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# **Shut Down Nuclear Power Plants The Life and Work of Dr. John Gofman**

by Maria Gilardin

**TUC Radio Podcast Part Two of Two**

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Broadcast quality mp3 of the 30 minute program is here:

<http://tucradio.org/JohnGofmanTWO.mp3> (20.1 MB)

TUC aka *Time of Useful Consciousness* is an aeronautical term. The time between the onset of oxygen deficiency and the loss of consciousness, the brief moments in which a pilot may save the plane.

[From: "A Day of Remembrance for Utah's Downwinders," 27 January 2012, ABC4:]

In the fifties and sixties the US Government conducted nuclear bomb tests at a Nevada Test Site. The radioactive fallout blew downwind. Those in its way suffered disease, cancer, and even death. Today there was an emotional ceremony at the state capitol.

At first the US Government said the tests and the radioactive fallout were safe. But then came the unusually high number of cancers, thyroid problems, and eventually deaths.

I look at all the downwinders I've worked with over the years—sorry—and how many of them are just too sick to come here. How many of them have passed.

It took the US Government decades to admit it was wrong, decades to compensate victims, and decades to create a National Day of Remembrance.

We now know the real story. We know that the government lied.

And if you've never heard Congressman Jim Matheson this emotional, he's got a good reason: his Dad, Utah's former Governor was a downwinder who died of cancer.

This ABC report was recorded in Salt Lake City, Utah, in January 2012.<sup>[1]</sup> And people in Utah are not the only victims of radiation poisoning. There are Downwinders with verifiable health effects at many other sites in Arizona, Nevada, New Mexico, Colorado, Idaho, Montana and also in Guam as a result of the Pacific bomb tests.

Animals were placed at many sites of those tests and it was clear that they suffered and died of radiation. And we know now that, beginning with the 1945 Trinity explosion in New Mexico, radiation was measured and the effects on humans and also sheep and cattle were described. In spite of that awareness the program of exploding nuclear devices began in Nevada and in 1951 the downwinders in Utah and beyond became the *de facto* test population. One can argue that in the US, for over 40 years, human experiments were conducted and the government knew that radiation can kill and lied about it and denied help to the people who were suffering.

And when the truth became known because the Downwinders organized and did their own statistics and sued in court, the Atomic Energy Commission and later the Department of Energy fell back to the position that only high doses have an effect and low level radiation is okay and nobody could have been harmed because the dose was too low. In the press and in the courts up to the Supreme Court, and in universities, they also lied and denied the consequences and continued the testing at the Nevada test site until 1992.

Although later tests were underground, many of them vented into the atmosphere. And maybe nothing would have changed had the sheer statistics not become overwhelming as an ever increasing number of downwinders got sick or died of cancers.

And it was not until 1990 when the Radiation Exposure Compensation Act was passed by Congress, that the government finally admitted that the radiation they released for 45 years, or had dug up in uranium mines, can be deadly. The [official document\[2\]](#) of the [Radiation Exposure Compensation Act\[3\]](#) acknowledges a huge list of cancers that are caused by radiation, among them: Brain, Breast (male and female), Colon/Rectal, Esophagus, Gall Bladder, most Leukemia's and Liver cancers, Lung, Multiple Myeloma, Lymphomas, Ovary, Pancreas, Stomach, and Thyroid and several more.

And anybody today who claims that radiation is not dangerous must take a look at the downwinders and translate this list of diseases into the suffering and deep down sadness and anger that it brought for each individual and the loved ones' around.

And the lessons from the downwinders apply to downwinders of nuclear accidents as well. Maybe people believe that nuclear power plants are different in their toxic effects. Even though it is true that they do not tend to explode in a mushroom cloud when there is an accident, they do emit the same deadly radioactive substances as a nuclear test: Radioactive Iodine 131, Cesium 137 that will remain deadly for 600 years, Strontium 90, and Plutonium that keeps killing at extremely low doses for [its half-life of] 24,000 years – to name just the most famous ones. And some of these elements escape in day to day routine operations. And we also know that these substances spread over vast distances over time and may eventually reach you, anywhere.

This is Shut Down Nuclear Power Plants, Part Two, a miniseries on the late Dr. John Gofman, a nuclear chemist and also a physician and professor of molecular and cell biology. He is one of the very important whistle blowers of the nuclear age. Having initially participated in the

Manhattan Project and separated the first plutonium used in Los Alamos by J Robert Oppenheimer, he came to do research on the medical effects of radiation at Lawrence Livermore Lab in California. He and his staff evaluated the health effects of radiation and radionuclide release from weapons testing, nuclear war, radioactivity in medicine, nuclear power, etc.—all of the atomic energy programs. His multi-year work convinced him that radiation is much more dangerous than previously assumed. After some consideration he eventually concluded that nuclear power plants need to be closed—and he defended that position in books, talks, and activism against the consolidated power of the nuclear establishment that tried to destroy him.

Within Lawrence Livermore Lab Gofman had to evaluate the claim of the Atomic Energy Commission, that radiation at low doses is safe, and it became clear that this was to be the foregone conclusion of his research. However Gofman's scientific integrity, his ethics as a medical doctor, not just a nuclear chemist, gave him the strength to follow the results of his research and say with conviction in 1969 that there is “no evidence of a safe amount of radiation” and “there would be twenty times as many cancers per unit of radiation as anyone had predicted before”. That pronouncement in October 1969 was the beginning of the end of Gofman's career in the nuclear field and eventually he was forced to resign from Lawrence Livermore Lab in 1973.

However in the intervening years, from late 1969 to '73 and beyond, the candid and public work by Gofman and his colleague, Dr. Arthur Tamplin, threw the AEC into damage control mode. It turned out that both Gofman and Tamplin had decided to fight for the recognition of the serious danger of nuclear radiation. Gofman remembered that first big clash with the nuclear establishment in an interview with KPFA Radio's public affairs producer Elizabeth Eielson in 1973:

We had found in the course of our research on cancer and radiation that the up-to-date statistics available—unfortunately from humans who were exposed to radiation—showed that the cancer risk per unit of radiation was 20 times what the expert bodies had thought some 3 years before.

We presented this in a totally low-key manner on an invitational paper at the Institute for Electrical and Electronic Engineers just thinking that people involved in the radiation field should know that radiation was much more hazardous with respect to cancer than it had been thought to be.

Much to our surprise, we were immediately attacked by the agency which supported our work, namely the Atomic Energy Commission, and by the nuclear power industry—both the utilities and the manufacturers of nuclear reactors. And it seemed somewhat strange to us that these people who ostensibly had a grave concern about the hazard of radiation—indeed we had been commissioned by the Atomic Energy Commission to find out the hazard of radiation—should be so vehement in their immediate attack upon us. And the fact that the attack came from the electric utility industry and the manufacturers of

nuclear reactors made us wonder if there wasn't something that the nuclear power industry had to hide.

As a matter of fact at that moment, nuclear power plants were the least of our concerns. In fact we thought that was one of the rather good peaceful uses of the atom. We much more concerned about such things as weapons testing and the use of atomic explosives for so-called peaceful purposes such as digging canals.

But the nuclear power industry descended on us in the most vicious manner imaginable, attempting to destroy our credibility as scientists. It turned out to be a rather stupid blunder on the part of the utilities and the nuclear reactor manufacturers and the AEC because with each of their increasing blistering attacks they invited more and more people in the scientific community and among the media, the press, the radio and television, to say, If these are people going hysterical about somebody putting out some information on radiation, there must be something they're trying to hide.

And, of course, they were trying to hide a great deal. Namely, trying to sell the idea of nuclear power as being cheap, clean, and safe. And our subsequent investigations directly went into the question of nuclear power and we've concluded that this industry is far, far from safe; far, far from clean; and the word cheap is really a joke because it is the most expensive imaginable way when you consider all the hidden subsidies and the costs that don't show in the actual operation of the plant—namely your government subsidies—this is the most expensive way to produce power.

The biggest subsidy of all that they have is to take away your right to redress if you are ever injured through the courtesy of the U.S. Congress passing a law called the Price Anderson [Act] Law<sup>[4]</sup> which virtually removes the requirement of any responsibility for damage caused by nuclear power.

That was Dr. John Gofman interviewed at KPFA by Elizabeth Eielson. He's talking about a paper he and his colleague Dr. Arthur Tamplin presented at the meeting of the Electrical Electronic Engineers [IEEE] in October 1969.<sup>[5]</sup>

The AEC retaliated almost instantly. Gofman was called before the equivalent of the medieval inquisition, AKA a congressional committee. He later described it an interview for the book, *Nuclear Witnesses*:

The system used to discredit scientists like us is usually to call you before the Joint Committee on Atomic Energy—it's a Congressional committee—and they let you present your evidence, and then they get all their lackey scientists...to come in and say why you're wrong.

So I got the call just like I expected to from the Joint Committee. Would I come in on January 18, 1970 to testify?<sup>[6]</sup>

In about three weeks Gofman and Art Tamplin wrote fourteen scientific papers. “We took some data on breast cancer,” Gofman said.

There was a whole study of radium workers and their deaths. A guy at MIT had said they wouldn't get cancer below the safe threshold. We pointed out his papers were wrong. There were the uranium miners, who were getting lung cancer. And we analysed that and showed how it also supported the idea that there was no safe dose. We studied the dog data. Studies were being done at the Utah laboratory and sponsored by the AEC—they were irradiating dogs and studying how many cancers appeared. We took a whole bunch of new human and animal data and wrote [fourteen additional] papers that buttressed our position, that indicated, as a matter of fact, that we'd underestimated the hazard of radiation ...<sup>[7]</sup>

Gofman and Tamplin mailed that paper to 200 scientists outside the Joint Committee. Within days Gofman received a phone call by one of the recipients who told him a story on condition to remain anonymous. The caller said:

Someone from the Atomic Energy Commission came to my house last weekend. He lives near me. And he said, “We need you to help destroy Gofman and Tamplin.” And I told him you'd sent me a copy of your paper, and I didn't necessarily agree with every number you'd put in, but I didn't have any major difficulties with it either. It looked like sound science. And—you won't believe this—but do you know what he said to me?

He said, “I don't care whether Gofman and Tamplin are *right* or not, scientifically. It's necessary to destroy them. The reason is, by the time those people get the cancer and the leukemia, you'll be retired and I'll be retired, so what the hell difference does it make *right now*? We need our nuclear power program, and unless we destroy Gofman and Tamplin, the nuclear power program is in real hazard from what they say.” And I told him no. I refused. I just want you to know if you ever mention this, I'll deny it. I'll deny that I ever told you this, and I'll deny that he said it to me.<sup>[8]</sup>

Gofman and Tamplin overwhelmed the Congressional Committee with data<sup>[9]</sup> and they, and the scientists lined up to discredit them, needed time to respond. Meanwhile both Gofman and Tamplin kept publishing and speaking on the hazards of ionizing radiation.

In June 1970 Gofman testified before the Pennsylvania State legislature, recommending that all construction of nuclear power plants cease – at least for 5 years.<sup>[10]</sup> Ralph Nader entered the action asking what Congress would do about the safety problem with nuclear power.

Meanwhile Livermore Lab could not find a way to fire Gofman and Tamplin. Gofman continued his research on cancer and chromosomes at the Lab. That work of course is very important up to today since it is understood now that radiation causes chromosome damage.

In 1971 John Gofman and Arthur Tamplin published their ground breaking book on nuclear

power: [\*Poisoned Power\*](#) made the best researched case for shutting down nuclear power plants and was used by the emerging anti nuclear movement. The book also inspired the first movie that made vivid the danger from nuclear power plants, *The China Syndrome*, starring Jane Fonda, Jack Lemmon and Michael Douglas. *Poisoned Power* covers all aspects of nuclear operation from mining, radiation, to waste, including advice for citizen's action and alternatives such as solar. Most of it as timely now as it was in 1971.<sup>[11]</sup>

In his interview with KPFA Radio's public affairs producer Elizabeth Eielson in 1973, Gofman explained some of his many findings:

But what you must understand is that a nuclear plant that's been operating—one of the large ones that's being built now—that's been operating, say, for between three months and a year, has within it, a repository of radioactivity equivalent to that of approximately a thousand Hiroshima bombs, the radioactivity of a thousand Hiroshima bombs.

Now very often the utilities industry in endeavoring to mis-state the position of the critics—that the critics say the nuclear power plant's going to explode like an atomic bomb. That isn't so at all. The nuclear power plant won't explode like an atom bomb. But, unfortunately, it doesn't have to.

If a nuclear power plant should lose its cooling water, through the action say, of a saboteur, an airplane crashing into the cooling water, or failure of the cooling system, the nuclear power plant will shut itself down. That sounds as though everything is fine. But that's where the trouble only begins. Because there is so much contained radioactivity in there that even after the plant shuts itself down the heat generated by that radioactivity will heat up that nuclear power plant at a rate of about 50 degrees per second. So it will very rapidly heat itself up to several thousand degrees and everything in the core of the reactor will melt and it will keep itself hot as a result of the further radioactive decay.

The accident that this could cause has been named, semi-facetiously, the China Syndrome. When asked why this is called that, they said because the darned thing could melt itself all the way through to China. Now in truth it won't melt all the way through to China. It's estimated that it will cool itself down and probably wouldn't melt more than a half a mile into the earth. The trouble is along the way there's water around and molten metal which is generating hydrogen by reacting with water and hydrogen is explosive as you know. So you have the probability of a chemical explosion of the hydrogen and the steam, spewing radioactivity out of this plant.

Remember: the inventory at full operation is something of the order of a thousand Hiroshima bombs-worth of radioactivity. That's such an astronomical amount of radioactivity that it's really just hard to contemplate what the numbers mean.

But I might put it this way. Now that we're going ahead building these nuclear power plants, 10 to 30 miles from major metropolitan centers like New York, Philadelphia,

Chicago, and we will in time build them close to Los Angeles, we now have a situation, if one of these accidents occurs and the wind is blowing in the right direction we can blanket a major city like New York, Philadelphia, and Chicago—any one of them—with radiation such that if the people stay there, for 12 hours or more, they're going to accumulate a dose of radiation in the neighborhood of several hundred of the radiation units we call the RAD. That means that what you do in the event of such a nuclear power plant failure is you must organize the evacuation say of a city like Philadelphia or New York and get the people out within say 6 to 10 hours because you can't afford to have them stay there 12 to 24 hours and get this fatal dose.

It's an interesting thing to contemplate how you'd get everybody off the island of Manhattan at a given point when there might be say 6 to 8 million people there and get them all out—these refugees from radioactivity—inside of a few hours. That's in the short term.

Then even for those who get lower doses, perhaps they haven't been right in the cloud of a such a disaster; if they get lower doses they may not show any injury acutely in days, weeks, or months. As a matter of fact if you ask them how they feel they'll say, I feel fine. And they do. But what they have now built into them is a new risk. Because for every RAD that they accumulate of radiation, they've engendered for themselves a two percent increase in the chance of developing cancer between 5 and 30 years later.

So if you take a group of people, for example, who don't get enough radiation to die of acute radiation sickness, say they get 50 RADs. They're going to have 50 times 2 or 100 percent increase in their cancer occurrence rate between 5 and 30 years later. So that in this group of people for every person who would die of cancer ordinarily, two will die of cancer or leukemia.

The other thing that you do is approximately at the same rate, about a two percent increase per RAD, you increase genetic mutations. So the offspring of these people for generations will suffer from the genetic diseases that can be caused by mutations. So the cancer and genetic hazard are the prominent, important late effects, the acute radiation sickness the early effect.

None of this occurs if everything goes perfectly. And what the nuclear power people would have us believe is that all acts of God will be avoided, no humans will ever make errors because they're infallible, all machinery will work perfectly under all circumstances and there will be no failures of equipment whatsoever, no airplanes will stray and crash, and there will be no psychotics or saboteurs and no conventional, guerrilla, or military activity.

Gofman also answered a question that has become so very close to our concerns today, the manner in which radiation travels and accumulates in living beings and the environment.

Elizabeth Eielson asks him:

**EE:** I've heard that even if [a] very small amount of radioactivity is given off by a nuclear power plant that it concentrates in food chains in a way that...

**JWG:** It depends on the chemical element of which this radioactivity is a member. Certain radioactivities like iodine concentrate extensively in the thyroid gland. Other radioactivities can build up from lower animals to man and concentrate quite extensively. So we have a whole host of situations.

For example, in fresh water the long-lived radioactivity known as cesium-137—one of the most hazardous of radioactivities produced in large quantities in nuclear power—behaves very similar to the element potassium. Therefore fish, which are growing and developing in this fresh water contaminated with cesium-137—just as these fish have to concentrate potassium to put in their muscle cells, the concentrate the cesium to the same extent.

So you can have the cesium-137 in fresh water at a certain level, but the concentration in fish flesh will be a thousand times as high.

These two clips came from Gofman's interview with KPFA Radio's public affairs producer Elizabeth Eielson.

That was part two of a radio series on the late Dr. John Gofman, Professor of Molecular and Cell Biology at UC Berkeley and director of two major studies on the effects of radiation at Lawrence Livermore Lab.

Gofman's research, expertise and legacy in print and recording are of great importance in order to understand and handle the Fukushima nuclear accident which is a cause of concern for all.

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on TUC Radio's secure website, [tucradio.org](http://tucradio.org).

My name is Maria Gilardin. Thank you for listening. Give us a call.

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6. Leslie Freeman, [Nuclear Witnesses: Insiders Speak Out](#) (New York: W.W. Norton & Co., 1981, 1982). All page numbers listed herein are from the 1982 paperback. p.[100](#).
7. *Ibid.*, p.[101](#).
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9. In all, Gofman and Tamplin wrote 24 technical reports, which came to be known as "[The G-T Series](#)." The complete list was published in John Gofman, [Irevey: An Irreverent, Illustrated View of Nuclear Power: A Collection of Talks, from Blunderland to Seabrook IV](#), (San Francisco: CNR, 1979), pp.243-245. These reports were submitted to two Congressional Committees: the *Environmental Effects Of Producing Electric Power*, Hearings before the Joint Committee on Atomic Energy, 91st Congress in October and November 1969; and the *Underground Uses of Nuclear Energy*, Hearings before the Subcommittee on Air and Water Pollution of the of the Committee on Public Works, U.S. Senate 91st Congress, Part 1, November 1969, and Part 2, August 1970. As was explained in the published listing of these reports, "It is no error...that the date given to an entire volume may be earlier than the dates on materials included in that volume. Congress can operate that way." Their strategy was well conceived as in this manner, the papers were given wide distribution by being published in their entirety in the Congressional Record.
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11. John W. Gofman and Arthur R. Tamplin, [\*Poisoned Power. The Case Against Nuclear Power Plants Before and After Three Mile Island\*](#), (Emmanus, PA: Rodale Press, 1979). The book was reprinted in 1979 with new data, a new Foreward, and “Before and After Three Mile Island” added to the subtitle. A combination of the 1971 and 1979 editions of *Poisoned Power*—since they were not identical—is available online through the above link.