

What I learned from Warren Nyer

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Nuclear Energy on the International and Domestic Scene

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ANS Past President 2011/12

Sometimes we listen. Sometimes we don't. But I always listened to everything Warren Nyer had to say.

Today, some of our nuclear community is assembled here to honor the CP-1 Team that realized the concept, design, and construction of the reactor that would extract energy from the atom for the first time controlled by humans. Today we recognize the drive of those bold pioneers and our linkage to them.

Today the link is weak. Our NS&T community is lethargic. We conduct broad research without specific deliverables. We created a dynamic expanding maze of licensing. Against common sense, as our experience and learning increase, the cost of nuclear power has gone up instead of declining. We have brought this upon ourselves.

My remarks are compelled by the basis of business – ‘conceive, design, build, sell, operate or use,’ then repeat. A basis the CP-1 Team utilized when they conceived, designed, built, and operated CP-1 for eventual use of a technology with which humans could harness the atoms' energy.

I invite your attention to one of those CP-1 pioneers, one who I got to know, Warren Nyer. I'm going to tell you:

who Warren Nyer was,
how I met Warren Nyer, and
what Warren Nyer taught me.

I will end by asking all of you today three ‘Whens.’

Who Was Warren Edwin Nyer?

Warren was born November 18, 1921. Not everyone in the nuclear community knows that Warren was a “halo boy,” as he told me, meaning he led a charmed life. Or that he was an accomplished gymnast and skier. Or that he climbed the Grand Teton in Wyoming. Or that he was one of very few physicists who worked at all five of the Manhattan Project's main sites – Chicago, Oak Ridge, Hanford, Los Alamos, and Alamogordo. Or that in the fall of 1941, he was a 19-year old physics student at the University of Chicago when he was hired into the University of Chicago's Physics Department by Dr. Jesse, with Dr. Compton's permission. The Physics Department became the Metallurgical Laboratory, which later formed the core of the Manhattan Engineer District, commonly known as the Manhattan Project.

Warren started out as a low-level workman in the Physics Department. One of his duties was pressing uranium oxide bricks. The only press available was at the Armour Institute, about a 45-minute drive away. One day, "A little Italian guy named Enrico," arrived to observe the pressing of the bricks. Warren, another man and Enrico went to the Institute and pressed two bricks. Soon thereafter a similar press arrived at the Physics Department, and soon after that Enrico Fermi arrived and asked Compton to assign Warren to his staff. He was, indeed a "halo boy."

Warren's duties expanded to include the messy job of machining graphite blocks. Warren later told his son, Michael, that the streetcars in Chicago stopped running at midnight, so he would go to school in the daytime, and work in the lab in the evenings, going home on the last streetcar of the day. He would leave covered with graphite. He said, "In any other city in the country, I would have been arrested for my appearance alone, but in Chicago, I was just another workman on his way home from the evening shift."

He worked on the construction of sub-critical, and later critical, piles with Enrico Fermi. His job in the lead-up to the CP-1 criticality experiment was in the "counting room" where he monitored the counting apparatus that measured the neutron drift in the "pile," which was located in the adjacent room. The scientists would discuss the project in the counting room adjacent to the pile. Warren several times told his son, Michael, "All I had to do to stay up to date on the research was to keep my mouth shut and my ears open."

After CP-1, he worked on the construction of the X-10 Graphite Reactor in Oak Ridge, then moved to Hanford to prepare equipment and measure radioactivity levels at B Reactor. Afterwards he moved to Los Alamos, working on multiplication experiments on uranium and plutonium, the underpinning of the nuclear reaction of the atomic bomb. He soon moved to the Trinity site at Alamogordo, where he was a participant and witness to the atomic bomb test in July of 1945.

After the war, Warren returned to Los Alamos in 1947, where he worked on resonance of the uranium nucleus with 14-MeV neutrons. This paper was published under his name in Los Alamos and is available over the internet to authorized individuals. Although Warren held only a bachelor's degree, many of the people of this era called him "Doctor," because he was an expert in his field. His son, Michael, believes this paper is source of honorarium. Michael noticed this and asked Warren about it, to which he replied, "They are only trying to flatter me."

Preferring to work on the peaceful uses of atomic energy, Warren moved his family to Idaho Falls just before Thanksgiving, 1951. There he headed an experimental physics group at the Materials Test Reactor at the National Reactor Testing Station – now INL. Starting in 1956 he ran the Special Power Excursion Reactor Tests (SPERT), which consisted of four different kinds of reactors operating from 1955 to 1979. At least one (SPERT 1) of these reactors was tested to destruction. He was later a member of the Atomic Safety and Licensing Board. He finished his career as a management consultant to several electric utility firms, advising them on reactor safety and licensing.

Warren started his nuclear career at age 19 and died on February 4, 2016 at age 94. He was the next-to-last living member of the group that worked for Enrico Fermi at the Chicago Metallurgical Lab. Ted Petry, is the sole remaining CP-1 pioneer.

How I Met Warren Nyer

Fifteen years ago, in 2002, Warren and I were among the attendees at the 60th Anniversary of CP-1 at Idaho State University. Strangely, he did not have a prominent role, nor do I recall him even speaking as the luminaries of that time reflected on the momentous events at CP-1.

I hesitantly approached this legend in nuclear history and introduced myself. I sensed that Warren was relieved to be contacted, since no one was talking with him. His early comment was along the lines of, “I hate these anniversaries since I just get paraded out as a museum piece.” Our friendship began with this encounter.

Back in Idaho Falls where we both lived at the time, I would pick Warren up for local Idaho American Nuclear Society meetings since he did not like driving after dark. After one of the IANS meetings, then INL Intern Hannah Yount, my wife, and I were invited in for a night cap. As we were leaving, Warren shared that we were the first people he entertained since the death of his wife Henrietta two years prior.

Speaking at another IANS meeting, Lt. Gov. James Risch declared December 16th 2003 as ‘Warren Nyer Day,’ because then-governor Dirk Kempthorne was on out-of-state travel, Risch was acting governor and held the authority to declare such a day.

After his very quiet marriage the next year to his second wife Martha, my family was invited to Easter Dinner at their home, allowing me to meet one of his sons, Michael.

On, Thursday December 16th, 2004 we held a hail and farewell party, where we hailed Warren on the first anniversary of “Warren Nyer Day,” and bid him and others gathered farewell as I was to serve as an ANS Congressional Fellows in Senator Chuck Hagel’s office the following year.

Later, when serving as ANS President at the Chicago Summer Meeting in 2012, we worked hard to fly Warren to the meeting as a revered member of the nuclear family, not as museum piece. But, after sitting on the tarmac at the Idaho Falls airport for two hours before debarking the delayed flight to await another, he declared “No more travel.”

When I visited Idaho Falls in 2013, Warren declined my request to visit him, though we had been in contact for years by phone, email, and letters. He did arrange a wonderful lunch meeting for me with his son, Michael, where Michael shared that his father told him to tell me, “I am fully retired now.” Those were the last personal words I received from Warren before his death in February 2016.

What Warren Taught Me

The Navy mistakenly taught me that SCRAM was the acronym for ‘Safety Control Rod Axe Man.’ Thinking the Navy was always right, I told this to Warren. He smiled, then told me what SCRAM really meant.

As he recalled the story from the head instrumentation person, Volney (“Call me Bill”) Wilson that the instrumentation group was divided into three task forces:

Rudolph Kanne oversaw detection equipment.

Louie Sloten oversaw mechanical things like the control rod and safety rod.

Bill Overbeck designed the circuits and control panel.

Recently, I learned that Wilson and Kanne were from GE’s research laboratory. They decided to have a ‘big button’ to push that would drive in one of the safety rods. Late one afternoon, Overbeck entered a converted handball court where several desks lined the south wall. He asked, “How he should label the Big Button?” In the discussion that followed someone, either Hugh Barton or Tom Brill, asked, “What are we going to do AFTER we push the button?” Bill Wilson said, “Scram out of here!” Bill Overbeck responded, “Okay,” and wrote the word “SCRAM” under the big red button.

Yes, there was Norman Hilberry, Fermi’s Deputy, who, in the first criticality experiment begun on the morning of December 20, 1942, held an axe to chop the rope to release another safety rod in the event of a problem. Yes, there were the three graduate students standing by to break glass carboys of a solution of cadmium sulfate on the pile to stop the fission reaction. They were later called the ‘Suicide Squad.’

On the second approach to criticality that afternoon, Warren Nyer replaced one of the members of the ‘Suicide Squad.’ This member in turn replaced Hilberry as axe man, because Hilberry needed to be relieved so he could tend to administrative tasks. Yes, the paperwork.

Michael Nyer shared with me that he followed his dad’s approach of, “Keep your ears open and your mouth shut.” At the age of five or six, he heard the men talking and one day the word “Scram” came up. Michael asked, “What does scram mean?” One of the men abruptly looked the young boy in the eyes and replied, “It means run like hell!” This memory sticks with Michael as it was the first time a swear word was directed at him.

Warren once explained to me the difference between the uranium (gun type), and the plutonium (implosion type) nuclear weapons. In the uranium bomb the two hemispheres of uranium only had to be rapidly brought together to produce an explosion, whereas, in the plutonium bomb, the nuclear materials had to be explosively compressed to produce the explosion. The reason the plutonium bomb was pursued is that enriched uranium production had produced only enough uranium for one bomb, but plutonium production rates were much higher, with enough plutonium being available by the end of July 1945 for two bombs. “We were certain the gun type (uranium) would work, but we had to test the plutonium implosion device.”

He went on to share that Henrietta stood on the ridge above Los Alamos where she could witness the glow from the Trinity test on July 16, 1945. Warren was in the observation station 10,000 yards south. Two other couples also witnessed the first nuclear explosion, John and Jane Burnham, and Marvin and Ruby Wilkening. Thinking he'd spilled secrets to me, I received a smile from Warren, who said, "No, the fast fission properties of plutonium are well known." Whenever Warren was asked, "What is the secret of the atomic bomb?" His reply was always the same, "The secret to the atomic bomb is, 'It can be done.' After that, it is only a matter of determination."

When he told me about the SPERT project, a project to run reactors to destruction, his comment I best remember was, "We could do anything if we intend to do it."

While sharing another meal, I asked Warren what books he might recommend I read for my NS&T career. "Only two," came his response. "*The Peter Principle*, and *Parkinson's Law*."

I pushed back. "I was thinking technical books."

Warren responded, "I expect you to know the technical science. You asked what books would help your career."

I've read them both. Several times. And I assign them to the engineers I mentor.

From "The Peter Principle," I ascribe to the most common summation of this work: "Most people are promoted to their level of incompetence."

Parkinson's Law, published in 1957, dispels the public visualization of elected officials, captains of industry, and civil servants as trustworthy, proven leaders, or technically competent as "ludicrous." This book provides a glimpse of reality with some simple laws:

Law 1: Work expands to fill the time available, thus staff in organizations grow according to the formula:

$$x = \frac{l + 2k^m}{n}$$

K: The number of staff seeking promotion by having more subordinates.

L: The difference in age of between appointment and retirement.

M: Number on hours devoted to answering the "minutes" [today email].

N: How many units/divisions be administered.

X then becomes the number of employees needed per year to be hired.

Someone should apply this law to the NRC and the DOE.

Law 2: Regarding high finance, there is a vanishing point of interest. In mathematical terms the amount of time spent on budget items is inversely proportional to its dollar amount.

Law 3: Councils, Committees, and Forums follow the elementary principle of science that they are organic rather than mechanical in nature. They are like a plant that takes root and grows a flower. The flower may wilt and die, but it scatters seeds to each bloom in their turn. Warren challenged me as ANS President to question whether some committees were past their time. And showing me that he was keeping up, he asked “Eric, what will the GIF (the GEN IV Reactor International Forum) accomplish?”

Law 4: This law addresses the principles of leadership selection and how to choose the right candidate from all who present themselves. In the past, the British used the interview to determine to whom the candidate is related, in other words, “who they knew.” During the Ming Dynasty, the Chinese used the “Competitive Written Examination,” held every three years for three days. The person with the highest marks was destined for the highest office, in other words, “what they knew.” The latter technique for leadership selection has been copied in many forms and works reasonably well.

Warren shared with me in the early 2000s that he believed our national leadership selection process had morphed into top leaders of NS&T, our NRC commissioners and our DOE leadership, are being selected via the political process with more of “who they knew,” instead of, as in his day, “what they knew,” when people like David Lilienthal, Lewis Strauss, Glenn Seaborg, and Dixy Lee Ray held leadership positions. As an aside I recommend you read Dixy Lee Ray’s last book “*Environmental Overkill: Whatever happened to common sense,*” published a year before she died.

Laws 3 and 4, about Committees and Leadership Selection, have combined in toxic ways throughout both the private and public sectors. In several places, I have seen committees of peers select their leaders based more upon who they knew rather than what they knew. We are mired in the quagmire of professional stagnation this type of anointed leadership wreaks upon our NS&T community.

Committees can be paralyzing. If computers start to take over our lives, as currently feared, all we need to do is organize them into committees.

When as ANS president I ran into a few delicate issues, Warren was always available by phone to listen and offer guidance. Why? He was Charter Member of the American Nuclear Society on December 11, 1954. He knew how it was built and where it was violating Parkinson’s Laws.

I urge each of you to discover the other Parkinson’s Laws.

Looking back today at what Warren instilled in me is that we, the NS&T community, stand on some tall shoulders of those strong individuals who took on a complex task and got the job done. Even during the national security threat of WWII, it was only six years from delivery of the Szilárd-Wigner-Einstein letter to President Roosevelt to delivery of the Manhattan Project.

In peacetime, it was Warren’s and others’ efforts from the MTR, ETR, now the ATR, and the SPERT series that boosted the fastest rate of growth of new energy source into the energy

market. Their spark? Their beacon? Simple – in 1953 President Eisenhower defined ‘Atoms for Peace.’ Argonne’s scientist Samuel Untermyer conceived the BWR, the ‘best water reactor,’ which led to BORAX-III, the first reactor in the United States that sent electrons over the power grid to Arco, Idaho on July 17, 1955. Then just 43 miles from here, on April 15, 1960 the first privately financed full-scale nuclear reactor, a boiling water reactor Dresden Nuclear Power Plant 1 fed 180 MWe to the grid. For brevity, I will not discuss ORNL’s well-known pioneering efforts on the PWR.

Three Whens

Warren and I regularly discussed three nuclear “whens,” regarding Waste, National Laboratories, and a Build. I surmise that the pioneers we honor today, were they here, might question us now, “When are you going to do these three things?”

1. When will waste be put to rest?

The Yucca Mountain Project was conceived over 30 years ago, in the 1980s. In our profession, we deal with the unchanging laws of physics – gravity, fluid flow, pressure. Yet also in our technical careers, we must grapple with ever-changing public opinion, public policy, and the laws of government. Yucca ridge is not a mountain. We all know the story. In the 80s, five potential repository locations were selected. By 1987, Congress changed the rules, really the law, to:

- direct the Secretary to select one preferred site;
- set forth the criteria for such site consideration;
- make the State with the site eligible for benefits;
- and revoke the Secretary's previous proposal to locate a monitored retrievable storage facility on the Clinch River (Oak Ridge, Tennessee).

Yucca Ridge became the only U.S. repository under evaluation. DOE began years of technical and environmental studies costing BILLIONS. The State of Nevada and special interest groups opposed the Ridge, despite all studies demonstrating it a safe storage site, surrounded, by the way, by many barren nuclear test sites in a very inhospitable chunk of federal land.

In, 2002 DOE recommended to Congress that Yucca Ridge be developed. Per the Law. The State of Nevada lodged an official objection which was overridden by a joint resolution of Congress. A license application to the NRC was submitted in June 2008 that NRC eventually docketed. Time and politicians conspired.

The 2008 elections happened. Anti-Yucca politicians were in control of Congress, the White House, the DOE, and the NRC (selected by ‘who they knew’). The DOE, under new political leadership of Secretary Chu, repudiated the Congressional decision to site the facility at Yucca Ridge – the Law – and declared that a geologic repository at Yucca Ridge was not a “workable” option. The Office of Civilian Nuclear Waste was dismantled and the NRC licensing process stopped.

What happened? Then-President Obama say that “change occurred,” and that is exactly why it took only two years for the government position held for two decades to be illegally reversed. The Yucca story validates Dixy Ray Lee’s charge of obligation to us: provide factually-based information that can be understood by policy makers and the public at large. The public and policy makers did not understand the benefits of this repository for the future of society and our technology progress. Was the Executive Branch – President Obama, the DOE, and the NRC – in violation of the Nuclear Waste Policy Act? Yes! The D.C. Circuit Court of Appeals in August 2013 reached the same conclusion.

The task, endorsed in an ANS Policy Statement, is simple: complete NRC’s Yucca Mountain licensing process.

2. When will our national laboratories deliver?

Our nation needs its national laboratories. These multi-program complexes attract world-class talent, do neat things. Let’s imagine, under the lens of Parkinson’s Law number 1, we evaluate this expanding complex and its people, and select a ratio reminiscent of the Warren Nyer SPERT days, say a ratio of all the people in the complex operating test/prototype reactors to the number of publications divided by all laboratory employees, or to the number of experiments that segue into industry, or to the number of patents awarded and from which the laboratory or industry can financially benefit, or you pick another ratio that somehow shows progress. Those employees need to be motivated to facilitate the transfer of that laboratory expertise from these “world class user facilities” to commercialization of peaceful uses of the atom into the US private sector. That’s progress. It is that simple. That’s the value statement to the U.S. taxpayer.

How can we get our national laboratories to deliver? Some suggestions:

- Get the “GAINS” gateway open.

- Get the laboratories focused on one fission mission/issue/area.

- Get DOE into a simplified oversight model that seeks national outcome of value to Congress and the U.S. public, utilizing metrics of excellence and effectiveness.

3. When will we build?

And finally, I think if all the CP-1 pioneers were here today, they would ask, as Warren Nyer asked me, this last question: When are we going to build an advanced reactor? We initiated the SMR program. Good. A program that committed over \$450M to their Licensing Technical Support program for small modular reactors in 2012. That was five years ago. It is creating the required paper for licensing. When, how, and can the US government issue a contract to pour concrete for just one small modular water-cooled reactor?

Have we lost the sense of purpose and conviction of those strong nuclear engineers who built CP-1?

The DOE's NE has just issued its new mission statement that opens with, "... advance nuclear power as a resource capable of meeting the Nation's energy, environmental, and national security needs..." I like it.

I would like to see each of us reaffirm the goals the Atomic Energy Act of 1954 set forth:

- Make the maximum contribution to the general welfare (AEA §1(a) & (b))
- Encourage widespread participation in the development and utilization of atomic energy for peaceful purposes (AEA §3(d))
- Make the benefits of peaceful applications of atomic energy available to cooperating nations. (AEA §3(e))
- Increase the standard of living (AEA §1(b))

We need to focus our resources on one thing – build the next fission tool, *our* CP-1. The tool needs to give us either fission in a fast spectrum or fission in system above 515C.

We all know, from GENIV, from GIF, from NEAC, that we have two choices upon which we all pretty much agree. Choose one – either a sodium cooled fast reactor or high temperature gas reactor for the next build.

This build:

- would be in keeping with the bills rumbling in Congress talking of Versatile Neutron Source;
- could unite the labs with individual deliverables like Spallation Neutron Source did at ORNL;
- would establish a formal framework working with U.S. industry; and,
- would put this nation back on the international stage, moving forward with a new fission tool.

Simply put: build the next fission tool now.

It is our nuclear community's moral imperative to be strong with fission power. We must be stronger in our approach. The weak – be it an animal, a technology, an organization – do not survive. There is no middle survival ground the between strong and weak. We must be strong.

Let us tip our hats to the moral strength of those pioneers of CP-1. Let's emulate those bold pioneers, and build fission tools and fission power plants.

But when?

Warren Nyer would say, "Now."

Loewen, Eric (GE Power)

From: Michael Nyer [REDACTED]
Sent: Friday, September 22, 2017 11:47 AM
To: Loewen, Eric (GE Power); Laural L. Briggs; Roger N. Blomquist; Roger Tilbrook; Jordi Roglans-Ribas
Cc: Michael Nyer
Subject: EXT: Warren Nyer

Sept. 22, 2017

Hello Everybody!

I know everybody loved Warren because he was so invariably nice to everyone. There was, however, a very hard core in him when he needed it. I believe this contributed much to his success, especially in the MTR and SPERT-LOFT eras and when he was on the Safety and Licensing panel.

I have frequently told people I know that Warren learned his profession from Dr. Fermi and his trade from Gen. Groves. (Warren told me he only spoke to Groves once, and saw him only a couple of times.)

I mentioned this at Warrens service, where several of the SPERT people were in attendance, and I got a good chuckle. I added that, "And those of us who knew Warren well know there is more truth than humor in that statement." This got a hearty, "Hear, hear!"

The last time I saw this aspect of Warren was a few years before he passed. There was a Federal program to compensate radiation workers for injuries or disabilities resulting from radiation exposure. Warren had for some time trouble with the cartilage in his wrists, and he had very little strength in his hands. This may or may not have been the result of handling of uranium and may of may not have been compensible. I asked him if he was aware of this program, and he replied that he was. I then asked if he had applied for it. He flashed into his Groves mode and told me with some anger, "I took my chances in the War along with everyone else, I'll be damned if I'm going back now for some special deal!"

Another time this came up was in about 1985, in a telephone conversation with an AP reporter. Judging by the response I believe the reporter asked something like 'Don't you feel bad about all the lives that were lost in the atomic bombings?' Warren replied with some anger, "Everyone I knew was in the service, and hardly a month went by that I didn't hear of the death or serious injury of a friend or classmate. I was perfectly willing to sacrifice any number of the enemy if it would save but one American life."

Warren told me several times 'It is not possible to make people do what you want them to do. You must make them WANT to do it.'

I just thought I should tell you this.

Please distribute this message as you see fit.

Best regards,

Michael Nyer