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NUCLEAR WITNESSES, INSIDERS SPEAK OUT: DR. ROSALIE BERTELL, MATHEMATICIAN AND MEDICAL RESEARCHER

> "There’s been a campaign since 1951 to convince the public that low-level radiation is harmless. People have a right to know what’s happening to human health. . . . The patriotic thing to do is to get it all out into the open. Let people know what’s happening."

contents:

The following is chapter 2 from the 1982 book *Nuclear Witnesses, Insiders Speak Out*, and is an interview with Dr. Rosalie Bertell, Mathematician, Doctor of Biometrics and Medical Researcher, detailing her personal experiences and knowledge regarding the nuclear establishment. The book contains a wealth of information about the radioactive contamination of Mother Earth by the nuclear industry since the 1940s.

Quoting the book’s author Leslie Freeman, "It is the premise of this book that if the American people knew the truth about radiation there would be no nuclear issue." The myth is that there is a "safe threshold" of exposure to radioactive material—a permissible dose below which no health effects can be detected.

Among other things, Dr. Bertell describes her years of research including learning how low-level radiation, the level of ordinary chest or dental X-rays (measuring the health effects of one to five chest X-rays) accelerates the aging process. The federal government "allows" the general public to receive equivalent bone marrow doses of one hundred chest X-rays per year. Nuclear workers are "allowed" to receive bone marrow equivalents of one *thousand* chest X-rays per year. These are federal regulation protection standards. Who’s interests are being served here? Who benefits? Certainly *not* the people being dosed!

As much as some people attempt to deny the facts, *all* of us on this planet are being dosed by the new "fire" a select group of boys have been playing with since the 1940s and the anonymous industry "moghouls" hiding behind them using the screen of "national security" to fatten their own bank accounts while the life of all is shoved over the edge of the abyss and into extinction. Make no mistake: the profit motive here is literally out of this world. Our collective gene pool of life, evolving for hundreds of millions of years, has been seriously damaged in less than the past fifty by the most banal of all human failings: simple, compulsive greed. The time remaining to reverse this culture of "lemming death" is on the wane. In the future, what will you tell our grandchildren about what you did in the prime of your life to turn around this death process?

— ratitor

[text in italics denotes the author's—Leslie Freeman's—voice.]

In 1963 she was offered a National Institute of Health grant to get her Ph.D. in mathematics. At the time there was a national program to shift mathematicians out of physics and chemistry and into biology and biological applications. "I became interested in taking what I already knew and moving it into understanding living systems.". . .

Then I received a postdoctoral grant from New York State to work at a National Cancer Research Center in Buffalo, Roswell Park Memorial Institute. This was originally a summer job. I started working at the research center in 1969, using the math to try to evaluate a very big statistical study that had been done.

It's called the Tri-State Leukemia Survey, and it was initiated because of an increase of leukemia at that time. Researchers had followed sixteen million people over three years between '59 and '62 in three states: New York, Maryland, and Minnesota. . . .

In all, I spent ten years on the analysis of this data.

At first I did all the general things, like examine occupations and socioeconomic status. We wanted to identify what it was that was increasing leukemia in this population. After about four years it became obvious to me and everyone else on the team that the really strong effect—leukemia effect—was coming from diagnostic medical X-rays.

That's when I became interested in radiation problems. For decades we had been told that these very low levels of radiation were harmless!

What I discovered is really very simple, looking back. But it took me a long time to get to it because I wasn't thinking that way.

Low-level radiation, the level of ordinary chest X-rays, or dental X-rays, accelerates the aging process. The increase in leukemia that we were seeing was really nothing more than premature aging. People were getting leukemia that they might not have gotten until they were much older. Or they might have died before they got it. By using X-rays we were increasing leukemia by accelerating body breakdown, aging. The person could no longer fight it off.

The leukemia rate is high at both ends of the age scale. Very young children, whose immune system is not yet operating fully, are vulnerable to it, as are the elderly. Leukemia rate reaches a low point at age fifteen and then it gradually goes up for the rest of life.

No one in medical research was talking about premature aging, but I found it mathematically. I found that the rate of leukemia went up like compound interest about 5.3 percent per year, just by living. It also went up at a rate of about 4 to 5 percent for trunk X-rays. You could see the leukemia rate go up with each chest or spinal X-ray. . . .

I had been measuring the health effects of one, two, three, four, and five chest X-rays. Then I found that the federal government allows the general public to receive up to five hundred millirems per year. That is equivalent in bone marrow dose to one hundred chest X-rays per year. That really was shocking!

Moreover, I learned that nuclear workers are allowed to receive up to five rems—which is the bone marrow equivalent of one *thousand* chest X-rays per year! These are the federal regulation protection standards! When you approach it from that direction, from low to high, instead of coming down to the standards from the atomic bomb casualties where people died immediately from high levels of radiation, the impact is different.

Federal standards derive from research on high exposures in a bomb situation. Those who determined the standards reduced the exposure level to one where you didn't see anybody drop dead.[3] It looked like a "safe" amount. But it isn't.

Understanding this standard is crucial right now with respect to the Three Mile Island accident, because the NRC has declared it "not an extraordinary event." And their criterion for declaring something an "extraordinary event" is that somebody off-site, a member of the general public, received an exposure of twenty rems or more.

That's the equivalent of *four thousand* chest X-rays![4]

There are no legal steps to protect or compensate the public until someone receives the equivalent of four thousand chest X-rays. That's an "extraordinary event."[5]

Most people have no idea of this definition and its implications for public health.

The criteria were established when no one was watching this industry. All of these definitions went through democratic processes, but nobody was paying any attention to it. And now they're all in law. This is the law.

I thought I just had an argument on my hands with the medical profession. I thought the task was convincing them that medical X-rays were causing health problems. I saw it as a limited problem.

Then a citizens' group telephoned the hospital to say there would be a public hearing near Buffalo in Niagara County, on a proposed nuclear power plant.[6] The group wanted somebody to come and talk on the health effects of low-level radiation, and the hospital contacted me.

I knew nothing about nuclear power plants, but I said I would tell them what I knew about radiation. The forum had been managed and organized by the utility company, who wanted to push the benefits of nuclear power, and advocated a generator in the community. That was my first experience of a public forum run by the utility companies, and it was an eye-opener. . . .

The five men representing the utility spoke first. Each took fifteen minutes to deliver a very tight speech, careful wording, and to show high-powered movies of nice, clean-looking nuclear power plants, everything done by remote-control equipment, people behind leaded glass looking in. You know, it was really impressive.

But then I listened to what they said about the health hazards, and I knew that they were not telling the truth. They were giving the impression that there was no problem at all. Everything was under control and radiation wasn't harmful at these low levels. . . .

I was called as the first speaker for the citizens' group after this performance . . . I went into what happened when people were exposed to radiation, what low-level radiation did, what I had discovered about medical X-rays, and how this nuclear situation was comparable.

I told them about Dr. Gerald Drake in Big Rock, Charlevoix County, Michigan. He was a general practitioner up there and had known the families for years. Big Rock was one of the first commercial nuclear power plants. I told them how he started noting changes in the health of his community, an increase in leukemia and cancers. He started noting this and reporting it and he was being told that it wasn't due to the power plant. It was the socioeconomic status of the women up there that had changed. Well, he had lived there all his life, and the problems came up after the nuclear plant moved in. I knew him and I had looked at his data.

But what really came out in the discussion and what really tipped the balance on the issue was that next to this power plant [Barker] was the Cornucopia Farms where they grow Gerber's baby food.

I think that convinced the audience.

The Niagara County legislature voted the first moratorium in the United States against nuclear power not long after this. The moratorium still holds. . . .

Nothing of this had been in the Buffalo newspaper, even though about a million people lived in Buffalo, within thirty miles of the plant! It was discussed in Lockport, a little town nearby. Just a very small notice to rate-payers: "We are considering building a new plant." These plans are usually kept quiet. That was ’73 or ’74. The nuclear power plants would move into a location very quietly. Most people didn’t even know one was being proposed or constructed. . .

The Barker experience made me suspicious . . . it was this overreaction that led me to find out more about what was going on in the nuclear power industry. I had a very uneasy feeling. They were working too hard to keep me quiet.

So I began to study the history of the federal regulations. I started investigating it on my own and reading everything I could find. I started looking at where the utility companies were getting the information they were giving people on the radiation questions. I found out it was pretty much coming from the American military experience at Hiroshima and Nagasaki.

I found that in September 1945, shortly after the bomb was dropped, the Americans set up the Atomic Bomb Casualty Commission in both Hiroshima and Nagasaki, and that the government has kept total control of the information on radiation effects ever since. The data base is not released to the scientific community. Research papers are released, but not the key information on doses for people, which would allow independent research on health effects. . . .

The problem is escalating dangerously. "Increasing radiation in our environment is producing more of these mild mutations, people who are already genetically damaged when they’re born and less physically able to cope with a radiation environment. Now you can’t continue to increase the number of people in a population with mild mutations at the same time as you increase radiation pollution that they are not able to handle. As far as I am concerned, this is a death process in the human species."[20]

Bertell fears that by the time people realize what is happening, there will be so much radiation in the environment that it will be too late. . . . "They don’t even know what to look for, if exposed. All they know is that they might die of cancer, but what they’re experiencing is acceleration of the aging process. They have no idea that when they get heart disease, that it’s at a younger age than they would’ve gotten it had they not been exposed to radiation." . . .

It got to me for a while. Four years ago I went to Barre, Vermont, and I stayed at a Carmelite monastery for a year (1975-1976) because I had to work it out within myself. I didn’t know how to handle it. I was beginning to realize what an incredible hoax was being promoted, but I spent a year in Barre before I felt free enough to confront death and accept it, free enough to give myself to this work, to care nothing about money or status, or what people think, or what "a Sister ought to be doing," or whether I ought to be teaching school someplace, or what the bishop thought, or all the rest of these encumbrances we have hanging on us. These we must set aside. . . .

We need to start documenting changes in human health through the Public Health Service, preparing evidence for courts of law, and getting a mechanism in place which makes companies accountable for the damage they do. We need written documentation, constant monitoring of community health.

We need to stop the total preoccupation of Public Health departments with infectious diseases and convince them to collect the information needed to document environmental diseases. That’s a big shift in public health policy.

We’re legally helpless now. Take the Three Mile Island accident. The public does not have a piece of paper saying what their health characteristics were before the accident, so how can they prove there’s been a change?

The most responsive organizations right now are out in British Columbia. Two full-time workers hired by the B.C. Medical Association have collected millions of pieces of information, and entered it into the computer in the University of Vancouver. They’re getting an idea of the health of the British Columbia population, and if uranium mining moves in, as threatened, they’re going to hold the mining companies responsible for whatever happens to public health as a result.

Once you get all the machinery in place and you're watching what's being done, the companies are going to be one hundred times more careful!

The worst straitjacket, however, is one we created for ourselves by dropping the atomic bombs. . . . We have been on military alert since 1945. It's causing inflation, unemployment, and it's causing great tension in the country.

It's draining money out of the domestic economy into the war machine. Government labs all over the country are brain drains for our finest young men and women. Oak Ridge, Brookhaven, Argonne, Lawrence Livermore, Los Alamos, all of the big expenditures for government laboratories are really dedicated to the weapons industry.

We could do without the Department of Energy. The Department of Energy has a mandate from Congress to develop weapons systems. They have three programs for energy: the nuclear, which is a front for the atomic bomb; fusion,[21] which is a front for the hydrogen bomb; and the new solar-powered satellites;[22] which are a front for the particle beam, laser, and microwave weapons of the future.

The 1980 budget of DOE contains more than 39 percent for weapons production. The proposed 1981 budget is over 41 percent weapons-production oriented. Energy is only a front at the Department of Energy. Unless we remove from DOE the mandate to develop weapons systems and change its pseudo-military character and eliminate the secrecy under which DOE operates in the name of defense and national security, we're not going to solve the energy crisis.

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Author's Note

Two things happened that led me to write this book. First, a doctor tried to convince me to take radioactive iodine for an overactive thyroid. I refused. Several months later John Gofman told me I was very fortunate. The radioactive iodine, he explained, would have increased the chance of my getting cancer by more than 100 percent.

The other thing that led me to write this book was the accident at Three Mile Island. Coincidentally, my thyroid condition had been diagnosed the same week that Three Mile Island vented radioactive gases into the atmosphere. I read everything I could lay my hands on, groping for the truth behind the evasive reports published by the Nuclear Regulatory Commission. I finally read verbatim transcripts of the Commissioners' meeting held the day after the accident. The words these men said to each other stunned me. They had no idea what was happening and no idea how to stop it. And meanwhile they were issuing reassuring reports to the public.

I wanted the truth. For the first time I felt my survival was at stake—nuclear power was not an abstract issue: it was a matter of life and death. I started to talk to people—scientists, doctors, nuclear workers.

I interviewed twenty-four people who have worked with or around nuclear materials. In nineteen cases I traveled to the person's home or place of work. Most interviews took between two and four hours and were followed up by phone interviews. I taped the in-person and telephone interviews and listened to them several times, taking notes. I then selected and transcribed those which I felt contained the clearest and most important information and were also the most fascinating as narratives. These were the transcripts from which I worked for the chapters of this book.

A word about the editing I did. In every case I tried to maintain the exact words, the exact flavor of the speech, and the exact meaning intended by the speaker. I have cut out sections that were redundant, irrelevant, unnecessary, or confusing. The repetitive "you know" or "like I said" was eliminated when it seemed too distracting— appropriate perhaps in conversation but not on the page.

Each chapter was returned to the narrator in draft form for comments, accuracy, and approval. In some cases a name was changed to protect an informant, an expression was changed, a statistic was corrected.

The final version of each chapter was then written—including an introductory section, footnotes, and a bibliography of sources relevant to the chapter. Each narrator was also asked for a photograph to include with his or her chapter.

The question that I asked initially in each interview was about personal background. This was followed by a series of questions about what experiences the person had which made him or her change or develop a point of view on nuclear power. I did not merely listen. When I did not understand, I asked questions. When I did not believe something, I said so. I asked for proof, for reasons, for the thoughts and feelings which made people act the way they did. I asked them to describe experiences in such a way that I could see what they saw and hear what people said and did. They described specific hearings and meetings. Again and again I asked to be told what went through their minds as they experienced the things they told me about. It was these personal moments that most brought me into their lives and that I have attempted to bring to the reader.

It is the premise of this book that if the American people knew the truth about radiation there would be no nuclear issue. The information speaks for itself. In this book people who have had direct personal experience with the nuclear establishment speak about what they learned. They did not necessarily start out as proponents or opponents of nuclear power; they are people who have in common a genuine respect for hard work. In almost every case they found their integrity as workers threatened by involvement with the nuclear establishment. When they mentioned that something was done sloppily, that some regulation was being violated, that something was dangerous, their concerns were ignored, trivialized, rationalized, or twisted. Some, unable to work under such conditions and feeling their sense of decency outraged and their survival in jeopardy, began to speak publicly. Then they found out what they were up against: it wasn’t just their boss, it wasn’t just their boss’s boss: it was the union, the utility company, the military-industrial complex that were insisting on the myth that nuclear power was "safe." No one was permitted to challenge this myth and retain credibility. Nuclear energy existed for the "benefit" of the people and nuclear weapons were necessary for "national security."

The stories in this book are evidence that even in the face of intimidation, people still believe their own experience matters and that other people matter. They are concerned about the lives of their children and the continuation of the species. These people know that when people hear the truth, they listen.

CHAPTER 2
Rosalie Bertell, Mathematician and Medical Researcher

A rainy afternoon, late in August, 1979. We are in the basement of a conference center in Stony Point, New York. From the next room come muffled voices and occasional laughter. It is close to the end of a Conference on Global Dimensions of Justice Issues. A few workshops are still in progress.

Dr. Bertell is here to lead one of the workshops. She lives in Buffalo with the Order of the Grey Nuns of the Sacred Heart. She has been a nun since 1951. She is also a mathematician and an expert on the relationship between low-level radiation and public health.

She is fifty years old, a small woman, with short, graying hair, dressed simply, without makeup or jewelry. She does not wear a nun's habit. Her speech is thoughtful and slow, until she talks about how data from health studies has been suppressed. "There's been a campaign since 1951 to convince the public that low-level radiation is harmless." She leans forward, indignant. "People have a right to know what's happening to human health."

Dr. Bertell once worked for Bell Aircraft, interpreting data from tests of guided missile systems. Now she is labeled by many as an enemy of the nuclear industry. "The patriotic thing to do is to get it all out into the open. Let people know what's happening." She sometimes fears for her own safety but feels she has no choice. "I can't go on with business as usual with what I've seen and with what I know." She remembers when she began to speak out. "I was very naive. Very dumb. I had no idea what I was walking into. There was a whole evolution to my understanding."

Growing Up: Guided Missiles and Becoming a Nun

Dr. Bertell was born in 1929 in Buffalo, New York, and grew up there. Her father was "a self-made man who hadn't even finished high school but had taught himself very complicated math, physics, and optics. "He had designed the submarine periscope systems used in World War II and gone on to become the president of a corporation, the Standard Mirror Company of Buffalo. Because of her interest in math, Bertell used to help her father by doing ten-year financial projections for his company. "I worked with him and learned a lot about the corporate business world "

Her grandmother lived with the family. "She was paralyzed from the waist down. My mother kept her at home, and we took care of her until she died at age eighty-seven." When Bertell completed high school, she won two scholarships, one in mathematics from a local college in Buffalo, and the other in music from a college in Rochester. "I decided to take the scholarship in Buffalo and give up music as a career because I wanted to stay home and help my mother care for my grandmother."

In college she majored in mathematics. She held many elected offices in clubs, working on state and national levels, and was always in the front line of everything. But she did not feel happy. "Somehow or other I had the feeling that I needed to pull away, that I was so engrossed in activity that I was not understanding what was going on. It seemed right that I enter a Carmelite monastery. They're one of the most withdrawn of Catholic religious communities. You go in and your whole life *is encompassed within their walls. Usually people don't ever come out for the rest of their lives."*

Not long after she finished college, she made the decision to enter the Carmelite monastery to be more in touch with herself, with "inward spaces." She needed two thousand dollars, "the dowry you are asked to bring in order to enter—a great deal of money to me in 1951. I did not ask my father. Part of our upbringing was to always pay our own way." So to earn the money and because she thought it would be a challenge, she took a job with Bell Aircraft and found herself involved in the basic research on guided missile systems.

"I had FBI security clearance, working in an office where armed people walked up and down between the desks. If you left your place during the day, you had to lock your papers in the desk drawer—even to go to the ladies' room. Our thermos bottles were examined at night when we left work, to see if we were carrying any papers out.

"These guided missiles were going to be the most wonderful weapons of the future, whereby you could target military objectives only, and never again hit hospitals or schools. It would revolutionize war. You were made to feel that you were doing a fine thing for humanity by inventing these bombs. And I believed all that."

Bertell found working at Bell Aircraft a tremendous intellectual challenge. "The job used my brain in a nice way. I remember being very excited one time when a missile was shot off and they couldn't tell whether or not it had turned upside down during the test. If it had turned upside down, all the instruments were recording opposite to the usual orientation." She took that problem on as a special project and saved their doing one missile shot over again. "Everyone praised me, and it was exciting."

While she worked at Bell Aircraft, Bertell did not question the purpose of these missile tests. "We were pretty well satisfied that everybody was a good guy and that this work wouldn't be used for a bad purpose." Her work seemed important, patriotic—a benefit to humankind.

One thing Bertell particularly noticed at Bell Aircraft was their technique of having people work only on their own small section of the weapons program. She realized that no one person was supposed to see the whole picture. "This was deliberately designed in for national security reasons. In fact, even today, our whole weapons production is designed not only so that no one person works on all parts, but also to be spread throughout the country." Uranium is mined in the Southwest, enriched at Oak Ridge, Tennessee, shipped out to Rocky Flats, Denver where the nuclear triggers are fabricated, and then to Pantex, in Amarillo, Texas, where the nuclear bombs are assembled.

After working on guided missile systems, Bertell entered the Carmelite monastery. Her whole lifestyle changed. "We used to dig four-foot ditches and lay pipes to run our own irrigation system. I learned how to thread pipes and put them together and lay cement walks. I learned plumbing and basic electricity. I found out that women could be pretty self-sufficient." She learned how to paint doors and grain wood, how to make sandals out of hemp, and while she worked, she had time to think.

What had she been doing at Bell Aircraft? What were the bombs being made for? What was war all about? Did people have to live in constant preparation for destruction? Maybe it was possible for people to live nonviolently. . . .

Bertell lived with the Carmelites for five years, and then left the monastery and entered an order in the Church which does teaching and social work. She also went back to graduate school and got a master's degree in mathematics in 1959.

In 1963 she was offered a National Institute of Health grant to get her Ph.D in mathematics. At the time there was a national program to shift mathematicians out of physics and chemistry and into biology and biological applications. "I became interested in taking what I already knew and moving it into understanding living systems."

Learning about Low-Level Radiation: The Tri-State Leukemia Survey

I worked on things like the kidney filter which screens out materials in the body, on how the body maintains a constant temperature and a constant level of blood sugar. All these can be modeled mathematically so as to predict what's going to happen when you perturb the system by introducing something foreign.

I finished the program and received the doctorate in 1966. I continued teaching in a junior college north of Philadelphia, Sacred Heart Junior College, during the regular academic year. We also have a college in Buffalo where I taught in the summers.

Then I received a postdoctoral grant from New York State to work at a National Cancer Research Center in Buffalo, Roswell Park Memorial Institute. This was originally a summer job. I started working at the research center in 1969, using the math to try to evaluate a very big statistical study that had been done.

It's called the Tri-State Leukemia Survey, and it was initiated because of an increase of leukemia at that time. Researchers had followed sixteen million people over three years between '59 and '62 in three states: New York, Maryland, and Minnesota. Those states have tumor registries, and they have a law on the books requiring a doctor to report as soon as he diagnoses leukemia. This meant these people could then be interviewed for the study.

We had about two thousand leukemias. We also had a random sample of controls, ways of learning the background of those who didn't have leukemia. We had detailed information on everybody—on family background, what parents and grandparents had died of, their own health history, any sicknesses they'd had, surgery, medicines they'd taken, their complete occupational history, residential history, whether they'd been exposed to farm animals or not, whether they had pets, whether they had sick pets—just about everything you could think of.

Included among our pieces of information was each individual's medical X-ray history. That was taken orally, and then checked by researchers at the source—the hospital, doctor's office, or dentist's office—who got verified signed reports of exactly what had been X-rayed and how many X-rays were taken.

When I was hired at Roswell Park the data had been collected and computerized but evaluation was just beginning. What was I looking for? Whatever it was seemed smaller than a needle in a haystack. But I spent the whole summer on it and got very interested, very involved in solving the puzzle.

The Biostat Department people liked me and I liked them, so I stayed beyond the summer, still teaching at the college in Buffalo but working one or two days a week at the research center on this survey. Eventually I stopped teaching and moved full time into research.

In all, I spent ten years on the analysis of this data.

At first I did all the general things, like examine occupations and socioeconomic status. We wanted to identify what it was that was increasing leukemia in this population. After about four years it became obvious to me and everyone else on the team that the really strong effect—leukemia effect—was coming from diagnostic medical X-rays.

That's when I became interested in radiation problems. For decades we had been told that these very low levels of radiation were harmless!

Leukemia and Premature Aging: Health Effects of Low-Level Radiation

What I discovered is really very simple, looking back. But it took me a long time to get to it because I wasn't thinking that way.

Low-level radiation, the level of ordinary chest X-rays, or dental X-rays, accelerates the aging process. The increase in leukemia that we were seeing was really nothing more than premature aging. People were getting leukemia that they might not have gotten until they were much older. Or they might have died before they got it. By using X-rays we were increasing leukemia by accelerating body breakdown, aging. The person could no longer fight it off.

The leukemia rate is high at both ends of the age scale. Very young children, whose immune system is not yet operating fully, are vulnerable to it, as are the elderly. Leukemia rate reaches a low point at age fifteen and then it gradually goes up for the rest of life.

No one in medical research was talking about premature aging, but I found it mathematically. I found that the rate of leukemia went up like compound interest about 5.3 percent per year, just by living. It also went up at a rate of about 4 to 5 percent for trunk X-rays. You could see the leukemia rate go up with each chest or spinal X-ray.

I decided I would try to measure radiation differently. I would see whether I could quantify this aging process.

You know, if you ask the right question, you start getting different answers. The question I asked was: If leukemia rate goes up with age, how much radiation would be equivalent to one year of aging for increasing the rate? In other words, I used natural aging as the measuring rod, and I said: How much radiation causes damage equivalent to the damage which occurs gradually with a year's aging and catches up with us eventually, even though we don't feel it happen?

What I found out was startling. An X-ray in the abdominal area, where it really hits the major blood-forming organs of the pelvic arch, ages us at the rate of about one rad, one year. One spinal X-ray is about one rad, and that's equivalent to one-year natural aging for increasing your leukemia rate. If the radiation is chest area or even upper thigh, one rad is about six-tenths of a year. You're not hitting as much of the bone marrow, apparently.

Then I learned that if you had dental X-rays, and X-rays of arms and legs, which are again less bone marrow exposure, one rad was equivalent to about a quarter of a year.

This was a measurable health effect.

Then I started finding other things. Radiation effects are more pronounced when people who show signs of premature aging—like those with heart disease, diabetes, or signs of inability to cope with the environment, such as asthmas and allergies—are exposed. You can account this way for something like 70 to 80 percent of these leukemias that occur before age fifty. These are the young adults who die of it—70 to 80 percent are young adults who show inability to cope with the environment through some chronic disease five or more years before they are diagnosed with leukemia. Their death is hastened by X-ray exposure.

The combination of radiation exposure and natural aging tips the balance.

This is now documented.[1]

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1. See Rosalie Bertell, "X-ray Exposure and Premature Aging," *Journal of Surgical Oncology* 9 (1977) 379-391; idem, "Measurable Health Effects of Diagnostic X-ray Exposure," in *Effect of Radiation on Human Health: Radiation Health Effects of Medical and Diagnostic X-rays*, vol. 2, hearings before the Subcommittee on Health and the Environment of the Committee on Interstate and Foreign Commerce of the U.S. House of Representatives, serial no. 95-180 (Washington, D.C., 11, 12, 13, and 14 July 1978), pp. 80-139.

I'm using this information to try to develop something for those who work with radioactive materials, so that by recognizing these signs of incompatibility with the environment, they'll know to get out of the business of handling radioactive materials.

Premature Aging and the Workers at Erwin, Tennessee

I had done all this research theoretically, but in 1979, when I went down to talk to the workers[2] in Tennessee, who were out on strike, the theory suddenly came alive in people.

What the workers were telling me was really shocking. The union's basic negotiating point was retirement at age fifty-five. The workers told me they're not going to "make it to age sixty-five." These were men who have worked eighteen to twenty years making plutonium fuel rods for navy submarines. They've been working with radioactive materials for a longer time than those in commercial industry.

I met a man there twenty-nine years old. I would've sworn he was sixty. He had pure white hair.

I spoke with about a hundred men. Twelve of them have had spinal surgery for what the doctors are calling "degenerative spine and premature aging."

Finally some of the workers asked me what it meant when you saw blood in the urine.

"Is this something that you can *see,* " I said, "or is this something the doctor detected with microscopic techniques?"

They said, "Oh, no! You can see it."

Out of a hundred workers, a hundred had experienced gross blood in the urine.

That means they were breathing in radioactive material—uranium and/or plutonium—and probably the body's water system was washing it through the kidneys and doing gross damage to tissues.

This radioactive material is doing tissue damage in very fine internal organs like the kidneys or bladder, producing gross blood in the urine. You know, the men were right: they're not going to make it to sixty-five.

And yet the social pressures on them right now are great, because they're being accused of being "unpatriotic." They're striking against the navy, and the navy needs fuel rods. Because they're asking for retirement at age fifty-five, it seems unreasonable to the ordinary American worker.

On the other hand, because of the men having eighteen to twenty years working with radioactive material, they can't get another job. No other employer wants to assume liability for a worker who has worked that long with radioactive materials. They can't retire under the present system, and they're not physically able to continue what they're doing. As you can imagine, this is heavy. This whole thing is heavy.

That is only one story among many.

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2. *workers:* workers who process plutonium for nuclear submarine fuel rods. Erwin, Tennessee, is operated by Nuclear Fuel Services, the same company that operates West Valley (see Chapter 8) where plutonium is reprocessed.

A LETTER TO H. DAVID MAILLIE, DIRECTOR OF HEALTH PHYSICS,
UNIVERSITY OF ROCHESTER MEDICAL SCHOOL, 3 APRIL 1980

I believe the problems at the Erwin N.F.S. plant are serious. I attempted to set up chromosome breakage and chromatid sister exchange tests for a few employees, so that we might have some idea of chemical and/or radiological damage to bone marrow. The men agreed, but the union doctors in Washington, D.C., failed to fulfill their function with respect to drawing blood and expressing it by air to Buffalo for analysis at Roswell. After this the union leaders were jailed and the men forced back to work. They have not responded to my follow-up letter, and I was told by others they were afraid of losing their jobs.

The Erwin plant has more recently been closed by the N.R.C. because of unexplained loss of plutonium. The former workers are apparently dispersed—trying to get other employment and silent about their experience. Other dialogue I have had with workers at the Rocky Flats, Colorado, plutonium plant and the enrichment plant in Paducah, Kentucky, convince me that there are real worker problems. However, unless the workers are free to cooperate with a serious study, I am at a loss as to how to proceed. In trying to do worker follow-up at the West Valley plant, I ran into legal blockades and finally a "reorganization" of the Erie County Departments with dissolution of the Environmental Health section and firing of the official who was supportive of the study.

. . . The public should be made aware of the blatant non-collection of data responsible for the exorbitant claims of the nuclear industry. . . .

Sincerely,
Rosalie Bertell, PhD, GNSH

Radiation Standards for Workers and the Public

I had been measuring the health effects of one, two, three, four, and five chest X-rays. Then I found that the federal government allows the general public to receive up to five hundred millirems per year. That is equivalent in bone marrow dose to one hundred chest X-rays per year. That really was shocking!

Moreover, I learned that nuclear workers are allowed to receive up to five rems—which is the bone marrow equivalent of one *thousand* chest X-rays per year! These are the federal regulation protection standards! When you approach it from that direction, from low to high, instead of coming down to the standards from the atomic bomb casualties where people died immediately from high levels of radiation, the impact is different.

Federal standards derive from research on high exposures in a bomb situation. Those who determined the standards reduced the exposure level to one where you didn't see anybody drop dead.[3] It looked like a "safe" amount. But it isn't.

3. The most important radiation standards are not laws, they are merely recommendations of the International Commission on Radiological Protection, the National Academy of Sciences, the National Council on Radiation Protection and Measurements, and National Research Council. Several government agencies also set, interpret and enforce radiation limits, such as the Nuclear Regulatory Commission, the Public Health Service the Department of Energy, and the Environmental Protection Agency. An excellent discussion of the problems of radiation protection standards can be found in *Radiation Standards and Public Health*, proceedings of a second Congressional seminar on low-level ionizing radiation (Washington, D.C.: Congressional Research Service, Library of Congress, 10 February 1978), particularly pp. 8-18.

Understanding this standard is crucial right now with respect to the Three Mile Island accident, because the NRC has declared it "not an extraordinary event." And their criterion for declaring something an "extraordinary event" is that somebody off-site, a member of the general public, received an exposure of twenty rems or more.

That's the equivalent of *four thousand* chest X-rays![4]

There are no legal steps to protect or compensate the public until someone receives the equivalent of four thousand chest X-rays. That's an "extraordinary event."[5]

Most people have no idea of this definition and its implications for public health.

The criteria were established when no one was watching this industry. All of these definitions went through democratic processes, but nobody was paying any attention to it. And now they're all in law. This is the law.

Killing the Proposed Nuclear Power Station at Barker, New York

I thought I just had an argument on my hands with the medical profession. I thought the task was convincing them that medical X-rays were causing health problems. I saw it as a limited problem.

Then a citizens' group telephoned the hospital to say there would be a public hearing near Buffalo in Niagara County, on a proposed nuclear power plant.[6] The group wanted somebody to come and talk on the health effects of low-level radiation, and the hospital contacted me.

I knew nothing about nuclear power plants, but I said I would tell them what I knew about radiation. The forum had been managed and organized by the utility company, who wanted to push the benefits of nuclear power, and advocated a generator in the community. That was my first experience of a public forum run by the utility companies, and it was an eye-opener.

The meeting was held at a local community college. The county legislators were there, and between two and three hundred citizens.

When we went in the back door of the auditorium, we were handed a piece of paper. It contained questions that the county legislators had asked and that we were supposed to answer. It seems the utility company had had the questions for two weeks. And they handed them to us as we walked in the back door that night. That was the first problem.

I had prepared a statement, and it was hard at the last moment, when the forum was about to start, to focus on the questions from the legislators. So I tried mentally to put the questions into the context of what I had prepared. Perhaps I could cover what they were asking.

Then we were handed programs, printed by the utility company. They had five speakers of their own, and they gave the speaker's name and expertise, books they'd written, that sort of thing. Below was a blank space marked "Citizens' Energy Committee," that was the four of us. Our names were not listed, and of course none of our credentials were given.

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4. There is a move to increase the amount of radiation nuclear workers are permitted to receive. Dr. Karl Z. Morgan, professor of Health Physics at the Georgia Institute of Technology and a pioneer in radiation protection, believes that the International Commission on Radiological Protection report (ICRP No. 26) will lead to "large increases in the present ICRP values for maximum permissible concentration or permissible dose limits. . . ." *Radiation Standards and Public Health,* pp. 12-13.

5. *Report to the Nuclear Regulatory Commission from the Staff Panel on the Commission's Determination of an Extraordinary Nuclear Occurrence,* NUREC-0637 (Washington, D.C.: U S. Government Printing Office, January 1980).

6. The Barker plant was proposed by New York State Electric & Gas Company. This public hearing was held in 1974.

Next I discovered that they had only enough chairs on the stage for the men from the utility company. We were asked to sit in the audience.

When I asked for an overhead projector—this *was* a community college—I was told they didn’t have one. But I kept insisting until I got an overhead projector. That one I won!

The five men representing the utility spoke first. Each took fifteen minutes to deliver a very tight speech, careful wording, and to show high-powered movies of nice, clean-looking nuclear power plants, everything done by remote-control equipment, people behind leaded glass looking in. You know, it was really impressive.

But then I listened to what they said about the health hazards, and I knew that they were not telling the truth. They were giving the impression that there was no problem at all. Everything was under control and radiation wasn’t harmful at these low levels.

As I listened, the audience around me sat there, not moving. There was no clapping. No audience response. They were mostly overwhelmed by the jargon, the physics, the movies, all the nuclear terms, the whole slickness of it.

I was called as the first speaker for the citizens’ group after this performance, and when I went up on stage I was mad.

"Now that you’re all finished," I said over the microphone, "maybe you’ll get up and give your seats to the citizens’ group."

They had to do that. Everybody in the hall had heard it.

It caused a little stir in the crowd, too.

As the men left the stage and the citizens’ group replaced them, I realized the citizens’ group was all women and the other group all men. I hadn’t thought it out, but I just looked around and saw the women and said, "It’s too bad that we have split this way on the issue. Maybe it is concern for life."

I got a standing ovation from the audience. The bottled-up emotion that people had, sitting there listening to all this stuff, was released. After that, anything we said got all kinds of audience response. It just broke the ice. Of course, the legislators reacted to the audience more than the information. They know where their votes are coming from.

I went into what happened when people were exposed to radiation, what low-level radiation did, what I had discovered about medical X-rays, and how this nuclear situation was comparable.

I told them about Dr. Gerald Drake in Big Rock, Charlevoix County, Michigan. He was a general practitioner up there and had known the families for years. Big Rock was one of the first commercial nuclear power plants. I told them how he started noting changes in the health of his community, an increase in leukemia and cancers. He started noting this and reporting it and he was being told that it wasn’t due to the power plant. It was the socioeconomic status of the women up there that had changed. Well, he had lived there all his life, and the problems came up after the nuclear plant moved in. I knew him and I had looked at his data.

But what really came out in the discussion and what really tipped the balance on the issue was that next to this power plant [Barker] was the Cornucopia Farms where they grow Gerber’s baby food.

I think that convinced the audience.

The Niagara County legislature voted the first moratorium in the United States against nuclear power not long after this. The moratorium still holds. They have since built a small, fairly clean coal-fired power plant, and there’s no talk in that whole area about ever putting in a nuclear power plant. They just killed it in one fell swoop.

So I started out with a victory.

Nothing of this had been in the Buffalo newspaper, even though about a million people lived in Buffalo, within thirty miles of the plant! It was discussed in Lockport, a little town nearby. Just a very small notice to rate-payers: "We are considering building a new plant." These plans are usually kept quiet. That was ’73 or ’74. The nuclear power plants would move into a location very quietly. Most people didn’t even know one was being proposed or constructed.

Retaliation: The Nuclear Industry Declares War

I think I caused the nuclear industry a lot of damage that night at the public hearing in the Niagara Community College, but their retaliation was even more surprising to me than the meeting had been. They managed to enlist somebody at the cancer hospital where I worked, a person who lived in Barker, who wrote a really strong letter to the Niagara County legislature and leaked it to the press. Following that, there was a big story in the Lockport press with the headline: ROSWELL DISAVOWS SCIENTIST.

This article implied that my science wasn’t representative of the institute. They used the term "representative" so the ordinary person would think it meant my science wasn’t any good, but it was used in a technical sense, meaning that I was not representing the institute’s official position on nuclear power.

It was a very nasty article and another eye-opener. I hadn’t expected that kind of thing. My department chairman wrote a letter to the newspaper, and the newspaper was pretty good about retracting the original article.

Then I got an invitation to speak on a local television talk show. It was just a daytime talk show, and I had not accepted, but I had mentioned at work that I had been invited to speak.

That’s when I got a telephone call asking me to come to the office of the director of the scientific staff at Roswell Park. I asked what the purpose of this meeting was. I requested to have it put in writing, but they refused and told me they were just going to talk to me about the policy of speaking on TV, that the institute had a policy. They wanted to explain it to me.

Well, I got suspicious, and I don’t know why except that I had asked them to put it in writing, and they hadn’t.

So I went to my supervisor [Dr. Irwin Bross]. He thought I was being paranoid, but he agreed to come because he thought it would make me feel better.

When we got downstairs and he saw six or seven top men at the institute going into the room, he really thought twice about having doubted my fears. Later he said he was very glad he had come. I was glad, because he was my only witness.

This meeting had been called very hastily, in violation of one of the written agreements with employees. If you call an employee on the carpet, you have to notify her supervisor, but they didn’t notify Dr. Bross. It was very definitely an intimidation session.

In any case, they brought in—without telling me the purpose of the meeting—both a cassette tape of what I had said at the meeting in Niagara Community College and a written transcription of it. Apparently the utility company had taped and transcribed what I’d said.

Their claim was this: when I introduced myself—and remember, my name was not on the program, nor any of my affiliations—and said that I worked at Roswell Park Memorial Institute, I had seemed to be speaking for the institute, for their policy, which is a very delicate question in an institute.

When I asked them to play the tape over, there was some static on it at the crucial point. They were guessing at what I had said during the static. They had no evidence at all.

The meeting went on for an hour. They were really uptight, especially the assistant director of the institute, who spoke for about five minutes straight about how terrible it was to cause trouble in the local community and speak in the name of the hospital.

When he finished, I asked him if he was trying to tell me that when I do research at public expense, and then go to a public meeting, I shouldn’t tell the public what I’ve found out.

This question so frustrated him that he walked out of the room, slammed the door, and never said another word.

Later I received a carefully worded letter changing the accusation. They were originally accusing me of saying I "represented" Roswell Park Memorial Institute. The rewording of the letter said I had spoken in such a way that some people in the audience might have thought that I was representing Roswell Park Memorial Institute.

So I wrote back and said I was glad to see they had changed the charge, and actually I had rights for a grievance procedure, and I would think about it. I let it go at that, and the institute let it drop too. I went on with my research.

The Barker experience made me suspicious. If it had not occurred, maybe something else would have made me suspicious, but it was this overreaction that led me to find out more about what was going on in the nuclear power industry. I had a very uneasy feeling. They were working too hard to keep me quiet.

So I began to study the history of the federal regulations. I started investigating it on my own and reading everything I could find. I started looking at where the utility companies were getting the information they were giving people on the radiation questions. I found out it was pretty much coming from the American military experience at Hiroshima and Nagasaki.

I found that in September 1945, shortly after the bomb was dropped, the Americans set up the Atomic Bomb Casualty Commission in both Hiroshima and Nagasaki, and that the government has kept total control of the information on radiation effects ever since. The data base is not released to the scientific community. Research papers are released, but not the key information on doses for people, which would allow independent research on health effects.

Author’s Note

One of the major problems with this data is that both the test group—A-bomb survivors—and the control group—people living in the suburbs of Hiroshima and Nagasaki at the time—were irradiated—the survivors, from the initial bomb blast, and the people in the suburbs, from radioactive fallout. Initially, the control group was composed of people who had received less than fifty rads exposure, and these people were compared to people who had received more than fifty rads. Obviously, this would obscure the observable differences between an irradiated and non-irradiated population and imply there was less an increase in the incidence of leukemia and cancer caused by radiation.

Later studies used a control population that had received less than ten rads and then used the general Japanese population, all of whom were exposed to radiation. Each time the control group’s radiation exposure was decreased, the comparison rate of health effects increased.

Radiation standards in the United States are derived from the data of the Atomic Bomb Casualty Commission, and according to many scientists permit both nuclear workers and the general population to be exposed to unsafe levels of radiation.[7]

Congress Joins the Attack: The Joint Committee on Atomic Energy

The more Bertell spoke out, the more she realized that radiation exposure levels were just one aspect of the nuclear problem. She began to write about her findings. One of her first articles, "Nuclear Suicide," published in "America" in 1974, led to nasty letters written in to the editor. "America" would print neither a follow-up article nor Bertell's responses.

"Somehow news of me filtered through to Congress. Senator Pastore, head of the Joint Committee on Atomic Energy, had worked with ERDA.[8] *So he asked them to look into what I was saying, and James Liverman, head of ERDA,*[9] *wrote me a letter, asking me to send some of my written works. Naively, I thought they were really interested."*

On 1 July 1975 Bertell sent them copies of her research articles, including an unfinished paper. She received a thank-you letter back and a request that she keep them on her mailing list. Nothing more.

"Then I got a letter from a man—I won't tell you his name—who worked for Union Carbide in Oak Ridge." He warned her that Union Carbide had begun to critique her scientific works. Union Carbide, one of the companies most heavily invested in the nuclear industry, would not critique Bertell's work objectively. She wrote the man from Union Carbide back, but never heard from him again. "He might have lost his job over it."

Then in September 1975 Bertell received a letter from a woman in Rhode Island who sent a packet containing a twenty-one page booklet critiquing Bertell's work. It was unsigned, and there was no indication of its source. The woman had received it from Senator Pastore.

The questions raised in the critique were designed to suggest that medical X-rays could not be causing the increased incidence of leukemia the Tri State Study was investigating. "For example, they suggested that I hadn't considered medical X-rays being taken to diagnose *the leukemia and that was why leukemia patients had received more X-rays. But I had eliminated any X-rays for the whole year prior to the diagnosis just to avoid that problem. I counted only those from one to twenty years prior to the diagnosis. They could have answered this question by a telephone call. It immediately put the reader in the frame of mind—'Oh, this person wasn't very thorough. After all, she didn't think of all these things.' It included anything they could find wrong with my work, even typographical errors. Other paragraphs were marked 'No comment' when they were important concepts. One thing that really got me—they always referred to me as* sister, *never* doctor.

"This critique was being sent out by members of Congress to their constituents."[10] *It was one of the turning points for Bertell. "I realized that this fight must be pretty important if government agencies would use this kind of low tactic."*[11]

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7. See J. Rotblat, "The Puzzle of Absent Effects," *New Scientist* 75 (1975): 475 and *Effect of Radiation on Human Health: Health Effects of Ionizing Radiation,* vol. 1, hearings before the Subcommittee on Health and the Environment of the Committee on Interstate and Foreign Commerce of the U.S. House of Representatives, serial no. 95-179. (Washington, D.C., 24, 24, 26 January and 8, 9, 14, 28 February 1978), pp. 1082-1086. The Atomic Bomb Casualty Commission is now called the Radiation Effects Research Foundation (RERF).

8. The Atomic Energy Commission was dissolved and split into two agencies in 1974—the Nuclear Regulatory Commission (NRC) with regulatory functions, and the Energy Research and Development Association (ERDA), which handles research.

9. James Liverman was director of the Division of Biomedical and Environmental Research. He requested Dr. Bertell's published reports on health hazards on behalf of the Joint Committee on Atomic Energy in a letter dated 24 June 1975.

10. For example, Senator John O. Pastore, chairman of the Joint Committee on Atomic Energy, sent Emma Sacco, a concerned constituent from Rhode Island, Dr. Liverman's report on Dr. Bertell's publications, claiming that ERDA "had considerable difficulty obtaining the publications by Sister Bertelle [sic]," despite the fact that she had mailed her publications to Liverman within a week of the time he had requested them. Pastore to Sacco, 22 September 1975.

11. According to Dr. Irwin D.J. Bross, ERDA wasn't interested in reporting on the scientific value of Dr. Bertell's work but in "a hatchet job" (from his letter to Senator John O. Pastore, chairman JCAE, 6 October 1975.)

In a letter from James Liverman to Mr. George F. Murphy, Jr., executive director of the Joint Committee on Atomic Energy, 17 September

The Funding of the Tri-State Leukemia Study Gets Cut

We were asking for a renewal of the grant in order to repunch our data. Our questions on low-level radiation could be answered with no more than a repunching of the data we already have in the Tri-State Leukemia Survey. This would save the government a lot of money—if they really want to know the answers.

Much more research is possible with this data. For example, the computer codes are now crude: upper-trunk, lower-trunk X-rays, limbs, arms and legs, head and neck, dental. I would have wanted to go back to the original folders which have detailed information and code directly a spinal X-ray, a barium enema, a pyelogram, etc. One could focus on the individual diagnostic procedure.

This Union Carbide critique of my work involved Sidney Marks, who worked for ERDA under James Liverman, and was apparently the man who hired Union Carbide to get these booklets together, and then provide them for Congress.[12] He worked sometimes at Battelle Northwest[13] and sometimes at ERDA.

He's the one who managed to have the ERDA grant taken away from Mancuso[14] and the one who went out to Denver when they found the plutonium[15] and told them not to worry, the government would do a study of their health. And the government has never done it. I mean,

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1975, Liverman acknowledges that the critique of Dr. Bertell's work was carried out by Union Carbide's statisticians from Oak Ridge and his staff at ERDA. Liverman himself critiques "possible flaws" in Bertell's leukemia study, concluding that the "results of Sister Bertell's research activity are not relevant to the nuclear power issue in an important way."

12. According to James Liverman, "In October 1975, Dr. S. Marks of my staff requested Drs. J. Storer and D. Gardiner, Oak Ridge National Laboratory, to undertake an analysis of Dr. R. Bertell's publication. . . . A report on the analysis of her findings was sent to the JCAE [Joint Committee on Atomic Energy, U.S. Congress] on November 14, 1975." James Liverman to Senator John Durkin, U.S. Senate, 20 March 1978.

Senator John Durkin had written James R. Schlesinger, secretary of the Department of Energy, that he was "deeply concerned that actions by your department appear to have had the effect of discouraging research into the health effects of low-level radiation.

" . . . The Tri-State Leukemia survey and research conducted by Dr. Thomas Mancuso have indicated that cancer may be caused by exposure to low-level radiation.

"This research is of major importance to the country. . . ."

Durkin expressed "dismay" at the "pattern of DOE interference with these essential independent studies" and stated that "Dr. Bertell's funding was recently cut off by the National Cancer Institute after unsigned critiques of her work were circulated, apparently by Dr. James Liverman, the acting assistant secretary for environment at DOE. Dr. Liverman did not see fit to send copies of the critiques to Dr. Bertell, although they challenge her professional competence. Dr. Liverman was also the official who relied on the phantom retirement plans of Dr. Mancuso to stop his research, a fact which raises questions about his commitment to learning the true dangers of low-level radiation." Durkin to Schlesinger, 27 January 1978.

13. Battelle-Pacific Northwest Laboratories is a private research organization funded by the federal government and noted for doing research in support of the nuclear industry. Dr. Sidney Marks worked for Battelle after working for the Atomic Energy Commission and ERDA. Congressman Tim Lee Carter, serving on the subcommittee which held hearings on the effects of ionizing radiation in 1978, commented that "it was an unusual situation in that $58 million and Dr. Marks went to Battelle about the same time." *Effect of Radiation on Human Health*, vol. 1 pp. 697, 725, 748-749.

14. Dr. Marks acknowledged that the decision to terminate the control with Dr. Mancuso was "my decision arrived at jointly with the staff. The matter was referred to Dr. Liverman. . . ." *Effect of Radiation on Human Health*, vol. 1, p. 697.

Dr. Mancuso was the principal researcher in a study of nuclear workers at the Hanford nuclear facility in Richland, Washington. Begun in 1965, the study was originally funded by the AEC, then ERDA, and then, when it appeared that the results would show a definite correlation between low-level radiation and cancer, ERDA transferred the project out of Mancuso's control to the pronuclear Oak Ridge Lab (run by Union Carbide) and Battelle Northwest (which handled research for the Department of Energy). Mancuso's funding was cut in July 1977 after Liverman's staff reviewed the study. Initially, Liverman explained the decision to cut Mancuso's funding as due to Mancuso's "imminent retirement." In a letter to Senator John Durkin, Liverman admitted his "use of the phrase 'imminent retirement' was unfortunate and in error" and that "other factors were overriding in importance in my decision" to cancel Mancuso's contract and transfer the program to Oak Ridge. Liverman to Durkin, 20 March 1978.

Congressman Paul Rogers had this to say: "Well, it looks like this to me, Dr. Liverman. First of all, you give retirement as the excuse, and now you say that was wrong. That is not what was meant. You never provided the doctor with his peer reviews so he could answer criticisms. Now you are claiming that the peer reviews were all negative, and they are not at all. The consensus was positive." *Effect of Radiation on Human Health,* vol. 1, p. 719.

The reviewers of Mancuso's study recommended that the study be continued and that the University of Pittsburgh should continue as the Contractor. But "contracts are being shifted here," Rogers noted, concluding, "It doesn't look very good, Dr. Liverman, I must say." Ibid., p. 722.

15. Plutonium has escaped from the Rocky Flats Nuclear Weapons Facility outside Denver, Colorado through several fires, leaking barrels of radioactive materials, and emissions to the atmosphere from the smokestack of the plant. In June 1976 four hundred cubic yards of radioactive dirt contaminated by plutonium had to be removed. It had been contaminated in 1968 when fifty-five-gallon metal drums in a storage area leaked. Anna Gyorgy and Friends, *No Nukes: Everyone's Guide to Nuclear Power* (Boston: South End Press, 1979), p. 64. Rocky Flats, managed by Rockwell International, manufactures nuclear weapon components out of plutonium.

there's a whole story about Sidney Marks and ERDA relative to assurance of the public that low-level radiation posed no problems.[16]

A site team from the National Cancer Institute then came to make a recommendation on our grant. Dr. Seymour Jablon, head of the Atomic Bomb Casualty Commission, which provided the information to back the present radiation standards,[17] was part of the site visit team. He's now with the National Academy of Science. As far as I can tell, Jablon had never before gone out representing the National Cancer Institute. In any case, I think he was one of the ones who wrote a negative critique of the grant proposal, saying something like the research "flies in the face of all known facts."

This implied that one only does research on what is already known! That's not a very good reason for turning down a grant proposal. Finally, the National Cancer Institute denied the renewal of the grant.[18]

So many other things happened at the same time that it is hard to sort them out. The American College of Radiology was promoting their mammography screening program—mammography for breast cancer. They were going to set up satellite cancer detection places all over the country, and I think it was a million and a half dollars they were getting to set up the mammography program.

Anyway, their arithmetic was wrong, and if they had gone through with the original program, they probably would have caused four to twelve breast cancers for every cancer they picked up, because of the radiation dose they were giving to women who had no symptoms.

Dr. Bross, my department chairman at Roswell,[19] went in rather strongly with other scientists and scuttled the mammography program. It is no longer discussed. But the radiologists lost all this money, and their satellite stations too.

Our grant proposal came up just afterward. We had the radiologists mad at us as well as the nuclear industry and I guess it wasn't too hard to get a few people to write negative reports on the funding.

At the bottom of the grant proposal it said: *If you would like to change your line of research, you could submit a new request for funds. We would be very happy to consider it.*

I felt it was outrageous. The research team—then down to nine professionals—had to disperse and find new jobs. We were out of money. We couldn't do computer work. We had no clerical assistance. One couldn't have access to the basic data.

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16. According to Dr. Bertell, Dr. Sidney Marks produced a scathing critique of Dr. Mancuso, Dr. Stewart, and Mr. George Kneale's study. Dr. Mancuso had to invoke the Freedom of Information Act to get a copy of the critique. After criticizing Dr. Mancuso for the Department of Energy, Dr. Marks went out to Battelle-Northwest and accepted a DOE contract to reanalyze Mancuso's data. Now he claims he needs at least twenty more years to get conclusive results. R. Bertell, "The Nuclear Crossroads" (La Veta, Colorado: Environmental Action Reprint Service). See also *Effect of Radiation on Human Health,* vol. 1, pp. 72, 714-727, 964-965 for a discussion of Dr. Liverman and Dr. Marks, and the way in which research on the effects of low-level radiation is suppressed.

17. Seymour Jablon served on the review panel of the Tri-State grant. He had studied the effects of the Hiroshima/Nagasaki bomb survivors, comparing radiation doses of one to two hundred rads with a nine-rad control standard. This study used a control group which had been exposed to nine rads of radiation, a level that the U.S. regards as causative of cancer. In congressional hearings, Jablon admitted, "We would have been better off not to have used persons with any measurable dose at all as controls. . . ." *Effect of Radiation on Human Health,* vol. 1 p. 1085.

18. Irwin D.J. Bross, "A Report on the Action of the Two Federal Agencies, ERDA and NCI, in Terminating Funding for Two Major Studies of the Health Hazards Produced by Low Levels of Ionizing Radiation," 5 July 1977, in *Effect of Radiation on Human Health,* vol. 1, pp. 951-976.

19. Irwin D.J. Bross, "Major Strategic Mistakes in the Management of the Conquest of Cancer Program by the NCI," testimony to the Subcommittee on Intergovernmental Relations and Human Resources of the Committee on Government Operations of the U.S. House of Representatives, 14 June 1977. Dr. Bross testified that mammography would cause five times as many breast cancers as it detected. Dr. Bross's cancer study grant from NCI was cut soon afterward.

Since I was not about to go into another research area—no way—I decided to strike out on my own. I wanted to ease the radiological burden on the public.

I resigned at the end of May 1978, with no definite future plans.

After Leaving the New York State Department of Health

Without the research job at Roswell Park, Bertell had no source of income. "It was rather scary. I not only have to eat and support myself, but we take care of our elderly retired Sisters and their medical bills, food and clothing, and also our young Sisters who are studying." By September 1978 Bertell had organized the Ministry of Concern for Public Health, a nonprofit association, and had begun acting as a radiation health consultant. Then, in December 1979, she asked the Board of Trustees of Global Education Associates to accept what she was doing as an International Task Force under their auspices, dealing with questions of energy and health. This gave the Ministry of Concern for Public Health nonprofit corporation status and nongovernmental organization status at the United Nations.

In organizing the Ministry of Concern for Public Health, Bertell intended to lend professional support to the individual researcher. She knew how powerless the lone scientist could feel against the entire nuclear industry.

"I'm trying to surround these researchers with other researchers, provide them with friendly reviews of their works and friendly criticism so as to help them do a better job. We are trying to be precise, honest, and unbiased. We have no vested interests, and even stand to lose funding and reputation because of our determination to protect the public health rather than military and economic policy."

Bertell considers genetic damage, i.e., damage done to the sperm or ovum, the most urgent problem facing us. When she speaks of genetic damage, she distinguishes between severe and mild damage. Severe damage could result in spontaneous abortions, neo-natal deaths, death in early childhood, or institutionalization, with the person having no offspring, and thus not further propagating the damage. Those with mild damage, such as asthmas and severe allergies, on the other hand, often live to thirty-five or fifty. "These are the ones I am concerned about, because they do have children, and they produce children with the same defects they have."

The problem is escalating dangerously. "Increasing radiation in our environment is producing more of these mild mutations, people who are already genetically damaged when they're born and less physically able to cope with a radiation environment. Now you can't continue to increase the number of people in a population with mild mutations at the same time as you increase radiation pollution that they are not able to handle. As far as I am concerned, this is a death process in the human species."[20]

Bertell fears that by the time people realize what is happening, there will be so much radiation in the environment that it will be too late. In addition to the normal radioactive emissions from nuclear plant operations, the "military is setting off two to three bombs a week in Nevada, blasting an incredible amount of radioactivity into the desert floor and venting some radioactive gases to the

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20. See R. Bertell, "Radiation Exposure and Human Species Survival," *Issue Papers: Working Documents of 10 March 1980 Public Meeting,* vol. 1 (Bethesda, Maryland: Committee on Federal Research into the Biological Effects of Ionizing Radiation, National Institutes of Health, 1980).

atmosphere." People are unaware of the increasing danger to their health. "They don't even know what to look for, if exposed. All they know is that they might die of cancer, but what they're experiencing is acceleration of the aging process. They have no idea that when they get heart disease, that it's at a younger age than they would've gotten it had they not been exposed to radiation."

Furthermore, people have no idea of the effect of radiation on children. "Take, for example, a nuclear worker who has a child with dysentery. He doesn't know that that sickness may be connected to his work. He just thinks it's something unfortunate. People don't realize that the effects of radiation in children can be increases in asthmas, allergies, rheumatic fever, pneumonia, dysentery, besides the leukemias and cancer, and any chronic diseases with a genetic component."

With what she has seen and what she knows, Bertell cannot be silent. "We are in a crisis," she says, "a big crisis."

Deciding to Take on the Whole Thing

It got to me for a while. Four years ago I went to Barre, Vermont, and I stayed at a Carmelite monastery for a year (1975-1976) because I had to work it out within myself. I didn't know how to handle it. I was beginning to realize what an incredible hoax was being promoted, but I spent a year in Barre before I felt free enough to confront death and accept it, free enough to give myself to this work, to care nothing about money or status, or what people think, or what "a Sister ought to be doing," or whether I ought to be teaching school someplace, or what the bishop thought, or all the rest of these encumbrances we have hanging on us. These we must set aside.

You have to become free, and to believe it possible to accomplish something. I think only God gives you that sense of hope. I had to feel the earth suffering, and I had to know that it didn't have to suffer. I had to know that we can live in harmony, with the earth, that this is crazy—this production of nuclear bombs, just for the sake of blowing one another off the face of the earth.

This is no way to live. It's totally unnecessary, and nobody wants it. The Soviets don't want it any more than we do. They want to live. They're people. They have families. They have children. They don't want this kind of thing. Nobody does.

The sadness gets to me when I see kids, young kids, and I wonder what their future's going to be.

No matter what anybody does, nobody can take my past away. I'm fifty. I've had a good life. But what will life hold for those now being born?

What Can Be Done?

We need to start documenting changes in human health through the Public Health Service, preparing evidence for courts of law, and getting a mechanism in place which makes companies accountable for the damage they do. We need written documentation, constant monitoring of community health.

We need to stop the total preoccupation of Public Health departments with infectious diseases and convince them to collect the information needed to document environmental diseases. That's a big shift in public health policy.

We're legally helpless now. Take the Three Mile Island accident. The public does not have a piece of paper saying what their health characteristics were before the accident, so how can they prove there's been a change?

The most responsive organizations right now are out in British Columbia. Two full-time workers hired by the B.C. Medical Association have collected millions of pieces of information, and entered it into the computer in the University of Vancouver. They're getting an idea of the health of the British Columbia population, and if uranium mining moves in, as threatened, they're going to hold the mining companies responsible for whatever happens to public health as a result.

Once you get all the machinery in place and you're watching what's being done, the companies are going to be one hundred times more careful!

The worst straitjacket, however, is one we created for ourselves by dropping the atomic bombs. Thereby we did away with the time lag between attack and mobilization for war. Once you move into the nuclear age, you must be able to react to attack in less than a half-hour or you are wiped out.

This requires constant alert. We have been on military alert since 1945. It's causing inflation, unemployment, and it's causing great tension in the country.

It's draining money out of the domestic economy into the war machine. Government labs all over the country are brain drains for our finest young men and women. Oak Ridge, Brookhaven, Argonne, Lawrence Livermore, Los Alamos, all of the big expenditures for government laboratories are really dedicated to the weapons industry.

We could do without the Department of Energy. The Department of Energy has a mandate from Congress to develop weapons systems. They have three programs for energy: the nuclear, which is a front for the atomic bomb; fusion,[21] which is a front for the hydrogen bomb; and the new solar-powered satellites;[22] which are a front for the particle beam, laser, and microwave weapons of the future.

The 1980 budget of DOE contains more than 39 percent for weapons production. The proposed 1981 budget is over 41 percent weapons-production oriented. Energy is only a front at the Department of Energy. Unless we remove from DOE the mandate to develop weapons systems and change its pseudo-military character and eliminate the secrecy under which DOE operates in the name of defense and national security, we're not going to solve the energy crisis.

It is possible and necessary. We can do it together. People who care must turn in the same direction. I wouldn't be putting effort into resolving this crisis if I didn't think we could make it. But time is running out.

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21. The House of Representatives approved overwhelmingly a twenty-billion-dollar commitment to nuclear fusion research over the next twenty years. "20 Billion Voted for Nuclear Fusion," *New York Times,* 26 August 1980, p. C-1.

22. Dr. Bertell learned about the solar-powered satellite system because she was on the review committee for the Citizens' Energy Project. The Department of Energy circulated the proposal for comment. (U.S. Department of Energy, DOE/NASA Satellite Power System and Evaluation Program, "Some Questions and Answers about the Satellite Power System," DOE/ER-0049/1, Washington, D.C., January 1980.)

"Sixty space stations are planned in this solar-powered satellite system (SPS), each of which is estimated to cost one trillion dollars. The SPS would work by concentrating the sun's rays, using laser and microwaves, down to a rectenna (a receiving antenna) on earth. The rectenna would convert solar energy to electricity. The SPS is also capable of wiping out all communications systems in a city, including computer memories, and can destroy ballistic missiles in air. It is an incendiary weapon and an antipersonnel weapon. The microwave can kill people and save buildings."—Bertell.

See Ron Brownstein, "A $1,000,000,000 Energy Boondoggle," *Critical Mass Journal,* June 1980, pp. 4-5. Additional information about the SPS system can be obtained from the Citizen's Energy Project (1110 6th Street, Washington, D.C. 20001).

Postscript: 4 October 1979

I was driving home after speaking by invitation to a group of doctors at Grand Rounds at Highland Medical Center in Rochester, New York. My remarks were primarily on the effect of radiation exposure from medical X-rays, but I did extend them to the nuclear power problem, since there is a nuclear power plant in Rochester.

Route 490 is three lanes each way, and I was in the middle lane, in fast rush-hour traffic. I became conscious of a white car in the left lane. It was too close to my car, so I pulled back, and when I did, the driver maneuvered into my lane directly in front of me and dropped a very heavy sharp object—metal, I think—out of the car, in line with my front left tire. I saw it coming, but I couldn't move out of the way. I tried to straddle it, but it caught the inside of the tire and totally blew it. It cut a deep slit in the tire about three inches long and put a lip in the metal rim. It must have been a very heavy object.

I think if I had hit it head on, it could have turned the car over because I was in a small Toyota.

The driver in the left lane must have seen what happened because he let me through, and I got onto the median strip, stopped, and got out to assess the damage.

A few minutes later a brown car marked "Sheriff" pulled over next to me. There were two people in it. I didn't see the driver. The passenger did not have a uniform on. He asked what happened and when I told him, he wanted to know if I had either the license number of the car or the piece of metal itself. I said no to both questions.

Then he told me that this wasn't their jurisdiction, but they had radioed the local Rochester police who would be there any minute. Then they took off down the highway.

I was there over an hour and no police came.

Later, when I contacted the sheriff of Monroe County, his office verified that the second car was not a sheriff's car. Monroe County doesn't have any cars of that description. Their men are told to stay with someone in distress even if it's not their jurisdiction.

The Monroe County sheriff's office combed all the written reports which had been broadcast on the police radios for the local cities, towns, county and state police. Nothing made reference to the incident.

The second car apparently was connected to the first one and had followed after to see what had happened.

BIBLIOGRAPHY

Anderson, Robert E., M.D.; Tsutomu Yamamoto, M.D.; and Todd W. Thorslund, B.S; "Aging in Hiroshima and Nagasaki Bomb Survivors: Soluble-Insoluble Collagen Ratio." Hiroshima, Nagasaki, Japan: American Bomb Casualty Commission, 1972. Technical Report No. 11-72. A paper based on this report was published in the *Journal of Gerontology* 29 (1974): 153-159.

Bertell, Rosalie to H. David Maillie, director of Health Physics, University of Rochester Medical School, 3 April 1980.

________. "Measurable Health Effects of Diagnostic X-ray Exposure." In *Effect of Radiation on Human Health: Radiation Health Effects of Medical and Diagnostic X-Rays.* Vol. 2. Hearings before the Subcommittee on Health and the Environment of the Committee of Interstate and Foreign Commerce of the House of Representatives. Serial No. 95-180. Washington, D.C., 11 July 1978.

________. "More About Nuclear Suicide." *Nuclear Opponents,* May-June 1975.

________. "New Structures for Growth." Invited address, World Future Studies Conference: Science and Technology and the Future, Berlin, East Germany, 8-10 May 1979.

________. "The Nuclear Crossroads." La Veta, Colorado: Environmental Action Reprint Service, 29 April 1978.

________. "Nuclear Power: Colossal Experiment on Human Beings." Syracuse, New York: Syracuse Peace Council, 11 March 1977.

________. "Nuclear Suicide." *America* 131 (1974).

________. "The Nuclear Worker and Ionizing Radiation." *American Industrial Hygiene Association Journal* 40 (1979): 395-401.

________. "Radiation Exposure and Human Species Survival." *Issue Papers: Working Documents of 10 March 1980 Public Meeting.* Vol. 1. Bethesda, Maryland: Committee on Federal Research into the Biological Effects of Ionizing Radiation, National Institutes of Health, 1980.

________. "Written Testimony on the Hazards of Low Level Radiation." Subcommittee on Energy and the Environment of the Committee on Interior and Insular Affairs of the U.S. House of Representatives, Washington, D.C., 6 August 1975.

________. "X-ray Exposure and Premature Aging." *Journal of Surgical Oncology* 9 (1977): 379-391.

Bertell, Rosalie, and Dr. Irwin D. J. Bross. *Proceedings of a Congressional Seminar on Low Level Ionizing Radiation.* Report No. 79-767-0. Washington, D.C.: U.S. Government Printing Office, 1976.

Bross, Irwin D. J. "A Report on the Action of the Two Federal Agencies, ERDA and NCI, in Terminating Funding for Two Major Studies of the Health Hazards Produced by Low Levels of Ionizing Radiation," 5 July 1977. In *Effect of Radiation on Human Health: Health Effects of Ionizing Radiation,* Vol. 1. Hearings before the Subcommittee on Health and the Environment of the Committee on Interstate and Foreign Commerce of the U.S. House of Representatives. Serial No. 95-179. Washington, D.C., 24, 25, 26 January and 8, 9, 14, 28 February 1978.

________ to Rosalie Bertell, on the activities of Dr. Sidney Marks, 13 April 1978.

________ to John O. Pastore, chairman, Joint Committee on Atomic Energy (JCAE), U.S. Congress, 6 October 1975.

________. "Low Level Ionizing Radiation is Hazardous to Health: A Coverup and its Consequences." In *Effect of Radiation on Human Health.* Vol. 1. 8 February 1978.

________. "Major Strategic Mistakes in the Management of the Conquest of Cancer Program by the NCI." Testimony to the Subcommittee on Intergovernmental Relations and Human Resources of the Committee on Government Operations of the U.S. House of Representatives, Washington, D.C., 14 June 1977.

Bross, Irwin D. J., and N. Natarajan. "Genetic Damage from Diagnostic Radiation." *Journal of the American Medical Association* 237 (May 1977): 2399-2401.

________. "Leukemia from Low Level Radiation." *New England Journal of Medicine* 287 (1972): 107-110.

________. "Risk of Leukemia in Susceptible Children Exposed to Preconception, in Utero, and Postnatal Radiation." *Preventive Medicine* 3 (1974): 361-369.

Brownstein, Ron. "A $1,000,000,000 Energy Boondoggle." *Critical Mass Journal,* June 1980.

Chowka, Peter Barry. "A Tale of Nuclear Tyranny." *New Age,* August 1980, pp 26-35, 68.

Court-Brown, W. M., M.B., and Richard Doll, M.D. "Mortality from Cancer and Other Causes after Radiotherapy for Anklylosing Spondylitis. *British Medical Journal* (1965): 1327-1332.

Durkin, John A., U.S. Senate, to James R. Schlesinger, secretary of the Department of Energy (DOE), 27 January 1978.

Effect of Radiation on Human Health: Health Effects of Ionizing Radiation. Vol. 1. Hearings before the Subcommittee on Health and the Environment of the Committee on Interstate and Foreign Commerce of the U.S. House of Representatives. Serial No. 95-179. Washington, D.C., 24, 25, 26 January and 8, 9, 14, 28 February 1978.

Effect of Radiation on Human Health: Radiation Health Effects of Medical and Diagnostic X-Rays. Vol. 2. Hearings before the Subcommittee on Health and the Environment of the Committee on Interstate and Foreign Commerce of the U.S. House of Representatives. Serial No. 95-180. Washington, D.C., 11, 12, 13, and 14 July 1978.

Graham, S.; M. L. Levin; A. Lilienfeld, et al. "Methodological Problems and Designs of Tri-State Leukemia Survey." *Annals of the New York Academy of Science* 107 (1963): 557-569.

Gyorgy, Anna, and Friends. *No Nukes. Everyone's Guide to Nuclear Power.* Boston: South End Press, 1979.

Liverman, James L., director, Division of Biomedical and Environmental Research, Energy Research and Development Administration (ERDA), to Sister Rosalie Bertell, senior cancer researcher, 24 June 1975.

________, acting assistant secretary for environment, DOE, to John A. Durkin, U.S. Senate, 20 March 1978.

________, director, Division of Biomedical and Environmental Research, ERDA, to George F. Murphy, Jr., executive director, Joint Committee on Atomic Energy (JCAE), U.S. Congress, 17 September 1975.

Mancuso, Thomas F.; Alice Stewart; and George Kneale. "Radiation Exposures of Hanford Workers Dying from Cancer and Other Causes." *Health Physics* 33 (1977): 369-384.

Pastore, John O., chairman, JCAE, U.S. Congress, to Emma Sacco, 22 September 1975.

Radiation Standards and Public Health. Proceedings of a second congressional seminar on low-level ionizing radiation. Washington, D.C.: Congressional Research Service, Library of Congress, 10 February 1978.

Report to the Nuclear Regulatory Commission from the Staff Panel on the Commission's Determination of an Extraordinary Nuclear Occurrence. NUREG-0637. Washington, D.C.: U.S. Government Printing Office, 1980.

Rotblat, J. "The Puzzle of Absent Effects." *New Scientist* 75 (1975): 475.

Seltser, Raymond, and Philip E. Sartwell. "The Influence of Occupational Exposure to Radiation on the Mortality of American Radiologists and Other Medical Specialists." *American Journal of Epidemiology* 81 (1965): 2.

"$20 Billion Voted for Nuclear Fusion." *New York Times,* 26 August 1980.

U.S. Department of Energy DOE/NASA Satellite Power System Concept Development and Evaluation Program. "Some Questions and Answers about the Satellite Power System." DOE/ER-0049/1. Washington, D.C., January 1980.

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KOYAANISQATSI

ko.yan.nis.qatsi (from the Hopi Language) n. 1. crazy life. 2. life in turmoil. 3. life out of balance. 4. life disintegrating. 5. a state of life that calls for another way of living.