FILE NAME: ! ăōŜăűƨă Mining (ASMI)

DATE: 200c hŎű

DOC#: ASMI03c

DOCUMENT DESCRIPTION: Journal Article π a ƛyʎyƎ l·yŘ a ŜyŘl·ŎƛűëƩ ƨℕ l ƨø űƨ YŜŜLJ l· ¢ƨÈƛŎ tℕƨŘdzŎű ƛy˜úKŜ a l·ℕ⌋ŜűLJfl·ŎŜ

Mining and Mendacity, or How to Keep a Toxic Product in the Marketplace

JOCK MCCULLOCH, PHD

The corruption of medical evidence about the hazards of asbestos began with the Canadian mines. Quebec at one time boasted ten of the 13 mines in Canada. Work conditions in the mines were harsh, and the mills were full of airborne fiber. Given the size of the industry, the Quebec mines were where occupational asbestosis should first have been identified, but research at the mines was done in company towns, where clinics were staffed by company doctors. Since the late 1920s U.S. parent companies and their Canadian subsidiaries have maintained that there is little if any disease among mine workers. Asbestosis in textile workers, they have claimed, has been due to the conditions in that industry and not the inherent dangers of asbestos. That fiction continues to shape the discourse about the usefulness of asbestos.
Key words: asbestos; industry influence; Canada.

INT J OCCUP ENVIRON HEALTH 2005;11:398–403

The global asbestos industry was born in the final decades of the nineteenth century. By 1920 mines in Canada, South Africa, the Soviet Union, and Southern Rhodesia supplied fiber for the manufacture of asbestos-based products in Western Europe and North America. Large companies such as Turner & Newall (U.K.) and Johns-Manville (U.S.A.) owned Canadian and South African mines in what was an early twentieth-century example of vertical integration. In the OECD states the manufacture of asbestos products peaked in the 1970s, with worldwide production exceeding five million tons per annum. Despite the known dangers, today more than two million tons of chrysotile, or white asbestos are mined and shipped around the world each year.* Besides dominating world trade in asbestos, Canada has aggressively promoted the use of asbestos in developing countries and has used its influence in international forums to protect its export markets.† Canadian producers and their U.S. parent companies have always claimed that asbestos is safe and that there is little or no disease among Canadian miners. The industry's management of medical knowledge has been the key to the continued use of asbestos.

In 1930 the principal manufacturers, including Johns-Manville, Turner & Newall (T&N), and Philip Carey, arranged a cartel that divided the global market into spheres of influence. The arrangement assured a supply of asbestos and set prices to the companies' advantage. It in effect guaranteed the industry's profitability and created a framework within which the big companies could flourish.[2,3] Canada was the key to the global industry. Most of the asbestos used in the United States during the twentieth century was mined in Quebec, which at one time boasted ten of the 13 mines in Canada. They included the Jeffrey Mine, which was the largest open-pit asbestos mine in the world. Johns-Manville controlled over 40% of Canadian output.[4]

In Canada as elsewhere, the industry relied upon the mines to produce fiber cheaply. The most expensive items in the manufacture of asbestos products such as brake linings and insulation were the raw materials. Wages and labor amounted to less than 40% of the final cost of production.[4] Canadian asbestos could be produced for less than $35 a ton, and it proved extremely profitable for Johns-Manville and its competitors such as Philip Carey to operate their own mines.[5] To make the mines safe would have eroded profits, and the comparative advantage of asbestos over synthetics would have been lost.

Since the late 1920s, U.S. parent companies and their Canadian subsidiaries have maintained that there is little or no disease among mine workers. Asbestosis in textile workers, so they have claimed, has been due to the specific conditions in that industry and not the inherent dangers of the mineral. That fiction continues to shape the discourse about the usefulness of asbestos, and has enabled the industry to keep its products in the marketplace.

ASBESTOSIS

Asbestosis is a form of pneumoconiosis caused by the inhalation of asbestos fiber. As lung tissue loses its elasticity, its capacity to function is reduced, thereby causing a progressive shortness of breath. The disease may result in a crippling fibrosis. Beginning in 1924, a number of papers on asbestosis appeared in the *British*

Received from the School of Social Science and Planning, RMIT University, Melbourne, Australia. Supported by the Australian Research Council.

Address correspondence and reprint requests to: Jock McCulloch, Social Science and Planning, RMIT, GPO Box 2476V, Melbourne 3001, Australia; e-mail: <jock.mcculloch@rmit.edu.au>.

*While there were three major commercial varieties of asbestos, chrysotile (white), amosite (brown), and crocidolite (blue), over 90% of the fiber used during the twentieth century was chrysotile.

†For an account of Canada's attempts to retain access to the French market for its asbestos see Sentes.[1]

Medical Journal. In February 1928, Merewether and Price began a study in response to emerging evidence of disease in U.K. factories.[6] By 1930, it was well understood that asbestosis was a serious fibrosis of the lungs, and that after ten years of employment, industry workers had a 50% chance of disability.[3] Asbestosis could be fatal and would progress even when exposure had ceased. In a memorandum published in 1933, Merewether noted that asbestosis was a more serious disease than silicosis. It destroyed the body's reserve capacity to resist other infections, so even a moderate degree of disability could be life-threatening.[7] Since 80% of the asbestos imported into the United Kingdom came from Canada, any major variation in disease rates between the two settings was unlikely.

With notable exceptions, the early literature on asbestosis focussed upon the factory workers in Western Europe who made asbestos-based products. It was not written about the men, women, and children who mined asbestos in Canada and Southern Africa. Labor conditions in African mines were notoriously bad, especially for black workers. In 1928, F. W. Simson, from the South African Institute for Medical Research, published a short article on fibrosis. On examining post-mortem material from a small number of Southern Rhodesian miners, Simson found curious yellow bodies in sections of lung tissue.[8] Simson had no data on the subjects' work histories, but at the least his research suggested that miners faced a risk of contracting asbestosis.

A far more important study of South African miners was completed in 1930 by George Slade, a physician employed at the New Amianthus mine in the Eastern Transvaal, which was operated by T&N. Slade had no x-ray equipment, so he relied upon a careful physical examination of each of the miners. He found that 70% of these workers had shortness of breath and almost all suffered from weight loss, the two classic symptoms of asbestosis. He concluded that over half the mill and mine workers had that disease.[9] By matching work histories against medical profiles, Slade was able to establish an association between exposure levels and illness. Despite their importance, Slade never published his results, nor was his thesis cited in the literature. He attended no conferences, and as far as is known, he never acted as a consultant for the Departments of Mines or Health. Having completed path-breaking research, Slade left the industry almost immediately and spent the rest of his career as a general practitioner in Johannesburg before retiring to the Channel Islands. He never again worked in the field of occupational health.[10] The South African Medical Register, which documents the names and addresses of all physicians, has no record of Slade's having practiced medicine in South Africa.

Canada produced far more asbestos than did Southern Rhodesia, with its mines supplying most of the fiber used by U.S. industry. Canada had a developed economy and, in theory at least, Canadian workers were protected by the law, unlike their South African counterparts. In 1930, Dr. Frank Pedley, then director of the Department of Industrial Hygiene at McGill University in Montreal, published two articles on asbestosis.‡ The Department had been set up by the Metropolitan Life Insurance Company in 1926 to provide it with information on morbidity and mortality in Canadian industries, including the asbestos industry. In an article in the *Canadian Medical Association Journal,* Pedley claimed that mining and milling in Canada might not present the risk associated with manufacture of asbestos-containing products in the United Kingdom.[11] In a second piece, Pedley remarked that there had been no case of asbestosis in Canada and that there was no evidence of a hazard in Quebec's mines.[12] Pedley made reference to Simson's study of Southern Rhodesia but failed to mention that the fiber causing asbestosis in Southern Africa was the same to which Canadian miners were exposed.

In May 1930, Dr. Stevenson, a mine physician with Canadian Johns-Manville, gave a paper on occupational disease to members of the Quebec Asbestos Producers Association. Stevenson was at that time engaged with Frank Pedley in a survey of asbestosis, and no doubt his audience assumed his presentation was based on data from that study. Stevenson explained that asbestosis rarely occurred in Canadian mine workers. While there might have been cases in the distant past, Johns-Manville was such a fastidious employer that as a preventive measure it transferred mill workers to other jobs after ten years of service.[13] Stevenson wished he had access to the x-rays of South African miners so he could become more familiar with the disease.

Such assertions about the absence of asbestosis in Canadian miners were repeated ad nauseam by the industry over the next half century. For example, during the first months of World War II, when public authorities began reviewing the Workmen's Compensation Act, Johns-Manville informed the Quebec government that there had been no case of asbestosis at its mines, and any reference to that disease in the legislation would only encourage groundless claims for compensation.[14]

Despite Pedley's and Stevenson's claims, they and the industry were fully aware of high levels of disease among Canadian workers. In 1930, the Metropolitan Life Insurance Company, along with the major companies, funded a study of asbestosis among Quebec miners. The project, which was coordinated by Dr. Frank Pedley and assisted by Dr.Stevenson, involved 141 Canadian Johns-Manville employees at Asbestos and 54 men at Thetford. Eighty-five percent of the Thetford miners had had ten years of service, compared with only 22% of those at Asbestos. Pedley and

‡The center was founded in 1926 by the Metropolitan Life Insurance Company.

Stevenson began with a review of the miners' general health.[15] Half of those in each group needed dental care; 10% of the men from Asbestos had hearing loss, while over half of the Thetford subjects had marked industrial deafness; 27 from Asbestos and 13 from Thetford had infected tonsils, and 10% of both groups had hernias, a serious disability in men required to do heavy work. Around 10% of the Thetford men had asbestos corns or raised areas of skin, similar to a small wart, caused by imbedded fibers. The general health of both groups was poor, especially for men who were fully employed. Unlike their U.K. colleagues, Pedley and Stevenson did not take work histories.

The clinical examination of the men's lungs was even more disturbing. Basal rales were common, but the most frequent complaint was shortness of breath, the classic symptom of asbestosis. Of the 40 men examined by Dr. Stevenson, 14, or 35%, had stage one asbestosis; of the 56 men x-rayed at Thetford, almost half had asbestosis; and of the 141 at Asbestos, 17 had the disease.[15] The high incidence at Thetford was consistent with the longer average period of service, and in his report Pedley wrote: "From this table one would conclude that asbestosis is not likely to develop with an exposure of less than five years, but that with exposure of more than ten years there is a great possibility of it developing."[15] Pedley concluded that while asbestosis was common, it was of little importance since there was no accompanying incapacity. In reaching that conclusion he ignored the heavy physical labor required of miners and his own finding that shortness of breath was common. He also ignored the medical literature from the United Kingdom, which was cited widely in the leading North American journals.[3]

Pedley wanted to publish the study, but to do so he needed permission. He approached Dr. Anthony Lanza at Metropolitan Life, which had provided part of the funding, but Lanza refused, and the study was never released. From that time, the views expressed by Lanza about disease in the mines varied according to the audience he was addressing. In private he acknowledged that claims about the absence of asbestosis in Canadian miners were motivated by the self-interest of the Canadian asbestos companies.[16] In public Lanza endorsed the fallacy that the Canadian mines were safe.[17] The final evidence of Lanza's view about the safety of the asbestos mines is found in the behavior of his employer. Metropolitan Life came to view asbestos workers as such a high-risk group it added an extra 40% loading to their health insurance premiums.[3,19]

In April 1940, with asbestos production levels rising, Dr. Stevenson presented another paper on the safety of Canadian mines at Sherbrooke. He explained that Johns-Manville staff were x-rayed annually and, of the 507 men at Asbestos with more than ten years of service, only 22, or just over 4% showed early signs of fibrosis. In fact there was so little disease in Canada it was almost impossible to conduct research. Stevenson did, however, admit that the Thetford mill was full of dust, and he wondered: "if it would be possible to have small ventilated chambers erected in certain locations in the mills where operators of machines could be kept, a part of the time, while still watching their machines, so that they could get clean air."[20] Paradoxically, there was dust and disease in the South African mines, but in Canada there was supposedly only dust. State authorities may have believed Stevenson, but Johns-Manville's competitors were less gullible.

Stevenson's paper was distributed within the industry and copies were sent to Johns-Manville's competitors in the United Kingdom. Turner & Newall operated the mine in Southern Africa where Slade had done his research in the late 1920s, and it also had mines in Quebec. Therefore, it was not surprising that T&N's chairman Sir Samuel Turner, was irritated by Stevenson's claims about the absence of disease. He commented that asbestosis was difficult to diagnose and that it was common for more cases to show up post mortem than during clinical examination.[21] Sir Samuel was certain that if the U.K. Medical Board had examined Johns-Manville's employees they would have found plenty of asbestosis. J. A. Cann, a senior executive with T&N. agreed.[22] Cann noted that x-rays were not a reliable method of diagnosis, and for that reason British physicians always took detailed work histories. Unlike many of his colleagues, Cann had had first-hand experience of Canadian mines, which gave him further reason to question Stevenson's claims. During a visit to the King Mine, Cann had found work conditions to be very poor. There was not enough draught to remove even the palpable dust from the mills, and pollution was particularly bad in the bagging areas. Under such conditions disease was inevitable.

There were a number of reasons why Stevenson's paper irritated his British readers. The most obvious was the claim that while there was disease at T&N's African mines there was none among Johns-Manville's North America workers. It is certain that Sir Samuel was aware of the conditions in Canada. He may also have been aware of research from a decade earlier in which Stevenson had been directly involved. But his irritation did not lead to any improvement in the work conditions on T&N mines.

THE MINES

Chrysotile miners in Canada faced many of the same problems as miners elsewhere, including low pay, dangerous conditions, technological change, intractable management, and shift work. In addition, the Quebec mines polluted the environment and had an intrusive impact upon communities that were dependent upon them for employment.[23] There were also technical factors that made asbestos mining particularly hazardous.

While methods of extracting asbestos ore have varied from open cut to depth mining, the aim of processing fiber is always the same, namely to preserve the mineral's physical properties. For that reason, asbestos is milled dry, which means that milling creates dust. After arriving at a mill, ore is fed into primary crushers, then crushed and sorted.[24] The ore is then crushed again, and the fiber lifted off by suction. The further into the milling process, the more dust is generated. The most hazardous jobs at Wittenoom (Australia), Penge (South Africa), and Shabanie (Southern Rhodesia) were in the bagging sections, were fiber was pressed, often by hand, into burlap sacks. Evidence from mines in Southern Africa from as late as 1980 shows that between a third and half of mill workers contracted asbestosis.[25,26] In Canada, however, there was supposed to be no disease. Those who ran the mines like the insurance industry knew better. In June 1946, one of Metropolitan Life's chief officers, Dr. George Whealty, visited the Thetford mine, where he met the new medical director, Dr. Paul Cartier. Whealty thought the medical survey of workers that Cartier had just begun would uncover a lot of asbestosis, as well as tuberculosis. He wrote to his colleague Anthony Lanza: "The more thorough the job the more problems they are going to discover. Since asbestosis is compensatable, this is going to cost them much money."[27]

During January 1949, the Montreal newspaper *Le Devoir* carried a series of articles on work and living conditions in the village of East Broughton. The author, Burton Le Doux , interviewed miners and their families and described the deplorable conditions under which they lived and worked. East Broughton was a poor community in Canada's poorest province. The sole source of employment for the village's 3,000 inhabitants was the Quebec Asbestos Corporation, a subsidiary of the U.S. company Philip Carey. The mine lay next to the corporation's factory, which operated six days a week. The rates of pay were poor and work conditions were hard. The mill was bitterly cold in winter, and there was not even a place for the men to eat away from the dust and noise. To keep the costs of production to a minimum, the corporation relied upon manual labor, and even the cleaning of the mill was done by hand. There was no safety equipment, and workers would themselves buy goggles to keep the fiber out of their eyes. Every part of the operation, from mining, to processing, to the bagging of fiber created dust. Le Doux found that the men's clothes were encrusted with grey-green fiber, as were their hands and faces, their eyebrows, ears, and hair.[28] The western side of the village was inundated with asbestos from the mill, and there was dust in all the houses.

As in any mine, some jobs were worse than others. The worst jobs at East Broughton were in the bagging section, where *empocheurs* bagged fiber by hand. *Empocheurs* were not corporation employees but worked for private contractors and were paid piece rates rather than wages. They would fill the burlap sacks, then shake and press the fiber, before sewing the sacks closed. *Pileurs* picked up the leaking sacks and piled them in the storeroom. The system provided the corporation with cheap labor and sheltered the parent company Philip Carey, from the possibility of legal action by workers who contracted asbestosis. The men were never warned of the dangers they faced, nor did company physicians tell them when they had contracted an occupational disease. Le Doux also found that the environmental exposure from the waste dumps was such that whole families were afflicted with respiratory illness. The provincial government in Quebec was well aware of the situation, according to Le Doux, but chose to do nothing. The conditions described in *Le Devoir* were as bad as those endured by black workers in South Africa, where under apartheid miners went unprotected by trade unions or the law.[10] Following Le Doux's reports, in February 1949 miners at Johns-Manville's Asbestos mine began a dramatic strike for better pay and work conditions. The strike, which soon spread to Thetford, lasted for five months and became a turning point in the history of labor relations in Quebec. It did not, however, end the threat of occupational or environmental injury.

Over the next 20 years, there was some improvement in working conditions in Canada's mines. When T&N's company physician Dr. J. F. Knox visited Thetford in December 1964, he found there was less dust on the pavements and roofs of domestic dwellings than on his previous visit 12 years earlier. But he noted that none of the new houses or the schools had been "positioned with the idea of avoiding dust blown off the encircling (asbestos) dumps."[29] He was particularly concerned that fiber from the 250 tons of waste dumped each day at Bell Mine was blown over the district.[29] A decade later, T&N's senior physician, Dr. H. Lewinsohn, found the area heavily polluted. Even the new mill at Lake Asbestos was choked with dust; he lamented that the ventilation system had been designed to enhance output rather than improve occupational safety.[30]

Ten years later, conditions were much the same. In 1976, the Beaudry Commission into the Quebec asbestos industry concluded that the mines and mills were unsafe, and that some 15,000 Quebec workers had spent their entire lives in a hazardous environment. "It is obvious" the Commission wrote, "after our study that the technical means to ensure a healthy working environment do exist and are readily available."[31] Beaudry commented of employers: "They have kept available information about the dangerous effects of asbestos dust away from the workers and the unions."[31] The Commission was also critical of the state inspectorate which had allowed such conditions to continue. Beaudry findings about the risk of occupational disease were borne out by subsequent research.[32]

Company medical officers play an important—if ambiguous—role in occupational health and safety. In theory, medical officers stand between labor, employers, and regulatory authorities. In practice they have to reconcile their duties as physicians with the commercial demands of industry. One such physician, Dr. Cartier, the director of the company clinic at Thetford, gave evidence before the Beaudry Commission. Cartier told the Commission that he often advised miners with asbestosis not to seek workers' compensation, because even if asbestotic workers left their jobs, the progressive nature of the disease would not have been halted: "So I figured it was in their best interest to stay at their jobs. Besides they didn't want to be reported ill and transferred to a lower paying job where they might of earned as much as $50 less a week."[33] Cartier admitted that there had been cases of workers who died a few months after receiving a clean bill of health from his clinic. He was surprised that the Quebec Asbestos Mining Association did not try to improve work conditions but he made no complaints. He was "just a French-Canadian doctor from the boondocks" and the Association were employing world experts at McGill University to research asbestos disease. Over time those experts had included Drs. Pedley and Stevenson.

CONCLUSION

Why were conditions so hazardous in the Canadian mines, and why did employers such as Johns-Manville and Philip Carey make no effort to prevent occupational disease? There were a number of reasons, ranging from the politics of medical research to the economic structure of the industry. Neither should we forget the failure of company physicians such as Stevenson and Cartier to protect their patients.

Until the 1970s, the industry funded most of the medical research into the effects of exposures to asbestos. Where the results were favorable they were released into the public domain and used as evidence that employers were providing a safe work environment. Where the results were unfavorable they were suppressed, and fictionalized accounts of disease rates were published in their place. The year 1930 was a crucial moment in the industry's history. The Pedley–Stevenson study of Thetford was completed in 1930. Slade's work on asbestos miners in South Africa was finished, and the Merewether–Price survey of asbestos manufacturing in the United Kingdom was released. The three studies were precipitated by the burgeoning rates of asbestosis at mines and factories and by the rise of asbestos-related litigation in the United States. That research coincided with the Great Depression, which saw a dramatic fall in demand for asbestos products. It also saw silicosis become a national issue. The introduction of power tools in foundries increased dust levels, and thereby the incidence of disability. Silicosis is dose-related and there was a clear boundary separating the wider public from the men and women who worked with silica. That made it possible for the industry to resolve the issue in its favor and thereby condemn two generations of foundry workers to disability and poverty. Although silicosis was an occupational disease, as Rosner and Markovitz have shown, the events of the 1930s in the United States to some extent undermined optimism about the safety of new technologies and the efficacy of industrial production itself.[34] Under those circumstances the results of the Pedley–Stevenson study could have seriously damaged the asbestos industry

The industry was dependent upon the mines for its profits. To make the mines safe would have required such a massive investment that asbestos would have lost its comparative advantage over substitutes. The situation was much the same in Southern Africa, where the hidden costs of production went unacknowledged by state authorities, who had no interest in the welfare of black workers. As a consequence, the in-house studies by Slade in South Africa and Dr. Pedley in Quebec had no impact upon occupational health or safety.

In Canada, internal factors also played a role. Regionalism in Quebec and the need for jobs encouraged state patronage and collusion over occupational disease. With the creation of the Societe Nationale d'Amiante in 1978, large parts of the industry were nationalized. Public ownership, which lasted until September 1992, was intended to wrest control from U.S. companies. The nationalization encouraged public support for an industry that for decades had been heavily subsidized by the federal government. The mining companies have also been supported by pension funds, the trade unions, and the Quebec crown corporations.[23] Mining taxes in Quebec have been far lower than the subsidies the industry has received. In 2002, for example, only 6,992 people worked in all types of mines in Quebec, yet total public expenditure on the industry was well above $107 million.[23] In various guises, that system of patronage goes back to the 1930s.

The industry's commercial success did not enrich mining communities such as East Broughton. Instead, over successive generations, those communities have borne the hidden costs of production, including pollution of the land and uncompensated occupational and environmental disease. The early denials about the existence of asbestosis ensured the industry's long-term survival. Having argued for decades about the absence of asbestosis in the Canadian miners, it was a small step for the major producers to argue, as they did after 1960, that neither was there mesothelioma. That fallacy has been maintained until the present.

References

1. Sentes K. Asbestos and the World Trade Organization: A case study challenging the legitimacy of the WTO as a forum for the

adjudication of public health and environmental issues. MA thesis, University of Alberta, 2002.
2. Asbestos and Certain Asbestos Products: A Report on the Supply of Asbestos and Certain Asbestos Products. The Monopolies Commission. London, England: Her Majesty's Stationery Office, 1973: 78.
3. Castleman B. Asbestos: Medical and Legal Aspects. 4th ed. NJ: Aspen Law and Business Books, 1996: 35.
4. Testimony of Lewis H. Brown, President, Johns-Manville Corporation, and President of Asbestos Institute, in Hearing on Code of Fair Competition for the Asbestos Industry: Transcripts of the Hearing and Appendix. National Recovery Administration, Washington, DC, Oct 19, 1933.
5. Management by Morgan. Fortune. 1934; 3.
6. Tweedale G. Magic Mineral to Killer Dust. Oxford, U.K.: Oxford University Press, 2000: 20-2.
7. Merewether ERA. A Memorandum on Asbestosis. Tubercle. 1933-34; 15.
8. Simson FW. Pulmonary asbestosis in South Africa. BMJ. 1928; 1:885-6.
9. Slade GF. The Incidence of Respiratory Disability in Workers Employed in Asbestos Mining with Special Reference to the Type of Disability Caused by the Inhalation of Asbestos Dust. MD thesis, University of the Witwatersrand, 1930.
10. McCulloch J. Asbestos Blues: Labour, Capital, Physicians and the State in South Africa London, England: James Currey, 2002.
11. Pedley F. Asbestosis. Can. Med. Assoc. J. 1930;22:253-4.
12. Pedley F. Asbestosis. Can. Public Health J. 1930;21:576-7.
13. Asbestosis. Paper presented by Dr.Stevenson to the Quebec Asbestos Producers, SherbrookeQU, Canada, 23 May 1938. T&N Papers Reel 009/1662. [Turner & Newall Papers (T&N Papers) refers to the archive held at the School of Business History, Manchester Metropolitan University, Manchester, England. Those papers are copies of internal company correspondence made available though legal discovery.]
14. Memo, Quebec Occupational Diseases Legislation, Vandiver Brown, 15 April 1940. T&N Papers Reel 009/1655-57.
15. Pedley F. Report of the Physical Examinations and X-Ray Examination of Asbestos Workers in Asbestos and Thetford Mines, Quebec, November 1930. Met Life Conspiracy.
16. Letter from A. Lanza, Metropolitan Life, to Mandred Bowditch, Saranac, Dec 13, 1937.
17. Lanza A, et al. Effects of the inhalation of asbestos dust on the lungs of asbestos workers. Public Health Rep. 1935;50(January).
18. Lanza AJ, Vane RJ. Industrial dusts and the mortality from pulmonary disease. Am Rev Tuberculosis. 1939;39:419.
19. Letter from Buell to J. C. McConnell, Metropolitan Life, Aug 22, 1939.
20. Asbestosis. Paper presented by Dr. Stevenson, Sherbrooke, QU, Canada, 15 April 1940. T&N Papers Reel 009/1643-50.
21. Memo, Sir Samuel Turner, 25 May 1940. T&N Papers Reel 009/1641-42.
22. Memo, J. A. Cann to C. S. Bell, London, 3 June 1940. T&N Papers Reel 009/1641-42.
23. Kuyek J. Asbestos Mining in Canada. Paper presented to the International Ban Asbestos Conference, Ottawa, Canada, September 13, 2003.
24. Investigations of the asbestos mines. In: Report of the Commission to Study Silicosis and other Industrial Pneumonocinosis. Salisbury, U.K.: Government Printer, 1938: 82
25. Visit to Shabanie and Gaths Mines, March 1987, Dr. P. Elmes 14 April 1987. T&N Papers 0301/1537-1540.
26. Asbestos dust levels in overseas companies. Executive Committee Meeting March 1981. T&N Papers 285/0591.
27. Memo from George Whealty to A. Lanza, 15/6/1945. T&N Papers 009/1893.
28. Le Doux B. A village of three thousand suffocates in dust. East Broughton and asbestosis. Le Devoir. January 12, 1949.
29. Report on visit to Thetford Mines, asbestos and Montreal. J. F. Knox, 17 December 1964. T&N Papers 2 Reel 101/1351-3.
30. Report from H. Lewinsohn on visit to Atlas Asbestos Company and the Bell Mine, Thetford Mines, Canada, 1973. T&N Paper Reel 76/1150-61.
31. Beaudry Commission. Conclusions and Preliminary Recommendation. T&N Papers Reel 417/1253-71.
32. Nicholson WJ, Selikoff IJ, Seidman H, Lilis R, Formby P. Long-term mortality experience of chrysotile miners in Thetford Mines, Quebec. Ann NY Acad Sci. 1979; 11-21.
33. Chief doctor says he tried to be human. Montreal Star. Nov 20, 1975.
34. Rosner D, Markovitz G. Deadly Dust: Silicosis and the Politics of Occupational Diseases in Twentieth-Century America. Princeton, NJ: Princeton University Press, 1987.