Department of Labor "should be a service agency for labor." Beyer had good reason for concern about the biases of government Public Health officials. Many developed very tight, if not cozy, relationships with industry. R. R. Sayers was on the board and various committees of the Air Hygiene Foundation. Lanza went from the Public Health Service to Metropolitan Life Insurance Company. W. P. Yant left the Bureau of Mines to join Mine Safety Appliances Company. O. A. Sander, Leroy Gardner, Henry K. Pancoast, Eugene Pendergrass, and even Philip Drinker worked as paid consultants to industry attorneys. In 1934 Roy Jones of the United States Public Health Service even complained that the many proposals calling for standard workmen's compensation in cases involving silicosis could bankrupt entire industries: "We apparently think of every case of pulmonary fibrosis as requiring compensation," he wrote, "whether disabled or able to work."[244]

If later sued, the company can clean the site then perform sampling under controlled conditions for use at trial. If the measurements still turn out high, the sampling can be hidden through the attorney work product privilege. This same tactic can be used when state officials seek to inspect facilities. As described by the Director of the Research and Education Department of the Molders and Workers Union, "How often did we complain about the conditions in the shop only to have the inspector call and make an "appointment" to visit the plant. Through this process we were at least able to get the place cleaned up once in a while, for the inspector always allowed some time before his visit. His usual 'clean bill of health' was signed and posted for a few days before the place was back in its neglected state." See Jim Wolfe, "OSHA: A Short Story," *Labor Studies Journal* 3, no. 2 (Fall 1978): 150.

[244] Traditionally, standard workmen's compensation paid for specified injuries at work without regard to a loss of wages. The Clara Beyer quote is from David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 126. "Clara Beyer, 98, dies, New Deal Official," *New York Times*, September 28, 1990, Section A, 18; see also Gerald Markowitz and David Rosner, "The Illusion of Medical Certainty," 231.

In return for this support most occupational doctors and researchers in turn sustained industry's position to the fullest extent possible. Medical articles throughout the period are replete with examples of this. Even when the facts provided strong evidence against an industry position the author would often find a way to minimize or ignore them. As noted above in discussing the history of the Gauley Bridge disaster, these industry-oriented articles had commenced by the early 1930s. If anything, the efforts to downplay silicosis in medical articles increased following the National Silicosis Conference. Perhaps the best examples concern articles considering the foundry industry, an industry employing numerous extremely dusty trades. A medical article excusing the foundry industry's past failures to take corrective action, written in 1938 by O. A. Sander, provides a typical example of the industry slant occupational health researchers frequently took. In this article he both claimed that foundries were justified in failing to take precautions as the result of understandable ignorance and that there was little advanced silicosis in foundries. Sander further argued that industry was naturally late in realizing its dust problems because dust concentrations dramatically increased between 1915 and 1925. Finally, Sander maintained that before the 1920s there were few cases of silicosis.

> …[E]arlier cases having been so relatively infrequent that they were not suspected as occupational in many instances…So little was the foundry industry concerned with these earlier

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Some of the consultation was undoubtedly due to the often inadequate salaries, budgets, facilities and budgets in many of the state industrial hygiene divisions; see Victoria M. Trasko and J. J. Bloomfield, "An Analysis of Industrial Hygiene Activities in State and Local Health Departments, 1940-41," *Public Health Reports (1896-1970)* 57 (June 5, 1942): 867; and Victoria M. Trasko, "Industrial Hygiene Milestones in Governmental Agencies," *American Journal of Public Health* 45, no. 1 (January 1955), 44.

> isolated cases that a survey to determine the extent of the hazard was not attempted until 1931.[245]

In his article, possibly written to assist in his expert testimony at trial, Sanders ignored several facts. First, he did not mention or cite the numerous previous studies demonstrating disease in sandblasters, a trade extensively used by the foundry industry. Second, power tools used in the enclosed spaces of foundries created large amounts of dust. Observers of sandblasting and other activities in foundries could readily see that the dust created was similar to that created in mining, an occupation that had seen considerable research. Many foundries were owned by large corporations, such as General Electric and Union Carbide, who either owned mines or were well aware of the potential of disease from excess dust such as that created by power tools. Finally, Sander also either ignored or was unaware of industry's stifling of articles that documented the problem, such as the censorship undertaken by the National Safety Council on Winslow's article.

In writing the conclusion to his article, Sanders implied that foundry owners still did not have much of a problem. His relevant conclusions are as follows:

> 2. With half of the total group having had less than 10 years of foundry exposure, about 7 per cent with definite silicosis were found.
> 3. Of the 279 with silicosis, 60 (or 22 per cent) had tuberculosis which either was definitely active or in which activity was indeterminate. In 8 of these (or 3 per cent of the silicotics), there was definite activity of the tuberculosis.
> 4. Serial observations have suggested that silico-tuberculosis as seen in foundry workers is primarily a reactivation of a previously acquired but walled-off tuberculosis.

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245 O. A. Sander, "Lung Findings in Foundry Workers A Four Year Study," *American Journal of Public Health* 28 (May 1938): 601-609.

> 5. Simple silicosis as seen in foundry workers is only very slowly progressive, so much so that no visible changes have appeared in 4 years of observation. Moreover, the simple silicosis among these workers is only rarely sufficiently advanced to cause symptoms and incapacity for work.
> 6. These studies suggest that the tuberculosis rate, among foundry workers at least, is not raised by dust exposure per se, but rises only after silicosis becomes definitely established.[246]

Sanders did not indicate what he meant by "definite" silicosis. Given the large percentage of tuberculosis in the silicosis he found, it likely meant what had previously been characterized as moderate or severe silicosis. He also did not indicate if any of the possible silicotics had tuberculosis, thus throwing doubt on his final conclusion that tuberculosis "only rises after silicosis definitely becomes established." This distinction would become important for workmen's compensation, since if the silicosis was not severe enough to cause disability by itself, industry medical experts could claim that an accompanying tuberculosis was unrelated to the silicosis and, thus, not compensable.

Other industry doctors, while admitting the dusty conditions, also claimed that little disease had actually developed from foundry operations. As late as 1945, L. E. Hamlin, Medical Director of the American Brake Shoe Company (a foundry owner) stated:

> In the foundry the atmosphere is often dense and the various operations produce quantities of dust and fume containing fair amounts of silica. Molders and other workers have breathed this air over many years and one would expect to see evidence of silicosis in their chest roentgenograms. But while a few employees' X-rays do show evidence of nodulation, the amount of actual definite fibrosis is relatively low. Routine examination of a large number of chest radiographs of these individuals had led me to call this type of film "The Foundryman's Chest," to indicate a rather typical partial

[246] O. A. Sander, "Lung Findings in Foundry Workers," 609.

> obliteration of linear markings and general lack of sharp detail without clear evidence of nodulation. X-rays of these men show changes which are more marked than normal, but they are not sufficiently definite to warrant a classification of silicosis.

Furthermore, in Hamlin's view, even under the worst of conditions silicosis required at least eight years to develop from a pre-silicotic stage to a definite degree of nodulation.[247]

Significantly, Hamlin limited his comments to individuals during the period they worked for the company, not after they left or were fired. Nor did he discuss what actions the company took when it found abnormal x-rays that did not yet "warrant a classification of silicosis." While certainly not provable at this time, prior history might suggest that the workers were then fired for "inefficiency." Drinker, perhaps the most recognized industrial hygienist of this period, described why employment constrained comments such as Doctor Hamlin's were meaningless as a measure of foundry induced silicosis.

> In the foundry industry…unskilled workers on the shakeout and the like are exposed to the highest dust concentration while the skilled molders (comparable to expert granite cutters) produce relatively little dust during molding. The unskilled foundry worker, having no deep feeling for his work, quits if he experiences any respiratory trouble. Thus there is a high labor turnover which accounts, in part, for the relative absence of silicosis and tuberculosis in this industry.[248]

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247 L. E. Hamlin, "Review of Silicosis," 47 and 49.

248 Philip Drinker and Theodore Hatch, *Industrial Dust*, 79. More recent research studies confirm that foundry type operations remain severe silicosis hazards; see Z. Starzynski, K. Marek, A. Kujawska, and W. Szymczak, "Mortality Among Different Occupational Groups of Workers with Pneumoconiosis: Results From a Register-based Cohort Study," *American Journal of Industrial Medicine* 30 (1996): 718–725; and K. D. Rosenman, M. J. Reilly, C. Rice, V. Hertzberg, C. Y. Tseng, and H. A. Anderson, "Silicosis Among Foundry Workers: Implications for the Need to Revise the OSHA Standard," *American Journal of Epidemiology* 144 (1996): 890–900.

Clearly, the statements of Hamlin and Sander did not reflect the facts of silica disease and its onset, but rather the evidence needed to defend the company at lawsuits and workmen's compensation hearings. Although efforts at providing a "head in the sand" negligence defense undoubtedly helped defense counsel in civil actions, this was not an element in workmen's compensation cases. Workmen's compensation was designed to provide plaintiffs with easier procedures for prevailing than civil suits. Contrary to the requirement of a showing of the defendant's negligence in a silicosis civil lawsuit, workmen's compensation was set up as a no fault procedure. In return for a claimant giving up his or her right to sue the employer, the claimant did not have to demonstrate any negligence on the part of the employer. However, it still required two elements in common with a civil law action: first, the plaintiff had to prove he or she suffered from silicosis as defined by the law; and second, the plaintiff had to prove the disability resulted, at least in part, from exposure while working for the defendant. The ongoing changes to the medical science being instituted by industrial medicine and hygiene professionals lessened the chance of plaintiffs prevailing on both of these issues. Changes made by the "experts" to the definition and requirements for diagnosis of silicosis provided the most help to attorneys in both civil actions and the increasingly ascendant workmen's compensation cases. It was this change that enabled Sander to claim so little silicosis in the foundry workers included in his study.

Silicosis, generally a slow but progressive disease, presented enormous problems for determining payment under this scheme. The disease generally took a number of years to become evident. Even then it did not become severe for a further period of years, often during the later stages of a career or even after the worker's retirement. This presented great difficulties in determining which company was responsible for the injury. Furthermore, the scale of potential liability was staggering. The number of workers with at least mild silicosis in certain industries, such as foundries, approached fifty percent of the work force, an extraordinary number of potential payments which might have bankrupted the system. In addition, silicosis predisposed and led to a number of other diseases not commonly thought of as being occupation-based, such as pneumonia and tuberculosis. Thus, the almost panic stricken articles and lectures by industry representatives during the mid 1930s.

The response was an attempt to stabilize and minimize the number of payments to sufferers of silicosis. The greatest support by experts resulted from the changes in the way that the occupational health community viewed silicosis. Mild silicosis could be tolerated within industry; only when it became so severe that a person could no longer work should it be considered worthy of consideration. This viewpoint dominated the National Silicosis Conference and helped industry control the state workmen's compensation legislation that followed. Following the National Silicosis Conference it seemed that every industry "expert" was reporting on silicosis being a disease of the past, even while numerous studies and inspections showed otherwise.[249] In one sense, silicosis,

[249] Gerald Markowitz and David Rosner, "The Illusion of Medical Certainty," 232.

as it had previously been known, was a disease of the past. Setting standards that gave the appearance of providing protection against the disease, limiting the medical practitioner who could diagnose the disease, arguing that only full disability should be included in any compensation scheme, and redefining silicosis—all these provided the primary means of accomplishing this. Thus, when the insurance and corporate lobbyists called on the legislature to pass legislation with a narrow definition of disability based on lost wages, they were able to point to a similar narrowing of the definition of silicosis within the public health community.

At the National Silicosis Conference, industry experts emphasized that with the new voluntary silica exposure standard industry now had the problem under control. Yet even as they promulgated the standard, medical experts admitted that it had limited usefulness. In his seminal industrial hygiene volume, Drinker agreed with the concern expressed by the National Silicosis Conference medical committee about the limited usefulness of a universal standard. In considering whether the standard could be made accurate he cautioned that one study found "the variations in dustiness were so great as to make unpractical an attempt to study the sickness rate in relation to dosage except in a general way." Furthermore, he understood the standard's real purpose. "The idea of adopting standards of permissible dustiness for each harmful dust has a medicolegal appeal that is not at all justified by the data available today… [Yet,] in none of the original studies was there a single suggestion that the threshold figures were useable as legal standards." Drinker expressed particular concern about the U.S. Public Health Service study of the granite-cutting industry, the primary source cited by most industry experts for their designation of “safe” maximum levels of dustiness. That study found that a maximum dust concentration of between 10 and 20 million particles per cubic foot of air was a “desirable” limit for dust. It concluded that this limit could be reached with the use of economically practicable ventilating devices. However, as the article also stated, "[i]t should be noted that the limit established was not found to prevent the occurrence of silicosis."[250]

Unfortunately, even this minimal and admittedly inadequate standard, while useful for publicity and critical to the defense of lawsuits, was often not followed. While many state commissions did not conduct comprehensive studies of foundry operation, in two states that did, Massachusetts and North Carolina, the commissions found that most foundries had not implemented the changes.[251]

During the late 1930s and 1940s industry medical experts not only wrote medical articles to assist defense attorneys, but they also attempted to co-opt the ability to diagnose it. They did this by embarking on a campaign to educate family doctors about the complexity of silicosis diagnosis. They warned local doctors not to attempt any diagnosis on their own. The experts maintained this caution was necessary because local doctors had neither the training nor the technology to distinguish between silicosis and benign pneumoconiosis. In addition, the IHF experts maintained that a diagnosis should not be made, even with a work history in a foundry, unless measurements had been taken of the silica dust in the air at the work place and—as mentioned by Sampson and

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[250] Philip Drinker and Theodore Hatch, Theodore, *Industrial Dust*, 78; and Sayers, R. R., Hayhurst, Emery R., and Lanza, A. J., “Effect of Dust on the Lungs,” 372.
[251] David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 71, note 61.

Gardner—a series of X-rays over a number of years.[252] The unspoken underlying reason for this effort was not medical. Rather it was legal. Local doctors diagnosing silicosis meant additional lawsuits. In addition, requiring that dust measurements and X-rays be obtained before rendering a diagnosis was extremely helpful to defense counsel, since, as was the case with the sites Smyth sampled in the 1930s (or the cases Sampson reviewed in 1933), most work locations had not been sampled prior to suits being filed and most individuals did not have a series of x-rays.

Some industrial medicine professionals focused specifically on assisting defense attorneys and lobbyists in their efforts to have industry friendly workmen's compensation legislation enacted. George Wright, a doctor whose research was frequently funded by industry and who continued to testify for toxic substance defendants into the 1990s, was one such professional. In a 1945 article he argued against partial disability in workmen's compensation. He began by recognizing that the diagnosis of silicosis "virtually precludes the employment of such a man by a new employer in any job having a silicosis hazard. This means the silicotic is no longer a free agent and is denied the opportunity for advancement under a new employer." However, even while recognizing that silicotics were denied opportunities, Wright argued that partial compensation was rarely warranted. Interestingly, he attempted to cast his opposition as concern about the worker. He admitted that breathing discomfort is "not rare even now… [but] would probably be greatly exaggerated by partial disability legislation… [A] [p]sychological element in

[252] David Rosner, and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 186; and Homer L. Sampson, "The Roentgenogram."

breathlessness exists to a varying degree in nearly all silicotics."[253] Thus, for their own psychological good, silicotics should be denied partial compensation even though they could no longer work at their better paying job and were being denied the opportunity of advancement.

However, the redefinition of silicosis remained the most important aspect of medical assistance to workmen's compensation defense. By the late 1930s industry's experts and consultants, as well as friends in the Federal and state public and industrial health services had redefined the medical criteria for silicosis diagnosis. This redefinition, undertaken at the instigation of insurance companies, attorneys and businesses, provided a more restrictive definition of silicosis as a compensable disease under workmen's compensation laws. Rather than using purely medical criteria the new definition used the loss of earning capacity as the objective "criterion" to determine which silicosis was worthy of consideration for compensation.[254]

Industrial medical experts redefined silicosis in three ways. First, as previously stated, they defined silicosis in terms of the inability to work, rather than by its physical manifestations. Second, they separated it from other diseases, such as tuberculosis or pneumonia, to which individuals with silicosis became predisposed. Gardner's and Sampson's articles concerning the Gauley Bridge workers provide prime examples of this. Finally, they minimized the respiratory effects of mild silicosis.

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[253] George W. Wright, "Medical Aspects of Compensation for Partial Disability from Silicosis," in *Industrial Tuberculosis Silicosis and Compensation*, ed. Leroy U. Gardner (New York: National Tuberculosis Association, 1945), 100, 104; and author's professional experience.
[254] Gerald Markowitz and David Rosner, "The Illusion of Medical Certainty," 231, 239.

Respiratory obstruction was the means by which simple silicosis caused disability. If a worker was having trouble breathing, then his work load had to be limited. This in turn potentially affected his pay level. Thus, under the workmen's compensation schemes that provided for partial disability, a worker with silicosis involving breathing obstructions could potentially make a workmen's compensation claim. As early as 1915, Lanza had remarked upon the ability of even relatively short exposures to produce such a disability. In a speech before the American Public Health Association he cautioned that "[e]xposure to this dust [flint dust composed of 95% silica] for a few years brings on disablement -from dyspnea and cough." Two year later, in his previously discussed landmark study he stated that even "the first stage [of silicosis] is characterized with slight or moderate dyspnea [labored respiration] on exertion." [255]

Yet by the mid 1930s industry medical consultants and researchers were almost universal in their minimization of respiratory obstruction in the initial stages of silicosis. Lanza no longer mentioned dyspnea during first stage silicosis. In fact most industry experts maintained that first stage silicosis caused no measurable harm and produced no disability. They ignored the earlier studies which had found that even at this stage the disease could be progressive. Rather, they maintained that only if exposure continued would it advance to silicosis' second stage, the point at which breathing was affected. By 1935, even the Public Health Service had ceased mentioning shortness of breath as a characteristic of first stage silicosis. Rather, it disregarded the progressive nature of the disease, focusing instead on that arbitrary and subjective stage when silicosis decreased

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[255] Anthony J. Lanza, "Health Hazards of the Metal Mining Industry," *The American Journal of Public Health* 6, no. 5 (1916): 476; and A. J. Lanza and S. B. Childs, "I. Miners' Consumption."

earning capacity. “The term of disability… may be defined as a decreased capacity to do the work required of the individual in the course of his usual occupation and/or increased susceptibility to respiratory infection causing a loss of time from work which may reasonably be considered as primarily the result of pulmonary fibrosis.” In 1936 Lanza went even further stating that “disability in silicosis is seldom due to the silicosis itself.” The following year, Attorney Waters, in his guise as a member of the Maryland Compensation board, declared “simple silicosis… causes relatively little severe disability.”[256]

In the end, industry’s efforts at modifying the medical paradigm and practice for silicosis, whether directed toward experts or family doctors, were simply building blocks for the main structure: the defense of silicosis lawsuits and enactment of industry friendly workmen’s compensation programs. Upon these edifices corporate profits rose or fell.

In seeking appropriate workmen’s compensation legislation, industry lobbyists and attorneys were especially concerned about the issue of having to pay for opportunistic diseases that often accompanied silicosis and often were the direct cause of the disability at issue. In one occupational disease information pamphlet, insurance industry executive and attorney Henry D. Sayer specifically remarked (from an insurance viewpoint) about the necessity of limiting workmen’s compensation coverage. He began with an understanding that “[w]e all start out with the proposition that all diseases fairly chargeable to an industry should be compensated by the industry." This understanding,

[256] Philip Drinker and Theodore Hatch, *Industrial Dust*; R. R. Sayers, *Relationship of Asbestosis and Silicosis to Disability*, United States Department of Labor, Division of Labor Standards Bulletin no. 4 (Washington, D. C.: Government Printing Office, 1935), 71; and Gerald Markowitz and David Rosner, “The Illusion of Medical Certainty,” 232, 233.

however, had its limits. "We differ, however, in the method of coverage, and the difference in method means vast difference in the rule of liability and the burden imposed upon industry." Sayer feared "blanket" coverage would lead to virtually any disease allowing compensation claims. The "great danger lies in the fact that such general and vague language will lend itself to the inclusion of any and every sort of illness and disease to which human flesh is heir." He ironically concluded by derisively belittling these ridiculous ideas as potentially leading to the inclusion of "natural" diseases such as tuberculosis, pneumonia, and cancer as occupational diseases: "We surely do not think of colds, pneumonia, tuberculosis… and cancer as occupational diseases." Sayer argued that blanket coverage could not resolve the liability crisis; rather, without strict new definitions, occupational disease coverage would provoke a new spate of lawsuits and compensation claims along with enormous discontent. He concluded that implementation of an all-inclusive method "will give rise and lead certainly to a great volume of litigation, all looking to court interpretations as to what is and what is not an occupational disease."[257]

As late as 1945 B. E. Keuchle, Vice President at Employers Mutual Liability Insurance Company continued to caution against blanket coverage. That year he wrote "The basis for the present opposition (in certain states) to extending the laws to include

[257] Gerald Markowitz and David Rosner, "The Illusion of Medical Certainty," 237; A 1936 *American Journal of Public Health* editorial discussing industrial occupational health hazards listed the tuberculosis rate of industrial workers as much higher than the general public. "Occupational Disease Control," *American Journal of Public Health* 26 (October 1936): 1031-1033. In unskilled workers—the individuals who worked most closely with silica and were therefore the most susceptible to silicosis—the tuberculosis rate in the 1930s was seven times as high as for professional workers. They were also the easiest to fire or replace. Abel Wolman, "A Century in Arrears," *American Journal of Public Health* 28 (December 1938): 1373.

compensation for diseases is the fear that through loose administration, these laws will be interpreted to offer complete social insurance against all sickness and old-age infirmities at industry's expense. Able administrators recognize this trend."[258]

Notwithstanding these concerns about broad workmen's compensation coverage, throughout the 1930s industry pushed for "appropriate" worker's compensation laws in selected states (usually those with numerous lawsuits). When coupled with industry-friendly loopholes, workmen's compensation legislation provided the fastest and most effective means of reducing the burden of silicosis lawsuits. Thus, from the IHF's inception, attorney Alfred Hirth and member companies fully supported inclusion of silicosis in workmen's compensation legislation. Their proposals called for tight limitations on the compensation with numerous restrictions to limit "racketeering" plaintiff attorneys.[259] These restrictions also served as loopholes—allowing companies to avoid paying legitimate claims. As even the association of industry doctors had noted, finding loopholes in compensation programs had been a standard practice for company lawyers since the first law was enacted in 1911.

Industry representatives believed the best way to limit compensation for opportunistic diseases was by limiting the use of the jury. They were so sure of their control over the most nationally respected experts that in their legislative proposals they frequently sought to have the issue of diagnosis left to a panel of experts. They argued initially that the diagnosis of silicosis is so complicated that the decision on disability

[258] B. E. Keuchle, "Occupational Disease Liabilities – Financial and Humanitarian," in *Industrial Tuberculosis Silicosis and Compensation*, ed. Leroy U. Gardner (New York: National Tuberculosis Association, 1945), 122.
[259] Henry B. Selleck and Alfred H. Whitaker, *Occupational Health in America*, 50.

could only be judged by silicosis experts, experts largely controlled by industry. For example, industry representatives proposed at the Oregon legislature that any claim to be referred to three experts who would have the final say with any appeal being based solely upon the record.[260]

Industry also argued before legislatures that the time to file a case should be limited to a short period (normally two years) after the last employment by the specific manufacturer. They justified this with the argument that employers needed some certainty and stability to their liability. The industrial medicine community apparently stood mute while this occurred. I have not found a single article published in the 1930s or 1940s by an industrial medicine doctor which sought to increase the time available for workmen's compensation claims. In many states these lobbying efforts were successful with new workmen's compensation laws requiring that applications for silicosis benefits be filed within one or two years after leaving employment. In Kentucky the law went even further, only allowing claims if the worker had reported the applicable lung illness to the state health board within sixty days of learning about the disease. The claimant also had to have worked in Kentucky for at least two years immediately prior to the diagnosis.[261]

These efforts continued for decades. As late as 1963, Attorney Waters, in his capacity as an IHF consultant, continued to recommend that companies lobby for very restrictive claims periods in state workers' compensation schemes for silicosis. In his 1963 Legal Series Bulletin Number 4, he recommended virtually the same legislative

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[260] J. C. Joy, *Report of the Interim Committee on Occupational Diseases* (Salem: State of Oregon Printing Department, 1939).
[261] Lorin E. Kerr, "Occupational Health: A Classic Example of Class Conflict," *Journal of Public Health Policy* 11, no. 1 (Spring 1990): 39-48, 42; and Lovell v. Osborne Mining Corp., 395 S.W.2d 596 (Ky. 1965).

program as that proposed in 1937 by him and other industry lawyers. These proposals were not due to a lack of knowledge concerning the progressive nature of silicosis. As he wrote in the same Bulletin, "It is known that frequently disability does not occur until many years after the termination of employment or exposure." Incredibly, this acknowledgement occurred less than a page before he recommended "a provision with respect to the time limitations of filing claims similar to that contained in the laws of the State of New Jersey, to wit: Two years after last exposure or last payment of compensation, or one year after employee knew or should have known of the existence of the disease, with an overall limitation of five years after last exposure." As suggested by Waters, this recommendation did provide a certainty of liability termination to employers—yet it left many, if not most, sufferers of this chronic and progressive disease without recourse. Under his scheme of compensation, claims were only payable at the time of disability. However, as recognized by both attorneys such as Waters and occupational doctors, such disability could be "many years" following the worker's last employment in a job that could cause the disease. Waters attempted to justify this position with the incorrect statement that "the existence of pneumoconiosis is medically determinable upon the termination exposure to dust…"[262] In actuality silicosis at lower exposure rates can have a latency period of twenty years or more before it shows on x-ray, but then it can be a very progressive disease. In addition, the new definition of silicosis required not only x-ray findings, but also decreased lung function, which for moderate exposures, typically occurred only several years following initial x-ray

[262] Theodore C. Waters, *Current Status of Compensation for Pneumoconioses*, Legal Survey Bulletin No. 4 (Pittsburgh: Industrial Hygiene Foundation of America, Inc., 1963), 16-18.

findings. This fact was well known to the medical experts retained by the IHF and industry. They apparently never corrected or even objected to the well publicized statements of Waters.[263]

During the 1960s workmen's compensation laws in many states still required occupational exposure to silica or other toxic substances within a set number of years prior to the compensation claim. For example, a Texas court denied an asbestosis claim for a long-time asbestos worker because he was diagnosed four years after his last job working with asbestos. South Dakota law required a person be exposed in five of the last ten years preceding disablement. Colorado had not only the five-year rule but the five years also had to be in Colorado. Other states required minimum periods of exposure, often five to ten years, before compensation would be provided. In one case a claimant (whom all parties agreed had debilitating silicosis), was denied compensation because his exposure length was four months less than the statutory five years.[264] Other states followed the lead of Kentucky, requiring that a certain period of recent exposure be in the state. Arizona required that 1200 shifts during the last twelve years be in the state. South Dakota required that at least half of the most recent ten years of work be in the state.[265]

Cases of this kind occurred throughout the U.S. In Alabama, an employee contracted a debilitating disease after working for same employer for 32 years, 23 of

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[263] As early as 1915 A. J. Lanza documented that symptoms from toxic exposures can arise years and sometimes decades later. Philip Drinker also emphasized this point in his book. Drinker stressed that silicosis can become disabling years after last exposure. He used the example of Welsh miners. Many of these miners passed their physical for the army, fought through World War I and then came back and died of silicosis. David Rosner and Gerald Markowitz, *Deadly dust: Silicosis and the On-Going Struggle*, 34; Philip Drinker and Theodore Hatch, Theodore, *Industrial Dust*, 28; and Peter S. Barth with Allan H. Hunt, *Workers' Compensation and Work-Related Illnesses and Disease,* 67.

[264] *Harvard Law Review,* "Compensating Victims of Occupational Disease," 916-937.

[265] Orosco v. Poarch, 70 Ariz. 432, 436, 222 P.2d 805, 808 (1950); Carr v. Homestake Mining Co., 88 S.D. 27, 215 N.W.2d 830 (1974).

them in mines—yet was denied compensation because he could not prove exposure to dust in his last five years of work. Georgia and Minnesota required claims to be filed within three years of the last exposure to silica dust. Texas and West Virginia (one year) also had short claims periods. In South Carolina, widows had to file within six years after the last exposure of the worker, notwithstanding when the disease was determined or death occurred. In at least one state, Utah, a claim was denied because the individual died before the commission acted, even though the original claim was timely submitted. [266]

With the broadly based assistance of both professional associations and medical researchers, the IHF and the silica industry largely obtained the legislation it desired. As Lorin Kerr discusses in his study of class conflict in occupational disease, even before the National Silicosis Conference and the IHF's establishment industry sought and in many cases obtained control of workmen's compensation for silicosis:

> Management control of compensation is obvious in the case of the West Virginia silicosis statute. In 1933 the legislature attempted to make silicosis compensable. The bill was strongly endorsed by the West Virginia Federation of Labor and legislators from mining counties, but was defeated by strong pressure from the mining industry. In 1935, management secured the enactment of legislation notable for its severe restrictions on workers' compensation. The Bulletin of the International Juridical Association stated in I936: "Whether or not the West Virginia workmen's silicosis law is declared unconstitutional, the subservience of the West Virginia legislature to the interest of employers is almost unparalleled in its hypocrisy and the statute must be wiped out." [267]

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[266] Campbell v. United States Steel Corp., 274 Ala. 326, 148 So. 2d 484 (1962); Vaughn v. Coal Operators Cas. Co., 6 Ga. App. 129, 126 S.E.2d 428 (1962); Graber v. Peter Lametti Constr. Co., 293 Minn. 24, 197 N.W.2d 443 (1972); Legate v. Bituminous Fire & Marine Ins. Co., 483 S.W.2d 488 (Tex. Civ. App. 1972); Barnhart v. State Compensation Comm'r, 128 W. Va. 29, 35 S.E.2d 686 (1945); Gunnels v. Raybestos-Manhattan, Inc., 261 S.C. 106, 198 S.E.2d 535 (1973); and Pacific States Cast Iron Pipe Co. v. Industrial Comm'n, 118 Utah 46, 218 P.2d 970 (1950).

[267] Lorin E. Kerr, "Occupational Health," 42.

In Wisconsin a court held that the compensation board's refusal to provide money to a diseased worker was appropriate despite his medical disability. The court ruled that "medical disability, does not, in the absence of an actual wage loss, entitle one to compensation." The court was simply following the state legislature's method of determining compensation for occupational diseases, a method which turned traditional workmen's compensation on its head. Traditionally injuries on the job were immediately visible and failure to pay compensation would likewise immediately hurt morale. However, since it was a chronic progressive disease, failure to pay for silicosis had much less effect on morale unless the worker had not retired or been fired for "inefficiency" before the silicosis became so disabling that he could no longer work. With the apparent blessing of the federal government's National Silicosis Conference and the establishment of the IHF, the silica industry and its insurance companies, attorneys, and public health supporters were successful in enacting similar schemes in states throughout the country.[268]

Once the workmen's compensation schemes were in place, occupational medicine and industrial hygiene experts still had a large role to play. As had occurred in civil litigation cases, industry attorneys retained many of them as expert witnesses at the compensation proceedings. For the period of the 1930s and early 1940s the official federal and state case reporters were replete with workmen's compensation cases involving silicosis. Almost all cases involved the testimony of numerous expert witnesses, with the most nationally respected ones normally appearing for the defense.

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[268] Gerald Markowitz and David Rosner, "The Illusion of Medical Certainty," 233; and Lorin E. Kerr, "Occupational Health," 42.

The decisions often turned not on the progressive nature of the disease but rather on the experts' specific testimony about whether the worker currently had a specific applicable disease, whether the individual was capable of work, and to what extent he could work.[269]

The definitions, restrictions, and limitations on silicosis that became generally accepted by occupational medical practitioners during the 1930s greatly assisted both defense attorneys and lobbyists, making plaintiff decisions much less likely. These changes provided the underlying basis for industry's embracement of workmen's compensation during the 1930s. The changes, including minimizing the past history of disease, defining silicosis in terms of its specific and unitary effect on the ability to work, and requiring greater quantification of exposure before diagnosis, were in large part successful. None of these changes came about as the result of new research findings, but all were necessary to ensure workmen's compensation claims would not become overwhelming to industry or insurance companies. With these changes silicosis no longer attracted the attention of the media and faded from the public view.[270]

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[269] See for example *Pennsylvania Pulverizing Co. v. Butler*, Circuit Court of Appeals, Third Circuit, 61 F. 311, 313-314 (At trial Professor Drinker had testified for the Pennsylvania Pulverizing Co.); *Ferguson & Lange Foundries, Inc., et al., Defendants in Error, vs. The Industrial Commission st al.*, Supreme Court of Illinois, 380 Ill. 185, 187 (June 11, 1942); *North End Foundry Company and another, Plaintiffs, v. Industrial Commission and others, Defendants,* Supreme Court of Wisconsin, 217 Wis. 363, 367-8, (March 5, 1935); *George McGehee, Appellee, v. Geo. S. Mepham and Company, Appellant*, Court of Appeals of Illinois, Fourth District, 279 Ill. App. 115, 124-126, (January 4, 1935); and *Coburn v. North American Refratories Co. et al.*, Court of Appeals of Kentucky, 295 Ky. 566, 571, 577-581, (June 25, 1943).

[270] Sayers and Gardner noted in their 1943 yearly report on pneumoconiosis that although silicosis compensation claims costs were continuing to rise, "the silicosis problem is not now attracting the attention it received a few years ago." R. R. Sayers, L. U. Gardner, L. Greenburg, E. R. Hayhurst, A. J. Lanza, and J. J. Bloomfield, "Pneumoconiosis: Industrial Hygiene Section," *American Journal of Public Health* 33 (July 1943): 849. In fact, in the state of Montana compensation benefits for silicosis almost doubled between 1941 and 1947; see "Silicosis Costs Rise in Montana," *Industrial Hygiene Newsletter* 7 (November, 1947), 3. That same year the medical director of Monsanto Chemical Company noted that "workers who have been employed in atmospheres well under the maximum allowable concentration of silica appear in some cases to be developing silicosis:" see R. Emmet Kelly, "Health Problems Resulting from Newer Technological Developments," 837.

Although many of the actual contacts and agreements between attorneys and medical researchers and practitioners remain mantled in the attorney work product privilege, it is clear that resolving the silicosis crisis involved the first wholesale attempt by industry counsel to control medical science relating to occupational health. With the rise of asbestos as the predominant occupational lung disease of the mid to late twentieth century, the methods use to minimize silicosis in the public eye would be both extended and evolve into more complex forms. Unfortunately for many of the companies, the role of the attorneys would not remain as shrouded as they were for silica.

Chapter 5 - The Asbestos Experience

The Chronology of Asbestos Hazards Public Knowledge

During the Great Depression, companies using silica were not the only parties facing increased costs due to occupational lung disease. Approximately a decade after medical doctors, government officials, and asbestos industry management clearly understood that close work with crystalline silica could cause silicosis, they also knew that silica was not the only substance that causes severe lung disease. By the early 1930s most individuals knowledgeable about occupational lung diseases understood that close work with raw asbestos fibers in the manufacture of asbestos textiles could cause severe asbestosis, often resulting in death.[271] Yet, nearly forty years went by before the occupational medicine professional community in the United States fully accepted the hazardousness of asbestos.[272]

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[271] Asbestosis was first recognized clinically in 1900 by H. Montague Murray, M.D., a physician at London's Charing Cross hospital; see William B. Fulton, Allan Dooley, L. Matthews, and Robert L. Houtz, *Asbestosis*, Special Bulletin no. 42, (Harrisburg, Pennsylvania: Commonwealth of Pennsylvania Department of Labor and Industry, 1935): 3. Henry K. Pancoast published the first American paper to mention asbestosis: H. K. Pancoast, T. G. Miller, and H. R. M. Landis, "A Roentenologic Study of the Effects of Dust Inhalation Upon the Lungs," *Transactions of the Association of American Physicians* 32 (1917): 97-108. E. R. A. Merewether, M.D., Chief Inspector of Factories in Great Britain, provided some of the earliest and best systematic reports of asbestos disease: E. R. A. Merewether, and C. W. Price, *Report on the Effects of Asbestos Dust on the Lungs and Dust Suppression in the Asbestos* Industry (London: HMSO, 1930). Many of Merewether's reports were published and widely read in the United States. See for example E. R. A. Merewether, "The Occurrence of Pulmonary Fibrosis and Other Pulmonary Affections in Asbestos Workers," *The Journal of Industrial Hygiene* XII, no. 6 (June 1930): 230-257. This journal was published by The Harvard School of Public Health.

[272] Asbestos is a fibrous mineral found in many serpentine or amphibole rocks. There are three commercially viable forms of asbestos; amosite and crocidolite come from amphibole rock, and chrysotile comes from serpentine rock. Chrysotile also normally contains a small amount of tremolite, an amphibole form of asbestos. Amphibole fibers are straighter than chrysotile and also last in the lung longer than chrysotile. Asbestos causes both nonmalignant and malignant (carcinogenic) diseases, with most research showing that the amphiboles are usually more carcinogenic. The non malignant disease, asbestosis, is a fibrosis of the interior of the lungs, primarily in the lower portions of both lungs, caused by the mechanical

In 1931 Anthony J. Lanza—the public health official whom we first encountered in Chapter 4, and the then current assistant medical director of Metropolitan Life Insurance Company—informed Johns-Manville and Raybestos Manhattan management that eighty-seven percent of their asbestos textile workers with over fifteen years experience had scarring of the lungs. Even more disturbing was his finding that forty-three percent of workers with less than five years experience had similar scarring. There were also indications that bystanders were susceptible to asbestosis. Even some watchmen and shipping clerks at the mill had asbestosis. Although, as shall be explored later, the report was not published for another five years—and company attorneys edited the final report—this finding was not unique. During the nineteen thirties numerous British, European, and American clinicians similarly reported asbestosis among indirectly exposed workers.[273]

Yet, while at least one industry study was delayed, independent hospitals and government agencies also cataloged a growing number of asbestosis cases. For example,

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scarring of the deep lung tissues by the fibers. Pleural thickening and calcification of the lining of the lungs can also occur. The malignant diseases include lung cancer and mesothelioma. Mesothelioma is a cancer of the lining of the lungs which usually causes death by suffocation. Asbestos works synergistically with smoking to greatly multiply the risk of lung cancer above the risk of either individual cause. During the twentieth century and especially the middle decades, thousands of products contained asbestos, including insulation, construction materials, gaskets, brakes, cloth, paper, oil drilling mud, plastics, kitchen potholders, and even dish cloths and kindergarten modeling clayVarious books contain information about asbestos and its associated diseases. Two well-known treatises which provide more information about these areas are Irving J. Selikoff and Douglas H. K. Lee, *Asbestos and Disease* (New York: Academic Press, 1978) and Paul F. Holt, *Inhaled Dust and Disease* (Chichester: John Wiley & Sons, 1987), 68-157. In 1948 *Science News-Letter* published a short article about new asbestos consumer products and, for fifty cents, offered to send samples to its readers "through the cooperation of the United States Rubber Company." *Science News-Letter*, "Dish Towels from Asbestos," 54, no. 13 (September 25, 1948): 204.

[273] David E. Lilienfeld, "The Silence: The Asbestos Industry," 793. These events are further explored later in this Chapter. They have been described by numerous authors. See for example, David Ozonoff, "Failed Warnings," 139-218; Robert N. Proctor, *Cancer Wars*, 113; and Barry I. Castleman, *Asbestos: Medical and Legal Aspects*, 4th ed. (Frederick, Maryland: Aspen Publishers, Inc., 1996), 517 (Castleman testifies extensively for plaintiff counsel in asbestos lawsuits).

during the early to mid 1930s John Donnelly, a physician at the Mecklenberg Sanatorium in Huntersville, North Carolina, wrote two articles describing both the progressive nature of asbestosis and the lack of controls in workplaces. His 1932 article succinctly provides his conclusions about the hazards of asbestos.

> . . . exposure to the inhalation of this dust [asbestos] for even a comparatively short time is a definite and serious industrial hazard, has been too frequently indicated to be open to doubt. The fact that the condition when once acquired is permanent and more or less rapidly progressive is most important from a public health viewpoint. It also seems to be the consensus of opinion, not only among writers on the subject, but also among the asbestos workers, that the protective devices now in use in many plants are most inadequate.[274]

By the late thirties, with the moral and financial support of the Roosevelt administration, numerous states began establishing industrial hygiene departments within their governments. Shortly thereafter, several of these state agencies, including those in North Carolina and Pennsylvania, became more active in investigating the asbestos hazards. The North Carolina State Bureau of Health commissioned the better known of these studies—a comprehensive asbestos study of textile workers by the physician Waldemer Dressen—yet the Pennsylvania study was first and provided possibly even more compelling data concerning the widespread hazards of asbestos. The Pennsylvania report, issued three years before the better-known Dressen Report, also examined textile mills. It found numerous work sites with exposure levels well in excess of five million particles per cubic foot (mppcf), several of which were even well in excess of twenty

[274] J. Donnelly, "Pulmonary Asbestosis," *American Journal of Public Health* 23 (December, 1932): 1281; J. Donnelly, "Pulmonary Asbestosis: Incidence and Prognosis," *The Journal of Industrial Hygiene and Toxicology* 18, no. 4 (1936): 222-228.

mppcf. The average exposure level in areas of the textile mills handling asbestos was just under 5 mppcf. In what would have been of great significance if it had become widely known, the investigators also found very high exposure levels in work activities for other types of asbestos usage. These activities included several of great significance for the construction and automotive industries, including sawing asbestos tiles and shingles, preparing asbestos insulation material, and grinding asbestos clutches, all far exceeded the 5 mppcf exposure level. Of the sixty four individuals examined, fourteen had asbestosis. Over one third (15) of the negative group were under the age of thirty, whereas none of the positive group were under thirty. The individuals with asbestosis comprised twenty five percent of the non control group and one third of the over thirty exposed group. This study does not appear to have received much attention from industry, likely due to the investigators' reluctance to recommend a safe concentration. "Nor is it possible from our findings to establish the maximum safe concentration of asbestos dust in the air." Without such a recommended level, industry could not publicize its conformance with an alleged recommend safe exposure level, nor claim it was taking actions which assured the health of its workers.[275]

Dressen, the U.S. Public Health Service physician, led the North Carolina study. In his 1938 report on the study he indicated that of the workers in the study with 100 million particle years of exposure to asbestos, half had asbestosis. Twenty percent of the workers with between fifty and ninety-nine million particle years of exposure had asbestosis, while none of the thirty-nine workers with less than fifty million particle years

[275] William B. Fulton, Allan Dooley, L. Matthews, and Robert L. Houtz, *Asbestosis: Special Bulletin No. 42*, 14, 15, 18, 19; the quote is at 28.

of exposure had asbestosis. From this information Dressen concluded that ten years' exposure to 5 mppcf of asbestos containing dust carried a very significant risk of asbestosis. He recommended a provisional safety threshold of 5 mppcf. Thus was born the first suggested United States maximum exposure level for asbestos.[276]

Yet, Dressen cautioned that the study was not definitive and did not provide assurances of disease prevention. He thus recommended only that "5 million particles per cubic foot may be regarded as the threshold value for asbestos-dust exposure until better data are available." Furthermore, he cautioned that the values "must be viewed with caution because they are based on small numbers of workers. This was particularly true in the groups with more than 10 years' employment," since even workers with less than 25 million particle year's exposure had significantly higher rates of cough than unexposed office personnel. In addition, at least 2 ½ % of workers with 25 million particle-year exposures had asbestosis. At a threshold level of 5 mppcf, this was only five year's exposure, less than a quarter of an individual's work life. Thus, Dressen's study actually demonstrated that the recommended threshold level was not a "safe" level of

[276] In 1932 only four states included industrial health within the purview of their government. Within five years that number increased to seventeen. By 1942 thirty six states had industrial hygiene activities; details are found in Victoria M. Trasko, "An Analysis of Industrial Hygiene Activities in State and Local Health Departments, 1940-41," *Public Health Reports* 57, no. 23 (June 5, 1942): 853-4; and W. C. Dressen, J. M. Dalla Valle, T. I. Edwards, J. M. Miller, and R. R. Sayers, "A Study of Asbestosis in the Asbestos Textile Industry," *Public Health Bulletin* No. 241, U. S. Govt. Printing Office, (Washington, DC, 1938). Although less well known, the Pennsylvania report issued three years earlier (discussed above in this Chapter), also found numerous work sites with exposure levels well in excess of 5 mppcf, several of which were even well in excess of 20 mppcf. The average exposure level in areas handling asbestos was just under 5 mppcf. It also found other occupations such as sawing asbestos tiles and shingles, preparing asbestos insulation material and grinding asbestos clutches all far exceeded the 5 mppcf exposure level. Of the sixty four individuals examined in Pennsylvania, fourteen had asbestosis. Over one third (15) of the negatives were under the age of 30, whereas none of the positive group was under thirty. The individuals with asbestosis comprised twenty five percent of the non control group and one third of the over thirty exposed group. I have found no citations to this study in any industry generated publications. William B. Fulton, Allan Dooley, L. Matthews, and Robert L. Houtz, *Asbestosis: Special Bulletin No. 42*.

asbestos exposure, for even individuals exposed throughout their work life to levels well below this value were at significant risk of contracting asbestosis. [277]

Throughout the 1940s, even as industry and governmental agencies publicly supported the 5 mppcf exposure level, awareness of the potential hazards of asbestos products, as opposed to raw fiber, continued to grow among both governmental agencies and industry. For example, the Pennsylvania Department of Labor and Industry issued a Safe Practice Bulletin in 1942 concerning usage of asbestos in the wire industry. General Electric, a member of the Industrial Hygiene Foundation, owned the studied plant. Asbestos came into the plant not as raw fiber, but as yarn and batting. The Safe Practice Bulletin emphasized that dust equipment was necessary even for these types of plants, which—unlike the formerly studied textile mills—did not use raw asbestos. In addition, the Bulletin emphasized that workers should take precautions, such as taking showers at the conclusion of their shift, so they did not carry asbestos fibers home.[278] These government studies and reports, however, provided little impetus to change the recommended exposure level for asbestos. Over thirty years would pass before the Federal government took action to reduce the workday exposure level below Dressen's admittedly provisional and inadequate level.

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[277] Particle years equal the average particle exposure for each work day multiplied by the number of years of exposure; see W. C. Dressen, J. M. Dalla Valle, T. I. Edwards, J. M. Miller, and R. R. Sayers, "A Study of Asbestosis." Also see E. L. Schall, "Present Threshold Limit Value in the U.S.A. for Asbestos Dust: A Critique," *Annals of the New York Academy of Sciences* 132 (December 31, 1965): 317-321; Robert N. Proctor, *Cancer Wars*, 113; and David Ozonoff, "Failed Warnings," 189.

[278] Robert L. Holtz, ed., *Occupational Disease Prevention: Exhausting Asbestos Fiber and Dust in Wire Insulation Manufacture, Safe Practice Bulletin No. 93* (Harrisburg, Pennsylvania: Commonwealth of Pennsylvania, Department of Labor and Industry, April 1942).

The nineteen thirties and forties also saw increasing reporting of lung cancer in populations of asbestos workers. The earliest recorded observation of lung cancer linked to asbestos occurred in a 1934 report by a pair of physicians, W. B. Wood and S. R. Gloyne, in England. They reported finding two lung carcinomas during autopsies of 53 individuals with asbestosis. At the time lung cancer was not a prevalent disease among the general population. Thus, journal editors found such case reports interesting. One year later physicians K. M. Lynch and W. A. Smith reported on a case of lung cancer in a man with asbestosis. The following year the editors of the *American Review of Tuberculosis* published a similar case report in which medical doctors D. S. Egbert and A. J. Geiger wrote that "the irritating effects of the inhaled asbestos particles may in this case have been a significant factor in the development of the primary lung cancer [and] seem sufficiently plausible to be worthy of consideration."[279]

Other reports followed, particularly in Germany. In 1938 German pathologist Martin Nordmann reported on two additional clinical observations of lung cancer related to asbestos. In 1941 Nordmann and a coauthor further reported lung carcinomas in white mice following inhalation of asbestos dust. Based on these studies, German medical writers reached consensus on the linkage almost immediately, with Germany in 1943—even amid the turmoil of World War II—declaring lung cancer to be an occupational disease when linked to asbestos exposure. Other European countries followed shortly

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[279] W. B. Wood and S. R. Gloyne, "Pulmonary Asbestosis: A Review of One Hundred Cases," *Lancet* 2 (1934): 1383-1391; K. M. Lynch and W. A. Smith, "Pulmonary Asbestosis III: Carcinoma of the Lung in Asbesto Silicosis," *American Journal of Cancer* 24 (1935): 56-64; The quote is from D. S. Egbert and A. J. Geiger, "Pulmonary Asbestosis and Carcinoma-Report of a Case with Necropsy Findings," *American Review of Tuberculosis* 34 (1936): 143-150, as quoted in David Ozonoff, "Failed Warnings," 199.

thereafter. Within three years the company doctor of an asbestos plant in London wrote that the link of asbestos and cancer was sufficiently strong to justify the introduction of better control measures. British doctors generally reached consensus by 1950, shortly after a report by British industrial medicine physician Edward Merewether, in which he found that at autopsy 13.2% of asbestosis cases had lung cancer.[280]

Similar information had also been independently developed in the United States. In the late thirties and early forties Leroy Gardner, a medical doctor and Director of Saranac Laboratories (whom we previously met in chapter 4), conducted numerous animal studies similar to those of Nordmann. Several asbestos manufacturing companies and their insurance company funded these studies. As early as 1942 Gardner determined that inhaled chrysotile fibers could induce malignant neoplasia in mice. By then he had also collected information on eleven cases of human lung cancer and two cases of what would become known as mesothelioma. Unfortunately, neither he nor his successors published much of this work. The work that was finally published provided either little or no information concerning cancer. Similarly, unlike prior symposium papers, the 1952

[280]Industry knew about Nordmann's findings the same year his report was published in Germany. By this time the Industrial Hygiene Foundation, an industry trade association discussed in the previous chapter, was collecting world wide medical articles for occupational dust diseases and publishing abstracts of them in its Digest that it sent to all members; see Daniel C. Braun Deposition on May 1, 1980 in *Harold W. Hoover, plaintiff vs. Johns-Manville, et al.*, Civil Action No. C65700, et al., District Court in the City and County of Denver and State of Colorado, abstract included on page 96, volume 2 of Defendants Exhibit 1 (Exhibit 1 cited on page 10 of the deposition). Nordmann was also discussed in Phillip E. Enterline, "Changing Attitudes and Opinions Regarding Asbestos and Cancer 1934-1965," *American Journal of Industrial Medicine* 20, no. 5 (1991): 688-692. Information about Britain and the London company doctor is from Geoffrey Tweedale, "Asbestos and its Lethal Legacy," *Nature Reviews: Cancer* 2 (April 2002): 2; and E. R. A. Merewether, *Annual Report of the Chief Inspector of Factories for the Year 1947*, (London: HMSO, 1949). Of course, at this time neither cancer, nor statistical arguments were fully understood, and certainly United States scientists viewed Nazi research with suspicion. However, the point here is not that this information should have made companies aware, but rather that it did make them aware of the potential hazards, as evidenced by their efforts to conduct their own subsequent research.

Saranac Laboratory sponsored symposium proceedings, which included extensive reports on the relationship between asbestos and cancer, were not published.[281]

Thus consensus arrived much more slowly in the United States. Many doctors were wary of the foreign studies, particularly those published in Germany during the Nazi era. As William E. Smith, Assistant Professor in the Department of Industrial Medicine of New York University, stated in 1952, "The experience described by Nordmann and Sorge does not afford evidence that asbestos dust is capable of provoking tumours."[282] One year later Smith wrote a paper evaluating the claims for occupational factors in lung cancer which typified the confused state of United States medical opinion concerning asbestos and lung cancer. In the asbestos section of the paper, he initially noted Merewether's findings of a much higher lung cancer rate among cases of asbestosis than among cases of silicosis. He indicated that this raised the question of "whether asbestosis predisposes to carcinoma of the lungs."[283] Even so, he believed that there were too few cases to provide convincing evidence. He seemingly acknowledged a causal relationship when he went on to implicitly suggest that the virtual disappearance of cancer among individuals employed in the British asbestos industry since the Merewether report was the

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[281] In 1949 Schepers visited the Saranac Laboratories for three months and was provided access to Gardner's records. Schepers eventually became the Director of the Saranac Laboratories in 1954. Gerrit W. Schepers, "Chronology of Asbestos Cancer Discoveries: Experimental Studies of the Saranac Laboratory," *American Journal of Industrial Medicine* 27 (April, 1995): 593-606; and Geoffrey Tweedale, "Asbestos and its Lethal Legacy," 2-3. As is described later in this Chapter, industry lawyers kept this information from becoming public. Saranac Laboratories is the same former tuberculosis facility discussed in Chapter 4. By 1932 Gardner was its director. He died in 1946. For a description of the early work of the Saranac Laboratories, see Edward R. Baldwin, "Saranac Lake and the Saranac Laboratory for the Study of Tuberculosis," *The Milbank Memorial Fund Quarterly Bulletin* 10, no. 1 (January 1932): 1-16.

[282] William E. Smith, "Lung Cancer with Special Reference to Experimental Aspects," *A. M. A. Archives of Industrial Hygiene and Occupational Medicine* 5 no. 5 (March 1952): 212.

[283] William E. Smith, "An Evaluation of Claims for Occupational Factors in Cancer of the Lungs," *ACTA Union Internationale Contra Cancrum* 9 no. 3 (1953): 478.

result of better ventilation. However, he did not explicitly acknowledge that the disappearance of cancer with falling exposure rates provided strong evidence that asbestos caused the cancers. Ironically, he then noted that he had visited Merewether prior to the conference at which he was speaking "and learned that additional cases [of lung cancer] had occurred," thus leaving open the question about whether better ventilation was sufficient to reduce any risk. His concluding thoughts on asbestos were simply that cases of lung cancer in asbestos workers "will require careful analysis with reference to the population at risk," especially since other countries such as Finland, with shorter periods of asbestos usage, did not show evidence of increased lung cancer in the asbestos worker populations.[284]

Smith's presentation of this paper at an international medical conference also demonstrated the distance between British and American doctors in accepting the linkage between asbestos and lung cancer. During the discussion phase of the presentation, a British doctor remarked that he had seen several specimens of "asbestos cancer of the lung" in the lower lobe at a medical lab in Wales. He asked Smith whether most such cancers were in the lower lobe. Smith did not appear interested in following up on the Welsh findings. He did not dispute the characterization of "asbestos cancer of the lung," but simply responded that he was not aware of a special localization.[285]

Still, during the 1940s and 1950s, a few American medical authorities recognized the potential hazards of asbestos, as well as other environmental toxic substances. These

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[284] *Ibid*.
[285] *Ibid*.

doctors attempted to call attention to the increasing list of reports linking asbestos and lung cancer. Wilhelm Hueper, M.D., of the National Cancer Institute, was foremost among these renegades. After immigrating to the United States from Germany in 1923, he had initially worked for Du Pont, before being laid off "for economic reasons."[286]

Hueper subsequently began work on his magnum opus, *Occupational Tumors and Allied Diseases*, a book based both upon his own experiences and his extensive reading of the medical literature. He published the book in 1942. In it, Hueper outlined the current evidence of asbestos lung cancers and provided several factors which were suggestive of an occupational causation. He concluded his examination with a look at "Medico-Legal and Social Aspects," calling the evidence "sufficiently serious, and the number of persons exposed to the suspected causative agent large enough to indicate a thorough and extensive clinical, statistical, and experimental investigation of the incidence and causative interrelation of asbestosis and pulmonary carcinoma." He repeated these same warnings throughout the following decades.[287]

By 1948, Hueper's pioneering efforts in occupational and environmental cancers achieved results. That year he was appointed the founding director of the Environmental Cancer Section of the National Cancer Institute (NCI). He remained at this post until

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[286] Wilhelm Hueper's work for Du Pont and his observations of misconduct there were previously discussed in Chapter 3 at pages 53-55 and footnote 101.

[287]Hueper was the first American researcher to understand the systemic meaning of experimental and clinical work on occupational and environmental cancers; see Wilhelm C. Hueper, *Occupational Tumors and Allied Diseases* (Springfield, Ill.: Charles C. Thomas, 1942), 403-405, and the quote is at 405. The following year this work was summarized in a Bulletin of the American Society for the Control of Cancer. Wilhelm C. Hueper, "Cancer in its Relation to Occupation and Environment," *Bulletin of the American Society for the Control of Cancer* 25 (1943): 63-69; Wilhelm C. Hueper Deposition on June 16, 1977 in *Eleanore Miller vs. Raybestos-Manhattan, Inc.,* 12. A detailed look at the history of Hueper's work is found in Christopher Sellers, "Discovering Environmental Cancer: Wilhelm Hueper, Post-World War II Epidemiology," 1824-1835.

1964. Throughout this career at the NCI Hueper stressed the importance of occupational carcinogens, including asbestos, to the growing level of cancers in society. For example, in an address before the Cancer Prevention Committee in New York on June 15, 1949, Hueper used asbestos as an example of how carcinogenic substances can shift the normal sex ratio of cancer incidence. He told the audience that Merewether's investigations provided many of the answers about asbestos and lung cancer. Although at the time the lung cancer male-female ratio was 5:1, in his study of asbestos workers, Merewether found the sex ratio to be only 2:1. In his 1951 article on occupational disease hazards, Hueper again made specific reference to the excessive incidence of lung cancer found by Merewether in his cases of asbestosis. Hueper used this example to demonstrate that plant physicians, by careful examination of the excessive rate of cancer among special groups of workers, frequently obtained clues concerning lung cancer causation.[288]

His 1955 monograph on environmental causes of lung cancer went even further, noting the sustained case reporting of lung cancer in asbestotic patients during the 1930s through the 1940s. He also noted that epidemiologic studies had found higher incidence of lung cancer among asbestotics. In discussing this possible connection, Hueper acknowledged that several doctors were skeptical of asbestotics having an excess risk of lung cancer, including Lanza, Vorwald, Warren and Cartier, with two more undecided. But a larger number—seventeen—believed the causal link either established or highly probable. One year later he published a chart of cancer deaths from occupational

[288] Wilhelm C. Hueper, "Unpublished draft autobiography," 131, 134; Wilhelm C. Hueper Deposition on June 16, 1977 in *Eleanore Miller vs. Raybestos-Manhattan, Inc.,* 36; and W. C. Hueper, "Occupational Cancer Hazards in American Industries," *A.M.A. Archives of Industrial Hygiene and Occupational Medicine* 5 (March 1952): 206.

carcinogens. Asbestos, with 112 known deaths, was third on the list, following only radioactivity (625 cases) and chromates (140 cases). In further support of his opinion, Hueper noted that in autopsies of asbestotics, thirteen point two (13.2) to twenty (20.0) percent had lung cancer compared to the general population's rate of only point eight (0.8) to two point four (2.4) percent.[289]

A few other occupational medicine doctors followed Hueper's lead. In a 1952 presentation before a Workmen's Compensation course at New York University, May R. Mayers, chief of New York's Division of Industrial Hygiene Medical Unit, noted the growing understanding of the relationship of asbestos and cancer:

> Silica and Asbestos are of special importance among the dusts which fall into this category [Pneumoconiosis]. The environmental conditions for their development are essentially similar. Nevertheless, silicosis is not, apparently associated with, or productive of lung cancer, whereas asbestosis very probably is.

In the same presentation he also cautioned about the inappropriateness of threshold or maximum exposure levels for carcinogens. [290]

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[289] Wilhelm C. Hueper, *A Quest into the Environmental Causes of Cancer of the Lung*, Public Health Monograph No. 36 (Washington, D. C.: U.S. Department of Health, Education and Welfare, 1955), 36-37 (As noted earlier, Lanza worked for the industry's insurance company and headed the industry friendly IHF medical committee; Vorwald did considerable work for industry; and Cartier was medical director for a group of Canadian asbestos mines.); and Wilhelm C. Hueper, "Environmental Causes of Cancer of the Lung Other than Tobacco Smoke," *Diseases of the Chest* 30, no. 2 (1956): 141.

[290] May R. Mayers, "Industrial Cancer of the Lungs," *Compensation Medicine* 4 (March-May 1952): 12, 14-15. Mayers also gave a talk on occupational diseases to the 146th annual meeting of the Medical society of New York. This talk, which also listed asbestos as a probable carcinogen, was published in May R. Mayers, "Occupational Disease Diagnosis," *New York State Journal of Medicine* 52, no. 19 (1952): 2381-2385. Given the intended audiences of these journals—individuals concerned with workmen's compensation and all New York doctors—it is highly likely that attorneys and doctors for most companies, as well as the IHF staff, read at least one of them.

British doctors were more willing to make the connection when they spoke in the United States. The best example might be noted British medical researcher A. I. G. McLaughlin's 1955 Saranac Lake "Occupational Chest Disease" Conference discussion of the status of research into dust diseases in Great Britain also fully supported Hueper's position on the relationship of asbestos and lung cancer. "The connection between asbestosis and cancer of the lung is becoming clearer, and in one series of 100 autopsies on asbestosis cases there were 25 cases of cancer of the lung," McLaughlin declared. He also noted reports of asbestosis appearing in other occupational groups such as pipe laggers and insulators.[291]

That same year a significant development occurred that had the potential of being a turning point in asbestos knowledge. Richard Doll—considered by some to be the leading epidemiologist of his era and later knighted by Queen Elizabeth—demonstrated that British asbestos workers suffered high rates of lung cancer. As with many other articles linking asbestos and cancer, the asbestos industry (in this case Turner and Newell of Britain), rejected its own doctor's request to publish his and Doll's article. When Doll published the findings on his own, company attorneys unsuccessfully attempted to have the journal editor reject the article, presumably because it might have hurt their profits.[292]

This study, while considered definitive in Europe, did not have an immediate impact in the United States. Henry Stokinger, a well respected industrial hygienist, offered one possible explanation in the 1956 *Annual Review of Medicine*. In this article

[291] A. I. G. McLaughlin, "The Dust Diseases in Great Britain," in *Transactions of the McIntyre-Saranac Conference on Occupational Chest Disease* (Chicago: American Medical Association Press, 1955), 88-9, 96.
[292] Geoffrey Tweedale, "Asbestos and its Lethal Legacy," 3: Robert N. Proctor, *Cancer Wars*, 115.

he stressed that, unlike what occurred in European countries, asbestos did not necessarily cause lung cancer in the United States. While he acknowledged that in both Europe and the United States, sixteen percent of individuals autopsied upon dying from asbestosis to date had lung cancer—a much higher percentage than normally found at autopsy—this in itself was not sufficient proof. Rather, he looked at the claimed distinctions in the rates of cancer between British and American asbestos workers, as well as what he considered a possible explanation for the distinctions. "It is of more than passing interest that the higher rate of cancer in asbestos workers in England is not paralleled in the United States or in Canada, according to Lanza," Stokinger noted. "The cause for this difference may lie in the type of asbestos…"[293] Stokinger apparently accepted the Canadian mining industry's claim that chrysotile, the form of asbestos found in Canada and predominantly used in the United States, did not have the same hazardous characteristics as did crocidolite or amosite.

An epidemiologic study published less than two years later seemed to buttress Stokinger's position. Two medical doctors, Daniel C. Braun and T. David Truan, both of the Industrial Hygiene Foundation, conducted this study for the Quebec Asbestos Miners Association (QAMA) and published it in 1958.[294] In their report, Braun and Truan indicated that they had studied every asbestos miner employed in 1950 with five or more

[293] Herbert E. Stokinger, "Toxicologic Aspects of Occupational Hazards," In *Annual Review of Medicine* 7 ed. David A. Rytand and William Creger (Stanford, California: Annual Reviews, Inc., 1956), 178. As was seen in the last Chapter, Lanza worked closely with both silica and asbestos industry attorneys.

[294] A couple of years later the IHF approached at least one other asbestos industry trade association, the Asbestos Textile Institute (ATI), about a similar study. On March 7, 1957 the ATI rejected the proposal because of the similar study being undertaken for QAMA. They did "not believe there is enough evidence of cancer or asbestosis in this industry to warrant a study," and the study "might stir up a hornet's nest and put the whole industry under suspicion." Barry Castleman, *Asbestos: Medical and Legal Aspects*, 112; and the author's mid 1990s personal interview of a participant in the ATI's decision.

years of exposure. They examined the death rates of this 6000 man cohort over five years and found nine confirmed and three suspected lung cancers. The nine confirmed cancers were only slightly above the expected rate of eight lung cancers for Quebec Province.[295] Ironically, only one year before, the June 1957 *Industrial Hygiene Digest* had summarized a Danish report which had found that 22 of 31 long-time insulators, a group whose exposures were likely substantially lower than that of miners, had abnormalities of the lung.[296]

The *Archives of Industrial Health* accepted the paper for publication—likely because the editor, Stokinger, did not believe in an association of asbestosis with lung cancer. As he wrote to the authors:

> I, myself, was particularly pleased to learn the main conclusion of the paper was against the association of lung cancer with asbestosis, for I had come to a similar conclusion on obviously less information but was afraid to say so for this reason. I am enclosing a review which contains a few sentences that I have marked in this connection that appears in the Annual Review of Medicine, Volume 7, 1956. You will recall at this time evidence greatly favored the positive correlation of lung cancer on exposure to asbestos.[297]

The Braun Truan Report and Lanza's opinions remained effective into the 1960s. For example, in 1960 the *Archives of Industrial Health* published yet another case report of an asbestos-related cancer. In his review of the medical literature the article's author, John Anderson, M.D., missed many of the European cases and the Saranac Lake animal

[295] Daniel C. Braun and T. David Truan, "An Epidemiological Study of Lung Cancer in Asbestos Miners," *A. M. A. Archives of Industrial Health* 17 (June 1958): 634-653.
[296] Industrial Hygiene Foundation, "Literature Abstracts," *Industrial Hygiene Digest* 21 (June 1957), 16.
[297] H. E. Stokinger to D. C. Braun of January 20, 1958, Daniel C. Braun Deposition on September 5, 1980 in *Thomas J. Neary, et al., v. Johns-Manville, et al.*, Civil Action No. H-78-790, et al., USDC for the District of Maryland, Defendants Exhibit 18.

research. In his discussion of causation, he noted that Hueper felt very strongly about the connection between asbestos and cancer, but, like many American doctors who were not familiar with European research or confidential Saranac animal research, Anderson was unwilling to make a "final assessment of the relationship between asbestosis and lung carcinoma." That same year an author of a medical textbook referenced the Braun Truan study in support of the position that "asbestos had not been found to be carcinogenic."[298]

The mid 1960s proved the turning point for medical opinion on this issue in the United States. In 1963, Thomas F. Mancuso, M.D., former chief of the division of industrial hygiene, Ohio State Department of Health, and a coauthor published an epidemiologic study of workers at a textile plant linking asbestos and lung cancer. Although this paper provided significant evidence of the linkage between asbestos and lung cancer, the enormous epidemiologic study of insulation workers published shortly thereafter by Irving Selikoff, M.D., of New York's Mount Sinai Hospital, quickly overshadowed it. At the 1964 international conference on the "Biological Effects of Asbestos," held under the auspices of the New York Academy of Sciences, Selikoff presented the results of a study covering approximately ten thousand insulation workers. Selikoff found not only a large incidence of asbestosis in the cohort, but also a very significant level of lung cancer. [299] Two decades after German health researchers had

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[298] John Anderson and Francis A. Campagna, "Asbestosis and Carcinoma of the Lung," *Archives of Environmental Health* 1 (July 1960): 27, 31, 32. The textbook is R. T. Johnson and S. Miller, *Occupational Diseases and Industrial Medicine* (Philadelphia, Pa.: W. B. Saunders Co., 1960).

[299] R. F. Mancuso and E. J. Coulter, "Methodology in Industrial Health Studies: The Cohort Approach with Special Reference to an Asbestos Company," *Archives of Environmental Health* 6 (1963): 210-226; and I. J. Selikoff, J. Churg, and E. C. Hammond, "The Occurrence of Asbestosis Among Insulation Workers in the United States," *Annals of the New York Academy of Science* 132, no. 1 (December 31, 1965): 139-155.

reached this conclusion, and almost a decade following a similar conclusion in Great Britain, U.S. specialists finally sensed the tide had turned.

Numerous other papers presented at the Conference also documented the hazardousness of asbestos. Twenty-three of the sixty-five Conference presentations dealt with asbestos and cancer. Twenty of the papers supported the relationship of asbestos and cancer, with the remaining three expressing no opinion. For most doctors, this conference settled the question about whether asbestos causes lung cancer: an overwhelming number of researchers had independently established causal links between asbestos and lung cancer.[300]

Since most of its members were attending the New York Conference, the International Union Against Cancer convened a working group on asbestos and cancer during the conference sessions. The working group, which included numerous government, academia, and industry experts from nine countries, published opinions stating that both carcinoma of the lung and mesothelioma were demonstrably associated with exposure to asbestos dust. The group also noted that its findings "suggest that a more serious and widespread hazard from exposure to asbestos dust may exist than is widely appreciated." It recommended in part that epidemiologic studies be extended to the insulating industry, the asbestos products industry, and other locations where asbestos was regularly used, including certain factories and the building industry.[301]

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[300] The articles and papers are contained in "Biological Effects of Asbestos," *Annals of the New York Academy of Sciences* 132, no. 1 (December 31, 1965): 1-766. For the importance of the Conference see Phillip E. Enterline, "Changing Attitudes and Opinions," 693.
[301] International Union Against Cancer Working Group on Asbestos and Cancer, "Report and Recommendations," *Archives of Environmental Health* 11 (August 1965): 223-224.

Shortly after the Conference, a groundswell began building for lowering the asbestos maximum exposure level (at this time the exposure level was called the Threshold Limit Value, or TLV). This may have resulted from New Jersey State Department of Health physician E. Lynn Schall's New York Conference presentation. Schall offered a powerful argument for lowering the recommended level of asbestos exposure. Schall first reviewed the history of the TLV. He wrote that in adopting this level the American Conference of Governmental Industrial Hygienists (ACGIH) had only relied upon some animal studies and one epidemiologic study, that of Dressen in 1938. Schall then argued that Dressen's study was both flawed and preliminary. The flaws were many and varied. The types of dust sampled included rock dust which increased the overall particle count. The counts varied dramatically between different operations. About fifteen months prior to the study, about 150 workers had been replaced. The majority of these individuals were not examined because they could not be found. The plants also had an abnormally large number of individuals who had worked less than five years, 333 of 511. Seventy-three were employed by the mills for less than a year. Furthermore, even Dressen had regarded the number as only a working figure. He had indicated that the values "must be viewed with caution because they are based on small numbers of workers. This was particularly true in the groups with more than ten years' employment." Schall argued that this fact was of special importance because, as Merewether had discovered, even with a smaller concentration of dust, fibrosis could develop fifteen to twenty-five years later. After almost thirty years, occupational medicine professionals had finally undertaken the research that Dressen had rightfully acknowledged was necessary. As Dressen had realized might be the case, his suggested exposure limit was woefully insufficient. [302]

Asbestos Science: The Handmaiden of Litigation

Why did this understanding take so long to gain traction in the United States? In his 1991 review of asbestos and cancer, Phillip Enterline, at the time a well respected Emeritus Professor of Biostatistics at the University of Pittsburgh Graduate School of Public Health, suggested this was due to several reasons, including, among others, the unpopularity of Germany among Americans after World War II, the adverse attitude of American leading experts such as Lanza and Vorwald, and the lack of experimental evidence. Although Enterline did not suggest that Lanza's or Vorwald's opinions might have been affected by their industry sponsored work, he did suggest one additional related factor for the delay in his conclusion: "…since the asbestos industry probably exercised some control over research… findings unfavorable to the use of asbestos were clearly not in their interest."[303] Enterline, for reasons that are later explored, left unsaid the probable outcome of this situation: if a finding was not in the economic or litigation interest of industry, it either would not be published or would be modified to suit the funding agency. Historical evidence suggests this is exactly what happened.

Indeed, with the considerable help of its lawyers, throughout much of the twentieth century industry managed to keep the most critical information about the

[302] E. L. Schall, "Present Threshold Limit Value," 317-321.
[303] Phillip E. Enterline, "Changing Attitudes and Opinions," 694.

hazards of asbestos, including its own studies, from becoming accepted by either the occupational medicine community or the public. The deception began almost as soon as employee asbestos cases began appearing and involved most, if not all of the major companies, with Johns-Manville attorneys taking the lead. From the medical side Anthony Lanza, Leroy Gardner, and the Industrial Hygiene Foundation played key roles in this process.

Lanza, in particular, provided great assistance to industry's defense of asbestos litigation. As discussed previously, Anthony Joseph Lanza had joined the Public Health Service, as a young physician in 1907, becoming Chief Surgeon to the Bureau of Mines in 1914. After leaving the Public Health Service in 1920 as a recognized pneumoconiosis expert and being hired in 1926 by Metropolitan Life, Lanza began directing industrial hygiene surveys for asbestos companies as part of his duties. Although Lanza subsequently expressed concern about the health of workers and their families and claimed to "have no axe to grind," these duties quickly brought him into the litigation science fold.[304]

In this administrative position Lanza became closely involved with corporate attorneys at least by 1929. In November of that year he sent a bibliography on asbestosis to Mr. Allan Wardwell, attorney with the Wall Street law firm of Davis and Polk, Johns-Manville's outside corporate counsel. This assistance continued throughout Lanza's career at Metropolitan Life and included all phases of litigation and workmen's

[304] A. J. Lanza memoranda of February 27, 1935, to Dr. Armstrong, Third Vice President of Metropolitan Life, obtained at Johns Manville Repository, Denver, Colorado and in author's possession.

compensation. For example, the following year he wrote to Wardwell about the proposed definition of asbestosis for the workmen's compensation schedule then being codified in New Jersey.[305]

As described at the beginning of this chapter Lanza completed what was possibly the first industrial hygiene survey for Johns Manville in 1931. He sent the report to Wardwell, as was a similar report for the Canadian plants prepared by Lanza's superior, E. McConnell, M.D. Although Lanza's survey found asbestosis in the vast majority of the long-term workforce, Lanza informed Wardwell that he "understood that this report is confidential and it will be given no publicity by us except with the consent of the firms concerned." In early 1932, probably as a result of the survey, Lanza recommended to Johns-Manville officials that they seek inclusion of asbestosis under the workmen's compensation laws. As the minutes of the meeting held to discuss the issue described: "[Lanza] is very strongly of the opinion that asbestosis should be made compensable… He feels that this is the only protection which the industry has… permitting the disease to remain outside the compensable class lends encouragement to unethical lawyers and physicians to work up claims." Lanza understood that lawsuits posed a much higher risk for the insurance company's assets than did workmen's compensation cases.[306]

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[305] David E. Lilienfeld, "The Silence: The Asbestos Industry," 791-2. Much of the following information about Lanza was obtained from Lilienfeld's thorough review of early occupational disease research; see A. J. Lanza letter to A. Wardwell, November 25, 1929, Exhibit 3 in *Laura Bialy, Administrator of the Estate of Theodore Bialy v. Johns Manville Corp. et al.* Civil Action C/AN 79-1336 (D. N.J.) (1986) (cited hereinafter as *Laura Bialy*); and A. J. Lanza letter to A. Wardwell, November 11, 1930, *Laura Bialy* Exhibit 7.

[306] The no publicity quote is from A. J. Lanza letter to A. Wardwell, March 20, 1931, *Laura Bialy* Exhibit 11; E. J. McConnell letter to A. Wardwell, July 9, 1931 *Laura* Bialy Exhibit 13. The only protection quote is from Minutes of July 15, 1931 meeting between Lanza, McConnell, and several Johns-Manville officials, *Laura Bialy* Exhibit 14; and David E. Lilienfeld, "The Silence: The Asbestos Industry," 792.

However, Lanza focused not only on urging Johns Manville to seek inclusion of asbestosis in Workmen's compensation, but, as he had the responsibility to do as an insurance company employee, continued to assist Johns Manville attorneys in the defense of their employee asbestos related lawsuits. After the meeting, Lanza helped Johns-Manville's general counsel, Vandiver Brown, in obtaining agreement from F. V. Meriwether, a U.S. Bureau of Mines doctor, to review x-rays for pending asbestosis lawsuits arising out of the Manville, New Jersey plant. In a letter following up on Lanza's contact, Johns-Manville's Vice President for Mines and Productions informed Meriwether of the confidentiality requirements for the readings:

> You will readily appreciate that we desire the readings to be held in strictest confidence and that no unnecessary publicity be given to the fact that you are making these readings for us… we wish, if possible, to prevent the results of our efforts being used against us either in the pending suits or in any suits which may be brought against us.

After Meriwether subsequently agreed to the conditions, Lanza informed Meriwether that Brown would coordinate the logistics of the readings. Following this initial effort, in 1933 Lanza met at least twice more with Johns-Manville officials and attorneys about pending litigation and research designed to assist in the company's defense. Further meetings in 1934 resulted in Lanza agreeing to approach Philip Drinker, a Harvard University professor in Industrial Hygiene whom we first encountered in Chapter 4, for dust control recommendations. The attorneys believed Johns Manville would be in a better litigation position if they could say the company had received recommendations and followed them.[307]

The important point from these events is not that Lanza, Meriwether, or Drinker were doing anything ethically inappropriate for this period, but that all much of this work was being done at the behest of attorneys to develop defenses for lawsuits, rather than to advance medical science. The only significant non attorney-directed research activity, the original survey, was kept confidential by the medical professional involved, as requested by the company attorneys. Given the legal ability of attorneys, through their attorney work product privileges, to withhold such information from either the public or the courts, we may never know how many other similar circumstances there are of public officials assisting companies in their lawsuits and then not using the information to further either medical science or appropriate regulatory action. The matter of fact actions of all parties to these events certainly seem to point to it being generally accepted and perhaps commonplace during the 1930s. As a result, published reports of these and other company sponsored activities must be considered very cautiously, for they certainly only provide the information which the companies wanted to be released, that is, information that would be helpful in improving their profits by limiting and defeating lawsuits or other similar costly events.

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[307] S. A. Williams to F. V. Meriwether, February 26, 1932, *Laura* Bialy Exhibit 16; A. J. Lanza Letter to F. V. Meriwether, March 24, 1932, *Laura Bialy* Exhibit 17; and David E. Lilienfeld, "The Silence: The Asbestos Industry," 792-793. Even while Lanza was assisting Johns-Manville attorneys in defending asbestos cases, he remained skeptical of their claims that Canadian asbestos was fairly innocuous. In 1937 he wrote another asbestos expert that "I have always had the feeling that [the Canadians'] argument was motivated by self-interest rather than to make a scientific contribution." A. J. Lanza to Bowditch, 13 Dec. 1937, cited in Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes: The White Asbestos Controversy, 1950s – 2004," *Isis* 95 (June 2004): 246.

The fear of “unethical lawyers and physicians” and thus reduced profits for Metropolitan Life might have been what led Lanza to reach the conclusion that he should not only keep the survey confidential, but that he should assist in deceiving Johns Manville employees. In 1933, in response to a Johns-Manville physician’s question about informing employees of the asbestos hazard, Lanza reportedly responded, “I doubt if the hazard is sufficient to justify warning posters. . . . This is especially true in view of the extraordinary legal situation.” Apparently the potential of eighty-seven percent of long-term employees suing Johns-Manville was more important to Manville’s insurance carrier representative than informing younger employees about the significant risk they faced from working with asbestos. The legal aspects of the problem influenced the medical response.[308]

With the long-delayed 1935 publication of Lanza’s Johns-Manville industrial hygiene surveys, this deception grew to include the misleading of medical professionals and the public. After receiving the galley proofs of the study, Brown became concerned about the report’s characterization of asbestosis as a serious disease and discussed proposed changes with one of the company’s outside counsel. Within a week the lawyer sent Brown a marked-up copy of the study, remarking that “one of our principal defenses… has been that the scientific and medical knowledge has been insufficient until a very recent period to place upon the owners of plants or factories the burden or duty of taking special precautions against the possible onset of the disease to their employees.” Brown forwarded these comments to Lanza with his confidence that “I trust that you will

[308] S. A. Williams letter to A. R. Fisher, August 29, 1933, *Laura Bialy* Exhibit 25.

give his comments and suggestions, as well as those mentioned in my letter, your most serious consideration." Brown then provided the classic attorney covering statement: "I am sure that you understand fully that no one in our organization is suggesting for a moment that you alter by one jot or tittle any scientific facts or inevitable conclusions revealed or justified by your preliminary survey. All we ask is that all of the favorable aspects of the survey be included and that none of the unfavorable be unintentionally pictured in darker tomes than the circumstances justify."[309]

The most substantive change requested by the lawyers reincorporated a sentence that had been in the original draft but left out of the final paper. This sentence described asbestosis as a milder disease than silicosis. Initially, Lanza had believed that this sentence was, in fact, true. However, by the time the final paper was ready for publication, he was well aware of British reports of asbestotics dying much earlier than silicotics. Thus, he had left it out of the final paper. Notwithstanding this knowledge, when the paper was published as a Public Health Report, the sentence was again included. In agreeing to its reincorporation, Lanza likely believed that the original sentence, as modified in the final paper, "Clinically, from this study, it appears to be of a type milder than silicosis," was literally accurate, if not wholly forthcoming. Nor, apparently, did he believe the attorney involvement in the changes detracted from the authority of the article. A year later he sent a reprint of the article to Wardwell, noting,

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[309] V. Brown letter to A. J. Lanza, December 21, 1934, *Laura Bialy* Exhibit 55.

"the Public Health Reports publication gives this piece an authoritative and dignified presentation."[310]

Lanza also assisted Johns-Manville's lawyers and depression-era profitability by expressing opinions which minimized the risk faced by employees of United States companies that used asbestos. He did this by claiming that British reports about asbestos hazards were not relevant to the United States because of differences in the asbestos being used in the two countries and the dustier conditions found in British factories. Indeed, in his 1936 article, he had written that "it is possible that the English factories may be more dusty than ours." The actual facts were somewhat different. Eighty percent of the asbestos in Britain in 1930 came from Canada, the same location that United States companies obtained most of their asbestos. Furthermore, Merewether had already indicated that the same type of machinery was used in both Britain and the United States, but dust control equipment "seems to be more generally used [in Britain] than in American factories." Given that, unlike the United States, by the 1930s Britain had regulations controlling dust levels in British plants, Merewether was likely correct in his assessment.[311]

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[310] A. J. Lanza, W. J. McConnell, and J. W. Fehnel, "The Effects of the Inhalation of Asbestos Dust on the Lungs of Asbestos Workers," *Public Health Reports* 50 (1935): 1-12; David E. Lilienfeld, "The Silence: The Asbestos Industry," 793; and David Ozonoff, "Failed Warnings," 170-172. The principle defenses quote is from G. Hobart letter to V. Brown, December 15, 1934, *Laura Bialy* Exhibit 53. The Public Health Reports quote is from an A. J. Lanza letter to Wardwell, January 16, 1935 (Bialy Exhibit 60).

[311] David S. Egilman, and Alexander A. Reinert, "The Origin and Development," 688-689. The more dusty quote is from A. J. Lanza, "Asbestosis," *Journal of the American Medical Association* 106 (February 1, 1936): 368-369. The more generally used quote is from E. R. A. Merewether and C. W. Price, *Report on the Effects of Asbestos Dust*.

However, although Lanza's actions kept some important asbestos hazards information from being made public and helped downplay foreign medical reports, published asbestos disease studies and case reports continued to increase during the early 1930s. By the mid 1930s the brake industry, significant manufacturers and purchasers of asbestos textiles for brake linings, decided they could no longer ignore the increasing number of case reports linking asbestos and other diseases. They were particularly concerned about the claimed linkage between asbestosis and tuberculosis. On November 9, 1936, Leroy Gardner of Saranac Laboratories met with Lanza, Brown, and other executives to discuss the possibility of animal studies. Nine days later the contract was signed for Gardner's laboratory to conduct animal experiments on the effects of asbestos dust for almost a dozen companies. Johns Manville's attorney established stringent confidentiality conditions for the experiments:

> It is further our understanding that the results obtained will be considered the property of those who are advancing the required funds, who will determine whether, to what extent and in what manner they shall be made public. In the event it is deemed desirable they shall be made public, the manuscript of your study will be submitted to us for approval.[312]

Gardner began the experiments in 1937. The interim results placed Johns-Manville and the other sponsors in a quandary. The asbestosis found in the animals was considered mild; however, 81.8% of the animals had developed lung cancer. One sponsoring company commented that "we feel that the reference to the question of cancer susceptibility should be omitted from the report since it is inconclusive."

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[312] Vandiver Brown letter to L. U. Gardner, 20 November, 1936, cited in David Ozonoff, "Failed Warnings," 201.

This work also put Gardner in a quandary. While he understood the work was confidential, Saranac Laboratories required a continued stream of funding. Without companies knowing what work was being undertaken by the Laboratory, funding would not be forthcoming. Thus, as had occurred in 1933, the lure of publication and publicity for his laboratory resulted in Gardner being reminded by Brown that his work was confidential. When the Saranac Laboratory Annual Report of 1938 mentioned the Laboratory's "asbestosis" work, Brown wrote about it to Raybestos-Manhattan's President, Sumner Simpson, including copies of the report and an additional article on pneumoconiosis written by Gardner. Simpson quickly responded that Gardner did not appear to be living up to the agreement not to publish without prior consent. Gardner was subsequently reminded that the corporate attorney written contract he had signed did not permit publication. Fortunately for Gardner, despite the undesired publicity, the companies continued funding the study for several years, but without a completion date. The final report was only in draft stage when Gardner died in 1946. It was finally published, without the cancer reference, after Brown told Lanza to "handle the matter," although one study participant claims this was not the result of sponsor pressure. A subsequent Saranac study, which also found increased cancer among asbestos-exposed mice, was never published.[313]

[313] During this period Gardner continued his work for mining companies, including some asbestos companies. One of the reasons the companies continued using Gardner, despite his missteps, might have been his willingness to closely collaborate with attorneys from these companies. Examples of this were previously provided in Chapter 4. In yet another example of this, on May 6, 1942 Ivan Sabourin, chief counsel of Johns-Manville's Canadian mining subsidiary, sent a medical report to Gardner that he (Sabourin) had "taken the liberty of drafting for you . . . for the benefit of my clients." He requested that Gardner send the report to several state workmen's compensation boards. David E. Lilienfeld, "The Silence: The Asbestos Industry," 794-5; David Ozonoff, "Failed Warnings," 201-202.

Thus, by the mid 1930s, asbestos product manufacturers and miners, like the silica industry, were concerned about the growing body of evidence demonstrating the hazards created by the dust of their product. The increasing asbestos disease lawsuits and workmen's compensation claims undoubtedly caused even greater concern. Therefore, when members of the silica industry suggested that action was needed to eliminate their litigation crisis, asbestos manufacturing companies took notice. When two hundred fifty industry executives met at the University Club of Pittsburgh for a "Symposium on Dust Problems," January 15, 1935, at least one asbestos representative was in attendance. Several prominent attorneys, as well as Lanza, Sayers, Pendergrass, and Drinker spoke to the assembled representatives. Johns Manville's representative, attorney Vandiver Brown kept a low profile at the meeting, as he later acknowledged, not wanting to attract the public attention that was then being directed toward silica exposures.

As Brown's subsequent memo clearly demonstrates, although he wanted to keep a low profile, he also wanted to help develop the direction and program for a proposed industrial hygiene foundation. At the meeting, Brown began by pointing out "that the members of the Asbestos industry did not care to be associated in the minds of the public or of employees with those industries whose problem was silicosis and for this reason [he] felt that there might be some opposition to having a representative of the Asbestos industry working with them." However, he agreed to serve on a temporary committee, subject to veto by his company or the asbestos industry, so long as "cooperation could be worked out without an undue amount of publicity." At the close of the meeting seven attendees, including Brown, were elected to form a temporary committee which would report back to the various groups on their recommendations.[314]

Although Brown may have stayed in the background at the initial meeting, once the symposium group decided to form the new industrial hygiene agency, subsequently known as the IHF, he quickly publicized its formation. Shortly after the new foundation's first meeting, Brown wrote to the editor of *Asbestos*, an industry trade magazine, extolling the IHF's usefulness to industry.

> Although the [IHF] is approaching various problems relating to air hygiene from an unbiased viewpoint, it is nevertheless the creature of industry and is the one institution upon which employers can rely completely for a sympathetic appreciation of their viewpoint. Its aim is to take an honest effort to appraise the evil, to advance scientific knowledge of many of its doubtful aspects and to suggest remedies, both preventative and curative. As such, it deserves and should receive the unqualified support of all members of industries faced with a dust hazard.[315]

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[314] Vandiver Brown, "Memorandum re: Mellon Institute of Industrial Research Symposium on Dust Problems – Pittsburgh," January 15, 1935, Author's personal collection. (This memorandum has been used and authenticated in a number of asbestos lawsuits.) Ironically, two years previously, on April 24, 1933, a few weeks before Rinehart & Dennis made an offer to settle the three hundred silicosis damage cases from the Gauley Bridge tunnel silica exposures, Johns-Manville's board of directors authorized its President to settle eleven asbestosis cases for $30,000.00. In a settlement strikingly similar to the silicosis cases, the plaintiff attorneys agreed to neither directly, nor indirectly, participate in any further actions against Johns-Manville. This settlement did not come to light until more than forty five years later. If it had been known at the time, public knowledge concerning asbestos hazards likely would have followed. Paul Brodeur, *Outrageous Misconduct* (New York: Pantheon Books, 1985), 21-22.

[315] Vandiver Brown letter to C. J. Stover, 4 December 1936, in David Ozonoff, "Failed Warnings," 197; While there is little information available about his specific actions, as a member of the IHF Legal Committee Vandiver Brown was well situated in the 1940s to assist in the control of lawsuits and ensure that crucial information became available to companies in their defense of worker compensation claims. Daniel C. Braun Deposition on December 9, 1976 in *Evelyn Rodeman, et al. v. Combustion Engineering, Inc., et al.*, Case No. C72-390, et al., USDC for the Northern District of Ohio, Eastern Division, 39. Brown was likely also the individual who ensured that asbestos companies were represented on the initial Temporary Committee formed at the symposium to develop the guidelines for the new industry trade association, the Industrial Hygiene Foundation. Vandiver Brown, "Memorandum re: Mellon Institute of Industrial Research Symposium on Dust Problems – Pittsburgh"; and David Rosner and Gerald Markowitz, "Workers, Industry, and the Control," 35.

Similar to what occurred within the silica industry, much of the asbestos industry responded. The IHF was inexpensive to join. According to a past President of the IHF, any company with an interest in occupational health could join. Even small companies could afford admission, since the Foundation dues operated on a sliding scale based upon the number of employees. From the 1930s through the 1960s the Foundation maintained a United States membership of about 144 companies, with small turnover each year.[316]

Little changed in the asbestos industry's position as the 1940s progressed. Through its Legal Committee and the various Legal Bulletins, the IHF kept companies fully informed about the various legal defenses available to them for asbestos and other work related diseases. Additional bulletins and digests provided abstracts of the increasing number of studies and case reports discussing toxic substance hazards and the growing recognition of a possible link between asbestos and cancer. Although the reports could be used by companies to consider changes in their operation, knowledge about them was also extremely useful to corporate attorneys, since the studies and reports threatened to limit industry's traditional defenses to workers compensation claims and lawsuits. Efforts to provide counterarguments to these studies may also be the reason the Legal Committee often suggested speakers and programs for joint medical and legal meetings and seminars sponsored by the IHF.[317]

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[316] Daniel C. Braun and Jane F. Brislin Deposition on December 27, 1977 in Esther Bailey, Executrix, Etc., Plaintiff vs. Johns-Manville Corp., et al., Defendants, C. P. No. 77-1, Civil Action No. 76-155-MM, et al., USDC for the Eastern District of Virginia, Norfolk and Newport News Divisions, 17; and Daniel C. Braun Deposition on May 17, 1985 in *Staffel B. Green, et ux., vs. GAF Corporation, et al.*, C. A. No. 82-2471, et al., USDC for the Western District of Pennsylvania, 9-10, 14-19.

[317] Daniel C. Braun Deposition on September 5, 1980, 49; and Daniel C. Braun Deposition on May 17, 1985, 14-19.

By the early 1940s the IHF was distributing a significant amount of information to its members concerning asbestos and other hazards. In his 1977 deposition the former President of the IHF, Daniel C. Braun, M.D., listed the benefits of the IHF as embracing monthly and annual publications, courses and meetings, and numerous services including toxicological, industrial health, air sampling, and engineering. Closed-door medical meetings that the IHF held for its members supplied one easy method by which the information was distributed. These meetings, such as the one planned in 1948 "for physicians associated with the asbestos industry" were occasionally mentioned in the IHF bulletin sent to member companies. In 1950 The IHF and the University of Pittsburgh School Of Public Health even jointly sponsored a postgraduate course for company medical directors and physicians on Pulmonary Disease and Employment.[318] The IHF supplied digests included abstracts of most of the then current medical and scientific articles concerning silica, asbestos, and a number of other hazardous materials. Although the actual records detailing the IHF's advice to individual members were destroyed in 1979—a period when plaintiff counsel had begun seeking records about industry knowledge—given the state of knowledge at the time, it seems likely that by the 1940s the IHF advised individual members similar to the previously described advice that the Pennsylvania Department of Labor gave to General Electric concerning asbestos product hazards and safety precautions, including the necessity of dust control equipment and

[318] Daniel C. Braun and Jane F. Brislin Deposition on December 27, 1977, 16-18, 25-26; Industrial Hygiene Foundation, "A Better Place to Work," *Transactions Bulletin* No. 9 (1948): 5; and Industrial Hygiene Foundation, *Foundation Facts* 12 (January 1950): 1.

other worker precautions, including showers before leaving work so dust was not carried home.[319]

Despite this available information, there is but slight documentation of any company making sincere attempts to even comply with the voluntary standards suggested by Dressen. In a 1976 interview, Dohrman Byers, a knowledgeable and long experienced industrial hygienist, described the problem facing anyone seeking to improve industrial health standards. At the time, in addition to the IHF, a few state agencies were conducting industrial hygiene surveys. Almost all of them were voluntary because state attorneys believed they would lose if an agency attempted to seek court approval of an inspection. Even when inspected, most companies "promptly ignored it most of the time…"[320]

Federally sponsored surveys of a number of shipyards during World War II also highlighted this problem. In his study of war-time shipyards, Drinker first inspected the Bath Iron Works shipyard in Maine during 1942. There he found conditions that presented "a real asbestos hazard." Hoping that the conditions at Bath Iron Works were not typical, he scheduled inspections at four other East coast shipyards. While the various yards varied in their conditions, they all exceeded the recommended five mppcf exposure limit by wide margins. However, due to the recent war related dramatic increase of workers and their high turnover, only a limited number of asbestosis cases were found.

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[319] Robert L. Holtz, Ed., *Occupational Disease Prevention*.

[320] This was another common trait of companies using either silica or asbestos. Robert L. Holtz, Ed., *Occupational Disease Prevention*; and Charles D. Yaffe, "Interview of Dohrman H. Byers on May 17, 1976," *Annals of the American Conference of Industrial Hygiene* 7 (1984): 38. Hueper testified in 1977 of similar experiences. During the 1940s to 1960s he visited several asbestos mining or manufacturing companies that either did not show him dust health hazard sites or took him to "work sites" that were obviously unused. Wilhelm C. Hueper Deposition on June 16, 1977 in *Eleanore Miller vs. Raybestos-Manhattan, Inc*., 15-17.

Of course, given the limited time period involved and the frequent departure and turnover of workers during World War II, this would be expected. Unfortunately, after the limited finding of asbestosis, few, if any, U.S. shipyards changed work practices until the 1960s.[321]

Throughout as well as after World War II, the IHF's staff continued their surveys of members' plants. The first in-plant dust investigation had occurred as early as 1938. During the first eight years of its existence, dust exposure investigations totaled over forty percent of the IHF investigations. One third of the total investigations involved plants working with silica or asbestos, one quarter with mining or processing ore, and one quarter with chemicals, with the remainder in miscellaneous categories. In 1946 alone they conducted ten dust investigations. The IHF announced in 1953 that it had conducted more than 600 "special studies" for its member companies. Of course, given companies desire of secrecy due to the potential of lawsuits or workmen's compensation claims, it is unlikely that companies would have allowed the IHF into the plants without both parties understanding of the necessity of confidentiality. Since the investigations were conducted confidentially, the IHF did not publicize the findings. Nor have I found any evidence that the results were anonymously passed on to state industrial hygiene offices.[322] Still, in light of these investigations and those by states such as Pennsylvania, by the late 1940s

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[321] W. Fleischer, F. Viles, R. Gade, and P. Drinker, "A Health Survey of Pipe Covering Operations in Constructing Naval Vessels," *Journal of Industrial Hygiene and Toxicity* 28 (1946): 9-16; and David Ozonoff, "Failed Warnings," 190-192.

[322]Industrial Hygiene Foundation. *History of Industrial Hygiene Foundation* (Pittsburgh: Mellon Institute, 1956), 2-5, 12-14, 18; T.F. Hatch, W.C.L. Hemeon, M.S. and F.R. Holden, "Findings from Foundation Plant and Laboratory Research, Health in Industry," *Transactions Bulletin No. 8*, Pittsburgh: Industrial Hygiene Foundation, (1946), Industrial Hygiene Foundation Archives, Carnegie Mellon University, 27-32, 27, 28, 31, and 32; and Barry I. Castleman, *Asbestos: Medical and Legal Aspects*, 727.

the IHF—and, with a high degree of probability, most of the asbestos products industry—knew that many of the activities involving asbestos in industry could create exposures sufficient to require precautions be taken to protect their workers.

Although most of the investigations from this period may have been destroyed, at least one 1940s investigation demonstrating this likelihood has survived. This 1947 report for North Carolina textile manufacturers, which surfaced through asbestos litigation discovery, clearly documented just these asbestos hazards. Since most of the study's sponsors were members of the Asbestos Textile Institute (ATI), an industry trade association founded in 1944 to promote the usage of asbestos textiles, it was that institution which reviewed the work. In the report to the ATI, the IHF's head engineer, William C. L. Hemeon, provided information both on the magnitude of the asbestosis problem in several textile mills and on methods of dust control. Furthermore, in the report Hemeon demonstrated that industry knew about the limitations of Dressen's report. In particular, Hemeon expressed little confidence in the five-mppcf threshold limit value then in place.

> The information available *does not* permit complete assurance that five million is thoroughly safe nor has information been developed permitting a better estimate of safe dustiness. It is nevertheless of the greatest importance either that such assurances be sought or a new yardstick of accomplishment be found for accurately measuring any remaining hazard in the dust zone below five million for the elimination of future asbestosis depends on the degree of control effected now.[323]

[323] W. C. L. Hemeon, *Report of Preliminary Dust Investigation for the Asbestos Textile Institute*, Pittsburgh, Pa.: Industrial Hygiene Foundation, 1947, 1, 22 (in author's private collection).

Hemeon suggested that a review of x-rays at the North Carolina textile factories - which were required to take annual x-rays of textile workers - would help determine if the five million exposure level was safe. In addition, he suggested that a general x-ray and medical survey of workers in one or two plants with a long history of good dust control would be of great value. There is no record of a follow-up investigation, nor did anyone publish Hemeon's report. The reluctance on the part of the ATI may have been partly due to Hemeon's discovery of a twenty percent rate of asbestosis among workers exposed to dust levels of only two mppcf. This was not information calculated to warm the heart of industry attorneys. As Enterline personally knew and properly observed in his 1991 article, publication was not in industry's interest, since it would have eliminated one of its key asbestos litigation defenses.[324]

Consequently, neither the industry nor the IHF took any action to either release the information to other researchers or to systematically study the health problems associated with asbestos. One individual associated with the IHF, T. F. Hatch, did note in a paper presented to the IHF membership that in many industries there was no systematic knowledge about the correlation between lung damage and the dust exposure of particular activities. He further acknowledged a need for more extensive information. Yet, he did not suggest that the information which the IHF had gathered either be made publicly available or correlated.

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[324] W. C. L. Hemeon, *Report of Preliminary Dust Investigation for the Asbestos Textile Institute,* 20; and David Ozonoff, "Failed Warnings," 198. Enterline's personal experience will be further examined later in this Chapter.

These in-plant dust studies had begun as early as 1938 and included major projects in the 1940s. Although the IHF's self published history repeatedly emphasizes how these surveys and investigations assisted companies by "fostering healthful working conditions . . . [and] advancing harmonious labor relations," there is also no evidence that any of the other IHF studies for specific companies were ever published. Nor does the history provide any details about the IHF's work in the area of asbestos or its diseases. This lack of publication concerning plant conditions and workers' health, even on an anonymous basis, raises the question about whether the surveys were for the purpose of advancing medical science and protecting the workers or rather to protect the companies from workers' claims and lawsuits. The fact that almost every company which made or sold asbestos products has now been sued, and none has used IHF surveys from any period to demonstrate in court that they met what they believed were the appropriate standards, suggests with high probability that almost all of the surveys found instances of high levels of dust in work areas.[325]

Throughout the 1940s the asbestos industry sought to control this growing knowledge about asbestos. Although both numerous in-plant surveys and at least two animal studies were then ongoing, industry representatives did not discuss their knowledge in forums where it could become public. For example, information about annual meetings of the IHF was published in an industry controlled journal, *Industrial*

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[325] T.F. Hatch, W.C.L. Hemeon, M.S. and F.R. Holden, "Findings from Foundation Plant and Laboratory Research, Health in Industry," 27-32, 27, 28, 31, and 32; The quote "fostering healthful working" is from Industrial Hygiene Foundation, *History of Industrial Hygiene Foundation*, 12. This quote also suggests that another purpose of the surveys might have been to keep workers satisfied that they were being protected; see Barry Castleman, *Asbestos: Medical and Legal Aspects*, 727. During the author's twenty year experience as both defense and plaintiff counsel in asbestos litigation, he is not aware of any additional IHF studies being put into evidence in his or other cases.

Medicine and Surgery, yet its 1950 synopsis of the Symposium contains not one comment about asbestos. This was the case despite the fact that one of the speakers, Arthur Vorwald, was in charge of the laboratory which had informed brake manufacturers that research studying the effects of the inhalation of asbestos by mice had produced reports of a substantial number of lung cancers. Since industry conducted its investigations and research confidentially and rarely released survey information to the public, medical professionals not privy to insider information had limited, if any, knowledge about research that was funded by companies or about the true conditions in the plants. This control of information was vital to industry's main concerns, defending workmen's compensation occupational disease claims and lawsuits and making a profit. Release of either the true conditions in plants, as shown by Hemeon, or the results of the animal tests entailed the potential enormous consequences at trial or adjudication. The failure of many legislators to recognize the true nature of silica and asbestos diseases remained industry's greatest defense to workmen's compensation claims even into the 1960s. As late as 1963, the IHF's legal committee was both informing industry attorneys that for dust diseases such as asbestos, "frequently disability does not occur until many years after the termination of employment or exposure," and at the same time recommending that they continue to seek legislation that allowed workers to file claims for only two or fewer years following employment.[326]

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[326] Industrial Hygiene Foundation, "Industrial Hygiene Foundation Eighteenth Annual Meeting-November 15 and 16, 1950," *Industrial Medicine and Surgery* 20, no. 1 (January 1951): 38-39; Three years later the same journal suggested that a typical question during the joint medico-legal panel of the 1953 Conference was not about the hazards of dust disease, but rather "What steps should be taken to secure general cooperation among compensation attorneys, industrial physicians and commissions to eliminate the

The 1949 leak of Saranac Laboratory information about the industry-funded mice inhalation study demonstrates the extent to which corporate attorneys went to keep industry information confidential. Upon learning of this leak, Johns Manville attorney Vandiver Brown traveled to South Africa in an attempt to retrieve a document that mentioned Gardner's work. The incident involved a thesis written by Gerrit W. H. Schepers, M.D., ScD. At the time Schepers, who would in 1954 become Director of the Saranac Laboratories, was in the United States as a Commonwealth Fellow from South Africa. In 1949 he had spent three months at the Saranac Laboratories as a representative of the South African government while also pursuing post-graduate studies. In his thesis for a New York University diploma, Schepers had mentioned Gardner's animal work on asbestos and cancer that he had learned about while at the laboratory. After his oral examination, Lanza, then a professor at the university and a member of Schepers committee, took Schepers to see Brown, at the time the chief attorney for both Johns-Manville and the asbestos consortium that had funded Gardner's research. At the meeting Schepers learned that Brown had been given the original of his thesis. Brown also asked Schepers for any copies to which Schepers replied that a copy had been sent to the South African government. Brown immediately flew to South Africa to retrieve the report from

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racketeering lawyer and the unethical medical witness?" The medical panel at that same Conference included talks on "stress disorders," "Problems associated with older workers," and "Compensation for Residual Disability." Industrial Hygiene Foundation, "Industrial Hygiene Foundation Eighteenth Annual Meeting-November 18-19, 1953," *Industrial Medicine and Surgery* 23 (January 1954): 20; and Theodore C. Waters, *Current Status of Compensation for Pneumoconioses*, Legal Survey Bulletin No. 4 (Pittsburgh: Industrial Hygiene Foundation of America, Inc., 1963), 16-17. At an early 1940s meeting between Charles H. Roemer (President of asbestos product manufacturer Unarco) and Johns-Manville President Lewis Brown and his brother, Vandiver Brown, one of the brothers told Roemer that Unarco managers were fools to notify employees about asbestosis, stating that Johns-Manville saves a lot of money by not telling them. Charles H. Roemer Deposition on April 25, 1984, *In the Matter of Johns-Manville. Et al. v. the United States of America*, U.S. Claims Court Civ. No. 465-83C; Barry Castleman, *Asbestos: Medical and Legal Aspects*, 401.

the Department of Mine officials. Gardner died in 1946 with the report still unpublished[327]

Thus, the activities of Johns-Manville, the IHF, and other asbestos companies throughout the 1930s and 1940s demonstrated the very danger of manipulation of science by those with strong economic interests that Hueper had warned against in 1943.

> Industrial concerns are in general not particularly anxious to have the occurrence of occupational cancer among their employees or of environmental cancers among the consumers of their products made a matter of public record. Such publicity might reflect unfavorably upon their business activities, and oblige them to undertake extensive and expensive technical and sanitary changes to their production methods and in the types of products manufactures. There is, moreover, the distinct possibility of becoming involved in compensation suits with extravagant financial claims by the injured parties. It is therefore, not an uncommon practice that some pressure is exerted by the parties financially interested in such matters to keep information on the occurrence of industrial cancer well under cover.[328]

With no discussion, there was little call for changing the asbestos exposure standards. Throughout the 1940s, 50s and 60s, an informal body of hygienists, the American Conference of Governmental Hygienists (ACGIH), worked with industry experts to provide guidelines on exposure limits to numerous toxic substances, including asbestos. The ACGIH had been formed as an independent entity in late 1937 and early 1938 at the urging of the United States Public Health Service. Its purpose was to promote industrial hygiene and coordinate activities between the states and federal government. The first meeting was held in June, 1938. Shortly thereafter a Committee on threshold

[327] Gerrit W. Schepers, "Chronology of Asbestos Cancer Discoveries," 600-601.
[328] Wilhelm C. Hueper, "Cancer in its Relation to Occupation and Environment," 63-69.

Limits began to function, but it was not formally established until 1941. Establishing such exposure limits or guidelines had already attracted the interest of industry which sought to keep the guidelines as high as possible. Although there is no direct evidence that this occurred for asbestos, the 1946 standard simply followed the Dressen's figure of five mppcf of total dust, without further consideration. What is important to bear in mind is that, given the general lack of new publically available statistics, exposure limits for asbestos did not change until 1968. In retrospect, relevant professional experts found that the failure to tighten the standards of this period resulted from a lack of evidence due to industry's control of the data. During the 1980s a committee of the Industrial Medical Association acknowledged that the failure of either groups like the IHF to make their investigations public or of industry to follow up on the initial investigations greatly hindered efforts at establishing scientifically based exposure limits for asbestos.

> No one seriously questions that factual data derived from human experience are by far the most reliable basis for TLVs [Threshold Limit Values]. The only significant source of such data is industry. Unfortunately, data of this kind are rarely available to ACGIH – either because industry has not taken advantage of its unique opportunity to develop them or because they remain hidden in industry's files for any one of several reasons.[329]

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[329] David Ozonoff, "Failed Warnings," 193-6; and Committee on Industrial Hygiene and Clinical Toxicology of the Industrial Medical Association [AAIPS], in M. E. La Nier (ed.), *Annals*, 141, quoted in David Ozonoff, "Failed Warnings," 199.

In the early 1950s, U.S. industries involved in asbestos production and utilization faced their greatest crisis to date. Case reports on asbestos related lung cancer were becoming increasingly prevalent. Abstracts contained in the IHF files include a number of 1940s and early 1950s German articles concerning asbestos and cancer of the lower lobe of the lung. In 1949 the official journal of the American Medical Association contained a short article about the relationship of asbestos and lung cancer. One year previously the *British Medical Journal* had acknowledged a growing impression of a linkage between lung cancer and asbestos, listing reports from France, Germany, and Scotland. Less than two years later, after Merewether's detailed report of asbestosis and cancer, British doctors generally accepted the linkage. Another German case report in 1954 discussed asbestos being found in the tumor tissues of what, by its description, was most likely mesothelioma.[330]

By 1950, company insiders also fully understood that asbestos presented a much greater hazard than was commonly known. In 1950 the medical director of Canadian Johns-Manville, a subsidiary of the largest United States asbestos manufacturer, wrote to his president that "there seems to be increasing proof that asbestos fibers do cause lung cancer ... this whole subject could cause our companies unlimited embarrassment and untold expense if labor leaders made use... of the subject. [331]

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[330]Abstracts contained in Jane F. Brislin Deposition on May 1, 1980 in Harold W. Hoover vs. Johns-Manville, et. al., Civil Action No. C65700, District Court in and for the City and County of Denver and State of Colorado, Exhibit 1, *Industrial Hygiene Digest*; Editorial, "Asbestosis and Cancer of the Lung," *The Journal of the American Medical Association* 140, pt. 2 (July 2, 1949): 1219-1220; Anonymous, "Some Dust Diseases of the Lungs," *The British Medical Journal* 1, no. 4561 (June 5, 1948): 1087-1089; and E. R. A. Merewether, *Annual Report of the Chief Inspector of Factories for the Year 1947*.
[331] K. Smith to Lindell, 28 January 1950 cited in David E. Lilienfeld, "The Silence: The Asbestos Industry," 795. Ironically, that same year a Raybestos lawyer demonstrated the manner in which lawyers

Since even companies without an internal medical department could join the IHF and then rely upon it to keep them confidentially informed about the medical literature, there seems little doubt that all companies either understood the hazards of asbestos or chose to not examine the evidence. Beginning in 1937, as noted above, companies had received this information from the *Industrial Hygiene Digest*, sent exclusively to all member companies. It provided companies with a detailed review of the current medical, legal, chemical, toxicological and engineering literature. For example, the January, 1950 *Digest* abstracted an article concerning asbestosis found at necropsy. That issue also observed that reports found carcinoma of the lung in the studied asbestotics at seven times the incidence of the general population. In addition, the IHF and its member companies had access to their own investigation data, such as that reported by Hemeon and Gardner. By 1952 the legal department of Johns-Manville was even recommending that a warning label be put on its bags of asbestos fiber. However, in meetings with government officials—such as the one with NCI staffers, including Hueper, in 1955—industry officials lied. After that meeting the NCI concluded that "there have been no asbestos-cancer animal experiments." Because they lacked the industry-held data, federal

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used industry-managed asbestos medical science in their favor. At a deposition of Hueper for a case involving a Raybestos brake lining plant worker with asbestosis and lung cancer, the attorney asked Hueper to justify his opinion about the linkage of asbestos and lung cancer, since the American medical literature did not have any publications showing that asbestos and lung cancer were linked. The attorney apparently did not mention the asbestos animal studies conducted for brake manufacturers, including Raybestos, in the 1940s that demonstrated lung cancer; nor did he mention the abstracts of international asbestos/lung cancer articles contained in the *Industrial Hygiene Digests* that were received by all members of the IHF. Wilhelm C. Hueper Deposition on June 16, 1977 in *Eleanore Miller vs. Raybestos-Manhattan, Inc.*

officials, unions, and even standard setting bodies such as the ACGIH did not realize the full extent of the hazard.[332]

When the IHF received requests for information from outsiders, they simply passed them on to the companies. For example, in 1955 J. Kane of the International Association of Heat and Frost Insulators and Asbestos Workers Union wrote to the IHF asking about the occupational disease risks in the insulation trade. Rather than either providing the information IHF officials simply passed the letter on the Johns-Manville for response.[333]

In a scenario reminiscent of the silica industry's efforts of the 1930s, the asbestos products industry's program of silencing critics, co-opting experts, and keeping research confidential largely succeeded in the United States during the early to mid 1950s, with industry's position dominating the public and medical dialog. As with silica, asbestos was viewed as a disease under control. A manual published by the Magnesia Insulation Manufacturers Association (MIMA) (an asbestos insulation products trade association) indicated that asbestos "offers no hazard to the worker." Moreover, although reports of lung cancers among asbestotics were in increasing, the lack of United States public recognition for the linkage kept asbestos companies from having to defend against lawsuits involving cancer.[334]

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[332] Daniel C. Braun and Jane F. Brislin Deposition on December 27, 1977, 23-24; Industrial Hygiene Foundation, *Industrial Hygiene Digest* 14 (January1950): 10, 12; and David E. Lilienfeld, "The Silence: The Asbestos Industry," (legal department) 795, (NCI meeting) 796.
[333] Barry Castleman, *Asbestos: Medical and Legal Aspects*, 731.
[334] David E. Lilienfeld, "The Silence: The Asbestos Industry," 796.

One example of the effects of this control was published in the 1956 *Annual Review of Medicine*. In this *Annual*, the well respected industrial hygienist Herbert Stokinger completely accepted the asbestos industry's position. He began by noting that to date sixteen percent of individuals autopsied upon dying from asbestosis had lung cancer. He continued, however, by dismissing its importance: as already noted, he relied on Lanza to argue that "It is of more than passing interest that the higher rate of cancer in asbestos workers in England is not paralleled in the United States or in Canada… The cause for this difference may lie in the type of asbestos..."[335] The important point here is that Stokinger indicated he received his information from the very insurance employee who knew that there were other indications and reports, not publicly available, that strongly suggested asbestos caused lung cancer. We can only speculate what Stokinger might have said if Lanza had passed on his or Gardner's work with the asbestos companies or had provided Stokinger with the information contained in IHF digests.

Yet given the scope and range of the new information being published, including Doll's 1955 British report and Hueper's continual reviews of occupational cancer, simply withholding information was deemed insufficient. Industry responded by harassing and refusing to provide information to its detractors, most notably Hueper. After Hueper joined the National Cancer Institute in 1948, he experienced almost constant attacks from many industrial concerns. For example, as we have already seen, DuPont officials first accused him of being a Nazi, and then a communist.[336] There is also some inferential evidence that the asbestos industry tried to stop publication of his papers. For example, in

[335] Herbert E. Stokinger, "Toxicologic Aspects of Occupational Hazards," 178.
[336] Wilhelm Hueper, "Unpublished autobiography draft," 135; Robert N. Proctor, *Cancer Wars*, 41-43.

1952 Hueper presented a paper on occupational pulmonary cancer at the Seventh Saranac Lake Symposium. Although it was customary for the proceedings to be published with funding received from industry sponsors, in 1953 the Symposium's chairman, Vorwald, informed Hueper that the proceedings would not be published since "he had difficulty obtaining the necessary funds from the sponsoring organization for printing the proceedings."[337]

Despite their pervasive influence among prominent writers, industry leaders recognized that Hueper's opinions could not go unchallenged. They thus sought ways to undermine his influence and decided to take affirmative action. The Asbestos Textile Institute, the same group for whom Hemeon had prepared a report, became the lead agency in this effort. At an ATI meeting in 1956, Kenneth Smith, M. D., Johns-Manville's Medical Director, suggested dealing with Hueper by embarking on "a program of investigation and publicity to counteract the unfavorable publicity presently directed to the asbestos industries as a result of the work of Doctor Hueper."[338]

In his attempts to achieve greater evidence about asbestos, Hueper inadvertently provided the industry with the means to undermine his influence. In 1954 Hueper went to Canada in an effort to publicize the fight against occupational cancer. At the first Canadian Cancer Research Conference he described asbestos as being among his industrial carcinogenic substances. During the meeting the statistician for the National

[337] Wilhelm C. Hueper Deposition on June 16, 1977 in *Eleanore Miller vs. Raybestos-Manhattan, Inc.,* 21-22; Doctor Merewether also spoke at the Symposium. In his speech he discredited the theory that American factories were less dusty than British factories. E. R. A. Merewether, *Comments at Seventh Saranac Lake Symposium*, 1952. Vorwald Archives, Washington, D. C. Cited in David S. Egilman, and Alexander A. Reinert, "The Origin and Development," 689.
[338] David Ozonoff, "Failed Warnings," 204.

Cancer Institute of Canada expressed concern about cancer in the Quebec asbestos mines. He told Hueper that he planned to conduct a survey of the area. Hueper offered to help. Some of the largest mines, however, were owned by the very North American asbestos manufacturers attempting to curtail Hueper's influence. They therefore took action to forestall any Canadian governmental study by offering to conduct their own. This study, funded by the Quebec Asbestos Mining Association (QAMA), was undertaken by employees of the IHF. It became known as the previously mentioned Braun Truan report.[339]

The QAMA investigation was not the only survey proposed during this period. Approximately one year after the commencement of the QAMA study, both Braun and Schepers presented proposals to the ATI for a similar study. They both also told industry that textile mills had a significant hazard of lung cancer. Braun, for example, wrote to Hugh Jackson, manager of Johns-Manville's Industrial Health Program on August 23, 1957, thanking him for providing information about an upcoming ATI meeting and informing him that a literature survey revealed "that the possibility of an association between lung cancer and asbestosis is much more likely to exist in asbestos factories than in mining operations." On October 6 of that same year Schepers gave a three hour speech at an ATI meeting, seeking approval for of a proposed survey of their operations and informing them "that they, as asbestos producers, stood accused by the medical literature of manufacturing products that can cause cancer and that they were the only ones that

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[339] Barry Castleman, *Asbestos: Medical and Legal Aspects*, 113.

could obviate this tragedy to their employees and customers by taking proper steps to safeguard them from asbestos dust exposure." The ATI rejected both proposals.

> The program was considered ill-advised at this time due to its implication that a relationship existed between asbestosis and carcinogenic development, a condition which, to date, has not been established although it has been given rather widespread publicity in the press.[340]

QAMA was already taking great efforts to ensure that its ongoing survey did not simply add to this widespread publicity. From the very beginning, company lawyers were intimately involved with the Braun Truan study and likely directed most, if not all, of its facets. The IHF sent the first letter concerning this potential investigation to Ivan Sabourin, General Counsel for both Johns-Manville Canada and QAMA. It sought to arrange for a preliminary visit by Braun to Canada. Sabourin was one of three Johns-Manville employees with whom Braun held discussions prior to the commencement of the study. These discussions occurred in Canada over the span of three days starting on February 19, 1956. The first meeting, held at Sabourin's home, occurred on February 19, 1956. Although Johns Manville's medical director, Kenneth Smith, was present, during the meeting Sabourin provided the "broad outline of the need for an epidemiological study, the interest of the Quebec Mining Association in such a study." Sabourin was also apparently very familiar with the IHF's medical research facilities, since he, rather than Braun, provided the group with an outline of the facilities of the IHF. Sabourin was also present during the February 20 meeting with the City Health Officer from Montreal, as

[340] The Braun quote is from Daniel C. Braun Deposition on September 5, 1980 in *Thomas J. Neary, et al., vs. Johns-Manville, et al.,* Exhibit No. 16. The Schepers quote is from G. W. Schepers, "Re: 'Changing Attitudes and Opinions: Asbestos and Cancer 1934-1965,'" *American Journal of Industrial Medicine* 22, no. 3 (1992): 463; and the ATI quote is from David Ozonoff, "Failed Warnings," 204.

well as the subsequent lunch with Verdun's City Health Officer and afternoon meetings. Subsequently, Sabourin attended most, if not all, of the three-day meetings. During the last day, Braun had a summarizing meeting with Sabourin, after which they visited a local physician "to clear up a point which Mr. Sabourin had missed at the Wednesday evening dinner meeting." Four months later IHF's managing director sent Sabourin a letter seeking confirmation of the study's acceptance and asking if the first part of July was a satisfactory starting date.

These events plainly point to the attorney, Sabourin, being the prime mover of the study—but even more important, his activities did not cease once the IHF received approval for the study. Although Sabourin may not have been quite as closely involved in all of the details of the subsequent study, as the investigation progressed, Braun met and talked with Sabourin on numerous occasions. Sabourin also arranged many of Braun's meetings with other individuals, as well as Braun's social calendar during his Canadian visits. Furthermore, upon completion, the report and twenty copies were sent, not to the head of QAMA, but directly to Ivan Sabourin.[341] Clearly, Sabourin was not only the prime mover but also the driving force behind the study. The study's ultimate purpose was not science or medicine, but legal.

The final report purported to show that cancer rates among miners was little different from that of Quebec Province as a whole. This result, however, was misleading.

[341] Daniel C. Braun Deposition on September 5, 1980, 112-113, 162. The quotes are from Daniel C. Braun Deposition on September 5, 1980, Defendants' Exhibit 3, Daniel Braun, *Notes on Dr. Braun's Trip to Canada re Lung Cancer Survey for Johns-Manville Corporation*, (February 28, 1956); Richard Walmer, letter to Ivan Sabourin dated June 7, 1956, Daniel C. Braun Deposition on September 5, 1980, Defendants Exhibit 13; and Daniel C. Braun letter to Ivan Sabourin dated March 8, 1957, Daniel C. Braun Deposition on September 5, 1980, Defendants' Exhibit 18.

At the time medical professionals knew that the high rates of cancer found in cities significantly raised the overall cancer rates of Quebec Province. The rural sections of Quebec Province (such as the area in which the miners lived and worked) had appreciably lower rates of cancer. Indeed, Braun and Truan's study of miners had found a death rate among them due to lung cancer that was two and a half times higher than that found in rural Quebec. More importantly, they found an even higher cancer rate in the lungs of deceased asbestotic miners. Autopsies determined that four of thirty-two miners who died of asbestosis also had lung cancer. In their initial report, the authors acknowledged the consistency of this highly significant rate with other studies that had examined the link between asbestosis and lung cancer. They then attempted to explain it by suggesting that perhaps asbestosis was being under-diagnosed at the asbestos mines. Still, they concluded that "the results suggest that a miner who develops the disease asbestosis does have a greater likelihood of developing cancer of the lung."[342]

Unfortunately, but not atypically, the report in this form was never published. Following QAMA's review of the report Sabourin met with Braun to produce a "condensation" for publication. The authors subsequently agreed to delete all reference to the relationship of lung cancer to asbestosis or rural sections of Quebec.[343] Sabourin obviously understood the precipice awaiting the industry if the original report had been

[342] Saxon Graham, Madeleine Blanchet, and Thomas Rohrer, "Cancer in Asbestos-Mining and Other Areas of Quebec," *Journal of the National Cancer Institute* 59, no. 4 (October 1977): 1140; Barry Castleman, *Asbestos: Medical and Legal Aspects*, 114-115. It is extremely important to correctly pick or determine the control group when conducting an epidemiologic study. Increased disease rates in the studied group can only be determined when risk factors are controlled and the group is compared to the appropriate background level in another comparable group that does not have the specific risk factor being studied.
[343] Barry Castleman, *Asbestos: Medical and Legal Aspects*, 114-117; and David E. Lilienfeld, "The Silence: The Asbestos Industry," 796-797.

released. It not only confirmed Hueper's opinions but would have made raised the bar significantly in the defense of asbestos lawsuits and workmen's compensation hearings.

Asbestos industry officials acknowledged the problems that this reduction in the report caused. They also recognized its necessity for litigation purposes. For example, Kenneth Smith, of Johns Manville wrote to the QAMA attorney about a condensed version he received:

> We have noted the deletion of all references to the association of asbestosis and lung cancer in this condensation. While we believe that this information is of great scientific value, we can understand the desire of the Q.A.M.A. to emphasize the exposure of the asbestos miner and not the cases of asbestosis...It must be recognized, however, that this report will be subjected to criticism when published because all other authors today correlate lung cancers and cases of asbestosis.

In a confidential note, written shortly after the report was completed, John Know, medical director of Turner & Newell—a large British asbestos firm—agreed that the study was flawed and actually demonstrated a higher incidence of cancer. Indeed, Know wrote that Braun and Truan "adopted a criterion of exposure that was bound to reduce their overall incidence of carcinoma, asbestosis, or anything else which affected a small proportion of long duration workers." On the other hand, the chief counsel for Canadian Johns-Manville praised the article. He thought it had "wonderful public relations value."[344]

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[344] Letter from K. W. Smith to I. Sabourin of December 20, 1957 quoted in David E. Lilienfeld, "The Silence: The Asbestos Industry," 797; Barry Castleman, *Asbestos: Medical and Legal Aspects*, 117; Ivan Sabourin letter to QAMA of June 22, 1958, *Laura Bialy* Exhibit 3200; The asbestos mining industry was also aware that by 1957 Saranac Laboratories had reported to the industry on an additional seventy cancers

As previously noted, Herbert Stokinger, the editor of the *Archives of Industrial Health*, published the paper, describing his pleasure in reading the conclusion of the paper. Since he did not think there was an association of asbestosis with lung cancer and was searching for confirmation of his belief he may not have closely examined the paper's methodological problems.[345]

A few public health officials, however, were highly critical of the report. In a letter to the Director of the NCI, Hueper complained about harassment, using the Braun Truan report as one of his primary examples. In it he indicated that for "quite some time" he had gained an impression that his difficulties in investigating environmental hazards resulted from "extra-governmental influences" that were more concerned with "practical economic implications" than with protecting the American people from environmental cancer hazards. In this fifteen page letter, Hueper listed numerous examples of harassment. He specifically noted that he had been requested to accept the findings of the Braun Truan report, when he had specific knowledge of at least thirty lung cancer cases found by Vorwald, and Schepers that the IHF study did not include. He went on to explain exactly why he could not accept the Braun Truan report's findings:

> I would ... consider it scientifically dishonest, if I would accept as correct, as suggested to me, the recently published allegation of [the QAMA/IHF study] concerning the frequency of asbestosis cancer of the lung among Canadian asbestos workers because I know that the total number of such cases is much higher than ... those cited by these authors who worked under the sponsorship of the American asbestos industry…My friends at the Ministry of Labor, Quebec,

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and four mesotheliomas among Canadian miners. Saranac Laboratories were not permitted to publish the results. G. W. Schepers, "Re: 'Changing Attitudes and Opinions: Asbestos and Cancer 1934-1965,'" 465.

[345] H. E. Stokinger to D. C. Braun of January 20, 1958, Daniel C. Braun Deposition on September 5, 1980, Defendants Exhibit 18.

> which has handled cases of asbestosis cancer, moreover, have assured me that [the authors of the IHF study] have not contacted them for information in asbestosis cancer. Under these circumstances I feel that I am not only under no obligation, but in fact also I would commit a scientific offense if I would honor the statement of [the IHF report] as anything more than specially manufactured scientific merchandise of shoddy quality.[346]

Although there is no direct evidence, this memo certainly raises the possibility that, in an effort to silence him, industry representatives had direct contact with Hueper's superiors. As already seen, other companies, such as du Pont, had no qualms about doing so.

Three years later, Hueper wrote a six page memo again describing the asbestos industry's intransigence during the 1940s and 1950s. In response to what appears to have been a question by the Associate Director of Field Studies at the NCI, about the feasibility of holding a workshop on occupational cancer hazards, Hueper indicated that the two prior conferences of 1948 and 1955 had not been followed by any meaningful action by industry. Moreover, at the two prior conferences, representatives of industry invited to the conferences "boldly refused to divulge definite figures and facts related to occupational cancer hazards and known to them." (One of those facts actually misrepresented by the asbestos industry was their claim that no animal studies had been

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[346] Wilhelm C. Hueper to John R. Heller, dated June 8, 1959, 1, located in MSC C 228, Box 17, Archives of the National Library of Medicine. Around the same time Hueper also spoke similarly to an organized labor group concerning the Braun Truan report. Wilhelm C. Hueper, "Organized Labor and Occupational Cancer Hazards," (undated), 20-21, Hueper Papers Collection, MSC 341, Archives of the National Library of Medicine. During the 1970s a report funded by NCI and based upon interviews with over eighty individuals examined the beginnings of the National Cancer Institute and the war on cancer. It found a "revolving door of industrial and government experts had operated since the earliest efforts to deal with cancer nationwide;" see Devra Davis, *The Secret History of the War on Cancer*, 14. As was noted in Chapter 3, legal harassment of scientists that offer opinions different from that desired by industry has not been confined to Hueper. See for example Miriam Shuchman, "Consequences of Blowing the Whistle in Medical Research," *Annals of Internal Medicine* 131, no. 12 (20 June 2000): 1013-1015.

undertaken.) The industry had not only continued "this spirit of non-cooperation and public irresponsibility," but even attempted to deny the existence of hazards in order to escape any liability to their workers. Hueper then pointedly described how several companies (including Quebec mining companies) had tried to repudiate the existence of hazards "by having investigators of their choice prepare and publish epidemiologic information based on incorrect, defective and biased data." This was a direct reference to the Braun Truan Report. He finally complained that to date the only epidemiologic study on asbestos was the miner study, [Braun-Truan report] despite the fact that ". . . 50 per cent of the employees of an asbestos brake lining plant in Pennsylvania who came to autopsy with asbestosis of the lung had also cancer of the lung." (This was a Raybestos plant.) The records at the National Library of Medicine unfortunately do not contain any response to Hueper's memos, so we can not further speculate about the actions or motivations of Hueper's superiors. However, the Surgeon General did forbid him to undertake an epidemiological study unless he could get industry's approval. [347]

In a 1962 article Hueper again emphasized the problems with the Braun-Truan study. In this paper he explained that the statistical analysis presented the largest problem. Canadian cities had a much higher cancer rate than other sections of the country. By including the city data in the expected rate of cancers, Braun and Truan had provided a base rate of cancer elevated far above that found in the general rural areas of the country that resembled the mining district. Hueper concluded the paper by

[347] Wilhelm C. Hueper to Dr. M. B. Shimkin, dated May 9, 1961, located in MSC C 228, Box 17, Archives of the National Library of Medicine; Surgeon General information in Wilhelm Hueper, "Unpublished autobiography draft," 139; and Wallace Werble, "The News This Issue: Research Notes," *Drug Research Reports* 4, no. 17 (September 13, 1961): 6, located in MSC C 228, Box 17, Archives of the National Library of Medicine.

emphasizing that "according to the data provided... by Braun and Truan, their conclusion is patently incorrect and grossly misleading and results in obscuring the existence of a markedly elevated lung cancer rate for members of this working group."[348]

Nor did Hueper confine his criticism to letters and articles. While speaking at Irving Selikoff's landmark 1964 New York Conference on Asbestos, Hueper yet again lashed out at the asbestos industry. It was predictable, he stated, that "no large-scale observations on the incidence, morbidity and mortality rates of asbestosis and asbestos cancers have been published from the giant American asbestos industry." He found it "regrettable" that "the original plan of having a recent epidemiologic survey on these aspects of asbestos production in Canadian mines and mills to be undertaken under the aegis of the National Cancer Institute of Canada was not adhered to and that this study was carried out as an industry-dominated venture which yielded highly controversial negative results."[349]

Other participants at Selikoff's 1964 Conference also took particular aim at the published Braun-Truan Report. In perhaps the most pointed analysis, industrial hygiene expert Thomas F. Mancuso noted two obvious major flaws in the study. First, the study was seriously diluted due to 66% of the workers being under the age of forty-four. Given the long latency period of lung cancer, the young age of the workers and the short follow up did not allow sufficient time to accurately analyze lung cancer rates. He also noted

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[348] Wilhelm C. Hueper, "Environmental and Occupational Cancer Hazards," *Clinical Pharmacological Therapy* 3 (1962): 776-813.
[349] W. C. Hueper, "Occupational and Environmental Exposures to Asbestos," *Annals of the New York Academy of Sciences* 132 (December 31, 1965): 184, 192.

that the group studied was a "survivor group" which excluded their contemporaries who had already died.[350]

Still other authors took particular aim at the voluntary standard, questioning why it was still being used. Hueper noted that even non-occupational exposures might be hazardous. As previously discussed, Schall's talk critiquing the threshold limit value and its sole evidentiary support, Dressen's report, received particular attention from the attendees.[351]

Industry lawyers did not stand by passively after this major assault on their one published study. Following the Selikoff's Conference, The ATI attempted to quell the furor with implied threats. Their attorneys sent letters to both Selikoff and the New York Academy of Science that warned them of the dangers in "innocent but unwise treatment of research data in public discussions."[352] However, it was too late to put the asbestos back into the bag.

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[350] Thomas F. Mancuso, "Discussion Following Asbestos and Neoplasia: Epidemiology Session," *Annals of the New York Academy of Sciences* 132, no. 1 (December 31, 1965): 589-602. Mancuso also coauthored articles with Hueper, including Hueper's 1952 discussion of occupational cancer in which the authors had briefly described the correct way to conduct surveys for cancer in occupational groups, specifically mentioning asbestos workers as one of those groups; see Wilhelm C. Hueper and Thomas F. Mancuso, "Studies of Occupational Cancer," *Public Health Reports* 67, no. 7 (July 1952): 644-49.

[351] E. L. Schall, "Present Threshold Limit Value," 317-321; Wilhelm C. Hueper, "Occupational and Environmental Exposures to Asbestos," 184-192. Section IV of the Conference, *Human Exposure to Asbestos: Community Studies* provided numerous opinions about the hazards of asbestos outside of the work place. *Annals of the New York Academy of Sciences* 132 No. 1 (December 31, 1965): 184-254.

[352] The quote is from in Cadwalder, Wickersham & Taft letter, October 26, 1964 cited in Jock McCulloch and Geoffrey Tweedale, "Shooting the Messenger: the Vilification of Irving J. Selikoff," *International Journal of Health Services* 37, no. 4 (2007): 621. This article also examines the historiography of books that have lambasted Selikoff. The three most prominent histories are by Jacqueline Corn, British medical historian Peter Bartrip, and Rachel Maines. Jacqueline Corn is the wife of noted and prolific asbestos defense expert, Morton Corn. Her book was sponsored by W. R. Grace, one of the largest manufacturers of asbestos fireproofing. Peter Bartrip's books have been funded by asbestos contractor ACandS and New York attorneys for British asbestos company Turner and Newell. In his books Bartrip found Selikoff to be both a key medical pioneer and a charlatan. Batrip's books read similar to legal briefs. This was

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With these new studies, conferences, and critiques, the asbestos company attorneys were reduced to fighting rear-guard actions. With increasing asbestos hazards research and knowledge, came ever-increasing lawsuits against the major companies. For the first time in 1966, Wayne Stephenson, attorney for an asbestos insulation worker Claude J. Tomplait filed a lawsuit against the manufacturers of the asbestos products he worked with. Eventually this case was settled with five companies for $75,000.00. Tomplait lost the trial against the sixth defendant becuase he could not remember at which jobs he had used its products. While that case was lost, in a subsequent coworker's case, the jury returned a verdict for the plaintiff, Clarence Borel, in the amount of $79,436.24. The dam of silence and confidentiality had burst. Shortly thereafter a plaintiff asbestos insulator, for the first time, won a case as a user of asbestos products from the manufacturer.[353]

Since that time the courts have been flooded with tens of thousands of personal injury lawsuits against asbestos manufacturers as well as numerous suits from property owners for asbestos products used during the construction of their buildings.[354]

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undoubtedly helpful to the defense attorneys during Bartrip's subsequent litigation testimony. Rachel Maine's book was sponsored by the Winthrop Group, a group of consultant historians who write commissioned histories and conduct litigation support for U.S. corporations. In their article, McCulloch and Tweedale demonstrate how each of these books failed to fully examine the historical record.

353 Paul Brodeur, *Outrageous* Misconduct, 6-7, 34-36; and Borel V. Fibreboard Paper Prods. Corp. (443 F.2nd 1076) (5th Cir. 1973) *cert. denied* 419 U.S. 869 (1974).

354 By 1982 16,500 unresolved lawsuits for asbestos disease had been filed against Johns-Manville. Additional cases were being filed on average of 500 per month. Barry Castleman, *Asbestos: Medical and Legal Aspects*, 243. In addition, by 1987 numerous class actions and individual property damage cases had been filed, most asking for millions of dollars in damages. Author's professional experience.

In the fight against this wave of lawsuits, the IHF provided considerable assistance to the defense lawyers. In its medical series bulletin, *The Pneumoconioses*, the IHF put the best light on current research by carefully selecting the information included. For example, the bulletin noted that reports linked both lung cancer and mesothelioma to asbestos but also cited one recent British study that held out hope of lung cancer risk being eliminated with good housekeeping. The *Bulletin*, however, failed to indicate what it considered the safe level of exposure or what good housekeeping would entail. Overall, the bulletin reads like a primer for attorneys to use when fighting legal and workers' compensation claims by workers. For example, on page twenty five it states:

> [I]t is advisable to reiterate the observations of many physicians, namely, that the X-ray picture should never be used to estimate the presence of the extent of impaired pulmonary function or disability. Many cases with X-ray evidence of third-stage asbestosis (the most advanced stage) have been known to carry out their usual work and live fairly comfortable lives for several years. On the other hand, no case of definite disability has been seen unless there was the typical X-ray pattern of asbestosis.[355]

A review of the medical articles authored by employees and consultants to the IHF during the 1960s and 1970s reveals research efforts more in keeping with providing support to litigation efforts than attempts to protect workers or determine the full nature of asbestos's disease potential. For example, Paul Cartier, Medical Director of the Thetford industrial clinic for the Canadian asbestos mines in the area, and Paul Gross of the IHF, published an article in 1962 concerning a case involving alleged non-asbestos

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[355] Industrial Hygiene Foundation, *The Pneumoconioses*, Medical Series, Bulletin no. 12 (Pittsburgh: The Industrial Hygiene Foundation, 1967), 25, Industrial Hygiene Foundation Archives, Carnegie Mellon University.

fibrosis of the lungs. Since the individual had worked with asbestos, most doctors likely would have expected this case to be the result of asbestos. Gross and Cartier specifically wanted clinical doctors to be aware of other, unknown, causes of fibrosis. While the worker had been employed in occupations involving exposure to asbestos for many years, Cartier did not did not believe the man had sufficient exposure for asbestosis. Like industry doctors who dismissed acute silicosis, he also believed the disease progressed too rapidly for asbestosis. The authors, however, were unable to determine the cause of the disease. In conclusion the authors stated: “This case illustrates the danger of making the diagnosis of pneumoconiosis on presumptive evidence. It also points up the desirability, if a diagnosis of pneumoconiosis is to be a reasonably sound one, to be in possession of all essential details of the industrial dust exposure.”[356] If the word silica had been substituted for asbestos, the entire article would have seemed appropriate in the 1930s. As had previously happened with silicosis cases, by calling for increased skepticism about asbestos diagnoses, even in cases of acknowledged asbestos exposure, the authors provided critical support to defense attorneys in almost all asbestos lawsuits.

IHF employees, including Gross, also wrote articles demonstrating that “asbestos bodies”—protein covered fibers found in lungs that were being used by plaintiff counsel to demonstrate asbestos exposure—did not always contain a core of asbestos. The IHF researchers determined that other fibers could also cause asbestos bodies. They suggested the bodies should be renamed “ferruginous” bodies, since they did not necessarily contain asbestos fibers. While this fact was extremely useful for defense of lung cancer lawsuits,

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[356] Paul Cartier and Paul Gross, “Nonoccupational Diffuse Pulmonary Fibrosis,” *Archives of Environmental Health* 4 (January 1962): 73-80.

it had questionable importance for occupational health, other than to show that other fibers might also be hazardous.[357] Gross followed up this determination with an article demonstrating that urban dwellers had large numbers of fibers in their lungs. Since these fibers in his estimation appeared to be from wood smoke, defense counsel could now contend that even lung fiber counts would not help a plaintiff counsel in establishing a connection between asbestos exposure and his client's lung cancer.[358]

Even when the researchers found a connection between asbestos and lung cancer, they developed a theory which exonerated pure asbestos. For example, in 1967 Gross reported on a rodent inhalation experiment he had conducted with chrysotile which found a substantial incidence of lung cancer, including at least one mesothelioma. While he acknowledged that this study confirmed experimentally the epidemiologically "surmised" relationship of asbestos and lung cancer, Gross "presumed" that the trace findings of heavy metals in the chrysotile caused the cancer, rather than any direct effect of the asbestos. This opinion provided a basis for defense attorneys to still dispute the cause of lung cancers in individual cases, despite the findings of numerous studies linking asbestos to lung cancer. If the culprit was heavy metals, rather than asbestos, then in any

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[357] Paul Gross, Lewis J. Cralley, and Robert T. P. deTreville, "'Asbestos' Bodies: Their Nonspecificity," *American Industrial Hygiene Journal* 28 (November-December 1967): 540-542; Paul Gross, Robert T. P. deTreville, Lewis J. Cralley, and J. M. G. Davis, "Pulmonary Ferruginous Bodies," *Archives of Pathology* 85 (May 1968): 539-546; and J. M. G. Davis, Paul Gross, and Robert T. P. deTreville, "'Ferruginous Bodies' in Guinea Pigs," *Archives of Pathology* 89 (April 1970): 364-373. Asbestos bodies had been used since at least 1957 to diagnose an individual with asbestos related cancer; see Wilhelm C. Hueper, "The Pathological Significance of the New Environmental Disease Panorama Resulting from Modern Industrialism," Presentation at the Fifty-Fourth Annual Meeting of the American Association of Pathologists and Bacteriologists, April 12, 1957, Washington D.C., Hueper Papers Collection MSC 341, Archives of the National Library of Medicine.

[358] Paul Gross, Lewis J. Cralley, J. M. G. Davies, Robert T. P. deTreville, and Jiri Tuma, "A Quantitative Study of Fibrous Dust in the Lungs of Urban Dwellers," *Inhaled Particles* 2 (1970): 671-681.

individual case, the plaintiff might have contracted lung cancer from exposures other than asbestos.[359]

The IHF's 1960s production of medical science materials useful to industry attorneys culminated with its 1968 book, *Industrial Hygiene Highlights*, edited by Lester V. Cralley, Chairman of the IHF's Engineering Committee and an employee of ALCOA. This book provided perhaps the best demonstration of the IHF's willingness to downplay the asbestos hazard, even after the medical consensus about the hazardousness of asbestos that was reached shortly after the 1964 Selikoff conference. The book, comprised of chapters written by individual authors, began with the long-held and largely respected industrial hygiene mantra that there is a dose-response relationship between poisons and injury; "risk becomes negligible when exposure falls below a certain tolerable level…" thus implying that any substance can be used so long as care is taken. This mantra takes into account the ability of the human body to fight off small doses of a great many materials. However, with regard to cancer, which can begin with the mutation of one cell, the mantra has limited usefulness.[360]

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[359] Paul Gross, Robert T. P. deTreville, Ethel B. Tolker, Marianne Kaschak, and Mary Ann Babyak, "Experimental Asbestosis: The Development of Lung Cancer in Rats With Pulmonary Deposits of Chrysotile Asbestos Dust," *Archives of Industrial Health* 15 (September 1967): 343-355. Lewis Cralley and Herbert Stokinger subsequently participated in a similar study. Cralley often worked closely with the IHF. We can only speculate about whether Stokinger had contacts with the IHF or industry attorneys before he published the Braun Truan report. J. R. Dixon, D. B. Lowe, D. E. Richards, L. J. Cralley, and H. E. Stokinger, "The Role of Trace Metals in Chemical Carcinogenesis: Asbestos Cancers," *Cancer Research* 30 (April 1970): 1068-1074. Cralley coauthored several articles with IHF members: see for example Paul Gross, John M. G. Davis, Russell A. Harley, Jr., Lewis J. Cralley, and Robert deTreville, "Asbestos: Identification of Fibrous Particles in the Lungs," *Journal of Occupational Medicine* 14 (October 1972): 757-759; and bibliography.

[360] Theodore Hatch, "Introduction," In *Industrial Hygiene Highlights*, eds. Lester V. Cralley, Lewis J. Cralley, and George D. Clayton, (Pittsburgh: Industrial Hygiene Foundation of America, Inc., 1968), 1-2. A similar approach to the risk of humans from radiation exposure caused by atomic fallout emerged at the same time, although in this instance it was the U.S. government which supported arguments that a safe threshold existed for exposure to radiation; see J. Christopher Jolly, "Thresholds of Uncertainty: Radiation

The epidemiologic section of the book took notice of increased attention being paid to the health effects of asbestos. The author, Lewis Cralley, a high official in the United States Public Health Service, who also had a close relationship with the IHF, wrote that he remained unsure of the relationship between asbestos and cancer. He cited Sir Richard Doll's 1955 findings of increased lung cancer among asbestos textile workers as the impetus for this interest, along with "a number of studies which tended to support the earlier findings." He then observed, without much discussion, that during the mid 1960s five major asbestos conferences had convened. The author identified the major result of these conferences to be an understanding "that little had been done to characterize the environmental exposures of asbestos workers in terms of types of asbestos used, metals and minerals associated with asbestos ores, and additives in processing." The chapter went on to observe: "Some researchers are of the opinion that the value set by American Conference of Governmental Industrial Hygienists of 5.0 million particles per cubic foot of air (mppcf) of total particulates *i.e.*, both respirable fibers and motes, is too high. On the other hand, available criteria for deriving current standards to prevent injury to health are still minimal and insufficient." After emphasizing that many of the cases of asbestosis were in workers initially exposed prior to World War II, when exposures were "generally quite high", the author conceded that the asbestos TLV should be reviewed with an eye toward "consider[ing] the merit of eventually" basing the number on the amount of respirable asbestos fibers in the air. The author

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and Responsibility in the Fallout Controversy," unpublished Ph.D. dissertation, Oregon State University, 2003 and Jolly, "Linus Pauling and the Scientific Debate over Fallout Hazards," *Endeavour* 26, 4 (2002): 149-153.

remained confident that reducing the exposure levels to those that "can be achieved with current good industrial hygiene control practices" would result in a decrease of lung cancer. Given the state of knowledge concerning asbestos at that time, most of these opinions seem fanciful at best. In keeping with Hueper's and Beyer's opinions about Public Health officials, Cralley did not suggest that a comprehensive epidemiological investigation be undertaken for United States asbestos manufacturers, even though as of 1977 not a single such investigation had been published. One possible explanation for Cralley's reticence to critically examine the country's asbestos usage might be his long and close association with the IHF. Not only was his brother Lester the chairman of an IHF committee, but Cralley had also participated in numerous IHF studies.[361]

The toxicology chapter of *Industrial Hygiene Highlights* provides still another example of information and opinions useful in defending against asbestos lawsuits. This chapter provided minimal information about asbestos, all of it minimizing any potential health effects. The chapter first cited an IHF study which did not find asbestosis in rats, even after heavy doses of chrysotile for sixty-two weeks. While the study did find a high incidence of lung cancer, the chapter's author highlighted the trace quantities of nickel, chromium and cobalt on the asbestos, clearly implying that the metals might have caused the cancers. The next reviewed study had not found a correlation between duration of asbestos exposure and breathing tests in workers, again implying a lack of causation

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[361] Lewis J. Cralley, "Epidemiological Studies of Occupational Diseases," In *Industrial Hygiene Highlights* eds. Lester V. Cralley, Lewis J. Cralley, and George D. Clayton, 11-14; Andrew D. Hosey, "Interview of Lewis J. Cralley of October 22, 1975," *Annals of the American Conference of Industrial Hygienists* 7 (1984): 61-67; Wilhelm C. Hueper Deposition on June 16, 1977, 18. (Selikoff's investigation of asbestos insulators had been undertaken at the behest of the union. The IHF may have conducted other investigations, but if so, none have surfaced. As noted earlier, Hemeon had suggested such an investigation in the late 1940s but his request was not approved by the companies involved in his surveys.)

between asbestos and disease. A third study determined that the oils sometimes associated with amphiboles had a weak carcinogenic response on mouse skin. From this one admittedly weak association—far less of an association than that found by a number of doctors for asbestos by 1950—the chapter's author suggested that oil might play a role in cancer. Finally, the author discussed one more potential litigation defense issue, citing another IHF finding that not all coated fibers in the lungs were asbestos, some of them were aluminum silicate.[362] By highlighting these studies and ignoring the numerous studies throughout the 1960s demonstrating the hazards of asbestos, this chapter clearly fit well within industry's desire to demonstrate that asbestos was fairly innocuous: almost anything *but* asbestos might cause cancer.

A final chapter in the book, devoted to new and recurring health hazards, seemingly tried to bolster the industry position that recognition of asbestos hazards was a recent phenomenon. The final two pages of the chapter discussed asbestos under the title "Old and continuing problems." The author opined that "we are just beginning to realize the extent of the problem from the use of asbestos." This was a critical point for defense lawyers in negligence cases involving silicosis, asbestosis, or lung cancer. If the hazards to the specific job classification had not been studied or reported when the workers were being exposed to silica or asbestos, then the companies contended that they were not negligent. However, only two sentences later the author admitted that "the problem of asbestosis has been studied extensively since the 1920s when a definite relationship was established between the fibers and the disease." Apparently, however, the author did not

[362] Emil A. Pfitzer, "Toxicology," In *Industrial Hygiene Highlights*, eds. Lester V. Cralley, Lewis J. Cralley, and George D. Clayton, 244-270.

believe this was the case with lung cancer. He implicitly cast doubt on asbestos' relationship with lung cancer by mentioning two unsolved problems regarding asbestos. These problems were the question about whether the metals associated with asbestos were the actual cause of lung cancer and the finding that not all "asbestos bodies" contain asbestos.[363] Both of these problems provided potential crucial elements for the defense of asbestos litigation. In sum, the asbestos information and opinions contained in *Industrial Hygiene Highlights* provided asbestos defense attorneys with a wealth of material to cast doubt on the association of any plaintiff's disease with asbestos.

Throughout the 1960s, the IHF, its employees, and agents did not limit their activities to developing an asbestos litigation-defense friendly scientific literature. Beyond publishing *Industrial Hygiene Highlights* and numerous medical articles, they also sought to subvert both governmental and quasi governmental health agencies and standards. The best example of industry's attempt to control the agenda, co-opt the experts, and manufacture science during the 1960s, came from the United States Public Health Service. There, as previously noted, Cralley worked closely with both Johns Manville and the IHF. During the 1960s he conducted a study of asbestosis in Johns Manville employees. When asbestos investigative reporter and author of the first mass media articles chronicling the beginnings of asbestos litigation, Paul Brodeur, asked him in 1968 if the study included lung cancer or mesothelioma, he responded that he was only interested in asbestosis. Brodeur then asked him if mesothelioma could occur with small exposures to asbestos, to which Cralley responded that "in his opinion the association

[363] Joseph A. Houghton, "New and Recurring Health Hazards of Industrial Processes," In *Industrial Hygiene Highlights*, eds. Lester V. Cralley, Lewis J. Cralley, and George D. Clayton, 356-357.

between asbestos and mesothelioma was not proven."[364] Brodeur apparently left the next obvious question unstated: If the association was not proven, why was it not a part of Cralley's study?

Cralley may not have even been that interested in asbestosis. When scientist William Johnson joined the newly established National Institute of Occupational Safety and Health (NIOSH) in the early 1970s, he examined the mortality data on asbestos textile workers that his predecessors, including Cralley, had accumulated. He was shocked at the data: "Just from the most cursory look at those data, almost anyone would know that there had been a tragedy of immense proportion in many, if not all, of those factories. Why, the men working in them were dying of asbestosis and cor pulmonale – a form of heart failure that often accompanies the disease-right on the job! Men in their fifties! And some only in their forties!" In a later interview Johnson remained cautious in his description of any purported government/industry cooperation in a cover-up. He would not say that the Public Health Service had covered up evidence, but he made a point to say he did not know if the study's authors were stupid, criminally negligent, or may have been concerned about their right to enter the plants being cut off, implying that at least one of these scenarios applied. Johnson further stated that even as the study was being conducted, everyone knew that many of the workers had advanced asbestosis or cancer.[365]

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[364] Paul Brodeur, *Expendable Americans*, 22-24.
[365] Thomas H. Murray, "Regulating Asbestos: Ethics, Politics, and Scientific Values," *Science, Technology, & Human Values* 11, no. 3 (Summer 1986): 6-7.

As late as 1972 at least some officials of the United States Public Health Service could still be viewed as conforming to the 1930s view of them held by Clara Beyer, confidential aide to Labor Secretary Frances Perkins, as industry lackeys. That year, even as many asbestos manufacturers were removing asbestos from their products, an article in *Food and Cosmetics Toxicology* comforted its readers with the news that US Public Health Service officials “are now satisfied that asbestos can be used safely in modern industrial plants.” The information came from Cralley. Industry attorneys could take comfort that at least some government officials still understood their viewpoint.[366]

Actions of the IHF with regard to asbestos policy during the 1960s also provided assistance to industry personal injury attorneys. Foremost among these were the actions directed toward the voluntary threshold limit value for asbestos. Gross became a member of the TLV Committee of the ACGIH in 1964. In 1965, he became chairman of the insoluble respirable dust subcommittee, the committee that established the Threshold Limit Value for asbestos. He remained active in the committee until 1983.

Although no direct evidence has been forthcoming that Gross worked directly for and with corporate attorneys while conducting committee business, several factors point strongly to this probability. First, throughout the 1960s and 1970s Gross performed research for Johns Manville, including a never-published confidential animal study on

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[366] Ibid; Clara Beyer reference from David Rosner and Gerald Markowitz, *Deadly Dust: Silicosis and the Politics*, 126. Hueper had similar experiences with officials in the Public Health Service. In 1952 the Surgeon General removed him “from any connection with occupational cancer epidemiology and forbade [him] to contact State Health Departments and industries in such matters” (Wilhelm C. Hueper Deposition on June 16, 1977, 13). Hueper also complained in his draft autobiography that throughout his career at the NCI, the Division of Industrial Hygiene, PHS “consistently tried to interfere with [his] efforts to investigate occupational hazards in man.” He attributed this harassment to the Division’s desire to “maintain cordial relations with industry (management).” Wilhelm Hueper, “Unpublished autobiography draft,” 137-139.

brake dust. Second, in 1969, as a member of a U.S. Public Health Service Committee he secretly provided draft copies of a Committee report to asbestos companies. Robert de Treville, at that time President of the IHF, wrote a memo concerning the report asking for industry comments, explaining: "we will attempt to see that needed corrections are introduced by Dr. Paul Gross, a member of the Committee."[367]

Yet, neither of these activities demonstrates the full extent of Gross' willingness to assist the asbestos industry to manufacture science. As part of a National Academy of Science (NAS) Committee, Gross provided both written documents and verbal reports about the ongoing committee study of asbestos in drinking water to Raymond L. Erickson, attorney for the Reserve Mining Company. This relationship was only disclosed when memoranda that Erickson wrote to his superiors about the discussions were provided to the government, pursuant to an early summer 1976 court order in litigation between the federal government and Reserve Mining. The memoranda recorded that Erickson "conferred with Dr. Paul Gross on May 5 and May 8, 1976, with respect to his participation in the subcommittee… Dr. Gross will be providing us with more information as to each of the individuals on the subcommittee in addition to copies of their draft reports which are identified and described generally in the attached two outlines." The memo also indicated that "Dr. Gross will be providing us with the draft

[367] Gross was not the only asbestos industry consultant on the ACGIH TLV Committee. Dr. Arthur Vorwald, who as Director of the Saranac Laboratory agreed to publish Gardner's non-cancer related research but withhold his animal cancer studies, served on the committee from 1951 until 1956. While on the committee Vorwald continued to conduct research for asbestos companies, some of which was never published. Barry I. Castleman and Grace E. Ziem, "Corporate Influence on Threshold Limit Values," *American Journal of Industrial Medicine* 13, no. 5 (1988): 546-7; Robert T. P. deTreville memorandum to IHF Fibrous Dust Study Sponsors of September 10, 1969, Industrial Hygiene Foundation Archives, Carnegie Mellon University.

reports to be submitted by the remainder of the subcommittee members and we should have some opportunity to assist Dr. Gross in evaluating the contents of those reports." [368]

When asked by a *Science* reporter about the incident, Gross attributed his conduct to his mistaken impression that the committee proceedings were open to the public. However, even after learning that Erickson would not be allowed to attend any meetings, he still provided Erickson with further information. In a later memorandum Erickson reported that Gross had informed him at one point that further documents could not be provided. However, "Dr. Gross felt he could read to me the draft conclusions pertaining to the health aspects of the subcommittee's report." [369]

Gross took all of these actions after initially indicating on his NAS pre-selection bias statement—required prior to any appointment to NAS committees—that he had no conflicting consultancies. When asked about this, he explained that his filing was proper since, although he had previously testified for Reserve Mining, he was not currently on retainer to Reserve Mining. Reserve Mining's attorneys apparently did not agree; they continued to list him as a consultant on their court filings.[370]

Although Gross denied that he had initially known about the confidential nature of the documents or being influenced by the attorney, and other participants believed he was being objective during committee discussions, these activities raise an inference of doubt about his independence. This inference is only strengthened by Gross' reading

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[368] Nicholas Wade, "NAS Committee on Asbestos: Discovery of a Special Relationship," *Science* 193, no. 4254 (August 20, 1976): 661.
[369] Nicholas Wade, "NAS Committee on Asbestos," 662.
[370] The "Bias Statement" asks scientists to declare, among other things, who they have consultancies with and whether they have made any public pronouncements on the issues in question. Nicholas Wade, "NAS Committee on Asbestos," 663-4.

another participant's draft conclusions to Erickson over the phone subsequent to the time he admitted understanding the confidential nature of the committee documents. At the bottom line, even if Gross' explanation of his activities is accepted, this incident clearly demonstrates the lengths to which attorneys will go in getting an edge in the medical science of relevance to litigation.

Yet, even if Gross correctly characterized his conduct, what does this say about industry's access to—and ability to influence—regulation and voluntary standards? If Gross felt comfortable conducting confidential asbestos research for companies, while at the same time not disclosing its implications for disease when asbestos exposure limits where set at the ACGIH, and was willing to provide confidential government reports to industry attorneys, it seems highly probable that he would not quibble about providing ACGIH information to industry attorneys or take the position they desired in committee discussions. The importance of Gross' influence at the ACGIH to industry only diminished in 1970, when the Federal government became intimately involved in industrial hygiene issues.

As the 1960s progressed a number of concerns had acted in concert to eventually secure federal action for occupational diseases. During this period, the increasing prevalence of asbestos disease was not the only area of anxiety for the nation's workforce. During the 1960s the nation's businesses and industry saw a reversal in the long-term gradual reduction in workplace injuries. From an injury frequency rate of 23.1

injuries per million man-hours in 1930, it had dropped to 12.0 in 1960. However, throughout that decade there was a steady increase, until the rate stood at 15.2 in 1970.[371]

By 1970, many labor and governmental leaders believed the injury rate was intolerably large. By that year injuries requiring sick leave were totaling 3% of the work force, with a loss of 100,000 man-years of production. Although later evidence suggested that the rise in injuries was either cyclical or, at best, evidence for an upward trending increase was mixed, Congressional committees in particular expressed concern about this development. The Labor Committee of the House of Representatives wrote that “this upward trend shows no signs of change,” while the Labor Committee of the Senate called for immediate action: “The knowledge that the industrial accident situation is deteriorating, rather than improving, underscores the need for action now.” Even the author of the conservative American Enterprise Institute’s analysis of the Act admits that the trend was “a troubling development for which no underlying causes have yet been identified.”[372]

Perhaps due to the voluntary nature of occupational diseases and their sometimes long latency period, less was known about occupational diseases. Even Selikoff’s massive study of 10,000 insulators had not been accomplished with business support, but rather through the union. However, it was estimated that only 25% of workers exposed to health hazards were adequately protected. At least one doctor testified about asbestosis:

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[371] John F. Burton, Jr., “The Occupational Safety and Health Act: Introduction,” *Labor Law Journal* 23, no. 8 (August 1972): 503.

[372] Bureau of National Affairs, *The Job Safety and Health Act of 1970*, Evaluative Studies 25 (Washington, D. C.: Bureau of National Affairs, Inc., 1971), 173, 218; Robert Steward Smith, *Occupational Safety and Health Act* (Washington, D. C.: American Enterprise Institute for Public policy Research, 1976), 5, 6-7.

"It is depressing to report, in 1970, that the disease that we knew well 40 years ago is still with us just as if nothing was ever known."[373]

However, even with this growing understanding of the problem, safety and health did not leap to the forefront of labor union concerns until the late 1960s following calls for environmental and pollution legislation. Union leaders such as Jack Sheehan, former legislative director for the United Steelworkers of America, believe that the Occupational Safety and Health Act would not have passed in 1970 "without the aggressive precedent of the environmental movement in this field." The November 1968 Farmington, West Virginia mine explosion that killed seventy-eight miners—and the growing movement to aid victims of black lung—also spurred calls for action by numerous individuals and organizations, including consumer and labor activist Ralph Nader. By 1970 an occupational safety and health bill became organized labor's top legislative priority.[374]

In 1970, these calls for action induced quick results from Congress. Every witness before the House subcommittee holding hearings agreed about the need for safety and health legislation. The initial House and Senate versions of the act passed with overwhelming bipartisan support, 383 to five in the House and eighty-three to three in the Senate. The Act was signed into law by President Nixon on December 29, 1970 and became effective 120 days later. At the signing ceremony for the Occupational Safety and

[373] Bureau of National Affairs, *The Job Safety and Health Act of 1970*, Evaluative Studies 25 (Washington, D. C.: Bureau of National Affairs, Inc., 1971), 13, 219; and Robert Steward Smith, *Occupational Safety and Health Act* (Washington, D. C.: American Enterprise Institute for Public Policy Research, 1976), 5-6.

[374] Susannah Zak Figura, "OSHA through Time: an Insiders' Portrait," *Occupational Hazards* 58, no. 4 (April 1996): 37-44, 37; John Mendeloff, *Regulating Safety* (Cambridge, Massachusetts: The Massachusetts Institute of Technology, 1979), 17-18; and Thomas O. McGarity and Sidney A. Shapiro, *Workers at Risk*, 33-34. Interestingly, writers from both the right and left political perspective appear to essentially agree on the main outline of these causal events; see Charles Noble, *Liberalism at Work: The Rise and Fall of OSHA* (Philadelphia: Temple University Press, 1986), 68-89; and Robert Steward Smith, *Occupational Safety and Health Act*, 5-6.

Health Act President Nixon called it "one of the most important pieces of legislation… ever passed."[375]

The Act contained 34 sections with numerous provisions for safety and health in the workplace. It provided not only for inspections of workplaces, but also established the National Institute for Occupational Safety and Health with research and education functions, as well as a Workmen's Compensation Commission to "undertake a comprehensive study and evaluation of state workmen's compensation laws." The Act required each employer to provide his employees with a job that is "free from recognized hazards that are causing or likely to cause death or serious physical harm." Perhaps the most crucial portion of the Act allowed OSHA agents to enter businesses "without delay." Since the time of the first state industrial hygiene agencies in the early part of the century, inspectors had to make appointments to visit businesses. Now for the first time, inspectors could examine the actual working conditions of factories and plants.[376]

Of equal importance, the Federal government could now conduct research and determine appropriate levels of exposure to toxic substances, rather than rely upon information from businesses whose profits depended upon keeping costs to a minimum. As authorized by the Act, during the winter of 1972 the Labor Department compiled and

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[375] Robert Steward Smith, *Occupational Safety and Health Act* (Washington, D. C.: American Enterprise Institute for Public Policy Research, 1976), 7; and John F. Burton, Jr., "The Occupational Safety and Health Act: Introduction," 501. The quote "one of the most" is from Susannah Zak Figura, "OSHA through Time: An Insiders' Portrait," 37.

[376] Robert Steward Smith, *Occupational Safety and Health Act*, 9. The quote "free from recognized hazards" is from The Occupational Safety and Health Act, Section 5(a)(1), (P. L. 91-596): the quote "undertake a comprehensive" is from John F. Burton, Jr., "The Occupational Safety and Health Act: Introduction," 501-2.

published in the *Federal Register* existing federal and national consensus standards to serve as a base for the agency's activities.[377]

Yet, in an election year, and as part of an administration that sought to nurture good relations with businesses, OSHA's initial efforts were severely criticized. The Watergate scandal did not only involve the burglary of the Democratic Party offices, but also exposed the desire of Republicans for OSHA to buttress businesses' support for the administration. During the investigation of the break-in, a memo from the first administrator of OSHA surfaced which put another light on the Republican administration's true feelings about the legislation. In this memo, George C. Guenther appeared to assure the President that he would not enforce the law and suggested that OSHA not propose any controversial standards in the near future. Although Guenther later claimed that the memo was only a statement of his views and was not put into effect, at least one commentator has suggested that Guenther "promised to slow rulemaking in exchange for industry contributions to the committee to Re-Elect the President."[378]

Even if Guenther's characterization of the memo is accurate, many commentators agree that, at least in its initial years, the agency failed in most respects to live up to its potential. In the first five years only three new health packages were adopted: asbestos, fourteen carcinogens, and vinyl chloride. Even the initial asbestos standard only came about due to an AFL-CIO petition. In response, an Emergency Temporary Standard of a 5

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[377] Susannah Zak Figura, "OSHA through Time: An Insiders' Portrait," 38.

[378] Jim Wolfe, "OSHA: A Short Story," 150-151; and Thomas O. McGarity and Sidney A. Shapiro, *Workers at Risk*, 36-38. The "promised to slow" quote is from Susannah Zak Figura, "OSHA through Time: an Insiders' Portrait," 39; United States Department of Labor, *History of the Department of Labor, John Stender Administration, 1973-1975: OSHA Becomes an Agency in Crisis*, http://www.dol.gov/oasam/programs/history/osha13 stender.htm, accessed on April 30, 2010.

f/cc exposure limit was put into effect on December 7, 1971. This limit was confirmed in the final standard promulgated in June, 1972. Since that time, however, asbestos has been increasingly closely scrutinized, with OSHA repeatedly lowering the allowable level of exposure.[379]

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Following repeated litigation discovery disclosures of company knowledge and continued advances in medical research, asbestos lawsuits grew exponentially in the 1980s. Companies scrambled to find new defenses. Subsequently, many companies such as Johns Manville, Keene Corporation, Armstrong World Industries, Pittsburgh Corning, and Owens Corning Fiberglas, that used the two most hazardous forms of asbestos—amosite or crocidolite—declared bankruptcy. The remaining companies that used or sold asbestos primarily used two scenarios in defending their cases. First, in every case they claimed the plaintiff's disease was caused not by their chrysotile product, but by amosite or crocidolite. In addition, even if their disease might have been caused by chrysotile, any

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379 Nicholas Ashford, *Crisis in the Workplace: a Report to the Ford Foundation* (Cambridge, Massachusetts: MIT Press, 1976); K. Robert Keiser, "The New Regulation of Health and Safety," *Political Science Quarterly* 95, no. 3 (Autumn 1980): 482; Gilbert S. Omenn, "Values in the Debate over Workplace Safety and Health: the Rancorous Rhetoric about Regulation," in Engelhardt and Caplan, eds. *Scientific Controversies* (Cambridge, Great Britain: Cambridge University Press, 1987), 443; Thomas H. Murray, "Regulating Asbestos: Ethics, Politics, and the Values of Science," In Ronald Bayer, ed., *The Health and Safety of Workers* (New York: Oxford University Press, 1988), 285. Thomas O. McGarity and Sidney A. Shapiro, *Workers at Risk*, 33-41, actually titles its chapter about the Nixon/Ford years "Inauspicious Beginnings." For a good, albeit short, summary of the asbestos exposure standards in the late 1960s through 1980, the efforts of Selikoff and unions to reduce the allowed levels of exposure, as well as the other early health initiatives of OSHA see David P. McCaffrey, *OSHA and the Politics of Health Regulation* (New York: Plenum Press, 1982), 81-104.

exposure to their product was too small to have contributed to the disease. The evolution also extended to plaintiff cases, as workers with different occupations and types of exposure began filing lawsuits. In addition, property owners began suing for removal of the asbestos products in their buildings.

With this evolution in the lawsuits came an evolution in the manner in which companies used and created science. The bankruptcy of virtually all manufacturers of amphibole-containing products left manufacturers using chrysotile as the sole defendants in virtually all asbestos cases. Officials of the country of origin for chrysotile, Canada, and scientists hired as experts for industry lawsuits argued that chrysotile was different. Its health effects were much less than those for amphibole asbestos. With proper precautions it could be used safely. The literature relating to this issue is mountainous, and, with the ongoing litigation in the United States, seemingly growing exponentially.

As the asbestos personal injury and property damage cases mounted in the 1970s and 1980s, litigation support increasingly drove the science. Every company, particularly those with only chrysotile products, strove to distinguish their product. Manufacturers of chrysotile containing products began emphasizing to worried purchasers that their products only contained “white asbestos” (chrysotile), a substance distinct from the amphiboles crocidolite and amosite, the asbestos types that caused mesothelioma, a deadly cancer. This distinction is somewhat misleading. Many mines that produce chrysotile are near amphibole deposits with the resultant product being a mixture of the two. Others, including almost all Canadian asbestos mines, have deposits that are contaminated with the amphibole tremolite. [380]

Although the mechanism of carcinogenicity remained obscure, much research became centered on the dimensions of fibers and their biopersistence, both areas of potential litigation defense to manufacturers of chrysotile asbestos products. One theory emerged that only long, durable fibers caused cancer. At trial, attorneys claimed that longer, more durable amphibole fibers caused an individual's cancer, not the shorter, "curlier," and less durable chrysotile fibers.[381]

Various segments of the industry also strove to influence medical opinion by concerted public relations efforts. On December 4, 1970 Johns Manville and other companies formed the Asbestos Information Association/North America (AIA) at its New York headquarters. The AIA's stated goals included providing a means to rebut "irresponsible and uniformed criticism" of the industry and its products and to "propagate the benefits and indispensability of asbestos through advertising, publicity, and speeches." Within a year its budget was $300,000, spent primarily on monitoring conferences and papers, with follow up activities ("lines of action") as needed. These follow-up activities included attempting to smear Irving Selikoff and to distinguish chrysotile from other fibers. Assisting in asbestos lawsuit defenses remained an

[380] Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes: The White Asbestos Controversy, 1950s – 2004," 239-259; and author's professional experience.
[381] M. F. Stanton, M. Layard, E. Tegeris, E. Miler, M. May, E. Morgan, and A. Smith, "Relation of Particle Dimension to Carcinogenicity in Amphibole Asbestos and Other Fibrous Materials," *Journal of the National Cancer Institute* 67 (1981): 965-975. See also R. F. Dodson, M. A. L. Atknson, and J. L. Levin, "Asbestos Fiber Length as Related to Potential Pathogenicity: A Critical Review," *American Journal of Industrial Medicine* 44 (2003): 291-297; and Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes," 249.

additional unstated goal of the AIA. This activity can perhaps be best illustrated by two articles written by Enterline, an eminent epidemiologist first mentioned at the beginning of this chapter. In 1978 the AIA commissioned a paper by Enterline in which he opined that the asbestos cancer hazard was not recognized in the United States until 1964. Enterline's 1991 paper which was quoted from at the beginning of the chapter also included this same opinion, with one important caveat: "…the asbestos industry probably exercised some control over research, and findings unfavorable to the use of asbestos probably exercised some control over research, and findings unfavorable to the use of asbestos were clearly not in their interest." Following the 1991 article, there were letters to the editor by Egilman and Hardy and a response by Enterline. In his response, Enterline offered—as one explanation for the failure to publish Gardner and Vorwald's work—the possibility that the studies did not really demonstrate cancer. Although both Hardy and Schepers—who were both at Saranac during the relevant periods—dispute this, the point here is not whether or not the studies were clear, but that they were not published and apparently not shown to Enterline when he was asked to write the editorial opining that the cancer risk was not known until 1964. This opinion, far from "propagating the benefits and indispensability" of asbestos, had only one logical purpose, to assist in the defense of asbestos lawsuits by showing that asbestos companies were not negligent in their sales of asbestos products.[382]

[382] Jock McCulloch, "Saving the Asbestos Industry, 1960 to 2006," *Public Health Reports (1974-)* 121, no. 5 (2006): 612; Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes," 245; Enterline, "Changing Attitudes and Opinions," 694; Harriet Hardy and David Egilman, "Corruption of Occupational Medical Literature: the Asbestos Example," *American Journal of Industrial Hygiene* 20, no. 1 (1991): 128; and Philip E. Enterline, "Early Animal Research on Asbestos Cancer," *American Journal of Industrial Medicine* 24, no. 6 (1993): 783-785.

Unfortunately, Enterline's 1978 article did not stop at failing to include industry research. In addition, it provided misleading information, particularly concerning Hueper. Although he credited Hueper with linking asbestos and cancer in 1943, Enterline pointedly cited to a government publication by Hueper's in which he failed to induce cancer during animal studies. Furthermore, by citation to another governmental publication, Enterline suggested that Hueper seemed to agree that German studies might have been unclear. Thus Hueper is made to seem unsure during the 1950s about the linkage between asbestos and cancer. In presenting this evidence, Enterline ignored Hueper's sustained, very public proclamations throughout the 1940s, 1950s and 1960s that asbestos caused lung cancer. If he had so desired, Enterline could have cited at least ten widely circulated publications of Hueper's concerning this opinion. In fact, even Hueper's 1956 monograph clearly associated asbestosis and lung cancer. Enterline's failure to cite the additional articles, or even fully explain the 1956 article, raises the possibility that the AIA asked him not to do so and specifically provided him with the only two cites of Hueper's work that cast any uncertainty on Hueper's long held (and otherwise clear) opinion concerning asbestos and cancer.[383]

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[383] Philip E. Enterline, "Asbestos and Cancer: the International Lag," *American Review of Respiratory Disease* 118, no. 6 (1978): 975-7; and Wilhelm C. Hueper, "A Quest into the environmental Causes of Cancer of the Lung," 36-38. For Hueper's opinions concerning asbestos and lung cancer through the decades, see for example Wilhelm C. Hueper, *Occupational Tumors and Allied Disease*, 403-405 (evidence is suggestive of causation); Wilhelm C. Hueper, "Environmental Cancer Hazards Caused by Industrial Air Pollution: Introductory Comment to the Discussion," *Archives of Industrial Hygiene and Occupational Medicine* 2, no. 3 (September 1950): 327 (asbestos is a carcinogenic agent of lung cancer); Wilhelm C. Hueper, "Environmental Causes of Cancer of the Lung other than Tobacco Smoke," *Diseases of the Chest* 30, No. 2 (1956), 141 (asbestos causes lung cancer); Wilhelm C. Hueper, "Prevention of Occupational Cancer Hazards," *CA: A Cancer Journal for Clinicians* 9, no. 3 (1959): 90-91 (asbestosis causes lung cancer); and Wilhelm C. Hueper, "Environmental Cancer Hazards," *Journal of Occupational Medicine* 14, no. 2 (1972): 149 (asbestos is carcinogenic).

In 1984, funding from the Canadian government, the Quebec government, and Canadian asbestos mining interests established another primarily public relations agency, the Asbestos Institute. Its stated purpose was (and remains) to "maximise (sic) the use of existing resources in a concerted effort to defend and promote the safe use of asbestos on a global scale." By 2001 it had received $54 million from its sponsors. During that period the Asbestos Institute sponsored conferences, undertook public relations initiatives, worked closely with industry attorneys, and disseminated "scientific" information, all touting the "safe use" of chrysotile. The following three examples of these activities demonstrate the character of their activities. In 1987 the Institute President reminded the readers of *The Economist* that in Selikoff's study "asbestos victims did not only inhale white asbestos but were exposed mostly to amosite asbestos," thereby implying that it was the alleged majority exposure to amosite that caused their diseases. The Institute also apparently organized an International Seminar on Safety in the Use of Chrysotile Asbestos, held in Havana, Cuba during 2000. At the Seminar, a British medical doctor argued that tremolite caused the cancers in Canadian miners, but much of it was removed in the milling process. In 2003 the Asbestos Institute publicized a new study that concluded chrysotile is safe, based upon a theory that short fibers are innocuous.[384]

[384] Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes," 249; and Geoffrey Tweedale, "Asbestos and its Lethal Legacy," 4. The Asbestos Institute 'purpose' and *Economist* quotes are from Barry Castleman, "Letter to the Editor," *Occupational and Environmental Medicine* 51 (1994): 431. Cuban seminar information is from David Egilman, Corey Fehnel, and Susanna Rankin Bohme, "Exposing the 'Myth' of ABC, 'Anything But Chrysotile:' A Critique of the Canadian Mining Industry and McGill University Chrysotile Studies," *American Journal of Industrial Medicine* 44 (2003): 544. Short fiber information is from David Egilman and Megan Roberts, "Letter to the Editor," *International Journal of Occupational and Environmental Health* 10, no. 1 (January 2004): 103. The Canadian Federal government may have provided the funding and support to the Asbestos Institute because it feared that the loss of mining business would affect Quebec province politics. A severe downturn in the Quebec economy might have provided the final boost needed by the separatists to achieve independence for French Canada.

In the same year as that of the founding of the Asbestos Institute, manufacturers of asbestos building products launched a similar public relations agency in the United States, The Safe Buildings Alliance (SBA). It also promoted the argument that chrysotile was the "safe" asbestos. Public and governmental relations headed the list of its purposes. The Safe Buildings Alliance coordinated closely with trial and regulatory counsel, keeping them updated about every governmental initiative that could affect litigation strategies and evidence. One of its major goals was to convince building owners that they did not need to remove asbestos products, particularly spray-on fireproofing and sound proofing, used in the construction of their buildings. Major funders for the SBA included W. R. Grace, National Gypsum, United States Gypsum, and Celotex, all former makers of asbestos spray-on products for buildings. The primary activities of the SBA included lobbying in Washington, D. C., preparing public relations informational bulletins, and organizing scientific meetings and conferences.[385]

As the 1980s drew to a close, both industry and public health advocates prepared large conferences to advocate their positions. Both conferences were attended by leading scientists. Both evaluated the hazard posed by asbestos in the environment. Both agreed that asbestos could be deadly, causing scarring of the lungs and cancers. That, however, is where agreement stopped. Other than the half of the audience composed of lawyers, almost no one attended both conferences. At the first conference, held in 1988 at Harvard University and sponsored jointly by the Safe Buildings Alliance and a realtor association,

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385 Safe Buildings Alliance, *Asbestos in Buildings: What Owners and Managers Should Know* (Washington, D.C.: Safe Buildings Alliance, 1989); and Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes," 251.

the doctors and scientists, most of whom were industry consultants and expert witnesses—or soon would be—explained why asbestos in buildings was not a cause for concern. Shortly after the Harvard Symposium, articles appeared in *The New England Journal of Medicine* and *Science*, extolling the virtues of chrysotile while lamenting that its detractors painted it with the same brush as the amphiboles. Although at least two of the authors, J. Gee and M. Corn frequently appeared as experts witnesses for industry asbestos trial counsel, neither article disclosed their industry connections. Subsequently, industry defense counsel enthusiastically used both articles at trial.[386]

Irving Selikoff hosted the second conference in New York in 1990. The scientists and doctors at this conference—many of whom were plaintiff attorney consultants or soon would be—explained why a third wave of asbestos disease approached due to the asbestos used in construction throughout the 1960s and 1970s. Plaintiff counsel attending this conference likely prepared lists of potential new client categories.[387]

In addition to public relations efforts and new review articles, industry attorneys were also receiving trial assistance from Canadian researchers. From 1966 into the 1990s, J. Corbett McDonald, a professor at McGill University in Montreal, Canada, conducted a massive study of 11,000 Quebec miners and millers. This study emanated from the Institute of Occupational and Environmental Health (IOEH), which was launched in 1966

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386 Brooke T. Mossman and J. B. L. Gee, “Asbestos-Related Diseases,” *New England Journal of Medicine* 320 (June 29, 1989): 1721-1730; Brooke T. Mossman, J. Bignon, M. Corn, A. Seaton, and J. B. L. Gee, “Asbestos: Scientific Developments and Implications for Public Policy,” *Science* 247 (January 19, 1990): 294-301; Geoffrey Tweedale and Jock McCulloch, “Chrysophiles versus Chrysophobes,” 251; and author’s professional experience.

387 Geoffrey Tweedale and Jock McCulloch, “Chrysophiles versus Chrysophobes,” 239-40. Having attended both conferences, I can confirm the importance of lawyers at both of them. At both conferences attorneys comprised a significant segment of the audience. Most of the audience discussion questions came from either attorneys or medical/scientific experts who were being provided significant funding by either plaintiff or defense attorneys.

by the Quebec Asbestos Mining Association (QAMA). Although McDonald denied that the IOEH was an industry initiative, it was the main recipient of QAMA research funding, receiving over $500,000 for research between 1966 and 1972. During the later stages of the study McDonald appeared as an expert witness for asbestos products manufacturers who were being sued by building owners for removal of the asbestos in their buildings. In his testimony McDonald argued that chrysotile only caused mesothelioma when it was contaminated by amphiboles, such as tremolite. He argued that proper milling and screening could and did remove the tremolite from most Canadian chrysotile used in manufacturing.[388]

By the late 1980s and 1990s McDonald and others argued that chrysotile only caused mesothelioma when it was contaminated with amphiboles. McDonald and other McGill scientists, as well as their sponsors, argued that proper milling and screening could and did remove tremolite from most Canadian asbestos used in manufacturing.[389]

The British Occupation Hygiene Society (BOHS) published the completion of McDonald's cohort study of eleven thousand Quebec miners and millers in a 1997 issue of its journal *Annals of Occupational Hygiene*. The journal also invited one of the study's authors to write a guest editorial. In keeping with the intense antipathy of industry and the necessities of litigation defense, Canadian epidemiologist and biostatistician Doug

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[388] Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes," 245-6, 252-3; and author's professional experience.
[389] Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes," 249-250.

Liddell used the editorial to launch an attack on the "menace" and "intense malice" of the Mount Sinai physicians—a group he characterized as "The Lobby."[390]

Just as had occurred in the 1930s silica crisis, in an effort to control or neutralize the leading medical authorities, asbestos litigation defense attorneys (including myself) were continuing to contact and arrange consulting agreements with many of the near legendary figures in asbestos. Those contacted and used by defense counsel in litigation included such legends of early cancer research as Sir Richard Doll and Christopher Wagner. Similar to Sir Richard Doll, Christopher Wagner held a hallowed position in asbestos lore, in Wagner's case for his landmark South African study in 1960 which definitively identified mesothelioma—normally an extremely rare disease—as having a close causal association to asbestos, and being particularly prevalent among crocidolite workers. Following Wagner's initial findings, the mining companies had withdrawn support for the research and suppressed a survey report, but the research was published in a British medical journal. This publication attracted so much criticism from the mining industry that it became difficult for Wagner to conduct research in South Africa. He subsequently immigrated in 1962 to Great Britain where he joined the government's Pneumoconiosis Research Unit in Wales.[391]

Wagner's subsequent writings and experience in litigation starkly illustrates some of the methods used in those contacts (and contracts) and their subsequent effects on science. In essence, Wagner, a giant among the asbestos occupational medicine field,

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[390] F. D. K. Liddell, "Editorial: Magic, Menace, Myth and Malice," *Annals of Occupational Hygiene* 41, no. 1 (1997): 3-12.

[391] J. Christopher Wagner, C. A. Sleggs, and Paul Marchand, "Diffuse Pleural Mesothelioma and Asbestos Exposure in the North Western Cape Province," *British Journal of Industrial* Medicine 17, no. 4 (October 1960): 260-271; and Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes," 242.

became a poster child for the manner in which attorneys can influence occupational science.[392]

When Wagner first came to prominence more than twenty years earlier as the "discoverer" of the asbestos/mesothelioma relationship, he had believed that asbestosis was not a necessary prerequisite to diagnose an asbestos related mesothelioma or lung cancer. He had also believed that all forms of asbestos caused lung cancer and mesothelioma. For example, in 1962 Wagner had opined that well developed asbestosis was not necessary for establishing the etiological role of asbestos in lung cancer. At the 1964 New York Academy of Science Asbestos Conference, he had even presented evidence linking Canadian chrysotile with mesothelioma. Even as late as 1979, Wagner had endorsed IARC's (and Wagner's) finding that chrysotile caused mesothelioma. One year later in response to a letter from Johns Manville, he wrote that his rat experiments produced a few mesotheliomas from chrysotile.[393] Thus, over a period of twenty years Wagner's opinions remained consistent: he believed all forms of asbestos caused mesothelioma and lung cancer.

This all changed during the late 1980s. From 1986 until 2001 Owens-Illinois, the former manufacturer of a leading asbestos pipe insulation (Kaylo), made regular

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[392] Much of the following material concerning Christopher Wagner is taken from Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes," 252-53; and Jock McCulloch, "Saving the Asbestos Industry, 1960 to 2006," 612.

[393] W. C. Hueper to Dr. H. L. Stewart letter, dated August 6, 1962, MSC C 228, Box 17, Archives of the National Library of Medicine. In this letter Hueper writes that he agrees with Dr. Wagner's opinion that asbestosis is not necessary to diagnose asbestos related lung cancer; J. Christopher Wagner, "Epidemiology of Diffuse Mesothelial Tumors: Evidence of an Association from Studies in South Africa and the United Kingdom," *Annals of the New York Academy of Sciences* 132, no. 1 (December 31, 1965): 575-578; Bogovski, P., J. C. Gilson, V. Timbrell, and J. C. Wagner, eds. *Biological Effects of Asbestos* (Lyon: International Agency for Research on Cancer, 1973); Geoffrey McCulloch, "Saving the Asbestos Industry, 1960 to 2006," 612.

payments to Wagner through an asbestos defense legal firm. While it is not entirely clear why he was retained, it was likely to keep Wagner from testifying for plaintiff attorneys and to have access to him for testimony and authoring medical articles about asbestos. The total sum paid to Wagner probably surpassed $300,000, a significant amount at that time, particularly in Britain where research wages were low. Wagner's monthly retainer often exceeded $6,000.00.[394]

Wagner's views changed no more than four years after his first payment from Owens Illinois when he testified that even heavy exposure to chrysotile did not cause mesothelioma. Since Kaylo—the asbestos pipe insulation material manufactured by Owens-Illinois and its successor manufacturer, Owens Corning Fiberglas—contained amosite, the attorneys also convinced him to testify that not even all amphiboles are alike. In 1990 at a London deposition he not only testified that chrysotile does not cause mesothelioma but was also unsure about amosite. He testified only that amosite can "probably with very heavy dosage" cause mesothelioma.

Wagner expressed similar views throughout the 1990s. His service on the independent Health Effects Institute's Asbestos Research Literature Review demonstrates just how far he had diverged from mainstream medical opinion. Among the eighteen panel members chosen from across the spectrum of opinions, Wagner was the sole dissenter from the panel's 1991 finding that chrysotile causes mesothelioma. These views only became stronger as the decade advanced. In early 1997 he wrote a letter to the editor

[394]Geoffrey McCulloch, "Saving the Asbestos Industry, 1960 to 2006," 612-13.

of the *American Journal of Public Health,* reiterating his position that crocidolite caused the vast majority of the mesotheliomas.[395]

By the late 1990s, Wagner lamented his decision to work with industry attorneys. When interviewed by a prominent public health historian in 1998, Wagner expressed regret "that he had allowed himself to be compromised." During the interview, Wagner "complained about how the asbestos industry set out to frustrate scientific discovery and how science had been hijacked by lawyers and the press—so much so that he expressed regret that he had ever worked on ARD." Even then he did not disclose his consultancy, which only emerged during legal discovery in 2001, shortly before Wagner's death.[396]

Although these activities of industry lawyers, consultants, and public relations representatives helped reduce payments in asbestos lawsuits, the mainstream international medical profession did not follow their lead. By the late 1990s most medical authorities worldwide had become convinced of the risks of chrysotile. The Canadian government, the Canadian mining industry, and American asbestos product manufacturers stood almost alone in advocating the "safe usage" of chrysotile. For example, in 1997 a Helsinki multidisciplinary panel concluded that while less potent, chrysotile still caused

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[395] J. Christopher Wagner, "Asbestos-Related Cancer and the Amphibole Hypothesis," *American Journal of Public Health* 87 no. 4 (April 1997): 687-8; Information on the Health Effects Institute is from Geoffrey McCulloch, "Saving the Asbestos Industry, 1960 to 2006," 613.

[396] Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes: The White Asbestos Controversy, 1950s-2004," 252-53; J. Christopher Wagner, "Asbestos-Related Cancer and the Amphibole Hypothesis," *American Journal of Public Health* 87, no. 4 (April 1997): 687-688. The Wagner quote is from Jock McCulloch, "Saving the Asbestos Industry, 1960 to 2006," 612. While defending Wagner at an early 1990s deposition in which Wagner was testifying as an expert witness, I personally experienced Wagner's willingness to modify his opinion as needed. At the time the author, there to defend Doctor Wagner at the deposition, was surprised but very pleased at how accommodating Wagner was to the author's position when he was asked if there were health effects distinctions between crocidolite and amosite—amosite being a key component in Kaylo. At the time, the author was not aware that Wagner was under retainer by Kaylo's early manufacturer, Owens Illinois.

mesothelioma. In 1998 a monograph published under the auspices of the U.N. Environmental program, the World Health Organization and the International Labor Organization concluded that "[e]xposure to chrysotile asbestos poses increased risks for asbestosis, lung cancer, and mesothelioma in a dose-dependent manner. No threshold has been identified for carcinogenic risks." In 2001 The World Trade Organization agreed that there is no safe limit to asbestos, all types are carcinogenic and "controlled risk" during manufacture, usage and disposal is unachievable. [397]

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Fortunately for industry, during the last decade of the twentieth century the role and scope of occupational disease science in civil litigation fundamentally changed. With this change in its usage in civil litigation came a change in the scientific literature. In June 1993, as first mentioned in Chapter 3, the United States Supreme Court handed down a decision in *Daubert v Merrell Dow Pharmaceuticals, Inc*. which required Federal judges to be gatekeepers for the admission of scientific evidence in their court room. The legally based scientific standard put forth by the Supreme Court both endowed defense attorneys with the authority to seek disqualification of plaintiff experts and opened the door to greater industry (with its greater financial resources) manufactured science.

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[397] Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes," 256; Geoffrey Tweedale, "Asbestos and its Lethal Legacy," 5. The WHO quote is from International Programme on Chemical Safety, *Environmental Criteria 203: Chrysotile Asbestos* (Geneva: World Health Organization, 1998), 94.

As previously quoted in chapter 3, Sheila Jasanoff argues that “in an ironic turn, the “science” that the Court officially embraced remained profoundly a creation of the court’s own biases, needs, and misconceptions concerning scientific inquiry; while urging judges to defer to scientific authority, the Court gave judges new resources for writing their preconceptions regarding science into law.” These preconceptions included some judges requiring doctors who testify as experts to meet standards that exceed those used in diagnosing patients and a widespread disregard for the uncertainty and skepticism inherent in scientific advances, particularly those that involve the human body. Through its strait-jacketed approach, *Daubert* has allowed industry attorneys to often exclude plaintiff expert opinions because of the inherent uncertainty of medical science, as well as to manufacture science through published studies in (often) industry sponsored journals.[398]

Robert Merton, the noted sociologist of science, highlighted this norm of “organized skepticism” in his 1957 book of essays, *Social Theory and Social Structure*. Merton defined “organized skepticism” as “a latent questioning of certain bases of

[398] Paradoxically, courts hearing criminal trials—with their higher standard of proof making it the very type of trial where the right to challenge expert opinions would seem most useful—have rarely allowed these challenges. On the other hand, civil trials—which only require a proof of more probable than not—have frequently excluded plaintiff experts. Sheila Jasanoff, “Law’s Knowledge: Science for Justice in Legal Settings,” *American Journal of Public Health* 95, no. S1 (2005): S50. This article contains an excellent critique of the Daubert opinion. Also see Jean Macchiaroli Eggen, “Toxic Torts, Causation, and Scientific Evidence After Daubert,” *University of Pittsburgh Law Review* 55 (1994): 889, 896; and Michael H. Gottesman, “From Barefoot to Daubert to Joiner: Triple Play or Double Error,” *Arizona Law Review* 40 (1998): 761 (discussing plaintiff difficulties in meeting the standard). For a discussion of the complexities of epidemiologic methodology that has not been considered by the Supreme Court see Richard W. Clapp and David Ozonoff, “Environment and Health: Vital Intersection or Contested Territory?,” *American Journal of Law & Medicine* 30, no. 2 & 3 (2004): 189-215, especially 199-212 (the authors discuss both the methods that can be used to pre-determine the outcome of a study and how easy it is to criticize past studies. Both techniques have been consistently used by industry litigation consultants; in particular see the discussion of industry brake articles, anon); and Jerome P. Kassirer and Joe S. Cecil, “Inconsistency in Evidentiary Standards for Medical Testimony: Disorder in the Courts,” 288 *JAMA* (2002): 1382-1387, especially 1382 for a discussion of legal standards exceeding diagnostic standards.

established routine, authority, vested procedures and the realm of the 'sacred' generally … Most institutions demand unqualified faith; but the institution of science makes skepticism a virtue."[399]

As noted above, the importance of *Daubert* is not its scientific failings, but the further openings it gave to industry's litigation defense attorneys. They not only used *Daubert* to limit plaintiff expert opinions, but used the vast monetary resources of industry to reshape the "peer reviewed" topography of occupational health science. They did this by hiring specialty consultant firms to conduct studies, reanalyze data, and deconstruct prior studies in industry friendly "peer reviewed" journals, often publishing two to four very similar articles from a single study or review. Other than those industry-funded scientists, there is very little interest today in rehashing the well-established hazards of asbestos. Thus an individual examining the peer-reviewed literature in 2010 for the hazards of asbestos brakes, for example, finds a very different landscape than that of ten years ago.[400]

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[399] Robert Merton, "Science in the Social Order," in *Social Theory and Social Structure* (Glencoe, Ill.: Free Press, 1957), 547.

[400] These "industry friendly" journals are often at least partially funded by industry or industry trade groups, have a substantial number of industry representatives on their editorial board, have limited, if any, disclosure of conflict of interest requirements, and rarely describe how their "peer review" process works. The two journals with perhaps the closest ties are *Risk Analysis* and *Regulatory Toxicology and Pharmacology*. The journal *Risk Analysis* has published a number of industry funded studies, often without an indication of any conflicts of interest. Shortly before June 2006 the editor in chief of *Risk Analysis* accepted employment with the industry oriented litigation support firm, Exponent. Center for Science in the Public Interest, "Integrity in Science Watch June 12, 2006," accessed on May 1, 2010 http://www.cspinet.org/integrity/watch/200606122.html. The journal *Regulatory Toxicology and Pharmacology* is perhaps the archetypal host of such articles. In 2002 the Center for Science in the Public Interest and over 40 scientists (some of whom testify for plaintiff counsel) wrote to the journal's publisher and owner requesting it to "hold the journal accountable to norms of publication ethics and to require greater independence of the journal from" the International Society of Regulatory Toxicology and Pharmacology, (ISRTP). The group made this request because ISRTP is supported by a large number of industry trade groups and large corporations that are subject to health and environmental regulations. The letter also listed a significant percentage of the journal's editorial board as having financial ties to products

Because of the one-sided nature of the ensuing research, defendants were able to react to the 1990s findings of the international health organizations by using their ability to modify the scientific literature. Since 2000, asbestos defense attorney-funded litigation support firms such as Environ and ChemRisk have published numerous articles in industry-friendly peer reviewed journals which argue for the relative innocuousness of chrysotile and the ability to use it safely with appropriate exposure controls. They even petitioned regulatory agencies to note the new "scientific" findings in their publications.[401]

Brake and automobile manufacturers have been leaders in this area of attorney driven scientific research. Automobile mechanics and brake lining workers had long been

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and companies that have been the subject of articles in the journal. These individuals included several lawyers representing industry and numerous consultants, such as Dennis Paustenbach, paid by industry and their lawyers to conduct studies for litigation and regulatory purposes. (Paustenbach has written at least 16 industry friendly articles published by this journal, including one concerning asbestos in automobile clutch discs.) The letter called on the publisher to require disclosure of interest statements with each article, including all financial conflicts, not just who funded the article. Olav Axelson, et al., letter to Ms. Kirsten Chrisman and Mr. Paul Weislogel of November 19, 2002, in Editor-in-chief, "Special Contributions, Correspondence about Publication Ethics and *Regulatory Toxicology and Pharmacology*," *International Journal of Occupational and Environmental Health* 9, no. 4 (October/December 2003): 386-389. The publisher and journal editor replied that he was confident that the board was balanced, without specifying why he was confident. He further stated that the journal was "peer-reviewed" without specifying how that peer-review worked. Finally, he agreed that there should be a disclosure of conflict of interest policy. Two months later the publisher wrote to announce that it had enacted a voluntary disclosure of conflict of interest policy.

[401] David Michaels and Celeste Monforton, "How Litigation Shapes the Scientific Literature: Asbestos Disease Among Automobile Mechanics," *Journal of Law and Policy* 15 (2007): 1137-1169. Since the 1990s automobile and automotive equipment manufacturers have funded "litigation support" consultants with tens of millions of dollars to develop tests and conduct scientific literature "reviews" that "demonstrate" their products are safe. Between 2003 and 2006 General Motors alone made payments of at least $8,975,366.00 to "litigation support" consultants. General Motors Corporation's Supplemental Response to Plaintiff's Request for Production of Documents Regarding Consulting Relationship with Authors who Published Industry-Favorable Literature, dated 21 November 2006, *Janet Unden, Personal Representative of the Estate of Richard Unden, Deceased, v. General Motors Corporation, et al.*, Case No. 05:6311, In the Circuit Court of the 13th Judicial Circuit in and for Hillsborough County, Florida. Since General Motors objected to providing any attorney work product information in the response, this amount may not have included any moneys paid to the same consultants through General Motors Corporation's outside counsel.

identified as being at increased risk for asbestos disease. As early as 1930, Merewether and Price had included manufacture and repair of brake linings in their list of British occupations at risk of asbestos exposure. In the United States, Hueper had included them in his mid-century listings of at risk occupations. Brake lining manufacturers faced asbestos lung cancer lawsuits as early as the mid 1950s. Yet brake manufacturers conducted few asbestos exposure or disease studies until after the *Daubert* decision.[402]

As a result of the recent publication activity by industry sponsored consultants, papers published on this topic since 2000 have substantially increased. During the ten year period between 1997 and 2006, journals published at least 39 papers relating to brakes and asbestos. One public health historian identified 26 such articles as being associated with litigation. Eighteen of the 26 papers were written by industry associated experts, while eight were written by experts who work primarily, but not always exclusively, for plaintiffs. In the papers sponsored by industry, most authors were not academicians or research scientists, but for the most part employees of self-professed litigation support firms such as Environ, Exponent Health Group, and ChemRisk. Two of these firms, Environ and ChemRisk, have received in excess of $20 million dollars for their litigation support work.[403] As a result of this work, literature reviews conducted today present a vastly different picture of the status of the science than a review conducted prior to 2000. By seeding the scientific literature, industry has attempted to

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[402] David Michaels and Celeste Monforton, "How Litigation Shapes the Scientific Literature: Asbestos Disease Among Automobile Mechanics," 1149-50.; and Wilhelm C. Hueper Deposition of June 16, 1977, 9-10. Since the one animal study on brake material conducted by the IHF in the 1950s was never published, it was likely positive.

[403] David Michaels and Celeste Monforton, "How Litigation Shapes the Scientific Literature: Asbestos Disease Among Automobile Mechanics," 1160-1165.

manufacture a new consensus in medical science, a consensus necessary for the successful defense of civil lawsuits.

A search of the internet medical article database PubMed for the period 1998 to 2008 reveals similar statistics:

PubMed articles with "asbestos" and "brake" used as search words 1998-2008

	Research or Study		Review or Letter to Editor	
	Negative	**Positive**	**Negative**	**Positive**
Industry Expert	**15**	**0**	**3**	**0**
Plaintiff Expert	**0**	**0**	**0**	**4**
Both sides	**0**	**1**	**0**	**0**
Unknown	**1**	**0**	**1**	**0**
Foreign	**1**	**4**	**0**	**0**[404]

Unsurprisingly, as the above chart demonstrates, both Plaintiff and Defendant experts published reports helpful to their sides. However, only industry experts published research articles, almost all of which were funded through attorneys. This manner of funding could allow for concealment of any unhelpful data or study results through the attorney-client privilege and the attorney work product privilege. This concealment is easily accomplished, even with the researcher having "the right of publication," for this right might only apply to the final report, with interim or draft reports being subject to editing and the final report being subject to acceptance by the funder. Thus, it is quite possible that additional studies were undertaken that did not provide the results desired.

404 See Appendix I for the articles. The classification of industry versus plaintiff expert is based upon the author's professional knowledge of asbestos experts. Although PubMed may not capture all of the brake and asbestos articles published during the period, it provides a broad cross section and includes most relevant journals. PubMed Website, http://www.ncbi.nlm.nih.gov/pubmed. Last accessed on November 23, 2010.

Some of the authors do not even reveal that they are consultants and expert witnesses in asbestos litigation. For example, an article by industrial hygienist and toxicologist Francis Weir, et al., which reported the results of an investigation into the amount of asbestos released into the air when lathes were used to grind brakes, simply stated that his work was funded by a "grant" from Hennessey Industries. Anyone curious to learn why Hennessy Industries would provide a grant for such a study must go to the Hennessy Industries website to learn that they manufacture and sell brake grinding lathes.[405]

The studies and reviews in the bottom four categories of the chart do not appear to have the same potential for bias. Most are positive reports. The foreign reports come from a variety of countries, including Poland, Tunisia and Australia. The one negative foreign report notes that its results may not be applicable to historic practices. "These low levels can be attributed to the wet cleaning or aerosol spray methods used in recent years to replace the traditional compressed air jet cleaning."[406] The unknown negative review comes from two doctors at Brigham and Women's Hospital in Boston. The author is not aware of any asbestos consulting by them, or by the two professors at the University of Michigan who wrote the negative letter to the editor.[407]

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[405] F. W. Weir and L. B. Meraz, "Morphological Characteristics of Asbestos Fibers Released During Grinding and Drilling of Friction Products," *Applied Occupational and Environmental Hygiene* 16, no. 12 (2001): 1149; Hennessy Industries web site is at http://www.ammcoats.com/about.aspx?id=56 reviewed on June 2, 2009.

[406] Paul Yeung, Kim Patience, Linda Apthorpe, and Deborah Willcocks, "An Australian Study to Evaluate Worker Exposure to Chrysotile in the Automotive Service Industry," *Applied Occupational and Environmental Hygiene* 14, no. 7 (1999): 449.

[407] F. Laden, M. J. Stampfer, and A. M. Walker, "Lung Cancer and Mesothelioma Among Male Automobile Mechanics: a Review," *Reviews of Environmental Health* 19, no. 1 (January-March 2004): 39-61; and A. Franzblau and D. H. Garabrant, "Repiratory Impairment Due to Asbestos Exposure in Brake-Lining Workers," *Environmental Research* 96, no. 1 (2004): 105-106.

Most of the industry studies did not contain new research but rather involved reviews and reanalysis of old studies or reconstruction of historic dust levels. Industry friendly or controlled journals published a majority of them.[408] As explained by David Egilman, associate professor of Public Health at Brown University and asbestos medicine expert, many of these studies incorporated two practices that have been common in industry occupational health related research since the 1930s silica crisis. First, they redefined the criteria for the disease, in this case the cause-effect relationship between the disease and the exposure; and second, they manipulated the data to obtain the desired result. The studies redefined the criteria by excluding any data that they deemed not sufficiently trustworthy. This was accomplished through the use of subjective reliability standards that only neutral or negative studies met. They then used statistical biases in manipulating the remaining data to ensure the final result.[409]

Other industry studies considered the levels of asbestos exposure for brake work under carefully controlled conditions. These airborne dust studies used various

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[408] See, for example, O. Wong, "Malignant Mesothelioma and Asbestos Exposure Among Auto Mechanics: Appraisal of Scientific Evidence," *Regulatory Toxicology and Pharmacology* 34 (2001): 170-7; Dennis J. Paustenbach, R. O. Richter, B. L. Finley, and P. J. Sheehan, "An Evaluation of the Historical Exposure of Mechanics to Asbestos in Brake Dust," *Applied Occupational and Environmental Hygiene* 18 (2003): 786-804; Michael Goodman, M. Jane Teta, Patrick A. Hessel, David H. Garabrant, Valerie A. Craven, Carolyn G. Scrafford and Michael A. Kelish, "Mesothelioma and Lung Cancer Among Motor Vehicle Mechanics: a Meta-analysis," *Annals of Occupational Hygiene* 48, no. 4 (2004): 309-326; P. A. Hessel, M. J. Teta, M. Goodman, and E. Lau, "Mesothelioma Among Brake Mechanics: an Expanded Analysis of a Case-Control Study," *Risk Analysis* 24, no. 3 (2004): 547-552; and Dennis J. Paustenbach, Brett L. Finley, E. T. Lau, G. B. Brorby, and P. J. Sheehan, "Environmental and Occupational Health Hazards Associated with the Presence of Asbestos in Brake Linings and Pads (1900 to Present): A 'State of the Art' Review," *Toxicology and Environmental Health B Critical Reviews* 7, no.1 (2004): 25-80.

[409] David S. Egilman and Marion A. Billings, "Abuse of Epidemiology: Automobile Manufacturers Manufacture a Defense to Asbestos Liability," *International Journal of Environmental Hygiene* 11, no. 4 (2005): 360-371. Egilman has testified extensively as an expert witness for asbestos plaintiffs and a few times for former asbestos product manufacturers. For a fuller and general discussion on how studies can use a variety of means to distort the record without lying, see Chapter 3 and John C. Bailar, "How to Distort the Scientific Record without Actually Lying: Truth, and the Arts of Science," *European Journal of Oncology* 11, no. 4 (2006): 217-224.

techniques to ensure that dust levels remained low. A study by Charles Blake, a Certified Industrial Hygienist who works for Bureau Veritas—an industry oriented health, safety, and environmental consulting group—provides an example of the methodologies used to assist attorneys in denying that a plaintiffs disease could have been caused by his brake work exposure. Blake's study examined asbestos dust generated during sealants and drive clutch replacements. It demonstrates two of the numerous ways in which airborne asbestos dust levels can be manipulated in a study to fall well below historic levels. Each of his fourteen experiments took only fifteen minutes and covered only a small portion of the work necessary to complete the job being analyzed. In his study Blake not only did not consider the build up of exposures over time, but the facility was both cleaned with modern equipment designed for asbestos removal immediately before the study and opened between each of the fourteen individual experiments, thus allowing any airborne fibers to dissipate and further reducing the work area fiber concentrations.[410]

Unlike Blake's study, many brake workers historically spent not fifteen minutes, but much of their day in the areas being used for brake work. This additional period greatly increased the potential for increased exposures. Asbestos fibers can remain

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[410] Charles L. Blake, G. Scott Dotson, and Raymond D. Harbison, "Evaluation of Asbestos Exposure within the Automotive Repair Industry: A Study Involving Removal of Asbestos-Containing Body Sealants and Drive Clutch Replacement," *Regulatory Toxicology and Pharmacology*, 52 (December 2008): 325-326. This journal's acceptance of Blake's article is very understandable, given the journal's close ties to industry. Its editor, Gio B. Gori worked during the 1980s and 1990s as a consultant for tobacco companies. Source Watch lists his activities for these companies as including attending conferences, writing and publishing books, letters and papers, and lobbying. Source Watch Website, http://www.sourcewatch.org/index.php? title=Gio_Batta_Gori, last accessed on May 28, 2009. Many of the journal's editors, such as Paustenbach and Wong, also have very close ties to industry attorneys. The article was partially funded by Ford and was likely paid for by Ford's attorneys—perhaps the same attorneys that have funded much of Paustenbach's work. See for example David Egilman and Samantha Howe, "Corporate Obstruction of Public Health via Manipulation of Epidemiology," *International Journal of Environmental Hygiene* 13, no. 1 (January/March 2007): 123.

airborne for considerable periods of time and are easily re-entrained. Thus, in many locations, exposures increased as the work day progressed. Taking readings over a fifteen minute period fails to include or even consider this potential for increased exposure.

More importantly, only part of an airborne asbestos concentration comes from the direct exposure to the new release of asbestos fiber. Re-entrainment of asbestos from prior similar activities presents a potentially even more significant portion of the exposure. For example, during the 1950s and 1960s, workers often used brooms to conduct daily or weekly cleanup of shop debris. In shops working with asbestos, brooms would remove large clumps of asbestos material from the floor: however, they simply caused smaller fibers to re-entrain into the air, to settle again hours later on work place surfaces. The asbestos fiber could remain on surfaces for months or even years, allowing it to become airborne each time activity took place in the room. The common practice of using compressed air to clean fibers off materials or brakes also caused fibers from both that material and many nearby surfaces to become airborne. Thus, contrary to the types of experiments conducted by industry experts, any air sampling of specific work practices must take into account the conditions of the 1950s and 1960s where build-up of fiber from past activities could dramatically increase exposure levels.[411]

The methods used and results obtained from these industry-sponsored studies contrast sharply with the few studies in the PubMed search which were conducted under actual working conditions. One recent study from Japan both reviewed the limited

[411] Some asbestos fibers can take up to eighty hours to settle out of the air: Iowa State University, *Asbestos Awareness Training* (Ames, Iowa: Iowa State University, 1996), at http://www.ehs.iastate.edu/publications/manuals/asbestosbook.pdf, last accessed on May 1, 2010; and author's professional experience in interviews, depositions and trials.

available literature and examined air samples from plants reprocessing brakes and clutches during the years 1982 to 1985. Although the study does not indicate who provided the funding, the participants included not only medical doctors and professionals from several Japanese universities but also employees of the Nagoya City Health Research Institute, so it may have been funded through a government entity. The authors sampled asbestos exposures of workers in three small asbestos brake reprocessing factories. They found very significant levels of exposure which decreased over the months of the sampling as good housekeeping and wet work practices gradually took hold. As would be expected, the study also found that air circulation, ventilation, and the amount of work performed all affected the levels of exposure. Unlike most of the industry studies that do not note their limitations—likely because at trial this would provide an avenue for cross examination—this study noted that it was not a random sampling of reprocessing sites and only conducted sampling in the summer when ventilation was better. This second limitation may mean that sampling in winter months would have demonstrated even higher levels of asbestos exposure.[412]

Two of the litigation support firms whose employees have authored the most industry friendly articles in the PubMed search, ChemRisk and Exponent, Inc., have a history of providing whatever litigation support science is desired by industry attorneys. ChemRisk's litigation support strategies were illustrated in chapter 3, which described its role in the 1990s chromium VI controversy. As described there, the Chrome Coalition

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[412] Kiyoshi Sakai, Naomi Hisanaga, Eiji Shibata, Yuichiro Ono, and Yasuhiro Takeuchi, "Asbestos Exposures during Reprocessing of Automobile Brakes and Clutches," *International Journal of Occupational and Environmental Health* 12, no. 2 (April/June 2006): 95-105.

hired ChemRisk and Environmental Risk analysis because they "felt that it was necessary to contract with a well regarded consultant in epidemieology (sic) and risk assessment to review all of the information that OSHA might use, determine the limitations and organize and develop a proper scientific basis (model) for predicting the impact of Hexavalent chromium on lung cancer in the workplace." Through the association's attorney's, ChemRisk conducted a reanalysis of the raw data, unsurprisingly determining—in a report subject to approval by the attorneys—that chromium was not a significant problem. They also sought to discredit prior research by ghostwriting an article that significantly altered the original findings. Another litigation support firm, Exponent, conducted another study, which manipulated the data to also show only a *de minimus* problem.[413]

In asbestos brake litigation these firms followed a similar course of action. For example, General Motors attorneys and Exponent developed a program of litigation support. On May 7, 2003 Patrick Sheehan, a Principal Scientist at Exponent, wrote a letter to attorneys representing General Motors that General Motors characterizes as "confidential correspondence from expert consultant to legal staff attorneys describing

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[413] R. S. Luippold, K. A. Mundt, L. D. Bell, and T. Birk, "Low Level Hexavalent Chromium Exposure and Rate of Mortality Among U. S. Chromate Production Employees," *Journal of Occupational and Environmental Medicine* 47 (2005): 381-385; T. Birk, K. A. Mundt, L. D. Dell, R. S. Luippold, L. Miksche, W. Steinman-Steiner-Haldenstaett, and D. J. Mundt, "Lung Cancer Mortality in the German Chromate Industry, 1958-1998," *Journal of Occupational and Environmental Medicine* 48, no. 4 (April 2006): 426-433; and David Michaels, Celeste Monforton, and Peter Lurie, "Selected Science: an Industry Campaign," 3-5. Information concerning the ghost-writing is contained in Peter Waldman, "Toxic Traces: New Questions About Old Chemicals," *Wall Street Journal* (December 23, 2005): A.1, obtained at http://www.familiesabainstcancer.org/?id=319 on April 17, 2009; Paul Brandt-Rauf, "Editorial Retraction," *Journal of Occupational and Environmental Medicine* 48, no. 7 (July 2006): 749.

litigation strategy tasks and budgets for proposed and ongoing work related to defending ongoing, pending and potential litigation." The purpose of the document was described as being "to set forth litigation strategy tasks to assist in ongoing, pending and prospective litigation." He sent another letter on July 22, 2003 about the same matters. The General Motors Corporation Privilege Log also lists draft memoranda from expert consultant to its staff attorneys on September 7, 2002 about the same subject matter. Since the actual wording of the documents that are listed on privilege logs is exempt form disclosure, the specific recommendations are not known. However, the various articles written and the positions taken by Exponent and ChemRisk employees certainly give a sense of the program agreed upon by the parties.[414]

As occurred for both chromates and benzene, Paustenbach's group has also written numerous articles that assist in the defense of asbestos brake lawsuits. Yet, independent scientific articles rarely, if ever, support their position. For example, in an article entirely funded by the big three United States automobile manufacturers, ChemRisk employees claim that their review of chrysotile-exposed cohorts in the scientific literature pointed to a threshold level for chrysotile that is higher than the exposure levels of brake mechanics. To arrive at their conclusion, the group evaluated

[414] General Motors Corporation's Privilege Log, Exhibit A, General Motors Corporation's Supplemental Response to Plaintiff's Request for Production of Documents Regarding Consulting Relationship with Authors Who Published Industry-Favorable Literature, dated 21 November 2006; R. S. Luippold, K. A. Mundt, L. D. Bell, and T. Birk, "Low Level Hexavalent Chromium Exposure and Rate of Mortality Among U. S. Chromate Production Employees," *Journal of Occupational and Environmental Medicine* 47 (2005): 381-385; T. Birk, K. A. Mundt, L. D. Dell, R. S. Luippold, L. Miksche, W. Steinman-Steiner-Haldenstaett, and D. J. Mundt, "Lung Cancer Mortality in the German Chromate Industry, 1958-1998," *Journal of Occupational and Environmental Medicine* 48, no. 4 (April 2006): 426-433; and David Michaels, Celeste Monforton, and Peter Lurie, "Selected Science: an Industry Campaign to Undermine an OSHA Hexavalent Chromium Standard," 3-4.

over 350 studies - but eliminated all but fourteen because they did not meet the inclusion criteria. The authors indicated that most of the studies were eliminated because of "lack of cumulative exposure information, lack of information on fiber type, and/or evidence of significant exposures to amphiboles." Unfortunately, the article does not provide a list of the evaluated articles, thus it is impossible to determine if the fourteen articles used are in fact the only ones that met the design criteria. At the conclusion of the article the authors acknowledge funding by the automobile manufacturers, but aver that "these three funding sources (and their counsel) did not provide editorial comments or review the manuscript prior to submission to the journal." Left unsaid is whether, as occurred in the chrome study, the funders (or their attorneys) edited the initial report that provided the basis for the manuscript. If this contract was similar to the one in the chrome study, automobile manufacturer attorneys could have stopped any publication simply by refusing to approve an initial report until it comported with their desires for litigation. Whether or not there was editing of the report, the article makes clear its purpose of assisting litigation by asserting a no-effect level of chrysotile that is higher than the normal level of exposure experienced by brake mechanics. It is safe to assume that if the group had not been able to provide an analysis that confirmed a no-effect level higher than brake mechanic exposures, ChemRisk would have at least thought long and hard about whether it wanted to publish a study in opposition to its primary clients: companies in litigation or regulatory controversies.[415]

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[415]J. S. Pierce, M. A. McKinley, D. J. Paustenbach, and B. L. Finley, "An Evaluation of Reported No-Effect Chrysotile Asbestos Exposures for Lung Cancer and Mesothelioma," *Critical Reviews in Toxicology* 38, no. 3 (2008): 191, 194, and 211. This article also assumed brake exposures to be at the low levels determined by other litigation support experts, rather than those found by third party authors such as the

Other recent articles about low dose mesotheliomas also raise questions about the article's validity. For example, three years prior to ChemRisk's article, a group from the University of California at Davis published an article not cited by ChemRisk about mesotheliomas from exposures well below those experienced by brake mechanics. This group determined that even residents near naturally occurring outcroppings of chrysotile or tremolite – chrysotile's normal contaminant - rocks had higher risks of mesothelioma.[416]

Along with these scientific literature litigation support efforts, brake manufacturers have also used another technique to buttress their litigation defense. This one involved using manufactured science to modify governmental scientific guidance. In 2003 the large law firm of Morgan, Lewis & Bockius LLP—well known for its numerous corporate clients—without revealing its client, challenged an EPA publication put out to provide guidance to automobile mechanics. The publication, known as the Gold Book,

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previously cited article concerning Japanese brake exposure levels or historic United States industry air sampling for brake work. For an example of moderately high exposure levels for brake work well after OSHA had begun conducting inspections of workplaces see G. D. Kenney, Memorandum dated March 30, 1977, "Asbestos Exposures During Brake Changes," author's personal collection, in which a Bell Laboratories employee found that his company's brake work exposure level was higher than permissible. In addition, fibers could not be counted on a number of the filters because the dust concentrations were too heavy. As stated in the memorandum, "As a result of these measurements it is evident that an exposure to asbestos fibers occurs during the operation of inspection and/or changing of brakes." Ironically, at nearly the same time as automobile manufacturers were funding a review of prior epidemiological studies to demonstrate that low levels of exposure to chrysotile did not cause cancer, two new research articles from Italy both found excess cancers in chrysotile worker cohorts. The first article studied workers at a tremolite-free chrysotile mine and found a greatly increased risk of mesothelioma, even among office workers, who would normally receive only low exposures. The second found a greatly increased risk of both lung cancer and mesothelioma among chrysotile textile workers: see Darlo Mirabelli, Roberto Calisti, Francesco Barone Adesi, Elisa Fornero, Franco Merletti and Corrado Magnani, "Excess of Mesotheliomas after Exposure to Chrysotile in Banlangero, Italy," *Occupational Environmental Medicine*, published online 4 Jun 2008 at doi:10.1136/oem.2007.037689; and Carlo Mamo and Giuseppe Costa, "Mortality Experience in an Historical Cohort of Chrysotile Asbestos Textile Workers," *Proceedings from the Global Asbestos Congress Conference* (Tokyo, Japan: Waseda University, 2004).

[416] X. Pan, H. W. Day, W. Wang, L. A. Beckett, and M. B. Schenker, "Residential Proximity to Naturally Occurring Asbestos and Mesothelioma Risk in California," *American Journal of Respiratory Critical Care Medicine* 172 (2005): 1019-1025.

had been written to inform auto mechanics about the methods which should be used to safely work around asbestos. The challenge was possible because of a law enacted in 2001 requiring agencies to follow quality control guidelines that allowed affected individuals the opportunity to correct misinformation. In this case the law firm claimed that the asbestos brake health pamphlet was “no longer current from a scientific perspective.” This claim was specifically based upon studies conducted by Exponent and funded by the automobile industry. The sponsors of the challenge achieved their goal. By 2006 the guidance was reduced from 15 pages to 2, with minimal detail.[417]

Finally, there is evidence that John L. Henshaw, at the time a “Teaming Partner” associated with ChemRisk and an expert witness for brake manufacturers in asbestos litigation—as well as the former the Assistant Secretary of Labor for OSHA from 2001 to 2004 during the George W. Bush Administration—similarly influenced a change in a health bulletin for asbestos brake work that had been posted on OSHA’s web site in 2006. Three weeks following the posting Henshaw sent an email to the head of OSHA’s Directorate of Science, Technology and Medicine, noting that the bulletin might be subject to a Data Quality Control challenge. The scare tactic worked. As of May, 2007, the OSHA bulletin contained a disclaimer that it “is not a standard or regulation, and creates no new legal obligations,” thus reducing the warning’s effectiveness. OSHA also suspended the employee who had prepared the original advice, for “issues related to the accuracy” of the bulletin and failure to include current literature, including ChemRisk’s work. Shortly afterward Henshaw informed a *Baltimore Sun* reporter that his intervention

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[417] David Michaels and Celeste Monforton, “How Litigation Shapes,” 1137, 1139, 1141, 1169 n. 4.

“was not undertaken on behalf of anyone by [himself].” He did not indicate whether or not the email had generated his additional usage as an expert witness by brake manufacturers. [418]

With the rise of litigation support firms, and the increasing sophistication of attorney litigation tactics, manufactured medical science continues to swell. As demonstrated in Chapters 4 and 5 attorneys involvement in occupational disease medical research has dramatically affected knowledge about disease, as well as the medical profession and public’s awareness of the hazards.

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[418] David Michaels and Celeste Monforton, “How Litigation Shapes,” 1137-42, 1166-68, 1169 n. 78.

Chapter 6 – Conclusion

As the twentieth century concluded, a growing number of post-modernist books and articles addressed the abundant outside factors that influence science and even whether science can be trusted.[419] Other books have studied the interaction of science and politics.[420] In addition, a profusion of books catalogue how industrial concerns often choose profits over safety or health.[421] However, the pervasive influence of *attorneys* in the manufacture and concealment of scientific knowledge throughout the twentieth century—although considered in a few specific events[422]—remains elusive in histories. The public and medical profession's understanding of the causes of cancer, as well as other occupational and environmental diseases, frequently has been delayed by failures to release scientific studies or by distortion of study results. Yet the vital role of attorneys in these events has, to date, received only limited attention from historians. Although little noticed by professional historians—even as they increasingly recognized varieties of external influence on science—attorneys have exercised a continuing influence on medical and especially occupation disease science throughout the twentieth century.

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419 This literature is voluminous and its origins extend at least back to the writings of Merton in the 1930s. For a current account of this issue see Harry Collins, "We Cannot Live by Scepticism Alone," *Nature* 458, (March 5, 2009), 30-31. For two influential books, see Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump*; and Bruno Latour, *The Pasteurization of France*.

420 See for example Sheila Jasanoff, *The Fifth Branch: Science Advisors as Policymakers* (Cambridge: Harvard University Press, 1990) which discusses the interaction of scientists and politics, and Naomi Oreskes and Erik Conway, *Merchants of Doubt*, which details the ability of a few scientists to spread doubt about important scientific issues with social consequences.

421 See for example Robert Proctor, *Cancer Wars: How Politics Shapes*; or Devra Davis, *The Secret History*.

422 See for example Jock McCulloch, "Saving the Asbestos Industry"; or David Michaels and Celeste Monforton, "How Litigation Shapes."

This thesis has sought to illuminate the period during which attorneys' techniques of manufacturing science with specific desired results were formulated. From the first workmen's compensation laws of the early twentieth century through the latest medical breakthrough attorneys have been involved in the production of science about disease, especially occupational disease.

The history of these activities reflects a continuing and growing intersection of science and litigation. Initial efforts to find loopholes in compensation laws progressed to today's systematic creation of the science necessary to present evidence to the jury. In the twenty-first century sophisticated litigation support firms are at the beck and call of attorneys, bragging that they can always find the evidence desired by their client.

Direct involvement by attorneys has made historical review of attorneys' activities in relation to science exceedingly complex. As British public health historians Geoffrey Tweedale and Jock McCulloch have noted, the trail of evidence surrounding these issues is not easy to follow. In their 2004 article about the controversy surrounding chrysotile asbestos from the 1950s to 2004, they lament the problems created for analysis by staggering complexity and volume of the literature, caused in part by "the debate [spilling] into the medico-legal and political arenas." [423]

In the introduction, I asked four questions concerning the intersection of the law and science:

1) For what purposes have attorneys historically used science?

[423] Geoffrey Tweedale and Jock McCulloch, "Chrysophiles versus Chrysophobes," 241.

2) What methods have attorneys used historically to create new scientific knowledge?

3) What, if any, methods have they used to hide scientific knowledge?

4) How has it affected scientific knowledge?

As demonstrated in the case studies of silica and asbestos, as well as other examples provided throughout this thesis, attorneys have used science repeatedly for the purpose of furthering their positions in litigation, workmen's compensation hearings, and before regulatory bodies throughout the twentieth and early twenty-first centuries. In this respect, given their professional objectives, they have invariably selected only that scientific evidence which supports their position.

However, sufficient scientific evidence has not always been available to ensure a successful outcome to their endeavors. Thus, attorneys have often resorted to contracting with experts for research or reanalysis of prior studies. In this effort, they have not been interested in the scientific truth, but rather in gathering evidence that will buttress their case. In this regard they have employed all of the means discussed in Chapter 3—managing the agenda, controlling or neutralizing the experts, and manufacturing science as necessary. As shown through both case studies they will use whatever techniques are legally ethical—in certain cases also going well beyond the ethical boundaries. When a study or research project does not provide the necessary evidence, the facts can be massaged or hidden, both relatively easy processes, given attorney client and work product privileges. The research and arguments used by both sides of the asbestos/lung cancer debate have used numerous created epistemic factors, for example case reports, epidemiological studies, interpretations of data, and criticisms and responses. As we have see however, there are questions about whether industry attorneys—or, in some cases, plaintiff counsels—actually believed some of their own arguments or simply used them to advance a litigation or regulatory agenda.

During the twentieth century industry and its attorneys—often with the assistance of subservient organizations such as the Industrial Hygiene Foundation or the Tobacco Institute—sought to move the issues of silica and asbestos disease out of the public eye into more controlled professional settings. With silica, a substance rooted in a discrete number of work places, they succeeded. Using silica as an example, asbestos industrial concerns and their attorneys placed great emphasis on profits, public relations, minimal regulations, and viable litigation defenses when considering their actions and public statements concerning health issues. As demonstrated most pointedly in the early asbestos studies and the recent history of Chromium VI litigation and regulation, when profit is involved there are few limits to efforts to create the appropriate evidence to enhance a position—efforts in which lawyers usually play a central role.

Unlike silica, however, asbestos—with its ubiquitous presence in industry, construction, and even white collar jobs and homes—proved more troublesome. This disease became a poster child of industry malfeasance. Today, even companies with less friable products—many of whom were originally outside the glare of lawsuits—are subject to a growing number of lawsuits for mesothelioma, a deadly cancer requiring only minimal exposure to asbestos. In response, their attorneys have turned to litigation support firms, who, for the right price, almost guarantee successful research or reanalysis of prior study results.

Recently, courts and some commentators have questioned the reliability of evidence obtained from research conducted in support of litigation. Ninth Circuit Judge Kozinski first questioned the credibility of litigation-generated science in the 1995 remand of the *Daubert, et al. v. Merrell Dow Pharmaceuticals, Inc.* case.[424] In this case plaintiffs attempted to establish causation through three groups of scientific experts: the first group reanalyzed previously published studies to establish a link between Bendectin and limb birth defects, the second testified concerning similar defects in animal studies, while the third noted the chemical structure of Bendectin is similar to other drugs suspected of causing birth defects. The appellate court affirmed the trial court's finding based upon the finding that the "opinions proffered by plaintiff's experts run counter to the substantial consensus in the scientific community…"[425] Furthermore, the court held that "testimony proffered by an expert . . . based directly on legitimate, preexisting research unrelated to the litigation provides the most persuasive basis for concluding that the opinions he expresses were "derived by the scientific method."[426] The Supreme Court apparently signaled approval of this approach in its 2008 decision on the *Exxon Valdez* case. In a footnote to that opinion, the court questioned the reliability of litigation-

[424] *Daubert, et al. v. Merrell Dow Pharmaceuticals, Inc.*, 43 F. 3d. 1311 (1995).
[425] *Daubert, et al. v. Merrell Dow Pharmaceuticals, Inc.*, 43 F. 3d. 1311, 1314.
[426] *Daubert, et al. v. Merrell Dow Pharmaceuticals, Inc.*, 43 F. 3d. 1311, 1317.

generated science. In that case, the court "declined to rely on" litigation-generated research "funded in part by Exxon."[427]

Other commentators have questioned the effectiveness of such a ban. They contend that the real problem is one of financial incentives. These same incentives apply to a broad range of scenarios. Two such commentators—at least one of whom has previously testified for plaintiff counsel—contend that "there seem no strong reasons to treat this conflict of interest differently from other relevant conflicts of interest."[428]

Yet this is only part of the issue. Perhaps even more telling, as described repeatedly in the cases of silica and asbestos, is the great danger of research being hidden when attorneys are involved. When attorneys become involved in scientific research, the question is no longer a search for scientific evidence, but rather a search for evidence that supports the attorney's position. Even if the contracted researchers maintain the highest standards of ethics with regard to their activities, this does not guarantee that the correct facts become public. Through the privilege of attorney work product, research that does not buttress the position desired by the attorneys can simply languish in some litigation file.

The net effect of these historical activities has been the distortion or delay in knowledge concerning occupational diseases. While the facts often surface in the end, the potential of massive human suffering can result from the delays inherent in "manufactured" science. Examples of this proliferate throughout the history of silica and

[427] *Exxon Shipping Company, et al., petitioners v. Grant Baker et al.,* 554 U.S. 471, 128 S. Ct. 2605, 171, L. Ed. 570, 590 fn. 17 (2008)
[428] Leslie I. Boden and David Ozonoff, "Litigation-Generated Science: Why Should We Care?" *Environmental Health Perspectives* 116, no.1 (January 2008): 117-122, quote at 121.

asbestos disease research. Even world renowned epidemiologist, and occasional defense expert, Richard Peto has commented about this problem in the scientific literature.

> Even the scientific literature is not immune from distortion by financial interests. The decades-long argument that "threshold" dose levels of carcinogens must exist below which the general population is absolutely safe has not been entirely motivated by the scientific plausibility of the hypothesis. With increasing understanding of the derivation of tumours from single cells acted on by mutagenic carcinogens, industry is slowly abandoning "threshold" arguments in favour of arguments (where the biological fallacies are somewhat better concealed by the mathematics) that thousandfold reductions in dose can conveniently be "statistically guaranteed" to produce a million-fold or some other enormous reduction in risk. Even if the scientists who propound such models are disinterested, industrial endorsement of them is not. Much excellent toxicology may be done by industry, and many industrial scientists and managers may be directly and honestly concerned with the prevention of hazards. But so many examples of financially motivated bias exist that the motives and work of industrial scientists and consultants are inevitably distrusted. [429]

Although Peto also criticizes environmentalists as at times exaggerating the problems, he continues by writing:

> My criticisms of Epstein's science, however, must be viewed in the light of the continued resistance of many industries to reasonable controls. One has only to read some of his descriptions of industrial behaviour to see where his passion comes from, and a suitably sceptical reader could derive much important information from the dozen or so detailed case-histories of particular carcinogens that make up the bulk of this book.[430]

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[429] Richard Peto, “Distorting the Epidemiology of Cancer: the need for a more balanced overview,” *Nature* 284 (March 27, 1980): 297.
[430] Peto, “Distorting the Epidemiology,” 300.

We can only wonder and fear what other knowledge remains hidden in the files of law firms. The integrity of public health science may well continue to erode unless we find some way to take both politics and the profit motive out of the health sciences that are designed to determine the human safety or hazardousness of products.

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Appendix

Appendix I[431]

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