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## An Expanding Light to Dispel the Darkness: A New Movement to Ban Nuclear Weapons

[Nuclear Technology, Radiation Exposure, and Plutonium  
Dynamics of Possible Nuclear Extinction Symposium  
A New Movement to Ban Nuclear Weapons  
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### Four People Who Inspire This Work



Steven Starr



Dr. John Gofman



Dr. Helen Caldicott



Tim Wright

Through their unconditional devotion to respecting and serving Life's needs as expressed in the conduct of their lives, these four earthlings are exemplars of the course to pursue: exercising our intelligence with clarity and coherence to engender a world of inclusion where everyone and everything belongs.

### Nuclear Technology, Radiation Exposure, and Plutonium

PLANET EARTH — 70 years ago today, the first atomic bomb used to kill people was detonated approximately 580 meters above the center of Hiroshima, Japan. From the [Hiroshima Peace Museum website](#):

One second after detonation, the fireball was 280 meters in diameter. The temperature at the center was over one million degrees centigrade. The heat emitted by that fireball raised surface temperatures near the hypocenter to 3,000 to 4,000 degrees centigrade. Five hundred meters from the hypocenter, the blast pressure was 19 tons per square meter. The maximum wind speed was 440 meters per second. This blast simply crushed all wooden buildings within a radius of two kilometers.[1]

The terrorizing capability to obliterate life on Earth with nuclear war was conceived 70 years ago. Its potential began to manifest in the late 1950s, and was wholly produceable by the 1960s when arsenals of multi-megaton hydrogen bombs numbered in the thousands and ICBMs were deployed. The means to create nuclear weapons came from the existence of uranium. The Manhattan project was all about enriching uranium. Since the 1960s the specter of nuclear annihilation has been steadily amplified by technology that continues the manipulation of uranium to generate radioactive elements especially suited to making nuclear warheads. As Dr. Gordon Edwards has noted, “Plutonium is the primary explosive in most nuclear weapons. It is an artificial element, created inside any reactor that uses uranium fuel. The first reactors were built in the U.S. in order to produce plutonium for bombs.”[2]

From 1995 to 2007 I had the great privilege and high honor to work with Dr. John Gofman[3] and his editor, Egan O’Connor, building the web presence of the [Committee for Nuclear Responsibility](#) (CNR). CNR was “a non-profit educational group, organized in 1971 to [provide independent analyses of sources and health effects of xrays and other ionizing radiations.](#)” In a 1979 Pacifica Radio interview Dr. Gofman recounted producing a small amount of plutonium in the fall of 1943 for the people working at Los Alamos on the Manhattan Project.

I remember when J. Robert Oppenheimer came back from Los Alamos and came to see me and said he absolutely needed a miligram of plutonium in a hurry. At that time the total world stock was about a tenth of a miligram—yet a year later we were going to have *grams* of it—and asked if we would prepare it. And we agreed to do it. So we bombarded a ton uranium nitrate on the Berkeley Cyclotron night and day for two months and then we set up a little chemical factory in Gilman Hall in the chemistry department on the campus and we worked night and day around the clock to separate that plutonium out of that ton of uranium and deliver it to Dr. Oppenheimer and Dr. Kennedy: one point two miligrams of plutonium. So it was the world’s largest factor of increase in plutonium production at that moment. The world’s first miligram. I don’t know whether I’m proud of that or sad about it now.[4]

As Maria Gilardin described in [Part One](#) of her May 2012 [TUC Radio Program](#), “Shut Down Nuclear Power Plants, The Life and Work of Dr. John Gofman,”

In spite or because of this lab work Gofman has done more in his lifetime to warn people of the dangers of plutonium and radiation than most other scientists. One reason why Gofman is considered one of the greatest scientists of the 20th Century by independent colleagues and by the Right Livelihood Committee that gave him the [1992 Award](#), is that his work bridged two of the most consequential disciplines for the understanding of the risks of

radiation: nuclear physics and medicine.[5]

Before the fall of 1943, the total world supply of plutonium was less than a quarter of a milligram. A 2011 report by the International Panel on Fissile Material estimates “the global stockpile of separated plutonium at  $485 \pm 10$  metric tons, of which, roughly half was produced for use in weapons. The other half was produced for civilian uses. About 98% of plutonium is held by states with nuclear weapons, and the remaining 2% is mostly held by Japan, which has over 10 tons of plutonium.”[6]

Among his many gifts, John Gofman had the ability to distill the essence of a process or property of the physical, biological world and make it understandable to people not possessing a background in science. One of his significant contributions to the study of the health effects of exposure to radiation was conducting highly detailed studies and publishing his results with all the raw data used to demonstrate how the conclusions made were reached. In a 1994 interview he succinctly described the fact that there is no safe threshold or dose of radiation exposure.

[I]onizing radiation is not like a poison out of a bottle where you can dilute it and dilute it. The lowest dose of ionizing radiation is one nuclear track through one cell. You can't have a fraction of a dose of that sort. Either a track goes through the nucleus and affects it, or it doesn't. So I said 'What evidence do we have concerning one, or two or three or four or six or 10 tracks?' And I came up with [nine studies of cancer being produced where we're dealing with up to maybe eight or 10 tracks per cell](#). Four involved breast cancer. With those studies, as far as I'm concerned, it's not a question of 'We don't know.' The DOE has never refuted this evidence. They just ignore it, because it's inconvenient. We can now [in 1994] say, [there cannot be a safe dose of radiation. There is no safe threshold](#). If this truth is known, then any permitted radiation is a permit to commit murder.

In 1971, Gofman and colleague, Arthur Tamplin published the seminal book, *Poisoned Power, The Case Against Nuclear Power Plants*. It was republished in 1979 with an extension to the subtitle, “*Before and After Three Mile Island*.” I produced [a complete hypertext representation](#) of the 1979 edition in 1998. [Chapter 8](#), “The Nuclear Legacy — Radioactive Wastes and Plutonium,” contains a section titled, **Plutonium, The Ultimate Hazard:**

The worldwide inventory of plutonium is man-made. It was virtually non-existent in the earth's crust before the U.S. atomic bomb program was initiated. By far the major use of plutonium today is in the manufacture of nuclear bombs.

Plutonium has several nuclides, the most important being plutonium-239 (Pu-239) which is used in the manufacture of nuclear bombs.... Its extremely long half-life, 24,000 years, will keep Pu-239's radioactivity undiminished much longer than the recorded history of modern man.

The cancer producing potential of plutonium is well known. An amount as small as one ten-millionth of an ounce injected under the skin of mice has caused cancer. A similar amount injected into the blood streams of dogs has produced bone cancers. However, it is

the lung that is the most vulnerable to plutonium.

The vulnerability of the lung to plutonium exists because plutonium exposed to air ignites spontaneously. As it burns, it forms numerous tiny particles of plutonium dioxide. These particles are intensely radioactive. If inhaled, they are deposited in the deepest portions of the lung. There they remain, immobilized for hundreds of days, and during this time their radiation is able to affect the cancer-sensitive cells of the lung. The tissue around the particle is exposed to a very intense localized dose of radiation.

Thus in just 7 decades—an infinitesimal blip in geologic time—we humans have created astronomically vast amounts of plutonium, an artificial element, and one of the most deadly dangerous substances imaginable. Further, it is supremely important to understand that a significant portion of the generated plutonium comes from nuclear power plants. Two books highly relevant to this situation are *The Nuclear Power Deception* and *Nuclear Wastelands*.<sup>[7]</sup>

I first began to learn of all this in the 1970s and was overwhelmed by it. I didn't know what to do to respond to the knowledge of the absolute power of nuclear weapons to destroy humanity and all life on earth. In addition, and inextricably related to the weapons themselves, was and is the ever increasing burden to the biosphere of man-made radioactive matter being generated in nuclear reactors. Regarding all this man-made radioactivity, Dr. Edwards has observed, "It is a big, big problem. In fact it's an unprecedented problem. One of the greatest—I believe—one of the greatest unsolved problems that the human race is facing."<sup>[8]</sup> It is the time span of these long-lived radioactive elements that is so difficult to comprehend, especially plutonium which will remain absolutely lethal to all biological life forms for what will be, in effect, eternity.<sup>[9]</sup>

## Dynamics of Possible Nuclear Extinction Symposium

Beginning on February 28 of this year Helen Caldicott convened an extraordinarily vital Symposium at the New York Academy of Medicine in New York City on **The Dynamics of Possible Nuclear Extinction (DPNE)**. It reawakened an urge to once more look deeply at the threat posed by the consequences of playing with the poisoned fire. In May work began on crafting a collection of files to highlight and emphasize the significance of this Conference. The shortcut link to it is: [ratical.org/ne](http://ratical.org/ne). Here you will find [background on the Symposium](#), [complete transcripts with inlined slides of 8 speakers](#) (soon to be 9), [mp3s of all speakers plus the Q&As](#), [additional educational materials](#), and [means to engage with people](#) working to abolish nuclear weapons.

Dr. Caldicott set up the Symposium after reading an article in the *Atlantic Monthly* that itself was based on a short article in the 19 April 2014 *Huffington Post*, written by Stephen Hawking (Director of Research at the [Centre for Theoretical Physics](#) at Cambridge), Stuart Russell (Berkeley computer science professor), Max Tegmark, and Frank Wilczek (both physics professors at M.I.T.) titled, "[Transcending Complacency on Superintelligent Machines](#)." I learned of this background from Maria Gilardin's [first installment](#) of an eight-part mini-series on the Symposium produced in her exemplary [Time of Useful Consciousness Radio program](#). The following is an excerpt of what the four authors wrote:

Artificial intelligence (AI) research is now progressing rapidly. Recent landmarks ... as self-driving cars, a computer winning at *Jeopardy!*, and the digital personal assistants Siri, Google Now and Cortana are merely symptoms of an IT arms race fueled by unprecedented investments ...

The potential benefits are huge; everything that civilization has to offer is a product of human intelligence; we cannot predict what we might achieve when this intelligence is magnified by the tools AI may provide ... Success in creating AI would be the biggest event in human history.

Unfortunately, it might also be the last, unless we learn how to avoid the risks. In the near term, for example, world militaries are considering autonomous weapon systems that can choose and eliminate their own targets; the [UN](#) and [Human Rights Watch](#) and Human Rights Watch have advocated a treaty banning such weapons....

Looking further ahead, there are no fundamental limits to what can be achieved: there is no physical law precluding particles from being organized in ways that perform even more advanced computations than the arrangements of particles in human brains.... One can imagine such technology outsmarting financial markets, out-inventing human researchers, out-manipulating human leaders, and developing weapons we cannot even understand. Whereas the short-term impact of AI depends on who controls it, the long-term impact depends on whether it can be controlled at all.

So, facing possible futures of incalculable benefits and risks, the experts are surely doing everything possible to ensure the best outcome, right? Wrong. If a superior alien civilization sent us a text message saying, “We’ll arrive in a few decades,” would we just reply, “OK, call us when you get here—we’ll leave the lights on”? Probably not—but this is more or less what is happening with AI. Although we are facing potentially the best or worst thing ever to happen to humanity, little serious research is devoted to these issues outside small non-profit institutes ... All of us—not only scientists, industrialists and generals—should ask ourselves what can we do now to improve the chances of reaping the benefits and avoiding the risks [of artificial intelligence].

Steven Starr[[10](#)] was one of the speakers at the Symposium. In 2013 with his help I made a hypertext transcript of the presentation he gave that March at the Helen Caldicott Foundation [Fukushima Symposium](#) [webcast archive is [here](#)] on “[The Implications of The Massive Contamination of Japan With Radioactive Cesium.](#)” In that talk he presents an examination in very clear terms of the what we are dealing with. While he focused on cesium-137, plutonium is also something new to us as a species.

Long-lived radionuclides, such as cesium-137, are something new to us as a species. They did not exist on Earth, in any appreciable quantities, during the entire evolution of complex life. Although they are invisible to our senses, they are millions of times more poisonous than most of the common poisons we are familiar with. They cause cancer, leukemia,

genetic mutations, birth defects, malformations and abortions at concentrations almost below human recognition and comprehension. They are lethal at the atomic or molecular level.

They emit radiation, invisible forms of matter and energy that we might compare to fire, because radiation burns and destroys human tissue. But unlike the fire of fossil fuels, the nuclear fire that issues forth from radioactive elements cannot be extinguished. It is not a fire that can be scattered or suffocated, because it burns at the atomic level – it comes from the disintegration of single atoms.

At the **DPNE** Symposium he spoke on “[Nuclear War: An Unrecognized Mass Extinction Event Waiting To Happen](#).” In it Mr. Starr presents a lucid, compelling assessment of the overriding necessity to educate recent generations growing up since the 1980s who essentially have no knowledge or understanding of the effects or consequences of nuclear war. Excerpting the beginning of his talk:

In 1945, Albert Einstein said, “The release of atomic power has changed everything except our way of thinking.” In 2015, seventy years later, we are still stockpiling nuclear weapons in preparation for nuclear war. Our continued willingness to allow huge nuclear arsenals to exist clearly shows that we have not fundamentally grasped the most important truth of the nuclear age: that a nuclear war is not likely to be survived by the human species.

Remarkably, the leaders of the Nuclear Weapon States have chosen to *ignore* the authoritative, long-standing scientific research done by the climatologists, research that predicts virtually *any* nuclear war, fought with even a fraction of the operational and deployed nuclear arsenals, will leave the Earth essentially uninhabitable.

It is not clear that these leaders are even *aware* of the findings of this research, since they have consistently refused to meet with the scientists who did the studies.

A universal ignorance of basic nuclear facts ultimately creates a very dangerous situation, because leaders who are unaware that nuclear war can end human history are likely to lack the gut fear of nuclear war that’s needed to prevent them from leading us into a nuclear holocaust.

Without this basic knowledge, it is almost impossible for anyone to understand the immense dangers posed by nuclear war. Thus I am now going to take some time to explain these facts, to try to insure my message today is clear.

Two days ago my wife Nina and I were blessed with a visit from my niece on her way from Vermont back to California. In her twenties, and filled with an abundant searching curiosity and energy, she was returning from working at a summer camp for teenagers and related how in conversations they expressed their underlying fear of the world ending as a result of myriad human activities. Of the plethora of issues demanding resolution through the exercise of our intelligence with clarity and coherence, it has always seemed the most fundamental challenge—far exceeding every other item on the list—is the threat of nuclear annihilation.[\[11\]](#)

## **A New Movement to Ban Nuclear Weapons**

As terrifying and paralyzing as the prospect of this reality is, energy wells up from within to seek

paths to address this seemingly impossible-to-solve puzzle. My interest to look at this is fundamentally inspired by Helen Caldicott's example and commitment.[12] One of the 8 (soon to be 9) transcripts is of Tim Wright who spoke about "[A New Movement to Ban Nuclear Weapons](#)." Tim is the Director (Asia Pacific) of the International Campaign to Abolish Nuclear Weapons ([ICAN](#)).[13] The ICAN was launched in Vienna on 30 April 2007. This [timeline](#) conveys a sense of its momentum. Tim spoke in a grounded, engaged, clear, voice. The awareness he expressed was palpable. At the start he acknowledged how reading Helen Caldicott's autobiography informed his own work:

Like most of you here today I come from a country that has experienced and continues to endure the devastating consequences of nuclear weapons. The cancer deaths, birth defects, cultures destroyed, food sources poisoned, Indigenous communities forever displaced from their sacred lands.

I learned of all this in the late 1990s when I read Helen Caldicott's autobiography, [A Desperate Passion](#). I learned of the misery that the British and Australian governments had knowingly and with little care or concern unleashed on our people, particularly our Indigenous People whom they saw as expendable, powerless, less than human.

The [atmospheric nuclear tests in Australia](#), and the hundreds of plutonium experiments that accompanied them, [dispersed radiation across much of our vast continent](#). No one has ever apologized for this and the suffering continues. This is my motivation for speaking out against nuclear weapons.

Dr. Caldicott is the living embodiment of a supremely vital, conscious member of our human family, calling us on to face squarely what we have brought into existence and what we must, if we are successful, abolish if we are to not fulfill what she shared in an e-mail last January. I asked about an exchange she had years ago with [Carl Sagan](#) to which she wrote, "I asked Carl if he thought that there was any other life in the universe and he said after a pause: No because if any other species had reached our stage of evolution they would have destroyed themselves."

As naive or foolish as it may sound, we cannot accept that this is the only possible outcome of the human project here on Earth. I understand that as a white man I have been given extraordinary privileges and opportunities that the majority of my fellow human beings alive today do not enjoy. With this understanding, I endeavor to live out the maxim, those to whom much is given, much is expected in return.

Tim described a promising recent shift in the way nuclear weapons are being thought about and related to by the overwhelming majority of the family of nations that do *not* possess, nor house, these annihilation machines.

Over the past few years, we have seen the start of a fundamental shift in the way that governments talk about nuclear weapons—not the governments of nuclear-armed nations or their nuclear-weapon-loving allies, who remain firmly stuck in cold war thinking, but the rest: the other hundred or more members of the family of nations, constituting the overwhelming majority.

Possessing the bomb, it is worth remembering, is not normal. Almost every nation in the world has made a legal undertaking never to acquire nuclear weapons. But for many years, these nations have taken a back seat in disarmament debates, waiting patiently, idly, hoping that the promise of Prague, and every other promise, would be realized. But no longer. The so-called humanitarian initiative on nuclear

weapons has emerged because of mounting frustration at the failure of nuclear-armed nations to fulfill their decades-old disarmament commitments under [the NPT](#). It has emerged out of recognition that simply bemoaning their inaction, no matter how loudly, is not an effective strategy for achieving abolition. Indeed, why would we expect the nuclear-armed states to lead us to a nuclear-weapon-free world? Why would they willingly, happily give up weapons that they hold so dear, that they perceive as the ultimate guarantor of their security, that they believe give them prestige and status in international affairs?

Meeting as we are at the [Academy of Medicine](#), it is perhaps appropriate to draw an analogy with the banning of smoking in public places, and I do apologize to the smokers here because it's not a very nice comparison. We would never expect the smoking community to initiate and lead efforts to impose such a ban. In fact, we would expect them stridently to resist it. The non-smoking community (the majority)—who wish to live and work in a healthy environment—must be the driving force. That should be obvious. Similarly, it is the non-nuclear-weapon states on whom we must depend to drive a process to ban nuclear weapons, to stigmatize them, to make them socially and politically unacceptable, to make it harder for nations to get away with possessing and upgrading them, and to help the nuclear-weapon states overcome this awful, debilitating addiction.

This flips the traditional arms-control approach on its head. The humanitarian initiative is about empowering and mobilizing the rest of the world to say “enough.” It is about shifting the debate from “acceptable,” “safe” numbers of nuclear warheads to their fundamental inhumanity and incompatibility with basic standards of civilized behaviour. It is about taking away from the nuclear-armed states the power to dictate the terms of the debate and to set the agenda—and refusing to perpetuate their exceptionalism.

In researching sources to link to for Tim’s talk, I looked up what I could find about what he referred to as “weasel states.”

The Non-Proliferation Treaty falsely divides the world into nuclear-weapon states and non-nuclear-weapon states. In reality, there is a significant group in the middle: 30 or so nations that claim the protection of U.S. nuclear weapons. They reinforce the idea of nuclear weapons as legitimate, useful, and necessary instruments. The humanitarian initiative has shone a spotlight on these [enabler states](#), known less affectionately as [“weasel states,”](#) and they are scampering. They are not used to this level of scrutiny. They have always claimed to be committed to disarmament. But are clearly part of the problem—and that we can change.

In doing so, I found my way to [Wildfire](#) and Richard Lennane. I wrote a summary paragraph about this project in the [What To Do section](#) of the **DPNE** collection:

This group is exercising refreshing human intelligence with clarity. The analysis presented is cogent and well-informed as well as highly effective at exposing government hypocrisy. Richard Lennane, listed as Wildfire’s “Chief Inflammatory Officer,” is based in Geneva, Switzerland and also serves as [“Head, Implementation Support Unit, Biological Weapons Convention,”](#) United Nations Institute for Disarmament Affairs (UNODA). Two highly incisive youtube films are [Wildfire statement at HINW14 Vienna](#) (4:56, Dec 2014) and [The Wildfire approach to nuclear disarmament](#) (3:19, 22 Jun 2015). Read a penetrating 2-page summary concerning the What, Why, How, Where, Who, & When of [“A treaty banning nuclear weapons”](#).



## Help Close the Book Now On Man-Made Nuclear Extinction

I wrote Richard asking for his ideas about a Petition my friend and colleague rebecca lord and I have been working on. The Petition is inspired by Steven Starr's talk, "[Nuclear War: An Unrecognized Mass Extinction Event Waiting To Happen](#)," and after asking him for help, Steven sent the text and references we are using for it. Richard wrote back with very helpful ideas, thoughts, and suggestions. We have incorporated some of what he shared in the current form of the present petition. A copy of it is listed in the [What To Do section](#) and the active Petition itself is [on change.org](#).

The current Petition's title is:

Demand the President of the United States publicly acknowledges and addresses the threat the US nuclear arsenal poses to the continued existence of Life on Earth.

Its essential thrust is to serve as an educational tool for all people to apprehend what has not been acknowledged, talked about, nor acted upon since the 1980s when both Ronald Reagan and Mikhail Gorbachev publicly stated that nuclear weapons could never be used. [Two slides](#) from the talk give by Alan Robock[14] on "[Nuclear Famine and Nuclear Winter: Climatic Effects of Nuclear War, Catastrophic Threats to the Global Food Supply](#)," summarize what they said. First was from a [1985 Reagan interview](#) while he was President:

### Ronald Reagan:

When asked about the effects of nuclear war in a February 12, 1985 interview in the *New York Times* said,



"A great many reputable scientists are telling us that such a war could just end up in no victory for anyone because we would wipe out the earth as we know it. And if you think back to ... natural calamities - back in the last century, in the 1800's, ... volcanoes - we saw the weather so changed that there was snow in July in many temperate countries. And they called it the year in which there was no summer. Now if one volcano can do that, what are we talking about with the whole nuclear exchange, the nuclear winter that scientists have been talking about? It's possible ..."

RUTGERS


<http://www.nytimes.com/1985/02/12/world/transcript-of-interview-with-president-on-a-range-of-issues.html?pagewanted=all>

Alan Robock  
Department of Environmental Sciences

and second was [a 2000 interview with State of the World Forum Co-Chair Mikhail Gorbachev](#):

**Mikhail Gorbachev:**

**"Mikhail Gorbachev explains what's rotten in Russia"**  
by Mark Hertsgaard  
Salon.com, Sept. 7, 2000



"Models made by Russian and American scientists showed that a nuclear war would result in a nuclear winter that would be extremely destructive to all life on Earth; the knowledge of that was a great stimulus to us, to people of honor and morality, to act in that situation."

**RUTGERS** <http://dir.salon.com/story/news/feature/2000/09/07/gorbachev/> Alan Robock  
Department of Environmental Sciences

Please do sign [the Petition](#); talk it up with your family and friends, as well as (of course) give it play on whatever social networking conduits you're hooked up to. Previously I was not inclined to make a facebook or twitter page for ratical.org. This will be amended in the near term to give additional visibility and play to [the DPNE collection](#) and its educational purpose: to assist in putting the threat of nuclear annihilation back on the front burner so we can finally, collectively, as the single, precious, fragile, extraordinarily gifted human family that we are, come together and abolish these weapons that another speaker, physicist and cosmologist, Max Tegmark, [15] so pointedly described in his talk, "[Artificial Intelligence and the Risk of Accidental Nuclear War: A Cosmic Perspective](#)":

Here we are on this planet, and we humans have decided to build this device. It's called the Spectacular Thermonuclear Unpredictable Population Incineration Device. I'm a little bit inspired by Dr. Seuss here, I have to confess. This is a long mouthful so let's just abbreviate it: S-T-U-P-I-D.

It's a very complicated device—it's a bit like a Rube Goldberg machine inside. A very elaborate system. Nobody—there's not a single person on the planet who actually understands how 100 percent of it works.

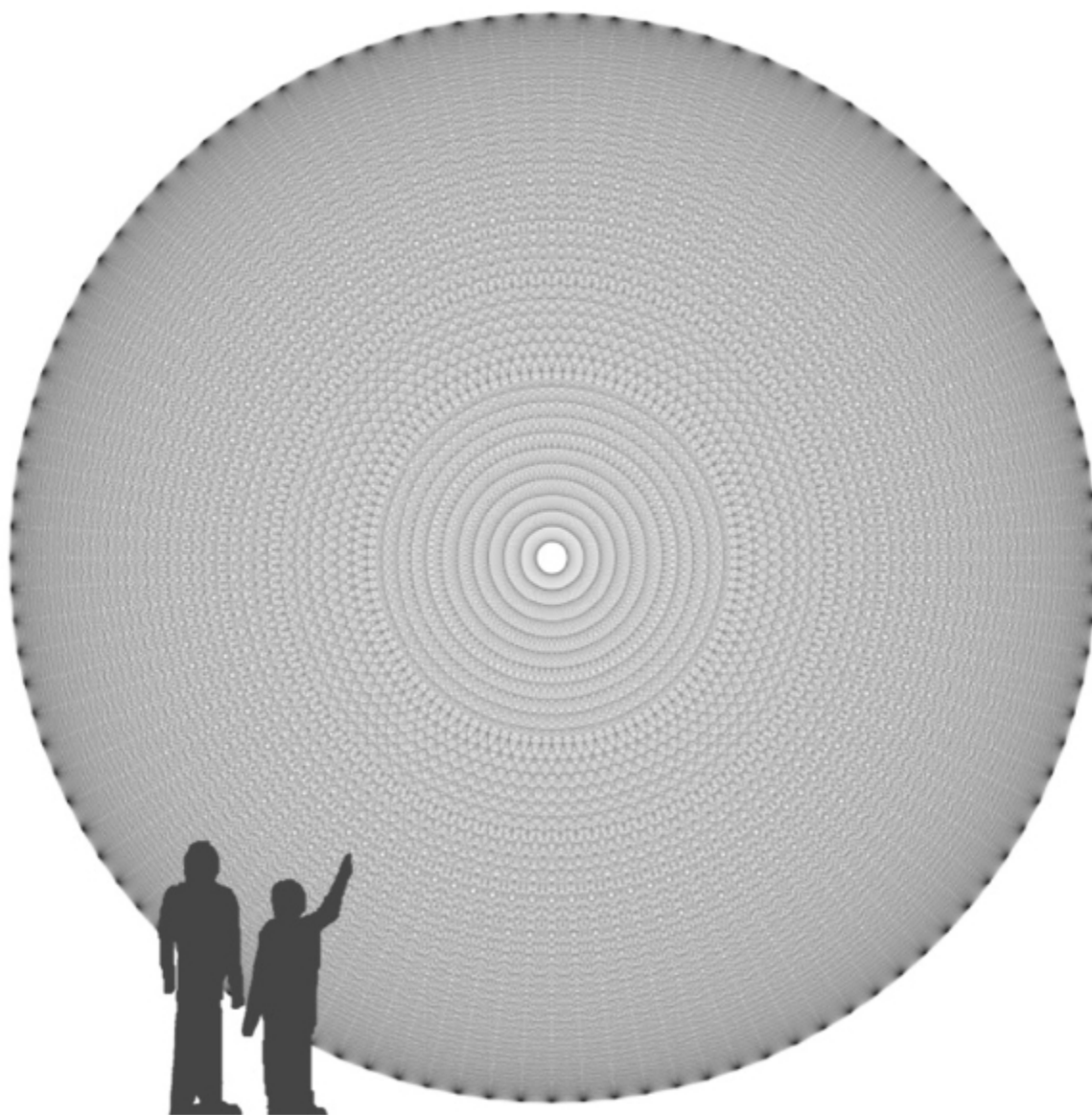
It was so complicated to build that it really took the talent and resources from more than one country, they worked really hard on it, for many, many years. And not just on the technical side—to invent the technology to be able to create what this device does. Namely, massive explosions around the planet.

But also to overcome a lot of human inhibitions towards doing just this. So this system actually involves also a lot of very clever social engineering where you put people in special uniforms and have a lot of peer pressure and you use all the latest social coercion technology to make people do things they otherwise normally wouldn't do.

And so a lot of clever thought has gone into building STUPID. It's kind of remarkable that we went ahead and put so much effort into building it since actually, really, there's almost nobody on this spinning ball in space who really wants it to ever get used.

Educating ourselves and others serves Life's needs here on Earth and gives significance and purpose to our days. It enables us to use our intelligence to act with clarity and coherence. A treaty banning nuclear weapons is a global humanitarian imperative of the highest order. It is achievable and increasingly urgent. The **DPNE's** [What To Do](#) section contains significant means to further the work of implementing a treaty banning nuclear weapons as well as to increase consciousness of the overriding necessity to do so. Once nuclear weapons are banned, there will still be the challenge of solving the problem of nuclear waste that continues to grow as long as nuclear reactors operate and that will be the most lasting and significant legacy our epoch leaves to the future. However dealing with the threat of extinction from nuclear weapons will buy more time to actually address the nuclear waste problem.[16]

Going through old bookmarks, I just re-visited the site of [Chris Jordan photographic arts](#). Quoting from the Contact page, "Chris Jordan's work explores the collective shadow of contemporary mass culture from a variety of photographic and conceptual perspectives. Edge-walking the lines between beauty and horror, abstraction and representation, the near and the far, the visible and the invisible, Jordan's images confront the enormous power of humanity's collective will. His works are exhibited and published worldwide." Re-exploring the site, where there are *many* extremely provocative and profound visual representations of our mass culture reality, I was especially struck by **E Pluribus Unum** as an indicator—as of 5 years ago—of how many people on Earth are engaged in engendering a world of inclusion where everyone and everything belongs. You must visit the page itself to apprehend the magnitude of what is being represented by zooming out from within this visualization.



**E Pluribus Unum**, 2010 24x24 feet, laser etched onto aluminum panels

Depicts the names of one million organizations around the world that are devoted to peace, environmental stewardship, social justice, and the preservation of diverse and indigenous culture. The actual number of such organizations is unknown, but estimates range between one and two million, and growing.

To be sure, there are a wealth of disturbing facts visualized by Jordan. Still, as with all eternal opposites, forever joined like two sides of a coin, there is also the life-affirming expression of the “enormous power of humanity’s collective will” to understand and be informed by. This power is what we must ALL engage, direct, and focus, to close the book on the possibility of extinction by nuclear weapons, for the sake of the children, all we share Earth with, and all that is yet to be born and live out lives here long, long, long after we are gone.

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## References

1. From [August 6, 1945; Hiroshima in ruins](#), Main Building, Image 01, The Hiroshima Peace Museum.
2. Quote from, [Plutonium, The Bomb](#), "[Nuclear Technology ~ A Primer](#)," by Dr. Gordon Edwards, president of the [Canadian Coalition for Nuclear Responsibility](#) (CCNR). The CCNR website provides an invaluable resource "dedicated to education and research on all issues related to nuclear energy, whether civilian or military—including non-nuclear alternatives—especially those pertaining to Canada."
3. Summary of the life work of [Dr. John Gofman](#):
  - o Ph.D. in nuclear/physical chemistry (UC Berkeley, 1943) and M.D. (UCSF, 1946);
  - o Group Co-Leader of the Plutonium Project (for the Manhattan Project) at the University of California, Berkeley, 1941-1943:
    - co-discovered protactinium-232, uranium-232, protactinium-233, and uranium-233;
    - with Robert E. Connick and Arthur C. Wahl shares patent #2,671,251 on the sodium uranyl acetate process for the separation of plutonium in irradiated fuel from uranium and fission products;
    - with Robert E. Connick and George C. Pimentel shares patent #2,912,302 on the columbium oxide process for the separation of plutonium in irradiated fuel from uranium and fission products;
    - and with Glenn Seaborg and Raymond Stoughton shares patent #3,123,535 on the slow and fast neutron fissionability of uranium-233, with its application to production of nuclear power or nuclear weapons;
  - o received several medical awards for pioneering work on the chemistry of lipoproteins and their relationship with heart disease;
    - Modern Medicine Award, 1954;
    - American Heart Association's Lyman Duff Lectureship Award, 1965;
    - Stouffer Prize (shared) for outstanding contributions to research in arteriosclerosis, 1972;
    - American College of Cardiology, 1974, selected as one of twenty-five leading researchers in cardiology of the past quarter-century;
  - o Founder and first Director, Biomedical Research Division of the Lawrence Livermore Laboratory;
  - o Chairman, [Committee for Nuclear Responsibility](#);
  - o Professor Emeritus of Molecular and Cell Biology, UC Berkeley;
  - o [Right Livelihood Award, 1992](#), *'for his pioneering work in exposing the health effects of low-level radiation'*;
  - o author of more than one hundred scientific papers in peer-review journals in the fields of nuclear / physical chemistry, coronary heart disease, ultracentrifugal analysis of the serum lipoproteins, the relationship of human chromosomes to cancer, and the biological effects of radiation, with especial reference to causation of cancer and hereditary injury; as well as fourteen books:
    1. [Dietary Prevention and Treatment of Heart Disease](#) with Alex V Nichols & E Virginia Dobbin (1958)
    2. [What We Do Know About Heart Attacks](#) (1958)
    3. [Coronary Heart Disease](#) (1959)
    4. [A Specific Common Chromosomal Pathway for the Origin of Human Malignancy](#) with Jason L Minkler; Robert K Tandy; Lawrence Radiation Laboratory. Bio-medical Division (1967)
    5. [Population Control Through Nuclear Pollution](#), by Arthur R Tamplin & John Gofman, (1970)
    6. [Poisoned Power, The Case Against Nuclear Power Plants Before and After Three Mile Island](#), with Arthur R. Tamplin, Ph.D (1971, updated in 1979)
    7. [Irrevy: An Irreverent, Illustrated View of Nuclear Power: A Collection of Talks, from Blunderland to Seabrook IV](#) (1979)
    8. [Some Medical Causes And Consequences Of Nuclear War: How Physicians Might Help To Prevent Nuclear War](#) (1980 or 1981)
    9. [Radiation And Human Health](#) (1981)

10. [X-Rays: Health Effects of Common Exams](#) with Egan O'Connor (1985)
  11. [Radiation-Induced Cancer From Low-Dose Exposure: A Independent Analysis](#) (1990)
  12. [Chernobyl Accident: Radiation Consequences for This and Future Generations](#) (in Russian, 1994)
  13. [Preventing Breast Cancer: The Story Of A Major, Proven, Preventable Cause Of This Disease](#) (1996)
  14. [Radiation from Medical Procedures in the Pathogenesis of Cancer and Ischemic Heart Disease: Dose-Response Studies with Physicians per 100,000 Population](#) (1999)
- o Helpful overviews include:
- [What Is Humanity's Most Harmful Law? The Law of Concentrated Benefit over Diffuse Injury](#), with Egan O'Connor, *CNR*, November 1993
  - [Gofman on the health effects of radiation: 'There is no safe threshold'.](#) *synapse*, January 1994
  - [What Is Factually Wrong with This Belief: "Harm from Low-Dose Radiation Is Just Hypothetical — Not Proven"](#), *CNR*, Fall 1995
  - [Answers to Frequently-Asked-Questions about "Radiation"](#), with Egan O'Connor, *CNR*, Fall 1996
  - [A Wake-Up Call for Everyone Who Dislikes Cancer and Inherited Afflictions](#), with Egan O'Connor, *CNR*, Spring 1997
4. See Also: [From Research to Laboratory Production of Plutonium](#), from 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.
  5. For the past 20 years Maria Gilardin has produced a weekly program, freely available as 29-minute broadcast quality [podcasts](#) on the web, called [Time of Useful Consciousness](#) Radio. *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. Her productions are exemplary in the realm of broadcast journalism. I have learned so much from and am forever indebted to Maria for her unparalleled skills in summarizing and distilling the essence of the most significant challenges we are confronted by in our epoch that must be constructively addressed and resolved.
  6. "Global Fissile Stockpile Estimates," section of [Fissile Material Cut-off Treaty \(FMCT\) at a Glance](#), *Arms Control Association*, August 2013. The source of the figures themselves are drawn from the [International Panel on Fissile Material's](#) (IPFM) 2011 [Global Fissile Material Report](#).

In addition, while writing this paper, I received further assistance from Steven Starr ([a speaker at the Symposium](#)) concerning plutonium:

Uranium was the key to generate plutonium although it is possible to make fissionable U233 from thorium in a nuclear reactor. However, they chose plutonium because it is so much cheaper to mass produce, and that is why 99% or more of modern nuclear weapons have plutonium "pits" as their primaries, and why the US and Russia have many tens of thousands of plutonium pits in storage (they kept them after the nuclear weapons were dismantled).

Note that when they talk about plutonium, quite a bit of it (I think at least half) is still in the spent fuel, still unseparated from the spent fuel rods, most of which are sitting in spent fuel pools at nuclear power plants. Japan has separated 10 tons of it, which will allow it to quickly become a nuclear weapon state. I think it is a "virtual nuclear weapon state" now, having produced all the components so that they can be easily and quickly assembled into nuclear weapons. I also think the purpose of the recent [Japanese State Secrets Act](#) was to prevent disclosure of this information, as much as it was to limit discussion and disclosure of what is going on at Fukushima.

See Also: ["United States Circumvented Laws To Help Japan Accumulate Tons of Plutonium,"](#) by Joseph Trento, *DC Bureau*, 9 April 2012.

7. The two books are:

1. [The Nuclear Power Deception](#), *U.S. Mythology from Electricity “Too Cheap To Meter” to “Inherently Safe” Reactors*, by Arjun Makhijani and Scott Saleska, (Apex Press: (1999), 266 pages, paperback.

~ [Borrow a copy from a Library near you](#) ~

This book provides critical analysis and historical evidence to refute claims that nuclear power can alleviate the build-up of greenhouse gases and reduce U.S. dependence on foreign oil. It also reveals the hazards of further proliferation of nuclear weapons from the growing quantities of plutonium generated by existing nuclear power plants throughout the world. Essential background reading for students, teachers, peace and environmental activists, and others concerned about nuclear power.

*The authors base their analysis on a sound grasp of the technology and a sophisticated understanding of the subterranean military, economical, political, and technical issues that lead to the failure of the first nuclear power era. Makhijani and Saleska successfully demystify the technology with lucid and accurate explanations.*

—[Professor Lawrence Lidsky](#), Department of Nuclear Engineering,  
Massachusetts Institute of Technology

A wealth of Selections from the Book are available in PDF form:

- [Summary and Recommendations](#)
- [Chapter 1: Romance with the Atom](#)
- [Chapter 2: Electricity Production and Nuclear Reactors](#)
- [Chapter 7: “Inherently Safe” Reactors: Commercial Nuclear Power’s Second Generation?](#)
- [Types of Nuclear Reactors](#)
- [Table of Nuclear Accidents](#)
- [Appendix A: Basics of Nuclear Physics and Fission](#)
- [Appendix B: Uranium: Its Uses and Hazards](#)
- [Table of Contents](#)

2. [Nuclear Wastelands](#), *A Global Guide to Nuclear Weapons Production and Its Health and Environmental Effects*, editors Arjun Makhijani, Howard Hu, and Katherine Yih, MIT Press, (2000) 669 pages, paperback edition includes afterword, briefly updating 1995 hardcover edition. (A joint project of the [International Physicians for the Prevention of Nuclear War](#) and the [Institute for Energy and Environmental Research](#).)

~ [Borrow a copy from a Library near you](#) ~

A handbook for scholars, students, policy makers, journalists, and peace and environmental activists, providing concise histories of the development of nuclear weapons programs of every declared and de-facto nuclear weapons power. The thorough documentation and analysis of Nuclear Wastelands brings to light governmental secrecy and outright deception that have camouflaged the damage done to the very people and lands the weapons were meant to safeguard.

*An astonishing ... collection of research on nuclear weapons.... This voluminous book is a kind of Baedeker of the Bomb. It meticulously gathers together every piece of public information about the nuclear cycle, some of it leaked, some of it dragged out thanks to court cases, some published in specialist commissions but little noticed at the time. No future research into nuclear weapons will be credible unless it refers to this study.*

—Jonathan Steel, *The Guardian (UK)*, 9 August 1995

8. Quote is at 13:42-13:53 from the film, [Gordon Edwards on High-Level Nuclear Waste in Schreiber, Ontario February 11, 2015](#). This presentation provides an historical overview of how the problem of nuclear waste came to be acknowledged and slowly grappled with. Near its beginning are some very helpful educational explanations about radioactivity. On an Apple computer, press Control-LEFTMOUSE on the local file link here – [<GordonEdwards021115.mp3>](#) – to download the mp3 to your machine.

9. Regarding the time span of long-lived radioactive elements, Dr. Gordon Edwards (Canadian Coalition for Nuclear Responsibility) published, [“Nuclear Waste: Abandonment versus Rolling Stewardship,”](#) 12 June 2015, in which the comparison is made,

The pyramids of Egypt are 5,000 years old. The Great Lakes did not exist 15,000 years ago. But the half-life of plutonium-239 is 24,000 years, and plutonium-239 gradually changes into uranium-235—which has a half-life of 700 million years.

Michael Madsen directed and narrated the 2009 documentary film, [Into Eternity, A Film for the Future](#). In a [2011 interview](#) with Helen Caldicott, Madsen [describes](#) the paradox of how to act responsibly with regard to taking care of lethal nuclear garbage generated in nuclear reactors:

As I always say about this film, nuclear energy stands on the shoulders of almost all the scientific knowledge that we have about the universe. It is really the powers of the universe that we are harvesting.

So much knowledge is fused together in this technology. In that sense it's the *hallmark* of human civilization. But the flip side is the waste which has this time span built in to it which I believe is beyond what we can really understand.

So on the one hand it's based on deep understanding in a scientific respect. But it also has this very, very difficult time span for us even to relate to.

Then if we cannot relate to it – if we cannot understand it or grasp it – it's suddenly impossible to act responsibly.

10. Steven Starr, MT (ASCP), graduated from the School of Health Professions at the University of Missouri, Columbia in 1985. He subsequently worked as a Medical Technologist over a period of 27 years at a number of hospitals in Columbia, Missouri, including Columbia Regional Hospital, Boone Hospital Center, and Ellis Fischel Cancer Center, as well as at Saint Mary's Health Center, in Jefferson City, Missouri. Mr. Starr is currently the [Director](#) of the [Clinical Laboratory Science Program](#) at the [University of Missouri](#).

Steven is an [Associate member](#) of the [Nuclear Age Peace Foundation](#) and [has been published](#) by the *Bulletin of the Atomic Scientists*. His writings appear on the websites of [PSR](#), the [Nuclear Age Peace Foundation](#), the Moscow Institute of Physics and Technology [Center for Arms Control](#), Energy and Environmental Studies, [Scientists for Global Responsibility](#), and the [International Network of Scientists Against Proliferation](#). From 2007 through 2011, he worked with the governments of Switzerland, Chile, and New Zealand, in support of their efforts at the United Nations to eliminate thousands of high-alert, launch-ready nuclear weapons.

Mr. Starr is also an expert on the environmental consequences of nuclear war, and in 2011, he made an address to the U.N. First Committee describing the dangers that nuclear weapons and nuclear war poses to all nations and peoples. He has made presentations to Ministry Officials, Parliamentarians, Universities, citizens and students from around the world, and specializes in making technical scientific information understandable to all audiences.

**NOTE OF APPRECIATION:** I am especially grateful to Steven Starr for the time and assistance he has generously provided helping me accurately describe key elements in the [first section](#) of this essay as well as the wording for [the Petition](#). Beyond this, his **DPNE** presentation on [An Unrecognized Mass Extinction Event Waiting To Happen](#) was for me, the most significant talk in its critical elucidation of the necessity of educating younger people to address the “universal ignorance of basic nuclear facts” that has been perpetuated since the end of the 1980s.

11. An inspiring collection to explore of people on the earlier side of life is [30 under 30 — Highlighting the next generation of leaders in humanitarian disarmament](#).
12. Helen Caldicott's devotion to serving Life's needs is life-long and constant. Inspiring to the extreme, she is an exemplar of uncommon tenacity and perseverance, devoting herself over the last forty-four years to an international campaign to educate the public about the medical hazards of the nuclear age and the necessary changes in human behavior to stop environmental destruction. A detailed summary of Dr. Caldicott's journey is provided in the [About section](#) of [helencaldicott.com](#). In addition, her [complete curriculum vitae](#) is an invaluable reference for informing oneself about what one single person can do to make a positive, life-affirming difference in the world.



13. Tim Wright helped set up ICAN beginning in 2006 and ever since then, he has been instrumental in expanding the movement's influence. More about Tim:

- o Tim Wright on [twitter](#) and [facebook](#)
- o [Introducing Tim Wright, ICAN's Own Radical Dreamer!](#), by Emily Watson, *Politics Personified*, 14 May 2015
- o [Interview with Tim Wright from the International Campaign to Abolish Nuclear Weapons](#), by Tony Robertson, *Pressenza*, International Press Agency, 3 March 2015
- o youtube: [ICAN statement on UN International Day for the Total Elimination of Nuclear Weapons](#), Tim Wright, Asia Pacific Director of the International Campaign to Abolish Nuclear Weapons (ICAN), delivers a statement at the UN in New York on 26 September 2014 to mark the first-ever International Day for the Total Elimination of Nuclear Weapons. Footage courtesy of UN Webcast.  
"Given the dire state of play, one might be inclined to despair. But to despair is a recipe for further inaction, and inaction a recipe for catastrophe of unprecedented proportions. Instead we must chart a new course. Rather than waiting in vain for leadership by the nuclear armed states, the rest of the world must embark now on negotiations to prohibit nuclear weapons categorically." (1:49-2:16)

14. Dr. [Alan Robock](#) is a Distinguished Professor of Climate Science in the Department of Environmental Sciences at Rutgers University. [Professor Robock](#) has published more 350 articles on his research in the area of climate change, including more than 200 peer-reviewed papers. His areas of expertise include geo-engineering, climatic effects of nuclear war, effects of volcanic eruptions on climate, regional atmosphere-hydrology modeling, and soil moisture variations. He serves as editor of [Reviews of Geophysics](#), the most highly cited journal in the U.S. sciences. His honors include being a Fellow of the [American Geophysical Union](#), the [American Meteorological Society](#), and the [American Association of the Advancement of Science](#), and recipient of the AMS Jule Charney Award. Professor Robock is a lead author of the 2013 Working Group 1 for the [Fifth Assessment Report](#) of the Intergovernmental Panel on Climate Change which was awarded the Nobel Peace in [2007](#).

In a 2010 interview in the [Newsletter of the Atmospheric Sciences Section](#) of the AGU, Professor Robock was asked, "What would you consider the most two significant achievements in your career?" He described the first achievement as the following:

The most significant achievement is my work on nuclear winter. In the 1980s, by running climate model simulations, doing studies of the impacts of forest fire smoke on surface temperature, and by writing about policy implications, I am proud to have been part of the team that warned the world of the danger of the use of nuclear weapons. Nuclear winter theory led to a vigorous discussion of the direct effects of the use of nuclear weapons and a realization that the nuclear arms race was crazy and dangerous, and that the use of nuclear weapons would be suicide. This led directly to the end of the nuclear arms race, several years before the end of the Soviet Union. Mikhail Gorbachev, then leader of the Soviet Union, described in [an interview in 1994](#) how he felt when he got control of the Soviet nuclear arsenal, "Perhaps there was an emotional side to it.... But it was rectified by my knowledge of the might that had been accumulated. One-thousandth of this might was enough to destroy all living things on earth. And I knew the report on 'nuclear winter.'" And in 2000 he said, "Models made by Russian and American scientists showed that a nuclear war would result in a nuclear winter that would be extremely destructive to all life on Earth; the knowledge of that was a great stimulus to us, to people of honor and morality, to act in that situation." [Robock, A., and O. B. Toon (2010), [Local Nuclear War, Global Suffering](#). *Scientific American*, 302, 74-81.]

I am now working with Brian Toon and other colleagues to warn the world that the current reduced American and Russian arsenals can still produce nuclear winter, and that even a nuclear war between India and Pakistan could produce climate change unprecedented in recorded human history. We are frustrated that people are not paying as much attention to our results as people did previously, but I was honored in September, 2010, by an invitation from Fidel Castro to come to Cuba and give a talk about nuclear winter. He listened for an hour to my talk and then wrote extensively about the need to rid the world of nuclear weapons. For the story of my trip, please visit: [climate.envsci.rutgers.edu/Cuba/](#)

For more about this work, go to [climate.envsci.rutgers.edu/nuclear/](#)

15. Max Tegmark has been concerned about nuclear war risk since his teens and started publishing articles about it at the age of 20. He is President of the [Future Of Life Institute](#) which aims to prevent human extinction as discussed in his popular book, [Our Mathematical Universe](#). His scientific interests also include [precision cosmology](#) and the ultimate nature of reality. He is an [MIT physics professor](#) with [more than 200 technical papers](#) and is featured in [dozens of science documentaries](#). His work with the [Sloan Digital Sky Survey](#) on galaxy clustering, shared the first prize in *Science Magazine's* [breakthrough of the year 2003](#).
16. Dr. Edwards' [February 2015 presentation in Ontario](#) covers a great deal of ground with regard to the problem of dealing responsibly with the radioactivity that will far outlast human history. In his 12 June 2015 essay on "[Nuclear Waste: Abandonment versus Rolling Stewardship](#)," the reality is addressed concerning the fact that we do not have a permanent solution to nuclear waste given we are pursuing Abandonment not Rolling Stewardship. From page 3:

Realizing that there is as yet no genuine solution to the nuclear waste problem – we do not know how to destroy this waste or render it harmless – the only responsible alternative to abandonment is Rolling Stewardship. There is a growing awareness on the part of those who have struggled with this problem that this is the way to go.

*"The word "disposal" has come to mean permanence and irretrievability in the minds of the public, and that raises questions about our stewardship of the waste. For that reason we do not use the word disposal."*

[NWMO, Choosing A Way Forward, Final Study \(2005\)](#), Page 21

Nuclear waste remains harmful for unimaginably long periods of time. Until the waste can be eliminated, it must be managed on a multigenerational basis. This implies continual monitoring and periodic retrieval and repackaging (e.g. 50-100 years).

Rolling Stewardship implies persistence of memory: the accurate transmission of information and the transfer of responsibility from one generation to the next. For example, there could be a ceremonial "changing of the guard" every 20 years, accompanied by a thorough refamiliarization with & recharacterization of the waste.

Rolling Stewardship will ensure that leakages can be rapidly detected and corrected. It will also provide a constant incentive to improve containment and find a solution to the waste problem. But it requires meticulous planning and commitment to succeed.

<http://ratical.org/ratitorsCorner/08.06.15.html>