Historyofscience.com ▼ Jeremy Norman & Co., Inc. ▼ Historyofinformation.com
History of Science, Medicine & Technology ▼ History of Media
Rare Books, Manuscripts, Appraisals ▼ P. O. Box 867, Novato, California 94948–0867
Email: jnorman@jnorman.com ▼ Telephone: 415–892–3181 ▼ Fax: 415–276–2317

November 4, 2016

…. Of the many medical and scientific archives that I have appraised during the past forty plus years, the archive of John W. Gofman stands out for his great scientific discoveries, and for his extraordinarily articulate scientific papers, books, speeches, legal testimonies, and interviews on topics concerning large scale health problems in atherosclerosis and heart disease and the carcinogenic effects of ionizing radiation. The archive is a major source of primary research material for subjects in which there is extensive political and scholarly interest, including the controversies fought out during his career concerning the safety of nuclear power plants, and the health dangers of exposure to ionizing radiation from nuclear fallout and from nuclear power plants, and from plutonium exposure from breeder-reactors. Dr. Gofman also campaigned against excessive exposure to ionizing radiation from unwise radiation therapy treatments, from excessive exposure associated with various diagnostic radiologic procedures, and from fluoroscopy employed during therapeutic procedures. These issues remain of great research interest both the socio-political and scientific points of view. Besides these scientific contributions to important socio-political issues, Gofman's discoveries of lipids as risk factors in atherosclerosis were probably deserving of the Nobel Prize for medicine, though he never received that award

A nuclear/physical chemist as well as a physician, Gofman co-discovered several radioisotopes, including Pa-232, U-232, Pa-233, and U-233 and proof of the slow and fast neutron fissionability of U-233 while working on his PhD dissertation under Glenn Seaborg. He was the third person ever to work with plutonium, and, having devised an early process for separating plutonium from fission products at J. Robert Oppenheimer's request, Gofman was the first chemist ever to isolate milligram quantities of plutonium, a key component in the atomic bomb.

Other topics to which Gofman made very significant contributions included lipoproteins, atherosclerosis, and coronary heart disease; the ultracentrifugal discovery and analysis of serum lipoproteins, including the identification of LDL, VLDL, and HDL and the discovery of LDL as a measurable risk factor in atherosclerosis. For this great work in 1974 the American College of Cardiology named Gofman as one of the twenty-five leading researchers in the field during the previous quarter-century.

Gofman also researched the relationship of human chromosomes to cancer, the biological and medical effects of ionizing radiation, with particular reference to cancer, leukemia, and genetic diseases, and the corresponding need to reduce radiation exposure very

significantly from both environmental and medical sources, and the lung-cancer hazard of plutonium. He warned of the extreme danger of the release of plutonium into the environment, the effect of which can last for hundreds of thousands of years. Paralleling his achievements as a scientific investigator, Gofman was an exceptionally able and prolific writer for both technical and popular audiences. The archive contains the manuscripts of many scientific papers, popular essays, and books, including unpublished works. It also contains the manuscripts of many short pieces, including "letters to the editor" which Gofman frequently sent in to newspapers and periodicals. Parenthetically, it should be noted that though Gofman was an outspoken advocate for minimizing exposure to unnecessary ionizing radiation, and therefore opposed the construction of new nuclear reactors, he always supported the continuing development of nuclear weapons.

At the time of my examination the John W. Gofman papers were stored in approximately 140 large banker's boxes, all of which I opened and reviewed. The donation comprises perhaps 200,000 or more sheets of paper, including correspondence, manuscripts of Dr. Gofman's many published books and papers, as well as the manuscripts of three unpublished books by Dr. Gofman, offprints of many of his scientific papers, scrapbooks documenting his work on lipids, laboratory notebooks for his discoveries relating to the Manhattan Project, clippings of the many newspaper and magazine articles written about him and his work, many publications and mailings issued by Gofman's Committee for Nuclear Responsibility, and CDs of audio recordings of Dr. Gofman's many radio interviews, as well as hundreds of photographs. There are also publicity pieces for Gofman's many books, and copies of the books themselves as well as a few books inscribed to Gofman by the authors such as Glenn T. Seaborg, Linus Pauling and Studs Terkel. Copies of papers and drafts in the archive include a great deal of material that is preserved nowhere else. Unpublished correspondence in the archive fills 40 or more banker's boxes.

I also understand that the archive includes 44 video cassettes of indeterminate length, some perhaps quite short, and others lasting an hour of more from videos of speeches and television interviews with Dr. Gofman. These I understand will be included in the donation after they have been converted from videocassettes to DVDs. The video material was not available for my examination when I visited. I did see printed transcripts of several television interviews of Dr. Gofman in the archive.

Besides the huge amount of high research value content, the Gofman archive is also of interest because its most significant written components were recorded before the year 2000, and are thus nearly all on paper rather than in the form of emails. Furthermore Dr. Gofman wrote many of his first drafts of his many writings in a most remarkably legible longhand. As a result, the archive is a kind of period piece reflective of the old-style of writing before the explosion of personal computing and the Internet.

Because of the size of this archive, and the limited time available, there was no way to provide even a basic inventory of the material involved while preparing this appraisal. Besides this aspect, Gofman's medical and scientific career was unusually complex. In order to describe the unique historical significance of the archive it was necessary to outline Dr. Gofman's exceptionally technical and varied scientific career in the context of the socio-

political environment of his time. This I decided to do through a chronological outline of Dr. Gofman's most significant achievements and key publications in the context of certain relevant political/scientific developments. Within this timeline I have noted certain archival items that I found especially notable. After that I have stated my qualifications as an appraiser, and provided a statement of my appraisal methodology and establishment of the fair market value of the archive. I have also included a list of published references that I consulted in the process of preparing this appraisal.

John William Gofman:
Timeline of Significant Events, Discoveries and Publications

1918. Birth

1939. Gofman graduated with a B.A. in chemistry from Oberlin College

1941-43. Gofman was Group Co-Leader of the Plutonium Project (for the Manhattan Project) at the University of California, Berkeley. This work included meetings at Chicago and Oak Ridge and meetings in Berkeley with J. Robert Oppenheimer from Los Alamos, to exchange information and to help DuPont engineers prepare for the reprocessing operations at Hanford, Washington in order to build the first atomic bombs.

The archive contains copies of Gofman's very early and very rare physics publications with his teacher Glenn Seaborg dating from as early as 1941, as well as other related publications.

1943. Gofman received his PhD in Nuclear/Physical Chemistry from University of California Berkeley. Dissertation: Discovery of Pa-232, U-232, Pa-233, and U-233. Proof of the slow and fast neutron fissionability of U-233. Discovery of the 4n + 1 radioactive series. Gofman's thesis supervisor, Glenn T. Seaborg, considered Gofman one of the most brilliant of all of his students. Gofman's dissertation, of which a copy is in the archive, was perhaps one of the most brilliant and original PhD theses ever produced in the UC Berkeley physics department.

The archive contains 1943 correspondence with physicists at Los Alamos (confidential) concerning physics experiments at Los Alamos and at Gilman Hall, Berkeley where Gofman was working.

The archive also includes a laboratory notebook of Gofman's work at UC Berkeley dated March-April 1944. This notebook was originally classified, but was later de-classified. There are also 4 spiral bound laboratory notebooks from this period that were not classified.

As a result of his PhD work Gofman shared in the following patents:

n° 3,123,535 (Glenn T. Seaborg, John W. Gofman, Raymond W. Stoughton): The slow and fast neutron fissionability of uranium-233, with its application to production of nuclear power or nuclear weapons.

n° 2,671,251 (John W. Gofman, Robert E. Connick, Arthur C. Wahl): The sodium uranyl acetate process for the separation of plutonium in irradiated fuel from uranium and fission products.

n° 2,912,302 (Robert E. Connick, John W. Gofman, George C. Pimentel): The columbium oxide process for the separation of plutonium in irradiated fuel from uranium and fission products.

1945, July 16. The first atomic bomb was exploded at the Trinity Site at the Almagordo Bombing and Gunnery Range in the Jornada del Muerto desert about 35 miles (56 km) southeast of Socorro, New Mexico.

1945, August 6 and 9. The United States dropped atomic bombs on the Japanese cities of Hiroshima and Nagasaki.

1946. Gofman received his M.D. from the School of Medicine, University of California, San Francisco. Upon graduation Gofman was the winner of the Gold Headed-Cane Award, a high honor for the graduate who showed a passion for patient care, academic excellence and community service.

1946-47. Gofman interned at University of California Hospital, San Francisco.

1947. The United States Atomic Energy Commission (AEC) was established by Congress to foster and control the peacetime development of atomic science and technology. President Harry S. Truman signed the McMahon/Atomic Energy Act on August 1, 1946, transferring the control of atomic energy from military to civilian hands, effective from January 1, 1947. This gave the first members of the AEC complete control of the plants, laboratories, equipment, and personnel assembled during the war to produce the atomic bomb.

1947-51. Gofman was Physician in Radioisotope Therapy, Donner Clinic, University of California, Berkeley.

1947-54. Gofman was Assistant Professor, Division of Medical Physics, University of California, Berkeley.

1950, October 21. Gofman's work on lipoproteins and heart disease was publicized in a feature article mentioned on the cover of the very wide circulation popular magazine *The Saturday Evening Post*, (a copy of which is in the archive).

1952. Lawrence Livermore National Laboratory was founded as the University of California Radiation Laboratory at Livermore, an offshoot of the existing UC Radiation Laboratory at Berkeley. It was intended to spur innovation and provide competition to the nuclear weapon design laboratory at Los Alamos, New Mexico, hub of the Manhattan Project that developed the first atomic bombs. Physicists Edward Teller and Ernest Orlando Lawrence, director of the Radiation Laboratory at Berkeley, were the co-founders of the Livermore facility.

1954-1973. Gofman was Professor, Division of Medical Physics, University of California, Berkeley. It should be noted that he was appointed full professor at the early age of 36.

1954-1957. Gofman was Medical Director, Lawrence Radiation Laboratory, Livermore.

1954-1966. Gofman was Clinical Instructor, Dept. of Medicine, University of California Medical School, San Francisco.

1954. Gofman received the *Modern Medicine Award*, for outstanding contributions to heart disease research.

1955. With Frank T. Lindgren Gofman published "The serum lipoprotein transport system in health, metabolic disorders, atherosclerosis and coronary artery disease," *Plasma*, 2, 413-484.

This was a long review of research conducted by Gofman and his team from 1949 to 1955; it footnotes 31 previously published papers by Gofman and associates. Gofman has been called the "father of clinical lipidology." He discovered and described the major classes of plasma lipoproteins: intermediate-density lipoproteins (IDL), low-density (LDL) and high-density lipoproteins (HDL), as well as VLD (very low density lipoprotein). He characterized LDL as carrier of "bad cholesterol" leading to atherosclerosis; however, he did not find that higher levels of HDL have predictive value as "good cholesterol" as is widely believed today. He drew attention to VLDL as risk factor, noting that diabetics are frequently marked by higher VLDL levels, and also noted the rise in atherogenic lipoproteins at much earlier age in men than women.

The archive includes 4 volumes of scrapbooks on Gofman's lipoprotein research from 1953-1956. These include newspaper, magazine, and scientific articles on Gofman's lipoprotein work. From the large number of newspaper and magazine articles it was evident that Gofman achieved remarkable fame by his early thirties.

The archive also includes a box containing about 50 glass slides pertaining to Gofman's original lipid discoveries. These slides, in an old wooden slide box, are invaluable.

1958. Gofman's first book: Gofman, with Alex V. Nichols, and E. Virginia Dobbin, published *Dietary Prevention and Treatment of Heart Disease* (New York: G. P. Putnam's Sons, 1958). This appears to be the first book to promote dietary changes, including reduction of fats, in the prevention of heart disease.

1959. Gofman's second book: *Coronary Heart Disease*. Springfield, IL: Charles C Thomas, 1959.

1961, December. *Operation Plowshare* begins with nuclear test "Gnome" in Carlsbad, NM.

At the peak of the "Atomic Age", following the first atomic bomb detonations at Hiroshima and Nagasaki in 1945 to end World War II, the United States initiated a program of "peaceful nuclear explosions" known as *Project Plowshare*. The United States Atomic Energy Commission chairman, Lewis Strauss, announced that the Plowshare project was intended to highlight the peaceful applications of nuclear explosive devices and thereby create a climate of world opinion that was more favorable to weapons development and tests. Proposed uses for nuclear explosives under Project Plowshare included widening the Panama Canal, constructing a new sea-level waterway through Nicaragua nicknamed the Pan-Atomic Canal, cutting paths through mountainous areas for highways, creating new harbors, and connecting inland river systems. Other proposals involved blasting underground caverns for water, natural gas, and petroleum storage. Serious consideration was also given to using these explosives for various mining operations. One proposal suggested using nuclear blasts to connect underground aquifers in Arizona. Another plan involved surface blasting on the western slope of California's Sacramento Valley for a water transport project. These projects were conceived and planned without taking into account the potentially disastrous carcinogenic and environmental effects of nuclear fallout. Under Project Plowshare 27 nuclear bomb tests occurred before the project was finally terminated in 1977. Parallel to developments in the United States, the Russians undertook a similar program entitled *Nuclear Explosions for the National Economy* (sometimes referred to as Program #7.

Promoting the aggressive development of nuclear power plants, in 1973 the US Atomic Energy Commission (AEC) predicted that, by the turn of the 21st century, one thousand reactors would be producing electricity for homes and businesses across the USA. This enormous potential build-up of nuclear reactors in the United States has been called "The Plutonium Economy." However, as it evolved in the United States, nuclear technology produced a range of technical, medical, environmental and social/political problems, from the nuclear arms race with Russia to nuclear meltdowns, the more subtle but equally dangerous carcinogenic effects of radiation exposure, and the unresolved difficulties of atomic bomb manufacturing plant cleanup and civilian nuclear power plant waste disposal and decommissioning. From 1973 onward nuclear reactor orders declined sharply. Many orders and partially completed plants were cancelled. Of the 253 nuclear power reactors originally ordered in the United States from 1953 to 2008, 48 percent were canceled, 11 percent were prematurely shut down, 14 percent experienced at least a one-year-or-more outage, and 27 percent are operating without having a year-plus outage. Thus, only about one fourth of those ordered, or about half of those completed, are still operating and have proved relatively reliable. By the late 1970s nuclear power was faced with economic difficulties and widespread

public opposition, coming to a head with the Three Mile Island accident in 1979 and the Chernobyl disaster in 1986.

Dr. Gofman and his associate Dr. Arthur R. Tamplin became the most outspoken critics of the nuclear reactor program after their research indicating that ionizing radiation was much more carcinogenic and mutagenic than was then currently believed. The archives extensively document their research, writings, speeches and court and congressional testimony on this issue.

1962, October 16-28. The Cuban missile crisis, in which Russia based nuclear missiles in Cuba, brought the world perilously close to nuclear war.

1963 – Dec. 1965. Gofman was Director, Bio-Medical Research Division, University of California, Lawrence Radiation Laboratory, Livermore.

1963. Around this time physicists Linus Pauling and Andrei Sakharov warned about the hazards of radioactive fallout from atomic bombs—risks that the U.S. Atomic Energy Commission repeatedly denied.

1963. The United States and Russia signed The Partial Test Ban Treaty (PTBT) or 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water. This treat prohibited all test detonations of nuclear weapons except for those conducted underground.

1963 - Sept. 1969. In addition to his professorship at the University of California at Berkeley, Gofman was Director for Biology and Medicine, at the Lawrence Livermore National Laboratory, where he was also an associate director of the entire facility. Soon after Gofman joined the Livermore laboratory an official at Livermore asked Gofman to help suppress publication of the work of AEC scientist Harold Knapp, who concluded that doses of radioactive iodine falling in Utah from bomb tests in Nevada were much higher than the AEC had publicly admitted. Despite the warning that "we can't afford to have him publish that evidence," Gofman reviewed Knapp's analysis with his staff, and found it accurate. Refusing to yield to political pressure, Gofman urged publication of the data, which was reluctantly allowed by the AEC.

Circa 1964-65. While Operation Plowshare was formulating a plan to expand the Panama Canal with hydrogen bombs, Gofman went on record as calling that plan "biological insanity."

1965. Gofman received the *Lyman Duff Lectureship Award of the American Heart Association* in 1965, for research in atherosclerosis and coronary heart disease. His lecture was published as "Ischemic Heart Disease, Atherosclerosis, and Longevity," *Circulation* **34** (1966) 679-697.

1965-66. Project Plowshare and all its projects were shelved as a condition of the *Treaty on the Non-Proliferation of Nuclear Weapons*, an international treaty whose objective is to

prevent the spread of nuclear weapons and weapons technology, to promote cooperation in the peaceful uses of nuclear energy, and to further the goal of achieving nuclear disarmament and general and complete disarmament. The treaty opened for signature in 1968, and entered into force in 1970.

1969 - January 1973. Gofman was Bio-Medical Research Associate, University of California, Lawrence Livermore Laboratory, Livermore.

1970. With his PhD student Arthur R. Tamplin, Gofman published, "Low dose radiation and cancer," *IEEE Trans. on Nuclear Science*, NS-17, Number 1, 1-9.

The authors concluded that exposure to ionizing radiation was very much more carcinogenic than previously acknowledged. The paper was one of the first to press for what is now commonplace: Quantitative estimates of health consequences from various amounts of exposure. In 1969 federal guidelines put the permissible radiation doses to the general public from military and civilian nuclear activities at 170 millirems (0.17 centi-sievert) per year, with this standard based on vague claims that it ought to be OK for these activities to double the population's combined doses from natural background radiation and average medical exposure.

At a time when only genetic effects on cancer were a primary concern, the paper enunciated three "general laws of radiation-induction of cancer in man." Over time these laws became widely accepted:

> "Law I. All forms of cancer, in all probability, can be increased by ionizing radiation, and the correct way to describe the phenomena is either in terms of the dose required to double the spontaneous incidence rate of each cancer or, alternatively, as the increase in incidence rate of each cancers per Rad of exposure.
>
> "Law II. All forms of cancer show closely similar doubling doses and closely similar increases in incidence rate per Rad.
>
> "Law III. Youthful subjects require less radiation to increase the incidence rate by a specified faction than to adults."

Gofman and Tamplin published about 15 papers on these issues within a year. A less technical paper on the subject was "Radiation, cancer, and environmental health," *Hospital Practice*, 5, 91-110. Through these papers, speeches, and interviews as well as their books on the subject, Gofman and Tamplin were instrumental in inducing the scientific community both to acknowledge the somatic (i.e. leukemia and cancer) risks of ionizing radiation and to adopt the so-called Linear No-Threshold (LNT) model as a means of numerically estimating actual cancer risks from low-level radiation, which was a watershed event in radiation-safety science and politics. The LNT model has since become the foundation of international guidelines for radiation protection.

Gofman and Tamplin's work raised such a furor that Robert Finch, then Secretary of Health, Education and Welfare, requested the National Academy of Sciences to form the BEIR-1 Committee (BEIR, *Biological Effects of Ionizing Radiation*).

1970. Tamplin and Gofman published *'Population Control' through Nuclear Pollution*. Chicago: Nelson-Hall, 1970. With a Foreword by Paul R. Ehrlich, author of *The Population Bomb*.

1970-74. Gofman served as Scientific Consultant to Vida Medical Systems; co-invented the VIDA heart monitor, a pocket-worn computer to detect and announce the occurrence of serious cardiac arrhythmias; invented a cardiographic skin electrode subsequently used widely throughout the USA.

> *The archive includes Gofman's laboratory notebook documenting his research on Vida products as well as his correspondence concerning the project and company promotional materials. There are also about 20 full 3-ring binders of business documents relating to this startup company, which eventually went out of business.*

1971. Gofman founded the non-profit *Committee for Nuclear Responsibility*. Board members included Richard E. Bellman, Ramsey Clark (Former U.S. Attorney General), Paul R. Ehrlich (a scientist and activist concerning the population explosion), Linus Pauling (Nobel Laureate), Harold Urey (Nobel Laureate), George Wald (Nobel Laureate). The CNR continued until Gofman's death. The two main goals of CNR were:

1. To make actual progress in preventing cancer, by helping other groups and individuals to eliminate the careless X-ray overdosing which occurred in medicine. X-ray dosage, Gofman believed, can be cut in half (or more) without interfering with good diagnostic information. CNR supplied the evidence for such action, and regards "getting the job done" as an ethical imperative — because every action which reduces unnecessary irradiation is guaranteed to prevent a share of future cancers which would otherwise occur.

2. To help other groups and individuals to prevent additional nuclear pollution of the planet. The importance of such prevention was supported by CNR's publication of Dr. Gofman's detailed proof that there is no safe dose (threshold dose) of ionizing radiation with respect to causing mutations and human cancer.

1971. Gofman and Tamplin published *Poisoned Power: The Case Against Nuclear Power Plants*. Edmmaus, PA: Rodale Press, 1971. Second edition, 1979. This book was also published in England with a Foreword by Lord Ritchie Calder. It was one of several books which Gofman and Tamplin published for the general public on the subject.

> *The archive includes a book-length unpublished handwritten manuscript entitled* Why Nuclear Weapons at All? (1971-72). *The file also contains several typescripts of this unpublished book.*

1971. Physicist Glenn T. Seaborg, Chairman of the United States Atomic Energy Commission, and science writer William R. Corliss published a book entitled *Man and Atom: Building a New World through Nuclear Technology.* This laid out a dreamy-eyed peaceful nuclear program even more expansive than Project Plowshare. Chapter 6 was entitled "Planetary Engineering."

1972, November. After two years of study, the BEIR I committee published its famous BEIR I report in November 1972. Although departing from Gofman and Tamplin's work in significant aspects, it nevertheless vindicated their arguments to a large extent. The report's long bibliography cited almost all of Gofman and Tamplin's work. Echoing Gofman and Tamplin, the BEIR I Committee emphasized that the carcinogenic effects of low-level radiation were of much greater concern than leukemia or genetic effects. The current radiation limit was "based on genetic considerations," and the committee concluded that the FRC limit was therefore "unnecessarily high" and could safely be "much lower."

According to the radiobiologist and environmental health specialist Edward Radford, who was a member of the BEIR I committee and the chairman of the BEIR III committee, "Gofman deserved credit for raising the issue of the somatic risks of low-level radiation as early as he did", but "never received the recognition he deserved for his contributions to radiation-safety science" because he was "stigmatized as an extreme antinuclear scientist." This label never accurately applied to Gofman since he was a proponent of nuclear weapons and nuclear deterrence, even though he warned of the health dangers of ionizing radiation and promoted ionizing radiation exposure safety.

Neither Dr. Gofman nor Dr. Tamplin was invited to be on the BEIR Committee and their exclusion from such quasi-official committees became permanent from this time onward.

1972. Gofman received the Stouffer Prize for his work on lipoproteins, atherosclerosis and coronary heart disease.

1972. Gofman published "Time for a Moratorium" in *The Case for a Nuclear Moratorium* issued by the Environmental Action Foundation. "This is a recommendation for a moratorium on the construction and licensing of any new nuclear power plants, breeder and non-breeder, plus a termination of licensing of all nuclear power plants now in operation."

1972. The AEC removed funding from Gofman's cancer research at Livermore. Gofman then applied to the National Cancer Institute for replacement funding but was rejected, as his place on a blacklist extended throughout the federal government.

1973. As a result of his blacklisting, Gofman retired from his Berkeley professorship and Lawrence Livermore Laboratory, and continued work as an independent analysist of radiation health effects through the Committee for Nuclear Responsibility.

1973, May 17. The Final Project Plowshare test "Rio Blanco -1,-2,-3" occurred at Rifle, Colorado.

1975, October 18. Gofman debated physicist Edward Teller, proponent of the aggressive development of nuclear energy and perhaps the primary architect of Project Plowshare, at San Luis Obispo Nuclear Energy Forum before a crowd of 5000. This debate was widely reported in the media.

> *The archive contains correspondence between Gofman and Edward Teller, and media coverage of the debate.*

1975, July. At the height of debate over the massive deployment of potential breeder-reactors, Gofman contributed his independent analyses of the lung-cancer hazard from inhaled plutonium. "The Cancer Hazard from Inhaled Plutonium," *Congressional Record*, July 31, 1975.

1977. Gofman prepared a report, present in the archive, which appears unpublished, on the *Habitability of the Environs of the Rocky Flats Plant*. The Rocky Flats Plant was a nuclear weapons production facility in the western United States, near Denver, Colorado. Operated from 1952 to 1992, it was under the control of the U.S. Atomic Energy Commission (AEC), succeeded by the Department of Energy (DOE) in 1977.

Gofman wrote extensively and testified in relationship to exposures from environmental releases of radioactive materials from this and many other nuclear programs, both civilian and military, including the Hanford Nuclear Reservation and the "Downwinder" exposures to civilians in Utah from the Nevada atmospheric nuclear test site, and from exposures to bomb tests in the Pacific Ocean, both to civilians and to the American military personnel (the "atomic veterans"), all well documented in the Archives.

1977, April. As one of the early acts of his Administration, President Jimmy Carter, who had received training in the Navy as a nuclear engineer, issued a statement on nuclear policy that began with a commitment to defer indefinitely the commercial reprocessing and recycling of plutonium. President Carter's decision marked a distinct break from the conventional wisdom inherited from the early days of the nuclear age that reprocessing of plutonium leading to plutonium fuel cycle was the indispensable key to achieving a plentiful supply of cheap nuclear power to meet the accelerating global demand for electricity.

Despite the demonstrated ability of nuclear reactors to produce energy, the supply of natural uranium to provide fuel for reactors was originally perceived to be in very short supply, which underscored the fact that less than one percent (.007) of this natural uranium was in the form of the isotope U-235 that sustained the energy-producing chain reaction in the reactor. A solution to this highly inefficient utilization of an apparently very limited resource was provided by the convenient fact that the

plutonium produced in a reactor by the capture of neutrons by the other natural uranium isotope U-238, which makes up more than 99 percent of natural uranium, is also a suitable fuel for reactors. Chemical separation of this plutonium (by the same process used to obtain plutonium for weapons) makes available more fissile material for use in reactors. Moreover, the physics is such that these reactors can be designed to produce more fissile material than they consume. These "breeders" can therefore in principle eventually consume all of the U-238 in natural uranium and thereby increase production of energy from a given amount of uranium by a factor of as much as 100. Caught up in the enthusiasm of the new nuclear age, most experts assumed that the solution of this problem would simply be a relatively straightforward engineering exercise that would lead to early introduction of plutonium reprocessing and breeder reactors, thus solving the world's energy problems.

However, plutonium reprocessing and the resulting "plutonium economy" presented a serious new security problem by substantially increasing the danger of proliferation of nuclear weapons. The technology of reprocessing plutonium for power generating reactors is the same as that for producing plutonium for weapons.

The archive extensively documents Dr. Gofman's outspoken opposition to the breeder reactor program both in speeches and publications.

1978, June 25. The archive contains a copy of Dr. Suess's *The Lorax* inscribed on the front endpapers, flyleaves and title page by many students in Seabrook, N. H. Seabrook, about 40 miles north of Boston, later became the site of the Seabrook Nuclear Power Plant, also known as Seabrook Station. Two reactors were planned, but the second unit was never completed due to construction delays, cost overruns and troubles obtaining financing. The construction permit for the plant was granted in 1976, and construction on Unit 1 was completed in 1986.

1978, January 28. The archive contains an unpublished lipoprotein paper showing continuing work by Gofman in that field: "Serum Lipoproteins, Coronary Atherosclerosis, and Ischemic Heart Disease. I. The low-density and very low density lipoproteins. II: The high-density lipoproteins. This was a paper that Gofman delivered at a symposium entitled *New Frontiers on the Relationship of Lipids, Lipoproteins, and the Arterial Wall in Heart Disease*. On this typescript Gofman noted in manuscript that as of 2005 he "stood by virtually everything in this paper."

1979. Gofman published *"Irrevy": An Irreverent Illustrated View of Nuclear Power*. This work was illustrated with cartoons. San Francisco: The Committee for Nuclear Responsibility, 1979.

1979, November. Gofman's independent analysis of the Hanford worker data was published in *Health Physics* 37 (1979) 617-63. The Hanford Site is a mostly decommissioned nuclear production complex operated by the United States federal government on the Columbia River in Washington state. The site has been known by many names, including: Hanford Project, Hanford Works, Hanford Engineer Works

and Hanford Nuclear Reservation. Established in 1943 as part of the Manhattan Project in Hanford, south-central Washington, the site was home to the B Reactor, the first full-scale plutonium production reactor. Plutonium manufactured at the site was used in the first nuclear bomb tested at the Trinity site on July 16, 1945, and in Fat Man, the bomb detonated over Nagasaki.

1979, March 16. The film *China Syndrome* was released 12 days before the Three Mile Island nuclear accident in Dauphin County, Pennsylvania. This film told the story of a television reporter played by Jane Fonda and her cameraman, played by Michael Douglas, who discovered safety cover-ups at a nuclear power plant. The script writer for the film stated that the film was inspired by Gofman's book *Poisoned Power* (1971).

1979, March 28. The *Three Mile Island* accident occurred. This was a partial nuclear meltdown in reactor number 2 of Three Mile Island Nuclear Generating Station (TMI-2) in Dauphin County, Pennsylvania. It was the most significant accident in U.S. commercial nuclear power plant history. The incident was rated a five on the seven-point International Nuclear Event Scale: Accident with Wider Consequences.

1979. Silkwood v. Kerr-McGee Corporation. Gofman was primary expert witness in the famous Karen Silkwood trial. In his autobiography, *Gunning for Justice*, Jerry Spence, the famous personal injury attorney representing Silkwood, stated on p. 159 that "Gofman had a *curriculum vitae* that would have made Albert Einstein look like an amateur. He was both a medical doctor, a heart specialist, and a nuclear chemist. He had written enough articles in both fields to fill a set of encyclopedias, and was the first to isolate a significant quantity of plutonium for the atomic bombs used at Hiroshima and Nagasaki. I referred to him I think correctly, as the Father of Plutonium. He himself had discovered uranium 233.

"I gave the doctor a piece of chalk and he wandered over to the blackboard. It was like giving Leonard Bernstein a baton ...."

1981 March. The Plowboy Interview with Gofman was published by *The Mother Earth News* (circulation over 1,000,000).

1981-83. Gofman issued *Radiation and Human Health*. (San Francisco: Sierra Club Books, 1981).

This was the first comprehensive book summarizing the evidence relating low-level ionizing radiation to cancer and other diseases. Unusually, Gofman issued an "updated and abridged edition" in 1983. This work was also translated into Japanese and published in Japan. The American and Japanese editions are present in the archive along with the manuscript, various drafts, and publicity items concerning the Sierra Club edition.

1982, September. Gofman testified as an expert witness in the Utah Fallout Trial (Judge Bruce Jenkins).

1982. The archive contains a book length unpublished typescript by Gofman entitled *What's Wrong with Arms Control?*

1983. Linus Pauling, winner of two different Nobel Prizes—for physics, and later for peace—published a remarkable tribute to John W. Gofman in the 25th anniversary of edition of his book *No More War!*, pp. 145-48. From this I quote:

"Gofman estimates that 328 kilograms of plutonium-239 or other plutonium isotopes had been released upon the forty-eight coterminous states of the United States by 1972 as a result of fallout from atmospheric testing of nuclear weapons, and that about ten times that amount had been deposited over the whole world, mainly in the Northern Hemisphere. Experimental studies with dogs (beagles) had shown that 0.38 microgram in the lung is enough to cause fatal cancer. Only a small part of the plutonium that is falling toward the surface of the earth gets into the lungs of human beings, but Gofman's calculations of the amount that is inhaled have led him to the conclusion that the plutonium from the bomb tests carried out up to 1972 have caused cancer that has been fatal or will ultimately be fatal in more than 100,000 people in the United States and a total of more than 950,000 in the world as a whole. Accordingly, plutonium must be taken into consideration, together with the radioactive fission products and carbon-14, in estimating the damage to human beings caused when nuclear warheads are detonated on the surface of the earth or in the atmosphere. We must also be similarly concerned about plutonium from the operation of nuclear power plants.

"Dr. Gofman also points out that misleading statements about the danger of plutonium are sometimes made by spokesmen for the government or for the nuclear power plant industry. The statement is made that no person has ever been shown to had died of cancer caused by plutonium. The reason that this statement is misleading is that after a person has contracted cancer it is, with rare exceptions, impossible to say what caused the cancer. Lung cancer caused by plutonium is indistinguishable from lung cancer caused by another carcinogenic agent. It is accordingly usually impossible to say that a particular patient who died of lung cancer had died as a result of the plutonium that he had ingested. Every person in the world now has some bomb-test plutonium in his or her lungs, so that every person is at risk from this cause of cancer as well as from cesium-137 and other substances produced by the explosion of nuclear weapons. Whenever a person dies of cancer there is a chance that death was caused by the plutonium that was inhaled and that had remained deposited in the lungs."

1983, August. Gofman testified as an expert witness in the Navajo Uranium Minors trial (Judge William Copple). According to *The New York Times* account of the trial, Gofman stated that "the magnitude of the radiation exposure is so large as to make even the exposures at Hiroshima and Nagasaki pale by comparison." He said that the government had never educated the uranium miners about the hazards of radiation in the mines. He described as "simply absurd" efforts to tie the lung cancers found in the uranium miners to cigarette smoking, and said that by the 1950s the U. S. Government

knew that radiation-exposed miners in East Europe had suffered higher-than-normal incidences of lung cancer.

1983, December. The film *Silkwood*, inspired by the life of Karen Silkwood, was released; it was directed by Mike Nichols and starred Meryl Streep, Cher and Kurt Russell. Silkwood was a nuclear whistleblower and a labor union activist who died in a suspicious car accident while investigating alleged wrongdoing at the Kerr-McGee plutonium plant where she worked. The film maintained factual accuracy to the story, with some incidents exactly parallel to the real-life experiences of Karen Silkwood. One scene in particular involved the activation of a radiation alarm at the plant. At her death Silkwood herself had forty times the legal limit of radiation in her body. Gofman was one of the leading expert witnesses in the successful 1979 lawsuit brought by Silkwood's family.

The archive contains correspondence between Gofman and Linus Pauling.

1984. Gofman was primary expert witness in the radiation lawsuit *Allen v. United States*.

1984, November. Gofman testified in the Wichita Radium Workers trial (Judge Patrick Kelly).

1985. With Egan O'Connor Gofman published *X-Rays – Health Effects of Common Exams:* San Francisco: Sierra Club Books, 1985. This book was the first quantification of cancer-risk from diagnostic X-rays.

1986, April 26. The Chernobyl accident, a catastrophic nuclear accident, occurred in the No. 4 light water graphite moderated reactor at the Chernobyl Nuclear Power Plant near Pripyat, in what was then part of the Ukrainian Soviet Socialist Republic of the Soviet Union (USSR).

1986, September 9. At the National meeting of the American Chemical Society, Gofman presented a paper in which he forecast about 475,000 radiation-induced fatal cancers over time, in the USSR and Europe, from the Chernobyl accident.

1986. Gofman wrote a satire entitled *The Chernobyl Story: If I Were Running the KGB, A Personal Account of a Million Deaths and Their Coverup" by John Vladomir Gofman*. This was never published, and the 114-page manuscript in the archive is the only copy.

1990. Gofman issued *Radiation-Induced Cancer from Low-Dose Exposure: An Independent Analysis.* San Francisco: Committee for Nuclear Responsibility, Inc., 1990. This book was also translated and published in the Russian language.

1992. Gofman received the *Right Livelihood Award* in Stockholm, Sweden. The Right Livelihood Award was established in 1980 to "honour and support courageous people and organisations offering visionary and exemplary solutions to the root causes of

global problems." It has become widely known as the "Alternative Nobel Prize" and there are now 166 Laureates from 68 countries.

1994. Gofman's book, *Chernobyl Accident: Radiation Consequences for This and Future Generations*, was translated into Russian and published in Minsk, Russia by CNR Books and Vshelshaya Shkola Publishing House. This work was never published in English. Its manuscript is preserved in the archive.

1995. Gofman issued *Preventing Breast Cancer: The Story of a Major, Proven, Preventable Cause of this Disease*. San Francisco: Committee for Nuclear Responsibility, Inc., 1995. "Our estimate is that about three-quarters of the current annual incidence of breast-cancer in the United States is being caused by earlier ionizing radiation, primarily from medical sources." A longer second edition was published in 1996.

1999. Gofman issued *Radiation from Medical Procedures in the Pathogenesis of Cancer and Ischemic Heart Disease: Dose-Response Studies with Physicians per 100,000 Population*. San Francisco: Committee for Nuclear Responsibility, 1999.

2007. *The Journal of Clinical Lipidology*. Official Journal of the National Lipid Association published a special issue on "John Gofman, MD, PhD, The Father of Lipidology." The issue reprinted Gofman's classic paper from 1955.

2007. Death.

Requirements of the Internal Revenue Service

"I also declare that I hold myself out to the public as an appraiser or perform appraisals on a regular basis; and that because of my qualifications as described in the appraisal, I am qualified to make appraisals of the type of property being valued. I certify that the appraisal fees were not based on a percentage of the appraised property value. Furthermore, I understand that a false or fraudulent overstatement of the property value as described in the qualified appraisal or this Form 8283 may subject me to the penalty under section 6701(a) (aiding and abetting the understatement of tax liability). In addition, I understand that a substantial or gross valuation misstatement resulting from the appraisal of the value of the property that I know, or reasonably should know, would be used in connection with a return or claim for refund, may subject me to the penalty under section 6695A. I affirm that I have not been barred from presenting evidence or testimony by the Office of Professional Responsibility."

My Qualifications as an Appraiser

Since 1971 I have specialized in rare books and manuscripts documenting the history of medicine, science and technology from the Middle Ages to the present. I am internationally recognized as one of the leading dealers in these fields.

Over the years I have undertaken many appraisals for individuals and institutions throughout the United States and Canada for the purposes of donation, sale, and insurance. These appraisals have ranged throughout the history of early and modern medicine and science, and have included rare books, autograph letters, manuscripts, scientific instruments, related art works and photographs.

I have also written extensively on different aspects of collecting and dealing in the history of medicine, science and technology. I am the author of the standard bibliography of historical medical and biological literature used throughout the world. It covers classics and landmark discoveries in all fields of medical and biological science from the ancient world up through about 2000. This bibliography is now freely available online at www.HistoryofMedicineandBiology.com. My qualifications and other writings are also discussed on our website, www.HistoryofScience.com.

Appraisal Methodology

References

Advisory Committee on the Biological Effects of Ionizing Radiations. *The Effects on Populations of Exposure to Low levels of Ionizing Radiation.* Washington, D. C.: National Academy of Sciences-National Research Council, 1972. (The BIER I Report.)

Caulfield, Catherine. *Multiple Exposures: Chronicles of the Radiation Age*. New York: Harper and Row, 1989.

Freeman, Leslie J. *Nuclear Witnesses: Insiders Speak Out.* New York: W. W. Norton, 1981. Chapter 4: John W. Gofman, Medical Physicist.

Gofman, John W. *Human Radiation Studies: Remembering the Early Years. Oral History of Dr. John W. Gofman, M.D., Ph.D*. Conducted December 20, 1994. United States Department of Energy, office of Human Radiation Experiments, June 1995.

Hacker, Barton C. Elements of Controversy: The Atomic Energy Commission and Radiation Safety in Nuclear Weapons Testing 1947-1974. Berkeley: University of California Press, 1994.

Human Radiation Experiments in the Department of Energy. Roadmap to the Story and the Records (SuDoc E. 1.20/3:0445). U.S. Department of Energy.

Advisory Committee on Human Radiation Experiments. *The Human Radiation Experiments: Final Report of the [President's] Advisory Committee on Human Radiation Experiments.* New York: Oxford University Press, 1996. Report of "an intensive inquiry into the history of government-

sponsored human radiation experiments and intentional environmental releases of radiation that occurred between 1944 and 1974."

Journal of Clinical Lipidology. Official Journal of the National Lipid Association. Vol. 1, Number 2, May 2007: "John Gofman, M.D. PhD, The Father of Clinical Lipidology."

Mangano, Joseph L. "John Gofman's Nuclear Courage," *The Nation*, September 14, 2007.

Mead, Margaret, and Dubos, René. *The Plutonium Economy*. Study material for the proposed policy statement. New York: National Council of the Churches of Christ in the USA, 1975.

Morgan, Karl Z. and Peterson, Ken M. *The Angry Genie: One Man's Walk through the Nuclear Age*. Norman, OK: University of Oklahoma Press, 1998. Chapter 9: "The Genie Goes to Court" (pp. 135-160) Re Silkwood and Allen legal cases.

Pauling, Linus. *No More War!* 25th Anniversary Edition. New York: Dodd, Mead & Company, 1983. Discussion of Gofman's work on pp. 145-148.

Seaborg, Glenn T. and William R. Corliss. *Man and Atom: Building a New World through Nuclear Technology*. New York: E. P. Dutton, 1971.

Spence, Gerry. *Gunning for Justice* by Gerry Spence and Anthony Polk. New York: Doubleday, 1982. Spence discusses Gofman's work as an expert witness in the Silkwood trial on pp. 159-163.

Terkel, Studs. *Coming of Age: The Story of Our Century by Those Who've Lived It.* New York: The New Press, 1995. "John Gofman, M.D., 76, San Francisco, California," pp. 401-12.

Walker, J. Samuel. *Containing the Atom: Nuclear Regulation in a Changing Environment, 1963-1971.* Berkeley: University of California Press, 1992. (Because Walker is the "historian of the United States Nuclear Regulatory Commission his works are reflective of the regulatory agency's viewpoint.)

Walker, J. Samuel. *Permissible Dose: A History of Radiation Protection in the Twentieth Century*. Berkeley: University of California Press, 1998. See pp. 338-62.