Eugene Wigner's December 2, 1946 talk about the world's first self-sustaining chain reaction

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While searching through the numerous boxes and files of documents containing the Alvin Weinberg papers stored at the Children's Museum of Oak Ridge, Tim Gawne came across a seven page speech that Eugene Wigner gave at the Oak Ridge High School on December 2, 1946. The speech commemorated the fourth anniversary of the world's first self-sustaining chain reaction of the Chicago Pile 1, where an experiment in a converted squash court at the University of Chicago's abandoned Stagg Field created nuclear science history.

The speech starts out, "I am to speak on the past and future of nuclear energy and since this excludes only what is the fleeting moment of the present, this seems indeed a very large order. Instead, I would like to give you a few personal recollections as far as the past is concerned and see what lessons those teach us for the future…"

Then he gives a brief history of his perspective of how all this nuclear science came to be, "The Uranium Project got really started on December 7, 1941 on Pearl Harbor day. My recollections of that day are naturally very vivid, as are probably yours too. It was a Sunday afternoon and I sat in my office when a friend telephoned the news of the Japanese attack. There was nothing that I could do but a nervousness grieved me which one usually feels before an important decision has to be made or before a wedding ceremony or something. That nervousness was absent from few of our days until VE Day, until the Germans surrendered."

Wigner continued, "Just about an hour after the news of Pearl Harbor reached me, I got another telephone message from Professor Smyth, you know, the man who wrote the Smyth report. He told me that the Government has decided to pursue the work on Uranium fission actively, and that it has charged Dr. A. R. Compton with the responsibility for the work on chain reactions. I was to see Dr. Compton an hour hence, in Dr. Smyth's office. I knew Dr. Compton, both personally and also indirectly quite well, and I said to myself: This is it!"

Can't you just feel the excitement in the moment? Wigner knew something really big was happening. Here it is five years later and he is giving a speech on what he had to know was the greatest scientific achievement in the history of the world and he was a part of it. He is talking in the Oak Ridge High School that was located just up the hill from Blankenship Field. He was talking at Oak Ridge, TN!

Next he gives more of the history of efforts expended to bring the Government to the point of actually funding research into Uranium fission, "That was it! Quite a few people had tried to persuade the Government for about two years to support the Uranium work actively – but these attempts were a disheartening work swimming in syrup, as a friend of mine expressed it."

"I presume it is always difficult for a layman to believe in a technical wonder before he has seen it, and few of our listeners believed what we said about the U-weapon. I also presume that very few people realized fully – and I believe not everyone realizes now – how inevitable the war was for America and how much we were in need of weapons. It all seemed so far and unreal, and it was so easy and comfortable to believe that it won't come to us.

"Hence, the impression of moving in syrup for those who were afraid that the country loses valuable, nay, irreplaceable time, who feared lest this country's friends will be gone before our day will arrive. All

this, all the syrup was washed away on December 7, 1941, with the Japanese attack and, as far as the Uranium work was concerned, with Dr. Compton's appointment to head up that work."

Wigner then explains that the phone calls were mere coincidences and that Dr. Compton's appointment had been decided before anybody in America knew about the Japanese attack. Think about that!

He also explains how Enrico Fermi and Leo Szilard had been trying to get just $3,000 from the Government to fund the Uranium research project, but after Pearl Harbor, funds began quickly to flow, so much so that he quotes Fermi as coming to his office in Chicago on a rainy afternoon and announcing in his undramatic but incisive way, 'Wigner, you'll see from now on the work won't suffer for lack of money. It will suffer because we'll have too much of it.'"

Fermi was correct, the research flourished in what Wigner referred to as "most favorable conditions." He indicated that "new and important results were announced almost every week." The problems of chain reacting units were raised and solutions to those problems were found. The size and shape of the pile began to emerge in the imagination of the researchers. This was a heady time. They were now unrestrained and could do things they had only been able to dream about without adequate funding.

Wigner said about the actual first controlled chain reaction, "The first establishment of the chain reaction four years ago today, was by far the most important landmark we passed. It was the crowning of Fermi's work, the logical result of his and his collaborators' efforts. The occasion itself was much less dramatic than we are inclined to think now; it is rarely a surprise to the traveler when he arrives at a landmark. He sees it already from some distance: it quickens his pace but the passing of it is rarely a surprise. What he hopes, if he is the competition with others, is that none of his rivals had passed the mark before him!"

He focused on the lack of assurance that this chain reaction was indeed the first in the world. Remember, they thought at the time that Germany was working on an atomic bomb. He said, "What we did not know was only whether we witnessed the first such demonstration on the earth, whether we were the first ones to obtain a chain reaction."

The difference between an expected milestone passing with little fanfare or excitement and an unexpected milestone such as a disaster was a comparison Wigner made between what happened in Chicago and Pearl Harbor.

He said, "The establishment of the chain reaction did not bring a relaxation in the efforts of the laboratory. The scale on which the chain reaction ran on December 2 had to be multiplied many million fold before we could obtain anything useful for war or peace. This increase of scale presented many problems of physics and engineering."

"Such was the pace of the work that at the time the chain reaction was established, our sights were already on a new landmark. Plans for the million-fold increase of the scale were already in the formative stage on December 2, but they had to be completed and checked from every point of view.

"Equally important, solutions of the second great task of the laboratory, the extraction of the product from the chain reacting units, were already envisioned. The chemistry of the new substance Plutonium,

of which we hardly had more than a dust speck, was as well-known as the chemistry of many old and long-discovered elements.
The rest of Wigner's talk dealt with the difficulties that presented themselves when the secrecy of the Uranium project prevented the involvement of public opinion in the process of developing and using the atomic bomb. He stated that the lack of public involvement, of necessity, prevented understanding of the true nature of the experiment.

He said, "Our statesmen must do all they can to adopt simple ideals with an appeal for everyone, to propose simple measures with obvious objectives and to carry them their message to all the people of the earth. The average American, the average Chinese, the average Russian may not have a quick mind, but it is a lot quicker than either we, educated people, or the politicians are inclined to believe. Their judgment, their sense of justice, if given time and opportunity is a lot keener than we often credit it."

"If our statesmen take the trouble to explain their intentions sincerely and in simple language, and if their have an opportunity too present them to all the people, we will have gone more than half way toward the solution of the problems which now agitate mankind.

"I wish to stress again the need for sincerity and honesty in our ideals and manners. It is easy to carry along those who have the same interests and the same desires which we have, even if our speech lacks logic and sincerity. But to those who have different interests and desires, who are not biased in the same way as we are, the hollowness of our argument will be plain at once, our lack of sincerity will be manifest.

"It is not easy to convince somebody that his desires are unjustified even if they are; it is impossible if they are not. If we cannot state our objectives in clear and simple language in such a way that their justices is apparent to everybody, the fault is probably not in our rhetoric but in our objectives.

"We, the American public, also have a duty in this connection. We must listen to all reasonable opinion, whether it originates inside or outside our boundaries. We believe that we, as a people, have the best education in the world. If we are not willing to listen to the other party, how can we expect the other, less educated party, to listen to us?

"I am not sure that all of us always fulfill this duty. On the other hand, if we have found a just basis, even leaned over backward some, if we spoke to full sincerity if we convinced that we have listened to all that the other party has to say, then we shall courageously stand up for what we believe is right. Weakness is as bad a crime as is selfishness.

"There is another respect in which we must outgrow our prewar habits and ways of thinking. You remember what I told you about the difficulties of raising money for the Uranium work before Pearl Harbor day. At the bottom of that difficulty was the firm belief, on the part of large sections of our population, that it is none of our business if the rights of the Austrians, the Jews, the Chechs, the Poles are trampled underfoot.

"All that appeared to be so far from us that we felt that we could just rest quietly in our castle while citizens of other nations were killed by the hundreds and imprisoned by the thousands. We now realize the error which we mad and which, I am convinced, almost cost us our freedom.

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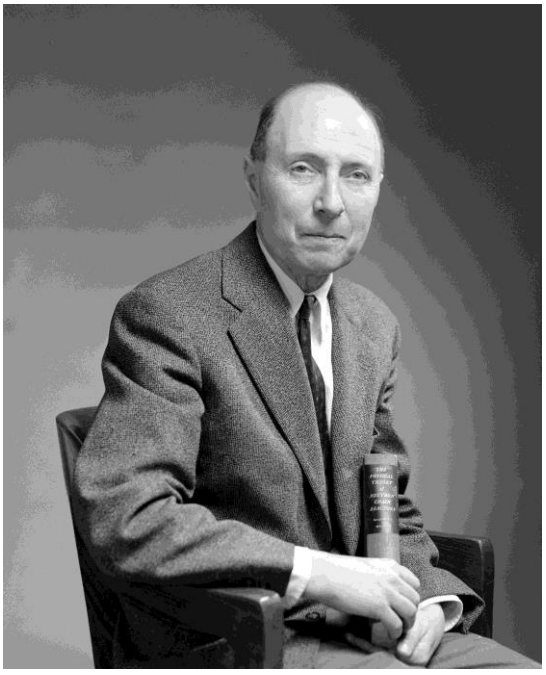
"And we must never slide back into that error – human rights form an indivisible unit. If people are killed on one place of the earth, if they are deprived of their freedom and belongings even in the most distant land, the murderers and robbers, if we leave them alone, will, given time and the encouragement of our acquiescence, seek us out in our own home and try to do to us what they have done to our fellow men.

"We must not shrug our shoulders when we hear about men being killed, women raped, no matter how far away that happens. It happens on our earth and we cannot remain neutral. If we hear that the bell tolls for some people's freedom, we need not send out to hear from which people's freedom it tolls – it tolls for ours.

I have just finished watching the "Pandora's Promise" documentary film on CNN. I find it frustrating to see how misleading discussions about nuclear power have been in the past and that some of the most misinformed are now realizing and promoting accurate facts regarding the safety of nuclear power.

Looking back at Eugene Wigner and his insight into nuclear energy is refreshing. He knew the importance of engaging the public in the discussion, and he realized the enormous potential of what had been created in war but held so much promise for peaceful applications.

I just saw a letter that Alvin Weinberg wrote in 1945 turning down a job with General Electric by stating he was only one of maybe 10 individuals in the world who knew how to manage a nuclear chain reaction and he felt it his duty to remain at the Clinton Laboratories and the Graphite Reactor. These men, Wigner and Weinberg, were truly dedicated to helping the world understand and make successful use of the tremendous power released with the start of the Nuclear Age. They dedicated their lives to it!



Eugene Wigner - Photo courtesy of Oak Ridge National Laboratory