1-0011-004-0014

CONFIDENTIAL

Office for Emergency Management
National Defense Research Committee
Office of Scientific Research & Development
1530 P Street, N.W.
Washington, D. C.

PLEASE REPLY TO
4800 FORBES STREET
PITTSBURGH, PENNSYLVANIA

TELEPHONES:
CARRICK 6900; OLYMPIA 5551

Mr. Belknap
St. Louis

Vault

April 17, 1943

Dr. C. A. Thomas
Central Research Laboratory
Monsanto Chemical Co.
Dayton, Ohio

Dear Charlie:

I do not know whether you or Mr. Belknap have already heard from Dr. Conant of his appreciation of the very generous and broadminded action of the Monsanto Company in giving up its patent rights to the U.S. Government in connection with composite propellants. In any case I would like to express my deep personal appreciation for this action. It seems to me that it sets a magnificent example to American industry in emphasizing that the work done with NDRC funds is work done for our country and not for private interests.

With reference to your letter of April 2nd addressed to Captain Bull advising of your decision to release all patent rights in respect to the U.P. Propellants to the Government, I would like to call your attention to Administrative Circular 10.03, paragraphs 9 and 12, a copy of which I am enclosing herewith.

In order to assist Captain Bull in taking care of the U.P. Propellant patent situation, it would be appreciated if you would request your patent counsel to review the Monsanto work from a patent point of view and to prepare invention reports in the form of complete patent applications. The cost of this work, as provided in paragraph 12 of 10.03, is properly reimbursable to Monsanto. I would suggest that you send these reports directly to Captain Bull so that he may correlate them with the cases which he will prepare covering the ERL work. Captain Bull will use his own judgment as to the proper scope of the claims in the various cases and therefore it is suggested that the Monsanto reports be submitted in tentative form using ordinary letter-size stationery. If your counsel desires any further information in regard to the form of the invention reports, I would suggest that he contact Captain Bull, directly.

Cordially yours

G. B. KISTIAKOWSKY
Chief, Division 8

cc. Dr. James B. Conant
Captain Benton A. Bull
Dr. May Dow

cc - Messrs. Schneider
Thomas (C.A.)

April 21, 1943

Dr. V. Bush, Director
Office of Scientific Research
and Development
1530 P Street NW
Washington, D. C.

My dear Dr. Bush:

Many thanks for your letter of April thirteenth which reached me this morning.

This Company was very glad to contribute to the government any part it played in the development of propellants, and was glad to approve the recommendation of Dr. Charles Allen Thomas, Director of Central Research of this Company, relative to the patent situation connected therewith.

Should you come this way, we should be delighted to have you let us know so that we might, in some way, make your stay in St. Louis more interesting to you.

Yours most sincerely

Charles Belknap
President

em

[illegible]

[illegible]

[illegible]

TO: ST. LOUIS

[illegible] M. C. BJARSON

March 23, 1944

Due to the splendid cooperation of your organization at Plant B, we will be able to make the first shipment of a product to the Government on time. This material was so important that the Government had requested us to have another industrial concern work on producing the same material as a stand-by. Monsanto came through while the other source did not develop on schedule.

We want to congratulate you on this work and sincerely appreciate the fine cooperation of all of the men connected with the work. Dr. Burbage, our representative from Central Research, says that everyone was most helpful on this project.

rds

Charles Allen Thomas

P. O. BOX 1663
SANTA FE, NEW MEXICO

September 8, 1945

Dr. C. A. Thomas,
Monsanto Chemical Company,
P. O. Box 86, Station B,
Dayton 7, Ohio.

Dear Charlie:

I am sure that you will have had from many illustrious sources appropriate expressions of appreciation for the work that Monsanto has done on the atomic bomb project. I would like to add my own voice to theirs, because I am perhaps in a position to know more intimately how decisive were the contributions that the workers of your company made and how helpless we should have been without their skill and devotion, and without your leadership. I wish that you would express to them this word of appreciation so that they may know, as we do, that we could not have made the bombs without their help.

I cannot write to you in any adequate terms of my own personal debt, nor of the bonds of affection and loyalty which are its consequence. I hope, in the years to come, that you will not regret your association with us at Los Alamos, and that the friendships which have grown from it will not languish.

Sincerely,

J. R. Oppenheimer

atw

1-0011-007-0007 Cert. Rec. Is

NEWS

FROM MONSANTO CHEMICAL COMPANY
ST. LOUIS, MISSOURI 4

For Release: On Receipt

NOTE TO EDITORS: 1945

The following statement has been cleared by the War Department for release and is offered for whatever interest it may be to you.

J. Handly Wright
Director, Industrial
and Public Relations
Monsanto Chemical Company

OAK RIDGE, TENN., August 14 - With army approval, Monsanto Chemical Company disclosed today that both the company and many of its leading scientists had been closely associated with the development of the atomic bomb since the inception of the project.

It was revealed that Monsanto's principle contributions to the program included research, process development, design of plant and subsequent production of some of the material. Later, the company assumed responsibility for the operation of a large part of the Oak Ridge project.

Many picked scientists participated in Monsanto's part of the undertaking in the company's operations at Dayton, Ohio, but so well was the secret kept that even fellow workers at Dayton did not know what was being done. Even some of the company's high officers were uninformed about it.

Dr. Charles Allen Thomas, Vice President of Monsanto and formerly Director of the Company's Central Research Laboratories at Dayton, headed a staff of Monsanto scientists which included Dr. C. A. Hochwalt, Dr. James Lum and his assistant, Dr. W. Conrad Fernelius, who worked at the Company's Dayton

(more)

operations. They have devoted most or much of their time to the project since its inception, working out some of the manufacturing and production problems which bore final fruit in the bomb which smote Hiro Shima and which promises an early end to Japan's resistance and the saving of hundreds of thousands of American casualties.

Dr. Thomas also supervised a staff of many chemists who worked in other parts of the country. He is in charge of all Monsanto operations which pertain to the project. Dr. M. D. Whitaker is in charge of the work for Monsanto at Oak Ridge.

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C
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P
Y

Oak Ridge, Tennessee
January 19, 1949

Dr. C. A. Hochwalt
Vice President - Research
Monsanto Chemical Company
Dayton, Ohio

Dear Dr. Hochwalt:

I want this informal note to convey to you and your associates my sincere thanks for the real and important contributions you made to the progress of the Atomic Energy Commission during 1948.

Your solution of the problems involved in development of Unit V ------ facilities in time to permit discontinuance of operations at Unit IV before the year's end, and your accomplishments in the ---------- are especially worthy of recognition. You are also to be commended for your fine co-operation with the Commission in its effort to reduce the number of personnel required at Mound Laboratory to the minimum consistent with the programs assigned to Monsanto.

Unfortunately, security considerations prevent our giving you this recognition and commendation publicly as we would like to do. However, I do want you to know the earnest efforts expended on our behalf by you, members of your staff, and your entire organization are both recognized and appreciated.

Sincerely,

J. C. Franklin
Manager
Oak Ridge Operations

cc: Mr. K. A. Dunbar
Area Manager, AEC
Dayton, Ohio

JCF-BD

Note: Above deletions to permit unclassified copying.

MONSANTO IN DAYTON *

Prior to 1926, Charles Allen Thomas and Carroll A. Hochwalt were employed by the General Motors Fuel Research Laboratory in Dayton where they were engaged in the research on the anti-knock additives for gasoline. This program of research led to the development of tetraethyl lead and its use in gasoline. When the General Motors corporation announced their intention of transferring their fuel research laboratory to Detroit and its consolidation with their General Research Department, Drs. Thomas and Hochwalt resigned, formed a partnership for private chemical research, and established a laboratory in downtown Dayton. The newly established laboratory cooperated with General Motors Corporation on a research contract for several years. Among their activities was an investigation of the chemical structure of natural rubber.

In 1928 the organization was incorporated as Thomas and hochwalt Laboratories, Incorporated and was moved to its present site on Nicholas Road. The research staff at this time was comprised of eight individuals including the founders. The Thomas and Hochwalt Laboratories did research on the manufacture of paper, on the development of uses for phosphorus and phosphoric acid, and in the preparation of synthetic resins from petroleum derivatives. The Monsanto Chemical Company became interested in the synthetic resin research and purchased some of the laboratory's developments in 1933. Three years later, in 1936, Monsanto acquired the entire organization which became the Central Research Department of the Company. By this time the laboratory staff had expanded to fifty-two and had accumulated a large stock of apparatus, instruments and other equipment for conducting chemical and physical research.

As new projects and responsibilities were assigned to the Department, additional buildings were constructed, including new laboratories, pilot plant buildings for the process development of new products, and shops for maintenance and the construction of necessary equipment. During World War II, the projects included the development of rocket propellants and atomic research under the Manhattan District. Additional personnel and research sites were acquired for these operations.

* Prepared for a Monsanto board of directors meeting in Dayton October, 1951.

At the end of World War II, the Atomic Energy Commission began the construction of the Mound Laboratory at Miamisburg, Ohio, and ultimately all of the Monsanto personnel engaged in atomic research were transferred to the new site. This atomic energy unit was placed under the administration of Monsanto's Central Research Department. The Nicholas Road Laboratory also acquired additional space for expansion-a surplus defense plant on the adjacent premises. This building provided space for the administrative staff, the engineering department, the maintenance and construction shops, and several specialized laboratories. Since acquiring the additional space, the laboratory staff has continued to expand and today 240 individuals are employed. The Central Research Department conducts a large part of the fundamental research undertaken by Monsanto, and cooperates with the various operating divisions on their special problems. Some of the current activities will be described by the laboratory staff during your tour of the research facilities.

October 23, 1951

GROWTH

From: Dr. Hochwalt

Background of Thomas & Hochwalt Laboratories

In 1921 Hochwalt was with General Motors. Tetraethel lead had been discovered in 1921, but was not in use because they had not yet found the scavanger for it. Hochwalt was one of several men working on that problem.

One day in 1923 Hochwalt came back from his vacation and noticed a new man in the lab - a guy with a red fringe of hair around a bald head, who was singing heartily away in the room next to Hochwalt's. Hochwalt took an instant liking to him, and they became close friends. Thomas was just out of MIT. He had known Hank DuPont there, and through Du Pont influence got his job at GM.

The two men enjoyed working together and had lots of ideas that didn't involve ethel gasoline. One was for a fire extinguisher. It looked so promising that in 1925 they went to Kettering and asked him whether they could work in the evenings on their own. He said okay. Sometimes they used their regular lab, sometimes Dr. Wahlaben's at the University of Dayton. The fire extinguishers then in current use would freeze below 32 degrees, and there was great need for one that could be used down to minus 40 degrees. By the end of 1925 Thomas and Hochwalt had developed one, and the Fyr Fyter company of Dayton bought the invention.

About this time GM and its subsidiary Ethel Corp., decided to move away from Dayton. Thomas and Hochwalt didn't want to go.

Thomas was courting a Dayton girl at the time, for one reason. So they decided to set up their own laboratories. They were assured by the company that bought their fire extinguisher that they would be retained as consultants, and also get a royalty on it, so this would set them up in business.

Tom Midgeley, head of GM research, didn't want to leave Dayton either, and he went to Sloan with a synthetic rubber idea. Rubber was high priced then because of the Stevenson Act, so Sloan retained Midgeley, who had decided to join forces with Thomas and Hochwalt, for $75,000 a year to work on synthetic rubber.

The laboratory was first set up on the third floor of Gray Manor Annex, which had been a private home. An interior decorator had the two lower floors. The three chemists, plus a lab boy and a girl to manage the business end, Mrs. Setzer, (sp?) made up the staff.

When natural rubber got cheaper again in 1928, GM canceled the synthetic rubber contract. But by that time they were working on other things. They developed the Carba soft carbon remover fluid which was sold to Stewart-Warner in 1930 for $300,000. Thomas married a Talbot, of the wealthy Dayton family, in 1928. The labs moved the same year from their original attic to the a building which had housed the Dayton Chemical Co., and is the site of the present Central Research Lab. There were eight people on the staff by that time.

2

The Story of Monsanto

Faith, Hope and $5,000

THE TRIALS AND TRIUMPHS
OF THE FIRST 75 YEARS

by Dan J. Forrestal

Simon and Schuster
New York
1975

for the Army a lightweight armor material for actual wearing by military personnel. It was called Doron and was named for Brigadier General George F. Doriot of the Quartermaster Corps. The product was made of glass cloth and resin, a forerunner of reinforced plastics typified by the famous Fiberglas.

War's end also enabled Edgar Queeny to report that Dr. Charles A. Thomas had led the group of scientists (in 1943 and 1944) who refined the 94th element, plutonium, preparing the way for the development of the atom bomb.

This story is best told by a letter written to Edgar Queeny on August 15, 1945, by Major General L. R. Groves of the War Department:

"With the advent of V-J Day and the realization of the United States and the world that the atomic bomb played a major part in bringing about peace at an earlier date than could otherwise be expected, I wish to personally thank you for the work done by Monsanto Chemical Company.

"A detailed description of your efforts must still remain undisclosed because of security requirements, but I want you to know that Dr. C. A. Thomas and his associates made a major contribution to our success. Dr. Thomas personally coordinated a very important phase of the chemical research pertaining to the project; he also completed vital research and solved production problems of extreme complexity without which the atomic bomb could not have been. . . .

"I also appreciate your taking over the contract for the operation of Clinton Laboratories (near Oak Ridge, Tenn.). . . . Your recognition of the need for industrial management of Clinton Laboratories showed your continued confidence in our prospective success at a time when success had not yet been achieved or even assured.

"I am sure Monsanto Chemical Company will continue to give aid to the nation in carrying on future development in the field of atomic energy."

This was prophetic. Within a few years Monsanto would indeed be busily engaged in researching peacetime uses of atomic energy as a contractor for the Atomic Energy Commission at a large installation called Mound Laboratories at Miamisburg, Ohio.

The message from General Groves was reproduced in *Monsanto Magazine*. In addition, a letter went to all employes saluting them for all they had done to help their nation during World War II.

No one seemed happier in 1946 than Josiah B. Rutter, Merrimac alumnus and now director of corporate engineering, when the company purchased from the government the Texas City styrene plant. Rutter had been the construction boss when the gleaming towers of Texas City were installed in seven days less than a year during the pressure-cooker strain of war's demands. He called the plant his "pride and joy." And he reveled in the company's postwar plans to expand and modernize, to add polystyrene molding compound as well as several petroleum-based

Atomic Quest

A PERSONAL NARRATIVE

By ARTHUR HOLLY COMPTON

NEW YORK · OXFORD UNIVERSITY PRESS · 1956

There I was in close contact not only with our crucially important pilot plant operation but also with Colonel Nichols, who as the District Engineer maintained his headquarters at Oak Ridge. While he gave a great part of his personal attention to operations there, he had also the responsibility, given him by General Groves, for much of the detailed operation of the Manhattan District.

At its peak the parts of this project that were being handled through our office were spending more than twenty-five million dollars a year. To make sure that this was being used wisely toward promoting the wartime program, I requested authorization from Groves to set up an Advisory Board. This board consisted of James B. Conant, who was keeping in close contact with all aspects of the atomic project, Charles A. Thomas, whom General Groves had put in general charge of plutonium chemistry, Enrico Fermi, our best authority on the atomic nucleus, and Zay Jeffries, an experienced hand in industrial research. The advice of this board on matters of major policy was invaluable.

At Hanford construction began early in 1943. First, housing had to be supplied for the construction crew itself. The almost deserted village swelled quickly to a size of fifty or sixty thousand. Barracks were built, and great mess halls, schools, and recreation areas. All of this was of the most temporary construction. Within three years the construction crew was gone, and Hanford was again a ghost town.

It was at the mess hall of Hanford that in the opinion of Julian Bernacchi was to be found the best food anywhere on the entire atomic project. As the thousands of men poured in to seat themselves at the tables they found in front of them the food already served in great platters and bowls. It came hot, fresh from the kitchen. As soon as a bowl was emptied and held up a waitress would replace it with a full one.

The construction of the production plant itself involved large quantities of concrete. The land where the structures were to be

should have the first pounds ready by 1 January 1945. 'If you do that,' was his answer, 'I'll give you a champagne dinner.'

'If we don't,' I replied, 'the dinner will be on me.' I missed the date by six weeks, but we were all elated that the delivery was possible so soon. After the war was over, I was happy to be host at a dinner in Saint Louis to Conant and Groves and Greenewalt, with others who had shared in drawing these schedules.

The costs had obviously been great. It remained yet to be seen whether they would be justified in terms of shortening the war. At least the power of the atom had not fallen first into the hands of our enemies where it could have been used to destroy us.

Two days after the phone call from Robert Oppenheimer, I had to give to the project leaders, who were meeting this time at Oak Ridge, my bi-weekly report on the progress of the project. 'Nothing has happened since our last meeting,' I told them, 'that is discouraging with regard to the ability to achieve a violent explosion.' Already by grapevine the news of the success of the New Mexico experiment had spread. But no one was speaking of it out loud.

That evening Charlie Thomas came with me to our Oak Ridge home. Thomas was at that time the able head of the Monsanto Chemical Company laboratories at Dayton which had in hand an important special assignment regarding the bomb itself. From 1943 he was General Groves's chief adviser with regard to the chemical work at Los Alamos. He had been a member of the party that viewed the New Mexico test.

As Thomas stood there in our yard telling me of what he had seen it was evident that the experience had given him a shock from which he had hardly recovered. 'The light,' he said, '—it was many times brighter than the sun. The mountains back of us showed as clear as in daylight. We were stationed ten miles away from the explosion. At the five-mile station two men were knocked over by the blast. The immense ball of flame rapidly going up into the sky was followed by a cloud of dark dust. The

hundred-foot steel tower on which the bomb was placed was completely evaporated. The surface sand around it for a thousand feet was melted into glass.'

Such was the weapon we had forged. Success, yes. The preliminary calculations had indicated that the explosion should have the energy of roughly 10,000 tons of TNT. The theoreticians recognized, however, that their calculations could not be relied upon closer than to a factor of two. Even at the last moment some were expressing skepticism as to whether an atomic explosion would in fact occur. They had accordingly given out their estimate cautiously as 5000 tons of TNT equivalent. The energy actually released in the test was equivalent to 20,000 tons. The predictions were as reliable as could have been expected.

The result—awesome, terrifying.

National Institute for Occupational Safety & Health
Office of Compensation Analysis and Support
4676 Columbia Parkway
Cincinnati, Ohio 4226

03-15-06 P02:27 IN

Dear Members of the Commision,

I am sending this information in reponse to the written report I received from you, February 14, 2006, of our telephone conversation in response to my application sent to you requesting SEC class status for the employees of the Monsanto Chemical Company from 1943 -1949 in Dayton,Ohio. My husband's track number is:

In response to your indication of the deficiencies, I am revising my answers and enclosing answers to questions F.1, F.2 and F.3. I hope the information I am sending will be satisfactory responses to the questions asked.

My knowledge of what was happening in Dayton is sparse to say the least for after my marriage, I only met a few Monsanto people and my husband never discussed the Dayton years. I only came into his life when he was working on light emitting diodes.

I would like to thank you for your suggestions and assistance on filling out the application.

Sincerely,

I hereby swear that I have written the information requested for questions F.1, F2, and F3, and have enclosed the necessary documents needed to support my answers as indicated in the documents and in answer to your response to my first application to request SEC status for the workers employed by the Monsanto Chemical Company during the years 1943-1949.

r Question F. I asks that the responder indicate either documents or statements provided by affidavit that indicate that radiation exposures and radiation doses potentially incurred by members of the proposed class, that relate to this petition, were not monitored, either through personal monitoring or through area monitoring. And describe completely as possible, to the extent it may be unclear, how the attached documentation indicate that potential radiation exposures were not monitored.
i

In The pamphlet "The History of the Dayton Project" on page 14, the writer states:

"Employees who were exposed to significant amounts of radioactivity on a daily basis were checked regularly both for their own health, and to assure no contamination was leaving the laboratory and entering the community".

The statement "radioactivity in the laboratory had to be carefully controlled. Here scientists were working with the largest amounts of polonium ever isolated, and the associated radioactivity was significant."

The reader finds that in the above statements there is no indication that the doses of polonium the class of workers received were monitored daily, either individually or through area monitoring where they worked. There is no indication of any dosimeters that were used, how often the employees were monitored, how long the employees were exposed to harmful substances. Individual radiation doses or area doses is never mentioned.

As a result, the reasonable person can only conclude that individual or area monitoring did not occur. "That they were checked regularly ...for their own health" does not denote monitoring. And the very fact that when NIOSH asked for records on dose exposue, the answer always is NA. Except for the two pamphlets I previously sent, I have no knowledge of any radiation procedures since my husband and I were married October and I came out to St.Louis.

HISTORY OF THE DAYTON PROJECT

rusting window screens and had no relationship to work at Runnymeade. It is significant to note that not a single accident occurred at either Monsanto location causing any injury to the public.

Great care was taken to assure the safety of the surrounding areas. Trucks equipped with radiation detection equipment made regularly scheduled runs throughout the greater Dayton area. Even as far as 75 miles distant, air and soil and water were sampled to ensure that radioactivity was not released in the community.

Radioactivity in the laboratory had to be carefully controlled. Here, scientists were working with the largest amounts of polonium ever isolated, and the associated radioactivity was significant. Employes who were exposed to significant amounts of radioactivity on a daily basis were checked regularly both for their own health, and to assure that no contamination was leaving the laboratory and entering the community. Schedules were established for delivery of the purified polonium which were exceptionaly hard to meet. It became an art to delay the courier arriving to pick up the polonium. Some deadlines were so close that an employe would be sent to talk with the courier and to keep him occupied while the final touches were put on the packages. Still, all commitments were met and shipments were made on schedule.

As early as 1946 it became evident that a permanent polonium production facility was needed. Thus a project which some thought might last only six months had grown to a state of permanence. Among the locations considered for the proposed facility was a site midway between the atomic plants at Los Alamos, New Mexico and Hanford, Washington. A Tennessee location near the Oak Ridge Atomic plant was also investigated. The Dayton area was finally selected for a number of reasons among which were a good supply of skilled labor and adequate water and power supplies. The site selected for Mound Laboratory was on a hill 878 feet above the sea level and about 200 feet above the Miami River in Miamisburg, Ohio. Adjacent to the laboratory is the largest conical Indian mound in the state of Ohio. From this prehistoric burial gound the laboratory derived its name.

Mound Laboratory became the first permanent Atomic Energy Commission facility when it was first occupied in May 1948. There were, in total, 14 major buildings constructed in the original $25.5-million complex with a total floor area of 366,000 square feet. Polonium processing was started in February 1949.

To answer question F. 2, I understand that I can select the following part of the statement....; that there is no information regarding monitoring, source, source term, or process from the site where the employees worked.

Since I sent my husband's application to the Department of Labor in and the file went to NIOSH, whenever I received a report from either office, that you asked for information regarding exposure monitoring on my husband's position at the Monsanto Chemical Co. in Dayton, Ohio from it always came back N A or NO as the recent report from NIOSH indicates. The Dose Reconstruction Activity Report. which is enclosed, still indicates the Monsanto Chemical Company does not accept their request (as they have done a number of times before), for exposure monitoring information. I can only assume those employees for whom I am seeking class action status of which my husband is a member, who worked for the Monsanto Chemical Company from 1943 -1949, and applied for SEC status received the same information that I have received on my husband's reports from NIOSH.

I am also enclosing aletter from the Monsanto Company dated May 2, 2003, in which Mr. Brian B. Buettner indicated that I was hired by Monsanto on He was employed as a Research Chemist in the Central Research Department at the Dayton, Ohio facility. I do not have a complete history of his employment but it does look like he continued to work for Monsanto up until his retirement on I can only assume that other Monsanto employees who applied to the SEC received a similar statement, for they probably wrote to the Monsanto Headquarters in St. Louis. Therefore, this statement is intended to cover the employees wo worked for the Monsanto Chemical Company at the Dayton facility during the period 1943-1949.

The only reason I can think of for the non-availability of the records for the period 1943-49 is that the archivist at Monsanto Headquarters told me during my visit to her office, that they are in Los Alamos and the only person who can get them is if that person gets top security clearance. However, I think one might assume that they are lost or destroyed because of time limits to retain papers. As a result there is no information regarding the monitoring, source, source term, or process from the site where the employees worked

NIOSH Dose Reconstruction Activity Report, January 2006

Public Health Service

National Institute for Occupational Safety and Health
Robert A. Taft Laboratories
4676 Columbia Parkway, MS C-45
Cincinnati, OH 45226-1998
Phone: 513-533-8423
Fax: 513-533-6840

This is your January 2006 Dose Reconstruction Activity Report. It has been sent to update you on the current status of your case and dose reconstruction program. No response or action is required from you at this time. **If you do not wish to receive your Activity Report, please contact our office at 513-533-8423 and we will remove your name from our report's mailing list.**

Your Dose Reconstruction Activity Report has two parts. Part 1 contains information on the current status of your case. This part of your report may remain unchanged if your case has not reached the next step in the dose reconstruction process at the time this report was created. Part 2 is updated in each report to provide you with current information about our dose reconstruction program.

Part 1: Individual Dose Reconstruction Case Status

Major Steps of the Dose Reconstruction Process

The major steps of the dose reconstruction process are listed in the left column. The date that each step occurred is listed in the right column. An "N/A" under "Date Step Occurred" means that the step has not occurred yet.

Steps in the Dose Reconstruction Process **Date Step Occurred**

- Case Received from DOL:

  The Department of Labor (DOL) is responsible for this compensation program. Once a claim has been filed, DOL must first determine if the period of energy employee's employment and medical condition are covered under this compensation program. After DOL determines that a claim involves a covered energy employee with cancer, DOL sends the case to NIOSH for dose reconstruction.

- Acknowledgement Letter Sent:

  The letter lets claimants know that NIOSH received the case for dose reconstruction. The letter includes the NIOSH Tracking Number and general information on dose reconstruction.

- Telephone Interview Conducted:

  The telephone interview provides claimants with the opportunity to inform NIOSH of any additional information regarding the work history of the energy employee. When we reach the point in our process when we are ready to conduct the interview, we will contact the claimant to arrange a convenient date and time for the telephone interview. Prior to the interview, we will send a detailed copy of questions to help the claimant prepare for the interview.

- Summary Report from Interview Sent:

  After the telephone interview has occurred, a summary report of the interview is sent to the claimant. The claimant is asked to review the report and provide comments and additions if necessary.

- Conflict of Interest Letter Sent: N/A

  This letter will be sent to the claimant explaining our Conflict of Interest Policy—that a dose reconstruction will not be assigned to a Health Physicist who worked at the same covered facility as the energy employee represented in the case.

- Case Assigned to Health Physicist for Dose Reconstruction: N/A

  This indicates the date that NIOSH assigned the case to a Health Physicist for dose reconstruction. Once the dose reconstruction is completed for a case, a draft report is sent to the claimant. Once the draft dose reconstruction report has been sent, claimants will no longer receive a Dose Reconstruction Activity Report.

Employment and Exposure Information

The table below provides information on when a request for the energy employee's exposure monitoring records was submitted and when NIOSH received a response to the request for records. Under the "Employer Accepts Requests for Exposure Monitoring Information" section, there may be a "No" listed. "No" can mean:

1. The employer does not accept requests because it does not have any exposure monitoring information.
2. A point of contact for obtaining the exposure monitoring information has not or cannot be established with the employer.
3. NIOSH already has possession of all monitoring information.

Employer(s) Verified By DOL	Employer Accepts Request for Exposure Monitoring Information	Date Request for Exposure Monitoring Information Sent	Date Exposure Monitoring Response Received
*Monsanto Chemical Co.	No	N/A	N/A

*Hundreds of thousands of documents have been collected that may contain information on the worksite(s) indicated above (*). In an effort to sort through this information in a timely manner, NIOSH has hired a contractor specifically dedicated to analyzing these documents over the next year. During this time, if the documents can be used to complete dose reconstructions for the worksite(s) identified with an *, we will begin working on the dose reconstruction. If at any time the contractor or NIOSH determines that there is not enough worksite or personal monitoring information available to complete your case, we will notify you that a dose reconstruction cannot be completed and your case will be referred to DOL for a decision without a dose reconstruction. NIOSH will also discuss with you other options for seeking possible compensation that do not require a completed dose reconstruction.

Medical Information

The table below provides information on the energy employee's cancers that were verified by DOL.

Cancer Description	Diagnosis Date

DOL is responsible for verifying covered employment and medical information for your case. If you have any questions regarding the employment or medical information stated above, please contact either your case examiner with DOL or the District Office where you filed your case.

Cleveland, Ohio	1-888-859-7211	Jacksonville, Florida	1-877-336-4272
Denver, Colorado	1-888-805-3389	Seattle, Washington	1-888-805-3401

F. 3 of the SEC petition requests documentation of the limitations of existing DOE or AWE records of radiation exposures at the facility, as relevant to the petition and that these limitations might prevent the completion of dose reconstruction for members of a class of workers, which in this case is my application for Special Cohort Exposure for the class of employees who worked for the Monsanto Chemical Company in Dayton,Ohio from 1943-1949.

My principal source to demonstrate the limitations is the book "The DRAGONS TAIL, Radiation Safety in the Manhattan Project, 1942-1946" by Barton C. Hacker, 1987, University of California Press. The Department of Energy, Health Physics Division, Nevada Operation Office, Las Vegas, Nevada in 1977 commissioned this book in response to public demand and congressional questions " regarding nuclear participant's radiation exposures and radiation safety practices in the nuclear weapons atmospheric testing program." Lawsuits were filed and questions had to be answered. (Church, Bruce W. Foreword, (vii-viii).

The search was on to find a historian knowledgeable in radiation sciences and one who could also pass DOE security clearance. In 1978 Dr. Barton C. Backer was selected. It was decided the content of the book would cover the Manhattan Project from 1942 - 1946. In developing this book, to achieve his goals Dr. Backer interviewed more than 81 of the leading scientists from all over the country who participated in the atomic weapons program, and those associated with the development of a Health Program during World War 11 to protect atomic workers at Los Alamos and participating laboratories across the country from harmful radiation. Before being published his book was also reviewed by leading scientists from top universities, institutes, institutions, such as the Smithsonian, government agencies, and those he had interviewed who were either involved in the "project or were scientific or historical experts.

To start, I think it is important to begin with important scientific discoveries of brilliant European scientists that set in motion the dynamics that were eventually to become the core of the formation of the atom bomb.

William Conrad Roentgen (1845-1923) a physicist discovered the X-Ray machine in 1895 and presented his findings before the Physico Society of Wurzburg. In 1896, he made a radiograph of his hand to demonstrate what he had found. A. Henry Becquerel (1852-1908) also a physicist, discovered in1896 the phenomenon of radio activity (qv). He continued his research on fluorescence, phosphorous and published "The Discovery of the Invisible Radiation emitted by Uranium". He was a colleague of the Curies. Marie Currie (1867-1934) and Pierre Curie (1867-1906) both physicists, who were wed in 1895 began their work together on the radio activity of uranium(qqv) which led to the discovery of polonium (qv) or radium F in1898. and radium (qv) in 1902. Although they worked together, most of the credit is given to Marie for the isolation of the elements. Then Ernest Rutledge (1871-1937) British physicist, named the radiations: alpha, beta, gamma particles and showed that alpha particles are helium

nuclei. Through his continued work on t he nature of radiations, he was the first to come up with an atomic theory in 1919. All five of these outstanding scientists won Nobel prizes: Wilhelm Conrad Roentgen in 1901, Marie and Pierre Curie, and A. Henry Becquerel in1903. Then Ernest Rutledge in 1908.1

The discovery of the X-ray machine created a sensation. It was embraced by the medical profession and the public. The medical doctors immediately saw the advantage of the machine in the treatment of patients while the public in general found it a novelty, "the in" thing to use in the roaring twenties. After primitive X-ray machines were made long lines formed and demonstrations were given Businessmen grasped its saleable features and before you knew it, radium was showing up in cocktails, creams, beauty parlor products, clock dials, clothes, toothpaste, china and vials of water that were to be consumed by the purchaser for his health (DeSantis & DeSantis).2 This brouhaha went on for approximately 25 years until the case of the women dial painters received publicity.

In 1903, imminent warnings about the hazards of the X-ray machine started to emerge. Although scientists, the medical profession, and layman were struck by the prospective benefits of this new invention, they soon were to learn of the hazards as reports of sustained injuries such as burned skin, loss of hair, bone and blood defects and deaths among radiologists, technicians and the public, filtered through the excitement. Yet, the warnings were dismissed by the majority.

Backer phrases it this way "Lacking precise measures either of hazards or gains, workers relied on their own judgments to strike some balance....Safety long remained a matter of personal choice and judgment. Trial and error, art more than science, governed the early use of X-Rays. The problem began with erratic machines. Although improved in detail, for nearly two decades (the) Roentgen X-Ray tube retained the same basic design" (p.11).

The first X-Ray tube was invented by William Crookes and consisted of a partially evacuated bulb containing 2 electrodes. When electric is passed through the tube, the residual gas is ionized and positive ions striking the cathode eject electrons from it . The electrons formed a beam of cathode rays that bombard the glass walls of the tube and produce X-Rays." 3 Then came the curved cathode to focus the electrodes on a heavy metal object called an anode. This produced harder rays of shorter wave lengths and greater intensity. The next improvement was made in 1913 by David Coolidge. He devised a thermionic tube. The cathode emits electrons because it is heated by an auxiliary current, not because it is struck by ions. The electrons are accelerated by high voltage across the tube. As the high voltage increases, the minimum wave length of the radiation decreases. Most X-Rays today are modifica-- tions of the Coolidge tube with improved shock-proof insulation and grounded cables. (Backer, pp. 13,14)

However, not all were caught up in the glee that pervaded the country. In 1907, members of the America X-Ray Society discussed some of the problems but not much came out of the meeting. The British X-Ray Society was also formed around the same time and the same thing occurred. As stories of the the ill effects of radiation continued, The American Roentgen Ray Protection Society was formed in 1921 and the British Roentgen and X-Ray Commission was formed also to establish radiation protection and recommendations. They decided to meet every three years. Other European countries followed suit. At the 1924 American meeting. Arthur Mutscheller, a physicist who had emigrated to America to accept a job as chief physicist with an x-ray equipment company presented a paper before them on his concept of tolerance dose, the type of shielding required, and the cost. He proposed a worker would be safe from radiation exposure if he did not receive over a period of thirty days, a dose exceeding 1/1oo of an erythema dose for all radiation exposure (Backer, pp. 14-15). At the first meeting of the International Congress in London in 1924, the physicists wanted an ionization based unit to measure doses from the X Ray machines even though most doctors were satisfied with the unit skin dose to measure radiation exposure. The physicists won out. The Committee was to report back at its next meeting in Stockholm, Sweden in 1928. It was then " The Congress adopted the roentgen as measured by the ionization of the air as the international X-ray unit. They also followed Mutscheller's dosage recommendations of 1/100 roentgens erythema dose per month as the tolerance dose" Names change and the Congress soon became known as International Committee on Radiation Protection (ICRP). European scientists and the public were ahead of the United States in realizing the dangers of these new scientific discoveries.They tackled the problems almost immediately after new discoveries occurred as can be seen by the attached information on the the hundred year "History of Dosimetry" NPL by W.Alan Jennings (4). The American's had no central protection group at that time. However, Lauriston Taylor who had a position with the National Bureau of Standards in 1927 attended the British meeting and returned to the U.S. to remedy that fact with the establishment of the Advisory Committee on X-RAy and Radiation Protection which was to become the National Committee on Radiation Protection (NCRP). The first thing the Committee produced was a report entitled "X-Ray Protection" in 1931. The National Bureau of Standards published it in their NBS Handbook,15 although it was not authorized by the government. It was not government policy. At the 1931 meeting ,the ICRP converted tolerance values of the erythema dose to roentgens. "The tolerance dose became 6 roentgens monthly, 2 roentgens daily or 0.00001 (10-5) roentgens per second)." In 1934, the American Advisory Committee suggested 1/ 10 r per day for hard X rays ... as a guide for radium protection". A tolerance dose still had to established for gamma rays.(Backer, pp. 15-19). wasn't till 1941 that the NCRP published its standard for radiation dose and body tolerance.

The drums of war were rolling across Europe in the latter part of 1939. A German Laboratory first recognized nuclear fission that could culminate in the development of a nuclear bomb (Backer, p. 3). When in 1941 Plutonium was discovered just prior to

World War 11, scientists from all over the world grew aware of the possibility of an atom bomb. Albert Einstein met with President Roosevelt and urged him to sponsor research to see if such a bomb were possible Roosevelt followed suit with a modest program at first. When the British indicated that such a bomb could be produced within a short time and affect the outcome of the European War, and information came from the University of California indicating that the newly discovered plutonium, element 94, could cause a chain reaction, the matter became serious. It was then the President ordered his staff, the armed services of the country, and appropriate government officials to look into the matter. It was unknown at that time whether or not such a bomb could be built from the conversion of uranium 235 to Uranium 238 then finally to plutonium, element 94. By the summer of 1940, the National Defense Research Committee was formed in June with Vannevar Bush as Chairman. The NDRC was to assist in the culling of the best scientists from across the country to become part of the Project. Contracts were let out to scientists associated with the top universities. Because of the European War, a number of scientists had emigrated and established themselves also at our universities. The challenge was to create the atom bomb and the Metallurgical Project was placed on the doorsteps of Chicago University under the guidance of Arthur H Compton, a physicist on the faculty of Chicago University and a Nobel prize winner. Enrico Fermi, also a Nobelist, who arrived in the U.S. after flee - ing fascist Italy was then at Columbia University. He was asked to go to Chicago where he became head of the Physics Division. In December of 1941 the Japanese dropped bombs on Pearl Harbor and World War 11 began. With top scientists already working on the bomb, the country now organized its civilian and business forces Immediately; the whole country took on a "war operations mode". Secrecy and the development of the bomb had "top priority" and safety from the hazards of the enterprise fell in between.

The status of dosimetry during World War11 was found to be unreliable due to the instrument itself and the conditions under which dosimeters were used. In this case, during the development of the atom bomb . While dosimeters were used for radiation exposure, there were many variables affecting the readings It appears, the Victoreen Minometer was none too reliable since shock or moisture might affect the results. It was only in 1945 that the pocket dosimeter was used (Backer, p.36). However it still had to be charged and depending upon the individual it may or may not contain the appropriate reading. There were also times when under war conditions they weren't used at all as when the first model of the atom bomb was tried in 1944, and didn't work. Nor were there instruments developed to measure the harm that resulted from the chemicals that formed from the resultant materials used to make the "bomb." (Backer, p.35) One might say dosimetry was still in its infancy and new instruments suffered through growing pains until well after World War11 as new ones, more stable and more precise, were developed. Measuring such a huge amounts of radiation in the making of the atomic bomb and the fallout from its testing had never been done before. Many questions arose concerning just what was to be measured, how radiation was to be measured, and the amount of radiation the body could tolerate, if at all, without ill effects. Research had to be done concerning the health of nation-wide work-

ers

Time was of the essence to develop new studies. Yet, time the United States did not have time to research, according to scientific standards, develop new methods and instruments for assessing new radiation hazards to protect the health of the valiant men and women who changed their lives to protect our country, no matter what the cost. Issues arose nationally and internationally. Some were resolved; some are still going on today, namely the dosage the human body can accommodate without harm (Fairlie, I.& Resnikoff, M).[4]

How does this information limit the Dose reconstruction that Niosh will perform to determine the amount of radiation the employees of the Monsanto Chemical Company received from 1943-1949?

1- The same problems that plagued the development of standards for the measurement of radiation doses from the X-ray and the assessment of bodily harm, are the same ones that the development of the atom bomb workers faced during World War11(Backer, pp. 4-5)

2- Dosimeters that were reliable and not affected by variations such as shock and moisture did not exist and measurements that did exist were unreliable. It also seems possible that those workers who needed them did not get them because of their scarcity at that time (Backer, pp. 36-42,.64, 65).

3- When film was introduced to back dosimeter badges, they too suffered from difficulties. Backer indicates "standardization presented problems as did questions about how photographic emulsions responded to different rays. Films value remained chiefly qualitative as one dosimetry pioneer suggested in 1939..." Only late in 1943 did film begin to join pocket chambers in tracking the X and gamma - ray exposures of project workers.

4. There was also a question of the dosage that was to be tolerated by the workers. Dr. Stone, one of the health physicists employed by the Chicago Health Division stated later "that established tolerances when the project began...rested on rather poor experimental evidence" Backer also indicates "Little or nothing was known about tolerance for other active nuclides. (p.p. 37, 38)

5. "New and reliable instruments were needed to detect the whole range of particles and rays produced in nuclear reactions....The hard and complex task of turning theory into working tools lasted throughout the war and after" (Backer, p. 39). "Devising dosimeters to measure Alpha rays required intense efforts while high speed neutrons in the presence of gamma rays also presented problems".

6. There were times when hazardous open air experiments occurred when the mid 1944 test of the first atom bomb failed "Developing new designs entailed a series

of hazardous open air experiments in the canyons around Los Alamos the next six months..... " ...testing the first bomb (Trinity) posed safety problems far more serious than even the broadest meaning of good housekeeping might span." (Backer, p. 5). There was not only danger to the AWE workers but also danger to the public.

7. The records no longer exist or can't be retrieved because of security reasons, and lost or destroyed files which seems to be an answer since "NA or No was consistently noted in the reports I received from NIOSH concerning dose reconstructions and most likely applies to all applicants who were atomic workers at the Monsanto chemical company during the 1943-1949 period.

Based on the limitations mentioned above, I believe it is very difficult for NIOSH to assess the amount of radiation exposure the AWE employees from the Monsanto Chemical Company were exposed to. Even though Federal Regulation rules spell out that default values will be applied and that applicants will receive the benefit of worst case conditions, I feel there are too many variables and exigencies that cannot be accounted for, particularly in this case when most of the AWE workers are deceased and I am assuming the information on the circumstances under which they worked are still unavailable.

1- Funk & Wagnells New Encyclopedia. Funk & Wagnells Inc., New York
Antione Henri Becquerel, Vol. 3, p. 275; Marie & Pierre Currie, Vol, 7, p.215; Roentgen, Vol.20, p.342 Ernest Rutherford, Vol. 21, pp. 14-15

2- DeSantis MD. & DeSantis B S., Radilogic History Exhibit, Wrong Turns on Radiologies Road of Progress, Radiographics, Vol... 11, NO 6, 1991, pp.1121-1238.

3- Jennings, Ian The History of Radiation Dosimetry, Centenary of the Discovery of X-rays NPI (National Physical Laboratory), 1995.

4- Fairlie, Ian & Resnikoff, Marvin, Bulletin of the Atomic Scientists, Nov/Dec97, Vol. 53, Issue 6.

I hereby swear that I have written the information requested for questions F.1, F2, and F3, and have enclosed the necessary documents needed to support my answers as indicated in the documents and in answer to your response to my first application to request SEC status for the workers employed by the Monsanto Chemical Company during the years 1943-1949.

THE DRAGON'S TAIL

Radiation Safety in the Manhattan Project, 1942–1946

BARTON C. HACKER

UNIVERSITY OF CALIFORNIA PRESS, 1987
Berkeley Los Angeles London

Foreword

The Department of Energy's Nevada Operations Office (DOE/NV) conceived this research project in the fall of 1977. At that time many questions and concerns were being raised by the public and Congress regarding nuclear test participants' radiation exposures and radiation safety practices in the nuclear weapons atmospheric testing program. No single document describing radiation safety practices in the nuclear test program then existed, but the need to develop such a document was becoming obvious. Hence we initiated the development of a manuscript that would (1) document the development of radiological safety in the nuclear weapons testing program, (2) be easy enough for the layman to understand yet contain enough specific information to make it useful for technical purposes, and (3) capture the reader's interest.

Time was of the essence; oral interviews had to be conducted with key former participants who were aging—many already in their seventies. Written documentation existed but was spread out over various locations across the country, and many documents were approaching the end of the required document retention period. Furthermore, a historian knowledgeable in radiation sciences proved rare; the person hired for the job had to undergo a steep learning curve. Compounding the time constraints, the historian had to be investigated for a DOE security clearance to allow him access to classified documents. In the spring of 1978 the author/historian was hired by Reynolds Electrical & Engineering Co., Inc., a DOE/NV prime contractor, to develop this comprehensive history. With the administrative details taken care of, Dr. Barton C. Hacker's efforts were under way by mid-1978.

As the early chapters were developed, it became evident that the initial two-year completion goal could not be met if the manuscript was to fulfill our original objectives. Integration of oral interview information with written documentation, all properly referenced, was a more