

AFFIDAVIT OF ERIC JOHN CHATFIELD

PROVINCE OF ONTARIO

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SS.

CITY OF MISSISSAUGA

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I, Eric John Chatfield, being first duly sworn upon my oath, do hereby state the following:

1. I am more than 18 years of age.
2. I have personal knowledge regarding the facts as set forth herein.
3. I am otherwise competent to testify as to the facts set forth herein.
4. I received my M.A. in Natural Sciences and my Ph.D. in Colloid Science from Cambridge University. I have more than 25 years' experience in the identification and analysis of asbestos fibers, and their behavior in water and air, through optical and electron microscopy. I have written and published more than 60 peer-reviewed scientific articles specifically relating to asbestos analysis. My curriculum vitae, which includes a list of my depositions, trial testimony and affidavits, is appended to this Affidavit as Appendix A.
5. I am a Fellow of the Chemical Institute of Canada and also a past President and one of the seven Founding Members of the Microscopical Society of Canada.
6. The International Organization for Standardization (ISO) is a worldwide federation of national standards bodies. The work of preparing International Standards is carried out through technical committees, sub-committees and working groups. I am chair of International Organization for Standardization (ISO) working group ISO/TC 146/SC 3/WG1, a group of international experts charged with the task of developing analytical methods for determination of asbestos. I am the author of ISO 10312, which is a direct-transfer method for determination of asbestos in air by transmission electron microscopy (TEM). I am also the author of ISO 13794, which is a corresponding indirect-transfer analytical method. Both methods were affirmed by international ballot and published as International Standards. I am also chair of ISO working group ISO/TC 146/SC 6/WG4, which is charged with the task of developing sampling strategies for determination of asbestos in indoor air. In 1988, I received a Tribute of Appreciation signed by the Administrator of the United States Environmental Protection Agency, Lee Thomas, in recognition of exceptional

support in development of the analytical method for determination of asbestos for the Asbestos Hazards Emergency Response Act (AHERA). In 1997, I received a Award of Appreciation from Committee D22 of the American Society for Testing and Materials (ASTM), in recognition of outstanding contributions in development of ASTM and International Standard analytical methods for determination of asbestos. All of these analytical standards development activities were, and continue to be, voluntary.

7. Since 1986, I have served as President and Principal Analyst of Chatfield Technical Consulting Limited, a company formed to provide optical and electron microscopy analysis of materials such as asbestos, and to research new methods of asbestos analysis.
8. From 1968 - 1986, I functioned as Head of the Electron Optics Laboratory at the Ontario Research Foundation, specializing in asbestos determination and electron microscopy.
9. I am joint author of the United States Environmental Protection Agency's (USEPA) analytical method for determination of asbestos in water, and also joint author of the 1990 USEPA method for determination of airborne asbestos levels at superfund sites. Under contract with USEPA, I have recently written a new method for determination of asbestos in vermiculite and vermiculite-containing products.
10. I have reviewed the following documents by Dr. William E. Longo and Mr. Richard L. Hatfield of Materials Analytical Services, Inc.:
 - (a) Removal and Replacing Valve Packing Work-Practice Simulation Protocol (Undated);
 - (b) Removal and Replacing Valve Packing, Work Practice Simulation, Study II, November, 1999;
 - (c) Removal and Replacing Valve Packing, Work Practice Simulation, Study III, November, 1999;
 - (d) Gasket Removal Study, Scraping and Wire Brushing, November, 1997;
 - (e) Gasket Removal, Scraping and Handwire Brushing, Work Practice Study II, April, 2000;
 - (f) Gasket Removal, Scraping and Handwire Brushing, Work Practice Study III, April, 2000;

(g) Gasket Removal, Electric Wire Brushing, Work Practice Study III, June, 2000;

(h) Durabla Gasket Fabrication, Work Practice Study, December, 1998

11. Other than to determine whether fibers found in the air are asbestos fibers, TEM is not generally used to measure occupational exposure to asbestos. TEM can be used to determine occupational exposure to asbestos, but only if the size fraction of fibers comparable with past epidemiology is measured.

World-wide, occupational exposure to airborne asbestos is measured by phase contrast optical microscopy (PCM). In the U.S., the method used is NIOSH 7400, or the OSHA Reference Method, which is almost identical. To my knowledge, no country has used, or is proposing to use, transmission electron microscopy for routine monitoring of occupational exposure to airborne asbestos. In the PCM method, air is drawn through a membrane filter, the filter is made transparent by exposure to a solvent, and fibers are counted using an optical microscope equipped for phase contrast illumination. By convention, only fibers longer than 5 micrometers (μm) are included. Using a modern optical microscope, the minimum diameter of fiber detectable is approximately $0.2 \mu\text{m}$, although in much of the past data the minimum detectable diameter may have been as high as $0.4 \mu\text{m}$. Some PCM methods impose an upper limit of $3 \mu\text{m}$ on the diameters of fibers to be included, because this is the maximum diameter for a respirable fiber. NIOSH 7400 does not impose this upper limit of diameter, and the results from this method therefore will include fibers that are not respirable if they are present. Some PCM methods also specify that fibers attached to or in contact with particles exceeding $3 \mu\text{m}$ in diameter are not counted, because the respirability of the particle determines the respirability of the combination. NIOSH 7400 does not impose this rule, and a fiber is counted regardless of whether it is attached to or in contact with a particle of non-respirable dimensions. PCM provides no method for identification of fibers; all fibers within the specified dimensional range are counted, regardless of their identities.

It has always been recognized that a PCM fiber count does not include all fibers, and that the measurement represents an index of exposure to asbestos. This index is directly relatable to past measurements which are associated with the epidemiology. Airborne asbestos always includes many short and thin fibers that are not detected by PCM, but these are accounted for by the use of a constant index of exposure based on a fixed size fraction of the airborne fibers. The fact that short and thin fibers can be detected by TEM is irrelevant, because the PCM index of exposure is the link to the past epidemiology from which current risks are calculated.

PCM is a rapid method for routine monitoring of workplace exposures, but it provides no means to identify fibers. In an atmosphere containing asbestos mixed with other kinds of fibers, it is sometimes important to determine how many of the fibers that were counted by PCM are actually asbestos. Method NIOSH 7402 was designed specifically for this purpose. After PCM analysis, TEM specimens are prepared from another sector of the membrane filter and, during the TEM examination, the fiber count is restricted to fibers longer 5 μm and thicker than 0.25 μm (i.e. the size fraction of those corresponding to the fibers counted during the PCM examination). During the TEM examination, fibers are identified and the proportion of asbestos is determined and applied to the results of the PCM fiber count.

In the studies made by Mr. Hatfield and Dr. Longo, NIOSH Method 7402 should have been used for the analysis of the air samples. This would have yielded data directly comparable with the epidemiological database. Instead, they elected to use an indirect-transfer TEM specimen preparation, and thereby generate data of no value because there are no scientific standards against which these data can be compared.

12. The method chosen by Mr. Hatfield and Dr. Longo to analyze the air filters from their studies is stated as ASTM Method D 5755-95. The title of this method is:

"Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Concentrations".

This method clearly states in Section 1.2:

"This test method describes the equipment and procedures necessary for sampling, by a microvacuum technique, non-airborne dust for levels of asbestos structures" (emphasis mine).

ASTM D 5755-95 does not include application to the analysis of air samples, and it is an improper use of this ASTM standard, given that airborne particulate rather than surface dust was being analyzed. The results of ASTM D 5755-95 are specified to be reported in structures/cm², not structures/cc as used in the studies by Mr. Hatfield and Dr. Longo.

Indirect-transfer TEM specimen preparation of airborne asbestos or asbestos-containing surface dust causes large changes to occur in the fiber size distributions, particularly in the case of chrysotile, and the measured fiber size distribution derived from such a preparation bears little resemblance to that which existed in the original sample. ASTM D 5755-95 states:

"The procedure outlined in this test method employs an indirect sample preparation technique. It is intended to disperse aggregated asbestos into fundamental fibrils, fiber bundles, clusters or matrices that can be more accurately quantified by transmission electron microscopy. However, as with all indirect sample preparation techniques, the asbestos observed for quantification may not represent the physical form of the asbestos as sampled. More specifically, the procedure described neither creates nor destroys asbestos, but it may alter the physical form of the mineral fibers."

International Organization for Standardization (ISO) standard ISO 13794 is an indirect-transfer method for determination of asbestos in air samples by TEM. As convener of the responsible ISO Working Group, I am the author of this analytical method. ISO 13794 states in the Introduction:

"The method defined in this International Standard incorporates specimen preparation procedures that result in selective concentration of asbestos fibres, and removal of organic and water-soluble materials. These procedures have the effect of dispersing the majority of the complex clusters and aggregates of fibres into their component fibres and bundles so that the asbestos in the air can be more accurately quantified."

These statements contained in ASTM D 5755-95 and ISO 13794 confirm that any large aggregates of material, including any which were of a size such that they were too large to be respirable, are dispersed by the analysis. If aggregates were present in the original samples, as is likely from sources such as those studied, elevated numbers of fibers will be reported. The indirect-transfer TEM measurements made by Mr. Hatfield and Dr. Longo therefore do not provide reliable information about the actual exposures during their experiments.

The scientific and appropriate way for Mr. Hatfield and Dr. Longo to have designed their studies would have been to incorporate measurements using the direct-transfer method NIOSH 7402, which states:

"This method is used to determine asbestos fibers in the optically visible range and is intended to complement the results obtained by phase contrast microscopy (Method 7400)".

TEM method NIOSH 7402 specifies a range of 100 to 1300 fibers/mm² for the density of fibers on the air sample filter. This range exactly corresponds to that specified for the PCM method NIOSH 7400. Clearly, the author of NIOSH 7402 (Paul A. Baron, Ph.D.; NIOSH/DPSE) anticipated that any air sample with a fiber density within the specified range for analysis by Method 7400 would also be suitable for analysis by direct-transfer, according to Method 7402. Therefore, in the studies by Mr. Hatfield and Dr. Longo, air

sample filters which were appropriate for PCM analysis would also be suitable for TEM analysis by direct-transfer.

13. The specified range of Method 7400 is 100 to 1300 fibers/mm². The fact that many of the samples collected by Mr. Hatfield and Dr. Longo exceeded the maximum of the range of the analytical method means that they failed to plan the experimental work properly. Many of the PCM fiber counts yielded fiber densities significantly exceeding 1300 fibers/mm², and neither the Phase Contrast Microscopy Airborne Analysis sheets nor the Summary of Data sheets make reference to any caveat or qualification of such results. Results outside of the range of the method are unreliable, and should not be reported without a caveat or qualification. Method NIOSH 7400 states:

"Fiber counts above 1300 fibers/mm² and fiber counts from samples with > 50% of filter area covered with particulate should be reported as "uncountable" or "probably biased." Other fiber counts outside the 100-1300 fibers/mm² range should be reported as having "greater than optimal variability" and as being "probably biased."

In Mr. Hatfield and Dr. Longo's studies, the procedures specified by NIOSH 7400 for reporting of PCM results outside of the range of the method were not followed. The reports by Mr. Hatfield and Dr. Longo fail to inform the reader that a significant number of the PCM measurements are outside the range of the method, and that the particular measurements are therefore unreliable.

14. The surface dust results reported in the simulations conducted by Mr. Hatfield and Dr. Longo cannot be interpreted in terms of human health, because there is no reliable way to predict airborne asbestos concentrations from indirect TEM measurements of surface dust. The method used for determination of the concentration of asbestos on the surfaces was ASTM D 5755-95, which is an indirect method. The asbestos structure sizes reported by the use of this method are totally different from those in the original dust. This was demonstrated by Chatfield (2000), for a range of different asbestos-containing materials. Moreover, if the width distributions of the asbestos structures reported in Mr. Hatfield and Dr. Longo's indirect dust measurements were really those that existed in the original airborne material, the results reported would contradict conventional physics. In particular, the falling speeds of isolated chrysotile fibers of 0.05 μ m diameter are such that they could not possibly settle to the sampled surface within the period of the tests, yet in many of the analyses such small diameter fibers represent the majority of the asbestos structures recorded. Accordingly, all of the fibers in the lower diameter range must have been generated by disintegration of larger structures, and the numerical structure concentrations reported are therefore meaningless, other than as a qualitative indication that there is asbestos on the surface. These distorted size distributions and structure concentrations that result from the application of

ASTM D 5755-95 cannot therefore logically be used as the basis for quantitative determination of past airborne asbestos, or prediction of future airborne asbestos concentrations.

15. The measurements of asbestos concentration on fabrics by the "Chatfield" method do not represent the nature of the asbestos structures as they exist on the fabric. This method relies on removal of attached asbestos from the fabric by ultrasonification in a surfactant solution. Use of surfactant, with or without ultrasonification, results in almost complete dispersal of chrysotile into single fibrils. This process using surfactant was developed and used in the asbestos industry to achieve dispersal of chrysotile into single fibrils for the manufacture of asbestos textiles (Heron and Huggett, 1971). It is therefore not surprising that the analytical data in the reports of Dr. Longo and Mr. Hatfield show that the majority of the reported asbestos structures are single fibrils in the range of $0.04\ \mu\text{m}$ in diameter. As is the case for the dust samples, the distorted size distributions yielded by this analytical method cannot be used as the basis for reporting of past airborne asbestos, or prediction of air concentrations resulting from possible re-suspension of asbestos from the fabric. The "Chatfield" method was never intended to retain the original size distribution of the asbestos structures as they are deposited on the fabric. The method was designed to remove asbestos fibers from the fabric in the most efficient way possible, so that any asbestos present could be detected reliably. The method was originally developed in response to an EPA request in connection with measurements on clothing in a shopping mall where an unexpected release of asbestos had occurred.
16. Re-suspension of asbestos structures from surfaces is a very complex function of the nature of the surface, the forces applied and the nature of the disturbance, the nature of the asbestos structures on the surface and the sizes of the asbestos structures (Fowler and Chatfield, 1997). The large forces required to re-suspend particles from surfaces may be visualized by the observation that dust settled on to an automobile is generally not removed by driving the automobile at high speed. Comparison of indirect-transfer and direct-transfer TEM specimen preparations of air samples collected from airborne particulate derived by abrasion of asbestos-containing materials shows that the majority of the asbestos structures reported by the indirect-transfer method did not exist as separate entities in the original airborne particulate material (Chatfield, 2000).
17. Tyndall illumination has long been known as a means of detecting small particles suspended in the air, and quantitative measurement instruments (Tyndallometers) are available that are based on this principle. The Tyndall effect is commonly observed when a shaft of sunlight enters a darkened room, when particles of dust suspended in the air become visible. However, the video

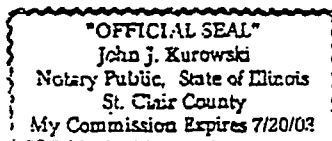
recordings prepared by Mr. Hatfield and Dr. Longo, in which dust clouds are illuminated by transverse illumination, are misleading for the following reasons:

- (a) all airborne particles, regardless of whether they are respirable or non-respirable, are illuminated. As used by Mr. Hatfield and Dr. Longo, the Tyndall effect does not discriminate between asbestos fibers and other types of particle. The contribution of asbestos to the dust depicted in the video recordings, and whether the particles are respirable or non-respirable, are therefore unknown;
 - (b) illuminated particles represent very intense point sources of light, and the limited depth of focus of video cameras results in de-focusing of these point sources of light. The de-focusing creates an extended illumination source from each point source, giving the overall effect of a snow storm. This type of demonstration grossly mis-represents the actual amount and size of the dust particles, and it is therefore misleading.
18. The reports of Mr. Hatfield and Dr. Longo contain a great deal of data, and this Affidavit represents opinions I have formed to this date. A full and detailed review of the data may reveal other matters that cause me to develop additional opinions.

S/ Eric J. Chatfield
ERIC JOHN CHATFIELD
President
Chatfield Technical Consulting Limited

SUBSCRIBED and SWORN to before me this 6th day of JANUARY, 2001.

JOHN J. KUROWSKI
Notary Public in and for
The State of Illinois, County of St. Clair



REFERENCES

American Society for Testing and Materials (1995): Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Concentrations (D5755-95).

Chatfield, E.J. (2000): Correlated Measurements of Airborne Asbestos-Containing Particles and Surface Dust. In: Advances in Environmental Measurement Methods for Asbestos, ASTM STP 1342, M.E. Beard and H.L. Rook, Eds., American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, pp. 378-402.

Environmental Protection Agency, "Asbestos-Containing Materials in Schools; Final Rule and Notice", Federal Register, 40 CFR Part 763, Vol. 52, No. 210, Friday, October 30, 1987, 41826-41905.

Fowler, D.P. and Chatfield, E.J. (1997): Surface Sampling for Asbestos Risk Assessment. Proceedings, Inhaled Particles VIII, British Occupational Hygiene Society. Annals of Occupational Hygiene, Vol. 41, Supplement 1, pp.279-286.

Heron, G.F. and Huggett, R. (1971): Dispersion based textiles. 2nd International Asbestos Conference, Louvain, 1971.

International Organization for Standardization, "Ambient air - Determination of asbestos fibres - Direct-transfer transmission electron microscopy method", ISO 10312, 1995.

International Organization for Standardization, "Ambient air - Determination of asbestos fibres - Indirect-transfer transmission electron microscopy method", ISO 13794, 1999.

National Institute for Occupational Safety and Health (NIOSH) (1994): Asbestos and Other Fibers by PCM, NIOSH Method 7400, Issue 2, 15 August 1994. NIOSH Manual of Analytical Methods, Fourth Edition, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Cincinnati, Ohio.

National Institute for Occupational Safety and Health (NIOSH) (1994): Asbestos by TEM, NIOSH Method 7402, Issue 2, 15 August 1994. NIOSH Manual of Analytical Methods, Fourth Edition, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Cincinnati, Ohio.

APPENDIX A

CURRICULUM VITAE - ERIC J. CHATFIELD

ERIC J. CHATFIELD: CURRICULUM VITAE

CURRENT AT 2000-06-30

Date of Birth: 21 November, 1936

Place of Birth: Oakthorpe, Leicestershire, United Kingdom

Citizenship: Canadian

Home Address: 2071 Dickson Road
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Present Position: President / Principal Analyst
Chatfield Technical Consulting Limited
2071 Dickson Road
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L5B 1Y8

Academic Record

1948 - 1955: Ashby de-la Zouch Boys' Grammar School
Ashby de-la Zouch, Leicestershire
United Kingdom

School Examinations:

1953: General Certificate of Education (Ordinary Level):
English Language
French
Latin

1954: General Certificate of Education (Advanced Level):
Chemistry
Mathematics
Physics

General Certificate of Education (Scholarship Level):
Chemistry
Physics

A State Scholarship was awarded on the basis of the
above examination results

1955 - 1958: St. Catharine's College, Cambridge University
Cambridge
United Kingdom

An open scholarship was awarded on the basis of entrance
examinations

University Examinations:

1957: Natural Sciences Tripos Part I (Honours):
Chemistry
Mineralogy and Crystallography
Physics
Mathematics

1958: Natural Sciences Tripos Part II (Honours):
Physics

1958: Graduated B.A.

1962: Graduated M.A.

1971: Graduated Ph.D.

The Ph.D. was taken externally under the special
regulations of Cambridge University, in which published
work is submitted as a thesis, followed by an oral
examination. The thesis consisted of publications on
studies of particulate aerosols produced by combustion
or vaporization of plutonium-alkali metal mixtures.

Professional Record

- 1986 - Present: President and Principal Analyst of Chatfield Technical Consulting Limited
- New company formed to continue to provide high quality optical and electron microscopy analyses formerly provided while employed at Ontario Research Foundation (1968 - 1986). The company performs TEM, SEM, PLM and PCM particulate analyses, principally asbestos, for a number of clients. In addition to routine analyses, the company conducts research into new methods of analysis: the relationship between direct and indirect TEM preparation has been investigated; a new method for analysis of asbestos-containing floor tile has been developed to provide quantitative results and to overcome the problem of false-negative results obtained by PLM analysis; a new method for reliable quantification of low concentrations of asbestos in building materials has been developed, including statistical interpretation of analytical results; and, an analytical method based on PLM and SEM has been developed for screening vermiculite samples for the presence of amphibole fibers.

Consultant to Ontario Research Foundation

- Asbestos Determination
- Electron Microscopy

Consultant to U.S. Environmental Protection Agency

- Airborne Asbestos Monitoring. Prepared the standard operating procedure (SOP) for analysis of air samples from abatement projects
- Member of Select Committee on Asbestos Analysis convened to define the TEM analytical method for the Asbestos Hazards Emergency Response Act (AHERA)
- Principal author of analytical method manual: Interim Superfund Method for Determination of Asbestos in Ambient Air
- Perform TEM and PCM asbestos analyses
- Prepare standards for quality assurance in asbestos analyses

Consultant to National Institute of Standards and Technology
(formerly National Bureau of Standards)

- Laboratory Assessor for the NVLAP Laboratory Accreditation Program for Bulk Asbestos Analysis
- Laboratory Assessor for the NVLAP Laboratory Accreditation Program for Airborne Asbestos Analysis by TEM

Consultant to Nissei Sangyo (Manufacturers of Hitachi electron microscopes) on materials applications

Lecturer on asbestos analysis

- Chief Lecturer for Asbestos Analysis Training Course sponsored by Hitachi

Consultant on asbestos analysis laboratory set-up, operation and equipment requirements

Consultant to University of Toronto Department of Anatomy Electron Microscope Unit on materials applications

Professional Record (Cont'd)

Expert witness on behalf of several defendants in asbestos property damage suits

Expert witness on behalf of several defendants in asbestos personal injury suits

Consultant to The Asbestos Institute

- Two missions to the United Arab Emirates, the Sultanate of Oman, Kuwait, and Turkey, to give seminars on measurement and identification of asbestos

Convener, ISO/TC 146/SC 3/WG1

- Determination of asbestos fibre content in ambient atmospheres; preparation of International Standard for Transmission Electron Microscopy Direct-Transfer Method, International Standard for Transmission Electron Microscopy Indirect-Transfer Method and Draft International Standard for Scanning Electron Microscopy Method

Consultant to Health Effects Institute - Asbestos Research

- Member of the Literature Review Panel
- Member of the Steering Committee for TEM Analyses

Member of the Editorial Advisory Board of Asbestos Issues magazine

Member, Der Verband der Chemischen Industrie e.V. (VCI) Working Group to develop a standard procedure for measurement of asbestos in parenteral medicines

Consultant to Hong Kong Laboratory Accreditation Scheme (HOKLAS)

- Technical Advisor on asbestos analysis laboratory set-up, operation and methods
- Laboratory Assessor for asbestos analysis laboratories (PLM, PCM and TEM)

Convener, ISO/TC 146/SC 6/WG4

- Determination of asbestos/mineral fibres in indoor air; development of a sampling strategy document

1968 - 1986: Head of the Electron Optics Laboratory
Ontario Research Foundation
Sheridan Park Research Community
Mississauga, Ontario, Canada L5K 1B3

Initially appointed as Associate Research Scientist, with successive promotions to position of Assistant Director.

Research Topics:

- (a) Development and evaluation of methods for identification and quantification of asbestos and other mineral fibers in air, water and

Professional Record (Cont'd)

mineral products. Most of this work was under contract with the U.S. Environmental Protection Agency and with the Federal Government of Canada. In 1982, my group completed a 3-year, \$480,000 contract with the EPA to develop a reference analytical technique for determination of asbestos in drinking water, based on electron microscopy. This document is the EPA accepted method for this type of analysis. It is also acknowledged that the identification criteria in this document provide the best state-of-the-art procedures for determination of asbestos, and these criteria have been incorporated by others in methods relating to inhalation or ingestion of asbestos.

- (b) Development of methods for determination of asbestos in bulk samples of building materials. In response to requests for this type of analysis, I established the PLM method, with additional confirmation of species identification by dispersion staining, as a routine service in 1977. Where necessary, SEM-EDXA was used to examine particularly difficult samples. Initially, I performed all of the analyses, and as the volume of work increased, I trained several technicians in the procedure. After basic training, technicians were not considered qualified to perform analyses independently until they had completed analysis of a series of approximately 200 samples, performed in parallel with me, and for which they had demonstrated complete agreement with me on both classification and identification. Some variance in individual estimates of quantification was considered acceptable.
- (c) Development of a new instrument, based on light scattering by magnetically-aligned asbestos fibers, which is capable of detecting 0.2 ng of asbestos. This instrument can currently provide discrimination between different varieties of mineral fiber, provide some information on their size distributions, and is capable of significant further development. Eventually, the instrument could be applied to both occupational and environmental monitoring.
- (d) Design and execution of environmental and occupational surveys for asbestos. In 1977, the National Survey for Asbestos Fibres in Canadian Drinking Water Supplies was conducted by my group. In this survey, the water systems of 71 Canadian municipalities were studied to evaluate the fate of asbestos which occurs in the water supply and to determine locations where asbestos enters the supply during the water handling. In the past 14 years, I have been involved with measurement of asbestos fibers in ambient atmospheres, particularly in buildings insulated with asbestos. In 1984, a study was conducted on behalf of Manville Corporation to measure the release of fibers to the ambient atmosphere from a landfill area which was still in use and which had been used for some time to dispose of materials containing asbestos and man-made mineral fibers. In 1985, a study was conducted for Johns-Manville Canada to measure release of fibers to the ambient atmosphere at a site where they were undertaking rehabilitation of an abandoned landfill area previously used for disposal of materials containing asbestos. I have also consulted for a number of companies

Professional Record (Cont'd)

in assessing the potential inhalation hazards associated with fiber contamination in mineral products such as vermiculite and talc.

- (e) Consultant to the Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario. As part of this consulting assignment, I provided two advisory reports published by the Commission, concerning measurement techniques for asbestos in both occupational and ambient atmospheres. I also participated as an expert witness at the Royal Commission hearings, and reviewed portions of the draft of the Commission's final report.
- (f) Ambient airborne particulate studies, using optical and electron microscopy. This work is often conducted on behalf of specific industrial clients who wish to monitor particulate emissions from their operations.
- (g) In 1984, I participated in EPA meetings to examine the possible approaches to final monitoring of buildings from which asbestos insulation has been removed. At that time I advocated the use of TEM, as the only definitive method. TEM has since been specified as the method of choice for analysis of air samples collected for the purpose of building clearance.
- (h) As a result of the large number of medico-legal cases which have developed in connection with asbestos, a requirement has arisen for analysis of lung tissue to detect the loading and variety of mineral fibers present. The large number of individuals who have been exposed to these materials has led to uncertainty as to the compensation which is justified when a death or disability occurs due to lung cancer. The methods currently used for tissue analysis are very unreliable, with a great deal of inter-laboratory variation. Accordingly, I initiated a research program to develop reliable methods for quantification of mineral particles in human lung tissue.

1958 - 1968: Nuclear Safety Section
United Kingdom Atomic Energy Authority
Aldermaston, Berkshire
United Kingdom

Initially appointed as Scientific Officer, and promoted in 1965 to Senior Scientific Officer.

Research Topics:

- (a) Laboratory studies of the rate of release and particle size distribution of particulate aerosols generated by oxidation of plutonium under conditions ranging from ambient temperatures to the ignition point. It was shown that, under some conditions, the oxide particles could all be in the respirable size range.

Professional Record (Cont'd)

- (b) Investigation, primarily by electron microscopy and diffraction, of the particulate aerosols generated by explosive vaporization of plutonium-alkali metal mixtures in oxygen. The objective of this work was to examine the materials which would be released to the atmosphere as airborne particles in the event of a melt-down of a sodium-cooled fast reactor fuelled by plutonium. It was shown that in these particles the plutonium had been converted to a hexavalent plutonate anion. When dispersed in aqueous media, the material was shown to be soluble, and then to hydrolyse to a colloidal dispersion of hydroxide particles with sizes less than 5 nm. Inhalation experiments with mice were conducted, and it was found that the plutonium initially deposited in the lungs was rapidly translocated to other organs.
- (c) Design and execution of field work, conducted in both Australia and Nevada, to investigate the dispersion of airborne particulate aerosols from simulated nuclear accidents.
- (d) Design, execution and interpretation of a radiological survey of the United Kingdom nuclear weapon test sites in Australia. Recommendation of de-contamination procedures to be followed prior to re-opening of the test range areas for public access.

Recorded Testimony Related to Asbestos Measurement

- 1981 July 09 Sworn Expert Testimony before the Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario. Counsel J.I. Laskin; Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario, 180 Dundas Street West, Toronto, Ontario, Canada M5G 1Z8.
- 1984 July 06 Testimony at the OSHA Rulemaking Hearing on Revisions to the Asbestos Standard, on Behalf of the Asbestos Information Association (North America). Attorneys T.B. Hardy and H.D. Peterson; Kirkland & Ellis, 655 Fifteenth Street, N.W., Washington, D.C. 20005.
- 1985 Dec 11 Deposition on behalf of U.S. Gypsum Co. (Defendant): U.S. District Court of the Eastern District of Tennessee, Eastern Division, No. 2-83-329; Sherry Wolfe et al. (Washington County Board of Education, Tennessee) v. U.S. Gypsum Co., National Gypsum Company and W.R. Grace & Co. Attorneys J.D. Pagliaro and D.J. Valenza; Morgan, Lewis & Bockius, 2000 One Logan Square, Philadelphia, PA 19103.
- 1986 Jan 28 Deposition on behalf of U.S. Gypsum Co. (Defendant): U.S. District Court for The Middle District of Georgia, Macon Division, Civil Action No. 85-126-3-MAC; The Corporation of Mercer University v. National Gypsum Company, et al. Attorneys J.D. Pagliaro and D.J. Valenza; Morgan, Lewis & Bockius, 2000 One Logan Square, Philadelphia, PA 19103.
- 1986 June 25 Deposition on behalf of U.S. Gypsum Co. (Defendant): Circuit Court of Jackson County, Missouri, Case No. N/A; School District of Independence, Missouri, No. 30 v. U.S. Gypsum Company. Attorney J.D. Pagliaro; Morgan, Lewis & Bockius, 2000 One Logan Square, Philadelphia, PA 19103.
- 1986 Oct 30 Deposition on behalf of U.S. Mineral Products Company (Defendant): U.S. District Court for The District of New Hampshire, Civil Action C 83-143-P; City of Manchester v. U.S. Mineral Products Company, et al. Attorneys J.T. Broderick, Jr. and R.C. Nelson; Devine, Millimet, Stahl & Branch, 111 Amherst Street Box 719, Manchester, N.H. 03105.
- 1986 Dec 15 Deposition on behalf of United States Mineral Products Company, Inc. (Defendant): U.S. District Court for The Western District of North Carolina, Greensboro Division, C-85-1256-G; Burlington City Board of Education v. United States Mineral Products Company, Inc. Attorneys J.A. Gardner, III and G.C. York; Hedrick, Eatman, Gardner & Kincheloe, 741 Kenilworth Avenue, Suite 300, Charlotte, North Carolina 28204.
- 1988 Apr 13 Deposition on behalf of United States Mineral Products Company (Defendant): U.S. District Court for The District of New Hampshire, Civil Action No. C-87-207-L; New Hampshire-Vermont Health Service Corporation, d/b/a Blue Cross/Blue Shield of New Hampshire v. United States Mineral Products Company, Inc. Attorneys J.T. Broderick, Jr. and R.C. Nelson; Devine, Millimet, Stahl & Branch, 111 Amherst Street Box 719, Manchester, N.H. 03105.

Recorded Testimony Related to Asbestos Measurement (Cont'd)

- 1988 Sept 27 Deposition on behalf of KenTile (Defendant): Court of Common Pleas of Allegheny County, PA, Civil Division No. GD 86-8810; Wunderley and Wunderley v. KenTile et al. Attorney George N. Stewart; Zimmer, Kunz, Loughren, Hart, Lazaroff, Trenor, Banyas & Conaway, P.C., One Oxford Centre, Pittsburgh, PA 15219.
- 1989 Aug 26 Deposition on behalf of Keene Corporation (Defendant): The Circuit Court for Anne Arundel County, Maryland, Civil Action No. 1108600; State of Maryland vs. Keene Corporation, et al. Attorney Thomas F. McDonough, Esquire; Royston, Mueller, McLean & Reid, 102 West Pennsylvania Avenue, Towson, MD 21204.
- 1990 Jan 29 Deposition on behalf of U.S. Mineral Products (Defendant): The Circuit Court for Anne Arundel County, Civil Action No. 1108600; State of Maryland vs. Keene Corporation, et al. Attorney Lenox G. Cooper, Esquire; Bastian, Clague & Clancy, Suite N-220, Little Falls Mall, 4701 Sangamore Road, Bethesda, Maryland 20816.
- 1990 Mar 13 Deposition on behalf of United States Mineral Products (Defendant): Commonwealth of Massachusetts, Suffolk, S.S., Superior Court, No. 82254; City of Boston, et al. vs. Keene Corporation, et al. Attorney Richard P. Melick, Esquire; Melick & Porter, One Joy Street, Boston, Massachusetts 02108.
- 1990 Aug 17 Deposition on behalf of U.S. Mineral Products Company (Defendant): U.S. District Court, Eastern District of Louisiana, C/A No. 88-4336, Section "C", Magistrate (2); State of Louisiana ex rel Board of Commissioners of The Port of New Orleans vs. W.R. Grace & Company - Connecticut and U.S. Mineral Products Company. Attorney Stephen M. Little, Esq.; Blue, Williams & Buckley, 3421 North Causeway Blvd., Ninth Floor, Metairie, Louisiana 70002.
- 1990 Nov 14 Continuation of Deposition on behalf of United States Mineral Products Company (Defendant): U.S. District Court for The District of New Hampshire, Civil Action No. C-87-207-L; New Hampshire-Vermont Health Service Corporation, d/b/a Blue Cross/Blue Shield of New Hampshire v. United States Mineral Products Company, Inc. Attorneys J.T. Broderick, Jr. and S.E. Merrill; Merrill & Broderick, 707 Chestnut Street, Manchester, N.H. 03105.
- 1990 Nov 26 Continuation of Deposition on behalf of United States Mineral Products (Defendant): Commonwealth of Massachusetts, Suffolk, S.S., Superior Court, No. 82254; City of Boston, et al. vs. Keene Corporation, et al. Attorney Richard P. Melick, Esquire; Melick & Porter, One Joy Street, Boston, Massachusetts 02108.
- 1990 Nov 27 Expert Witness Testimony at Trial on behalf of United States Mineral Products (Defendant): Commonwealth of Massachusetts, Suffolk, S.S., Superior Court, No. 82254; City of Boston, et al. vs. Keene Corporation, et al. Attorney Richard P. Melick, Esquire; Melick & Porter, One Joy Street, Boston, Massachusetts 02108.

Recorded Testimony Related to Asbestos Measurement (Cont'd)

- 1990 Dec 15 Continuation of Deposition on behalf of United States Mineral Products Company (Defendant): U.S. District Court for The District of New Hampshire, Civil Action No. C-87-207-L; New Hampshire-Vermont Health Service Corporation, d/b/a Blue Cross/Blue Shield of New Hampshire v. United States Mineral Products Company, Inc. Attorneys J.T. Broderick, Jr. and S.E. Merrill; Merrill & Broderick, 707 Chestnut Street, Manchester, N.H. 03105.
- 1990 Dec 19 Expert Witness Testimony at Trial on behalf of United States Mineral Products Company (Defendant): U.S. District Court for The District of New Hampshire, Civil Action No. C-87-207-L; New Hampshire-Vermont Health Service Corporation, d/b/a Blue Cross/Blue Shield of New Hampshire v. United States Mineral Products Company, Inc. Attorneys J.T. Broderick, Jr. and S.E. Merrill; Merrill & Broderick, 707 Chestnut Street, Manchester, N.H. 03105.
- 1991 Mar 07 Deposition on behalf of U.S. Mineral Products Company (Defendant): U.S. District Court for The Eastern District of Pennsylvania, No. 830268; Asbestos School Litigation. Attorneys Stephen J. Imbriglia and Carl H. Delacato, Jr.; Hecker Brown Sherry and Johnson, 1700 Two Logan Square, 18th and Arch Streets, Philadelphia, PA 19103.
- 1991 Sep 16 Deposition on behalf of U.S. Mineral Products Co. (Defendant): U.S. District Court Central District of California, Case No. 89 3843 TJH (Tx); State Farm Mutual Automobile Insurance Company vs. U.S. Mineral Products Co. Attorney Stephen J. Imbriglia; Hecker Brown Sherry and Johnson, 1700 Two Logan Square, 18th and Arch Streets, Philadelphia, PA 19103.
- 1991 Dec 09 Deposition on behalf of United States Mineral Products Company (Defendant): U.S. District Court for The District of New Hampshire, Civil Action No. C-87-207-L; New Hampshire-Vermont Health Service Corporation, d/b/a Blue Cross/Blue Shield of New Hampshire v. United States Mineral Products Company. Attorney J.T. Broderick, Jr.; Merrill & Broderick, 707 Chestnut Street, Manchester, N.H. 03105.
- 1992 Mar 19 Deposition on behalf of U.S. Mineral Products Company (Defendant): U.S. District Court, Eastern District of Texas, Beaumont Division, Case No. B-87-00507; Dayton Independent School District, et al vs. U.S. Mineral Products Company, et al. Attorneys Peter C. Kennedy; Hecker Brown Sherry and Johnson, 1700 Two Logan Square, 18th and Arch Streets, Philadelphia, PA 19103, and David A. Livingston; Livingston & Markle, 200 Waugh on the Bayou, 55 Waugh Drive, Houston, TX 77007.
- 1992 Jun 15 Expert Witness Testimony at Trial on behalf of U.S. Mineral Products (Defendant): Superior Court of the State of California for the County of Los Angeles, Case No. Sec 77762; H & H Cerritos v. U.S. Mineral Products et al. Attorney Jill A. Franklin; Schaffer & Lax, 5757 Wilshire Blvd., Suite 600, Los Angeles, California 90036-3664.

Recorded Testimony Related to Asbestos Measurement (Cont'd)

- 1992 Nov 02 Affidavit on behalf of Les Industries Cafco Ltee/Industries Cafco Ltd. and United States Mineral Products Company (Defendants): Supreme Court of British Columbia, No. C900884, Vancouver Registry; G.W.L. Properties Ltd. and Bentall Properties Ltd. v. W.R. Grace & Co. of Canada Ltd. et al. Counsel Eric A. Dolden; Freeman & Company, 885 West Georgia Street, 19th Floor, Vancouver, British Columbia V6C 3H4.
- 1993 Jan 05 Deposition on behalf of United States Mineral Products Company (Defendant): United States District Court for the Western District of Kentucky, Louisville Division, Civil Action File No. 91-0126 L-B; Farm Credit Bank of Louisville vs. United States Mineral Products Company. Attorney Stephen J. Imbriglia; Hecker Brown Sherry and Johnson, 1700 Two Logan Square, 18th and Arch Streets, Philadelphia, PA 19103.
- 1993 Jan 19 Deposition on behalf of U.S. Mineral Products Company (Defendant): Superior Court of the State of California, County of Los Angeles, Case No. C 683 086; Trizec Properties, Inc. and Marina Airport Buildings, Ltd. v. United States Gypsum Company et al. Attorney Kevin J. McNaughton; Schaffer & Lax, 5757 Wilshire Boulevard, Suite 600, Los Angeles, California 90036-3664.
- 1993 Mar 04 Deposition on behalf of Westinghouse (Defendant): The Circuit Court of Jackson County, Mississippi; Asbestos Personal Injury Cases Abrams Lead Nos. 88-5422 (2), 89-5088 (2), 89-5121 (2), 90-5427 (2), 88-5420 (2), 89-5252 (2), 90-5069 (2), 90-5322 (2), 89-5153 (2), 90-5352 (2), 89-5268 (2), 90-5045 (2), 90-5274 (2), 88-5181 (2), 91-5187 (2), 91-5098 (2), 91-5000 (2), 90-5387 (2), 91-5119 (2), 90-5369 (2), 91-5135 (2), and 90-5178 (2). Attorney David H. Worrell Jr.; McGuire Woods Battle & Boothe, One James Center, 901 East Cary Street, Richmond, Virginia 23219-4030.
- 1993 Apr 13 Expert Witness Testimony at Trial on behalf of Fibreboard Corporation (Defendant): The Court of Common Pleas, Hamilton County, Ohio, Case No. A8405380; Cincinnati Board of Education vs. Armstrong World Industries, Inc., et al. Attorney Thomas L. Eagen, Jr.; Cash, Cash, Eagen & Kessel, 1000 Tri-State Building, 432 Walnut Street, Cincinnati, Ohio 45202.
- 1993 Jun 29 Expert Witness Testimony at Trial on behalf of Westinghouse (Defendant): The Circuit Court of Jackson County, Mississippi; Asbestos Personal Injury Cases Abrams Lead Nos. 88-5422 (2), 89-5088 (2), 89-5121 (2), 90-5427 (2), 88-5420 (2), 89-5252 (2), 90-5069 (2), 90-5322 (2), 89-5153 (2), 90-5352 (2), 89-5268 (2), 90-5045 (2), 90-5274 (2), 88-5181 (2), 91-5187 (2), 91-5098 (2), 91-5000 (2), 90-5387 (2), 91-5119 (2), 90-5369 (2), 91-5135 (2), and 90-5178 (2). Attorney James F. Stutts; McGuire Woods Battle & Boothe, One James Center, 901 East Cary Street, Richmond, Virginia 23219-4030.

Recorded Testimony Related to Asbestos Measurement (Cont'd)

- 1993 Aug 20 Affidavit on behalf of Westinghouse Electric Corporation (Defendant): The Court of Common Pleas of Delaware County; Asbestos Cases No. 86-8499 & 86-8199, 86-8119, 86-8415, 87-7986, 86-8625, 86-8498, and 86-8624. Attorney T. William Alvey, III; McGuire Woods Battle & Boothe, One James Center, 901 East Cary Street, Richmond, Virginia 23219-4030.
- 1994 Jan 07 Deposition on behalf of United States Mineral Products Company (Defendant): The Commonwealth of Massachusetts, Suffolk County Superior Court, C.A. No. 90-3791-A; Commonwealth of Massachusetts v. Owens-Corning Fiberglas Corporation, et al. Attorney Stephen J. Imbriglia; Hecker Brown Sherry and Johnson, 1700 Two Logan Square, 18th and Arch Streets, Philadelphia, PA 19103.
- 1994 Mar 21 Deposition on behalf of Westinghouse Electric Company (Defendant): In Re: Baltimore City Personal Injury Asbestos Litigation in The Circuit Court for Baltimore City, CA No. 93076701; ABATE, et al. vs. ACandS, INC., et al. "Post-Abate/Consolidation II" (Asbestos Personal Injury Cases Filed after October 1, 1990. Attorneys James F. Stutts and Morton A. Sacks; McGuire Woods Battle & Boothe, One James Center, 901 East Cary Street, Richmond, Virginia 23219-4030.
- 1994 Mar 23 Deposition on behalf of U.S. Mineral Wool (Defendant): State of Wisconsin: Circuit Court: Milwaukee County, Case No. 92-CV-012266; Glendale-River Hills School District vs. U.S. Mineral Wool, AAER Sprayed Insulation, and Asbestospray Corporation. Attorney J.T. Broderick, Jr.; Broderick & Dean, 707 Chestnut Street, Manchester, N.H. 03105.
- 1994 May 23 Deposition on behalf of U.S. Mineral Products Co. (Defendant): Superior Court of the State of California for the County of Los Angeles, Case No. C 728 817; Sunset Vine Tower Ltd., a California general partnership, v. Carey Canada, Inc., et al. Attorneys Kevin J. McNaughton and Jill A. Franklin; Schaffer & Lax, 5757 Wilshire Boulevard, Suite 600, Los Angeles, California 90036-3664.
- 1994 May 24 Continuation of Deposition on behalf of U.S. Mineral Products Co. (Defendant): Superior Court of the State of California for the County of Los Angeles, Case No. C 728 817; Sunset Vine Tower Ltd., a California general partnership, v. Carey Canada, Inc., et al. Attorneys Kevin J. McNaughton and Jill A. Franklin; Schaffer & Lax, 5757 Wilshire Boulevard, Suite 600, Los Angeles, California 90036-3664.
- 1994 May 25 Expert Witness Testimony at Trial on behalf of U.S. Mineral Products Co. (Defendant): Superior Court of the State of California for the County of Los Angeles, Case No. C 728 817; Sunset Vine Tower Ltd., a California general partnership, v. Carey Canada, Inc., et al. Attorneys Kevin J. McNaughton and Jill A. Franklin; Schaffer & Lax, 5757 Wilshire Boulevard, Suite 600, Los Angeles, California 90036-3664.

Recorded Testimony Related to Asbestos Measurement (Cont'd)

- 1994 Jun 15 Deposition on behalf of United States Mineral Products (Defendant): State of Michigan in the Circuit Court for the County of Wayne, No. 84-429634-NP; Board of Education of the School District for The City of Detroit vs. The Celotex Corporation, et al. Attorney Carolyn Sullivan, Esquire; Melick & Porter, One Joy Street, Boston, Massachusetts 02108.
- 1994 Sep 01 Expert Witness Testimony at Trial on behalf of Westinghouse Electric Company (Defendant): In Re: Baltimore City Personal Injury and Wrongful Death Asbestos Cases in The Circuit Court for Baltimore City, CA No. 93076701; ABATE, et al. vs. ACandS, INC., et al., Cross-Claim Proceedings. Attorney Melissa K. Force; McGuire Woods Battle & Boothe, The Blaustein Building, One North Charles Street, Baltimore, Maryland 21201-3793.
- 1995 Aug 15 Deposition on behalf of Union Carbide (Defendant), and on behalf of United States Mineral Products Company (Defendant): State of Illinois, County of Cook, SS: in the Circuit Court of Cook County, Illinois, County Department - Law Division, No. 92 L 9934: Board of Education of the City of Chicago vs. A, C and S., Inc., et al.; No. 92 L 9933: Evanston Community Consolidated School District No. 65, et al., vs. A, C and S., Inc., et al.; No. 92 L 9932: Board of Education of High School District No. 211, et al., vs. Abitibi Asbestos Mining Co., Ltd., et al.; No. 92 L 9927: Board of Education of Township High Schools, et al., vs. A, C & S., Inc., et al. Attorney, on behalf of Union Carbide, Matthew E. Norton; Burke, Weaver & Prell, 55 West Monroe Street, Chicago, Illinois 60603, and Attorney, on behalf of United States Mineral Products Company, Peter C. Kennedy; Hecker Brown Sherry and Johnson, 1700 Two Logan Square, 18th and Arch Streets, Philadelphia, PA 19103.
- 1996 May 06 Deposition on behalf of Kaiser Aluminum & Chemical Corporation (Defendant), and on behalf of Westinghouse (Defendant): In the District Court of Orange County, Texas, 128th Judicial District: No. A-920967-C: Robert L. Abernathy, et al. vs. A. C. & S., Inc., et al.; No. A-920961-C: Ina Sue Bailey, et al. vs. A. C. & S., Inc., et al.; No. A-930553-C: Edsel Dewell Cardwell, et al., vs. A. C. & S., Inc., et al.; No. A-930810-C: Ben Grady Gilbert, et ux, vs. A. C. & S., Inc., et al. Attorney, on behalf of Kaiser Aluminum & Chemical Corporation, Jack L. Harvey; Wharton Levin Ehrmantraut Klein & Nash, P.A., 104 West Street, P.O. Box 551, Annapolis, Maryland 21404, and Attorney, on behalf of Westinghouse, Robert E. Thackston, Jenkins & Gilchrist, P.C., Fountain Place, 1445 Ross Avenue, Suite 3200, Dallas, Texas 75202-2799.
- 1996 Aug 14 Deposition on behalf of United States Mineral Products Company (Defendant): In The Common Pleas Court of Montgomery County, Ohio, Case No. 91-3339; NCR Corporation vs United States Mineral Products Company. Attorneys Paul F. Slater; Danaher, Tedford, Lagnese & Neal, 20 Exchange Place, 31st Floor, New York, New York 10005, and Gary W. Gottschlich; Porter, Wright, Morris & Arthur, P.O. Box 1805, 1600 One South Main Street, Dayton, Ohio 45401-1805.

Recorded Testimony Related to Asbestos Measurement (Cont'd)

- 1996 Sep 06 Deposition on behalf of Owens-Corning Fiberglas Corp. (Defendant): Superior Court of New Jersey, Law Division: Middlesex County, Docket No. L-1133-93; Ronald F. Pecyno, Sr. and Josephine Pecyno, his wife v. The Anchor Packing Co., et al. Attorney Andrew Constantine; Tucker, Goldstein & Constantine, Cherry Hill Plaza, Suite 507, 1415 Route 70 East, Cherry Hill, New Jersey 08034-2210.
- 1996 Oct 17 Deposition on behalf of U.S. Mineral Products (Defendant): United States District Court, District of New Jersey, Civil Action Nos. 87-4227 (HAA) and 87-4238 (HAA); The Prudential Insurance Company of America, et als, vs United States Gypsum Company, et als. Attorney Marissa Banez; Danaher, Tedford, Lagnese & Neal, 20 Exchange Place, New York, New York 10005.
- 1997 Jan 15 Deposition on behalf of U.S. Mineral Products (Defendant): United States District Court, Southern District of New York, 91 CIV. 0310 (CLB)(MDF); The Port Authority of New York and New Jersey, (formerly known as "The Port of New York Authority") and Port Authority Trans-Hudson Corporation vs. Allied Corporation (individually and as a subsidiary of "Allied-Signal, Inc."), et al. Attorney Paul F. Slater; Danaher, Tedford, Lagnese & Neal, 20 Exchange Place, New York, New York 10005.
- 1997 Jan 16 Continuation of Deposition on behalf of U.S. Mineral Products (Defendant): United States District Court, Southern District of New York, 91 CIV. 0310 (CLB)(MDF); The Port Authority of New York and New Jersey, (formerly known as "The Port of New York Authority") and Port Authority Trans-Hudson Corporation vs. Allied Corporation (individually and as a subsidiary of "Allied-Signal, Inc."), et al. Attorney Paul F. Slater; Danaher, Tedford, Lagnese & Neal, 20 Exchange Place, New York, New York 10005.
- 1997 Oct 07 Deposition on behalf of Kaiser Aluminum & Chemical Corporation and Mallinckrodt, Inc. (Defendants): In the Circuit Court of Monongalia County, West Virginia; In Re: Mon Mass II. Attorney Jack L. Harvey; Wharton Levin Ehrmantraut Klein & Nash, P.A., 104 West Street, P.O. Box 551, Annapolis, Maryland 21404.
- 1997 Nov 19 Deposition on behalf of A. C. & S., Inc. (Defendant): In The Superior Court of The State of Delaware In and For New Castle County; In Re: Asbestos Litigation Sparco Trial Group, C.A. No. 96C-02-142. Attorney Wayne A. Marvel; Maron, Marvel & Wilks, P.A., 1201 North Market Street, Wilmington, Delaware 19899.
- 1997 Dec 03 Deposition on behalf of United States Mineral Products Company (Defendant): The Court of Common Pleas, Cuyahoga County, Ohio, Case No. 187471; Ohio Hospital Association against Armstrong World Industries, Inc., et al. Attorney Paul F. Slater; Danaher, Tedford, Lagnese & Neal, 20 Exchange Place, New York, New York 10005.

Recorded Testimony Related to Asbestos Measurement (Cont'd)

- 1997 Dec 12 Affidavit on behalf of Owens-Illinois: Supreme Court of the State of New York, County of New York; Index No. 44559/84, The City of New York, et al., against Keene Corporation, et al., Index No. 19280/87, The City of New York, et al., against AAER Sprayed Insulations, Inc., A Division of Rogers Insulating & Roofing Company, Inc., et al.; Index No. 19288/87, The City of New York against AAER Sprayed Insulations, Inc., A Division of Rogers Insulating & Roofing Company, Inc., et al. Attorney Daniel T. Ellis; Fuller & Henry P.L.L., 1 SeaGate, Toledo, Ohio 43604.
- 1998 Jan 19 Deposition on behalf of Owens Corning Fiberglas (Defendant): Superior Court of New Jersey, Law Division: Camden County, Docket No. L-11092-93; Joseph Marianna, Sr. v. Owens Corning Fiberglas, et al. Attorney Darren H. Goldstein; c/o Kelley Jasons McGuire & Spinelli, L.L.P., Suite 1400, One Penn Center, 1617 JFK Boulevard, Philadelphia, PA 19103.
- 1998 Oct 14 Deposition on behalf of Union Carbide Chemicals and Plastics Company, Inc. (Defendant and Third-Party Plaintiff): The United States District Court for the Eastern District of Pennsylvania, In Re: Asbestos Products Liability Litigation (No. VI), Civil Action No. MDL 875; Conwed Corporation vs. Union Carbide Chemicals and Plastics Company, Inc., vs. Owens-Corning Fiberglas Corporation, et al. Attorney Trevor J. Will; Foley & Lardner, Firstar Center, 777 East Wisconsin Avenue, Milwaukee, Wisconsin 53202.
- 1998 Nov 13 Deposition on behalf of Kaiser Gypsum Company, Inc. (Defendant): In The Superior Court of The State of California In and For The County of San Francisco; No. 968557: Frank DeNola, et al., v. Asbestos Defendants (BHC), et al. Attorney Allan D. Gutsche; Jackson & Wallace, 580 California Street, 15th Floor, San Francisco, California 94104.
- 1998 Nov 20 Continuation of deposition on behalf of Kaiser Gypsum Company, Inc. (Defendant): In The Superior Court of The State of California In and For The County of San Francisco; No. 968557: Frank DeNola, et al., v. Asbestos Defendants (BHC), et al. Attorneys Edward E. Hartley; Dillingham & Murphy, LLP, 225 Bush Street, Sixth Floor, San Francisco, California 94104-4207, and Bruce A. Fichelson; Jackson & Wallace; 580 California Street, 15th Floor, San Francisco, California 94104.
- 1998 Dec 03 Expert Witness Testimony at Trial on behalf of Kaiser Gypsum Company, Inc. (Defendant): In The Superior Court of The State of California In and For The County of San Francisco; No. 968557: Frank DeNola, et al., v. Asbestos Defendants (BHC), et al. Attorneys Edward E. Hartley; Dillingham & Murphy, LLP, 225 Bush Street, Sixth Floor, San Francisco, California 94104-4207, and Allan D. Gutsche; Jackson & Wallace, 580 California Street, 15th Floor, San Francisco, California 94104.
- 1999 Aug 27 Deposition on behalf of Defendant: Asbestos Litigation Limited to: Sharon Edwards; C.A. No. 96C-12-039. Attorney Wayne A. Marvel; Maron, Marvel & Wilks, P.A., 1300 North Broom Street, Wilmington, Delaware 19899-0288.

Recorded Testimony Related to Asbestos Measurement (Cont'd)

- 1999 Oct 15 Expert Witness Testimony at Trial on behalf of Rhone-Poulenc AG Company (formerly Benjamin-Foster, Division of AMCHEM Products) (Defendant): Civil District Court For The Parish of Orleans, State of Louisiana, Number 95-18815, Division "A"; Barry Hoerner, et al. versus ANCO Insulations, Inc., et al. Attorneys Janet L. MacDonell and André C. Broussard, Jr.; Deutsch, Kerrigan & Stiles, L.L.P., 755 Magazine Street, New Orleans, Louisiana 70130-3672.
- 1999 Nov 24 Certification on behalf of Southdown, Inc. (Defendant): Superior Court of New Jersey, Chancery Division - Sussex County, Docket No. SSX C-38-99, Civil Action; Township of Sparta v. Southdown, Inc. and New Jersey Department of Environmental Protection. Attorney Sy Gruza; Beveridge & Diamond, Park 80 West Plaza II, Suite 200, Saddle Brook, New Jersey 07663-5836.
- 2000 Feb 23 Certification on behalf of Southdown, Inc. (Defendant): Superior Court of New Jersey, Chancery Division - Sussex County, Docket No. SSX C-38-99, Civil Action; Township of Sparta v. Southdown, Inc. Attorney Sy Gruza; Beveridge & Diamond, Park 80 West Plaza II, Suite 200, Saddle Brook, New Jersey 07663-5836.
- 2000 May 10 Deposition on behalf of Rhone-Poulenc AG Company (formerly Benjamin-Foster, Division of AMCHEM Products) (Defendant): Civil District Court For The Parish of Orleans, State of Louisiana, Number 98-18635, Division "J", Sect. No. 13; Claude Trosclair, Jr., et al. versus ACANDS, Inc., et al. Attorney André C. Broussard, Jr.; Deutsch, Kerrigan & Stiles, L.L.P., 755 Magazine Street, New Orleans, Louisiana 70130-3672.

Publications Related to Asbestos Measurement

1. Chatfield, E.J. (1974): A Technique for Trace Asbestos Determination in Air and Water Samples. Proceedings, First Annual Meeting, Microscopical Society of Canada, 24-25.
2. Chatfield, E.J. (1974): Quantitative Analysis of Asbestos Minerals in Air and Water. Proceedings, 32nd Annual Conference, Electron Microscopy Society of America, 528-529.
3. Chatfield, E.J. and Pullan, H. (1974): Measuring Asbestos in the Environment. Canadian Research and Development 7, No.6, Nov./Dec., 23-27.
4. Chatfield, E.J. (1975): Asbestos Background Levels in Three Filter Media Used for Environmental Monitoring. Proceedings, 33rd Annual Conference, Electron Microscopy Society of America, 276-277.
5. Chatfield, E.J. and Glass, R.W. (1976): Analysis of Water Samples for Asbestos: Sample Storage and Technique Development Studies. Symposium on Electron Microscopy of Microfibers, U.S. Food and Drug Administration, 123-137, (Published 1977).
6. Chatfield, E.J. (1976): Particulate Matter Studies in SEM and TEM. Proceedings, Third Annual Meeting, Microscopical Society of Canada, 60-61.
7. Smith, D.K., Thomas, G.H., Christison, J. and Chatfield, E.J. (1977): Survey and Test Protocols for Point-Of-Use Water Purifiers. Report 77-EHD-8, Environmental Health Directorate, Health Protection Branch, Department of National Health and Welfare, Ottawa, Ontario, Canada.
8. Chatfield, E.J. (1978): Identification and Measurement of Asbestos Fibers by Electron Microscopy, Parts I and II. Asbestos, 59(8), 4-13; 59(9), 6-12.
9. Chatfield, E.J. and Dillon, M.J. (1978): Some Aspects of Specimen Preparation and Limitations of Precision in Particulate Analysis by SEM and TEM. Scanning Electron Microscopy/1978/I, 487-496.
10. Chatfield, E.J., Dillon, M.J. and Glass, R.W. (1978): Preparation of Water Samples for Asbestos Fiber Counting by Electron Microscopy. E.P.A. Report EPA-600/4-78-011, Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Athens, Georgia 30613.
11. Chatfield, E.J. (1978): A New Technique for Preparation of Beverage Samples for Asbestos Measurement by Electron Microscopy. Proceedings, Ninth International Congress on Electron Microscopy, 102-103.
12. Chatfield, E.J. (1979): Preparation and Analysis of Particulate Samples by Electron Microscopy, with Special Reference to Asbestos. Scanning Electron Microscopy/1979/I 563-578.

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14. Chatfield, E.J. and Dillon, M.J. (1979): A National Survey for Asbestos Fibres in Canadian Drinking Water Supplies. Report 79-EHD-34, Environmental Health Directorate, Health Protection Branch, Health and Welfare Canada, Ottawa, Ontario, Canada.
15. Chatfield, E.J. (1979): Errors and Misidentification in Particulate Analysis. Twelfth Annual Symposium of the Society for Toxicology of Canada, Montréal, Québec, Canada.
16. Chatfield, E.J. and Lewis, G.M. (1980): Development and Application of an Analytical Technique for Measurement of Asbestos Fibers in Vermiculite. Scanning Electron Microscopy/1980/I, 328-340.
17. Chatfield, E.J. (1980): Analytical Procedures and Standardization for Asbestos Fiber Counting in Air, Water and Solid Samples. National Bureau of Standards Special Publication 619. Proceedings of the NBS/EPA Asbestos Standards Workshop (Issued March 1982), 91-107.
18. Chatfield, E.J. (1980): Progress in Analytical Procedures for Asbestos in Environmental Samples. Proceedings, Fourth Symposium, Electron Microscopy and X-ray Applications to Environmental and Occupational Health Analysis, Pennsylvania State University, October, 1980. (In Press).
19. Chatfield, E.J. and Riis, P. (1980): Development of a Rapid Survey Technique for the Detection of Asbestos Fibers in Water Samples. National Bureau of Standards Special Publication 619. Proceedings of the NBS/EPA Asbestos Standards Workshop (Issued March 1982), 108-120.
20. Méranter, J.C., Davey, A., Chatfield, E.J. and Dillon, M.J. (1980): A National Survey for Asbestos in Canadian Drinking Water Supplies. Proceedings, 53rd Annual Conference, Water Pollution Control Federation, Las Vegas, Nevada.
21. Chatfield, E.J. (1980): The Problems of Measurement of Asbestos. Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario. Public Meeting Number 2: Asbestos in the Context of General Issues, December 1980, Toronto, Ontario, Canada.
22. Chatfield, E.J. (1981): Airborne Asbestos Fibres: A Summary of Some Measurement Problems. Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario. Public Hearings, July 1981, Toronto, Ontario, Canada.
23. Stott, W.R., Chatfield, E.J. and Méranter, J.C. (1981): SEM-Based Automated Fiber Counting. Proceedings, 16th Annual Conference, Microbeam Analysis Society, Vail, Colorado 53-56.

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Professional Affiliations

Memberships in Professional Associations

Member of the Institute of Physics (M.Inst.P.)

Fellow of the Royal Society of Chemistry (F.R.S.C.) (U.K.)

Fellow of the Chemical Institute of Canada (F.C.I.C.)

Memberships in Scientific Societies and Technical Committees

Past President of the Microscopical Society of Canada
(One of the 7 Founding Members)

Member of the Electron Microscopy Society of America

Member of the Microbeam Analysis Society

International Organization for Standardization

Convener of Working Group TC 146/SC 3/WG1, Environmental Asbestos Measurement

Convener of Working Group TC 146/SC 6/WG4, Indoor Air Asbestos/Mineral Fibre
Sampling

Member of Canada-Commission of European Communities Bi-lateral
Working Group on Asbestos Cooperation

Canadian Representative on the International Mineralogical Association
Working Group on Electron Microscopy in Mineralogy

Member of the Ontario Ministry of the Environment Expert Committee on Asbestos
Determination

Member of ASTM Section D22.05.07, Asbestos

Member of The Environmental Information Association

Member of The Aerosol Society

Member of The Image Analysis Group of Eastern Ontario

Patent:

U.S. Patent 3927320, December 16th 1975.
Method and Apparatus for Deriving from a Scanning Electron
Microscope Signals that can be Displayed Stereoscopically.

Inventors: E.J. Chatfield and V.H. Nielsen

Awards:

Microbeam Analysis Society:
Victor Macres Award for Instrumentation, 1974.

Ontario Research Foundation:
W.R. Stadelman Award for Technical Excellence, 1984.

United States Environmental Protection Agency:
Tribute of Appreciation, 1987.

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Textbooks:

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