Rediscovering the Forgotten Creators of the German Atomic Bomb (Part 1 of 2)

(As published in The Oak Ridger's Historically Speaking column the week of March 3, 2025)

EDITOR'S NOTE: This "Historically Speaking" column contains the opinions of Dr. Todd H. Rider based upon the research and information contained in his book, "Forgotten Creators: How German-Speaking Scientists and Engineers Invented the Modern World, And What We Can Learn from Them."
[https://riderinstitute.org/revolutionary-innovation/]

I now bring to you Historically Speaking readers yet another most interesting insight into Germany during the Manhattan Project and World War II era. This one is based on extensive research and is published online for your review…see above link in Editor's Note. Todd Rider has also been featured on *Hidden History: Stories from the Secret City:*

Part 1: https://www.youtube.com/watch?v=E0j4vsrz5XE
Part 2: https://www.youtube.com/watch?v=t1pPh048r0o
Part 3: https://www.youtube.com/watch?v=LQ8AQm6kboY
Part 4: https://www.youtube.com/watch?v=DHss4fDGCAY
Part 5: https://www.youtube.com/watch?v=SfYvRarCrg8

Get ready to have your mind filled with new information regarding the history of German atomic weapons.

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Spring 2025 is the 80^{th} anniversary of the end of the World War II German nuclear weapons program. Although the standard historical view since the war has been that the German nuclear program was quite small and primitive compared to the U.S. Manhattan Project, recently declassified and rediscovered archival documents reveal a very different story.

According to information now available, between 1938 and 1945, Germany acquired thousands of tons of uranium and thorium ores from German territory, Poland, Czechoslovakia, Romania, Bulgaria, Belgium, Portugal, and possibly additional countries.

One route to producing fission fuel for nuclear weapons is enriching uranium—separating the highly fissionable uranium-235 isotope that constitutes approximately 0.72% of natural uranium from the rest that is relatively inert. During World War II, the United States enriched uranium primarily using a combination of "calutrons" or electromagnetic separators (the Oak Ridge Y-12 facility) and gaseous thermal diffusion (the Oak Ridge K-25 facility).

Documents that are now available show that the Nobel-Prize-winning German physicist Dr. Gustav Hertz invented gaseous thermal diffusion enrichment in 1923, and the German government considered his research so important that he was able to work throughout the war despite his Jewish ancestry. In 1940 Auergesellschaft, a major German uranium company, invented an improved method of diffusion enrichment.

When Soviet forces entered Germany in 1945, they discovered that factories in the town of Neustadt an der Orla were uniquely skilled at producing nickel membrane filters for diffusion enrichment. What exactly had those factories been doing during the war?

In September 1946, General Leslie Groves of the Manhattan Project sent Percival C. Keith, chief designer of Oak Ridge K-25, on a Top-Secret two-week trip to Czechoslovakia. What mission would have required Keith's unique knowledge and would have justified the risk if he were captured by Czech or Soviet forces? Was Keith sent to inspect, strip, or sabotage a former German enrichment plant in Czechoslovakia?

Unfortunately, all other details are still classified even today. What we do know from the available documents is that Gustav Hertz, personnel from Auergesellschaft, those factories in Neustadt an der

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Orla, and resources from Czechoslovakia all played vital roles in the postwar Soviet nuclear weapons program.

Similarly, rediscovered archival documents reveal that the German scientist Manfred von Ardenne, one of the inventors of television and the electron microscope, built a prototype calutron electromagnetic isotope separator in 1941. After successfully demonstrating his calutron, he called upon the German government and German industry to mass-produce his calutrons for large-scale uranium enrichment.

Documents from the U.S. Army Air Forces and Office of Special Services (OSS) reveal that at least three large facilities were built for von Ardenne's machines and that at least one of those facilities was destroyed by Allied bombing. Further information about this wartime work remains classified, although von Ardenne is known to have played a leading role in the postwar Soviet nuclear program.

Perhaps most importantly, Germany developed gas centrifuges, which are more efficient than calutrons and gaseous diffusion for uranium enrichment, and which therefore have now become the preferred method of enrichment worldwide. Documents show that the German scientist Dr. Georg Bredig invented gas centrifuges sometime before 1895.

By World War II, uranium gas centrifuges were being produced in Kiel (by two different groups), Munich, Freiburg, Göttingen, Thuringia, Breslau (now Wrocław, Poland), and even factories in nominally neutral Switzerland for export back to Germany. How many uranium gas centrifuges did Germany produce and use during the war? Again, the details remain unavailable even 80 years later.

If Germany had built one large Oak-Ridge-like facility for all its uranium enrichment machines, it would have been straightforward for Allied bombers to destroy that facility. To minimize the risk from Allied bombing, Germany would have been strongly motivated to divide up its uranium enrichment machines among many smaller sites far apart, especially in the eastern regions of German-controlled territory (further from U.S./U.K. bombing) and in the numerous large underground facilities that were highly resistant to aerial bombing. That is what Germany did with most of its other major industries as the war progressed. Indeed, a declassified October 1944 report from a highly placed OSS spy cites several leading German industrialists as privately admitting that is exactly how Germany distributed its nuclear production facilities.

Other declassified wartime and early postwar documents actually name many of the German nuclear sites: twin I.G. Farben factories in Opava and Ostrava, Czechoslovakia, said to have 30,000 workers each and to be producing an important new type of explosive material for nuclear weapons; a similar 30,000-person facility underground in Thuringia; underground factories with huge numbers of workers making explosive nuclear material south of Hamburg; one or more uranium enrichment facilities on the outskirts of Berlin; an underground facility at Redl-Zipf, Austria processing what sounds like uranium hexafluoride through hundreds of unusual vertical cylindrical "boilers" that sound like centrifuges or gaseous diffusion cells; heavily guarded and energy-consuming underground facilities near Landsberg in southeastern Germany that were making a critical new explosive material; a similar heavily guarded underground facility at Dubnica (now in Slovakia); highly secretive underground facilities near Stechovice (now in Czechia) powered by a German-built hydroelectric plant; facilities in Silesia (now part of Poland); and many other specific sites in Germany, Poland, Czechoslovakia, and Austria.

From the official Manhattan District History, during the final year of the war, all of Oak Ridge (both the facilities and the town itself) consumed an average of 0.189 gigawatts of electrical power. According to postwar reports by the U.S. Strategic Bombing Survey and the British Intelligence Objectives Subcommittee, at the end of 1944 the Greater German Reich was producing over 22 gigawatts of power despite all the Allied bombing. Including all other countries aiding Germany during the war, the total was probably around twice that amount.

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Thus, operating enrichment facilities fully comparable to Oak Ridge would have required less than 0.86% of the power of the Greater German Reich, or probably less than 0.5% of the total power aiding Germany. Other documents indicate that German enrichment (especially centrifuges) was more efficient than Oak Ridge and that German bomb designs used methods more efficient than the U.S. Little Boy, so Germany would have needed much less power than Oak Ridge.

Another route to producing fission fuel for nuclear weapons is to use a fission reactor to convert natural uranium-238 into highly fissionable plutonium-239, or alternatively to convert natural thorium-232 into highly fissionable uranium-233. For that purpose, the United States built several large graphite-moderated fission reactors at Hanford, Washington during and after World War II, plus several large heavy-water-moderated fission reactors at the Savannah River Site in South Carolina after the war.

The most famous wartime fission reactor in Germany was a small experimental reactor that was supervised by Dr. Werner Heisenberg and his associates and that never managed to achieve criticality (self-sustaining fission reactions) by the end of the war. However, recently rediscovered archival documents mention several other wartime reactors that may have achieved criticality and may have also been much larger.

A U.S. aerial surveillance photo of St. Georgen an der Gusen, Austria from March 15, 1945, shows what appears to be largely underground octagonal pool-type fission reactors under construction or operational. An aerial surveillance photo of this same site on April 16, 1945, shows that German forces filled the site with earth and concrete and sealed it before U.S. troops arrived.

Surviving Austrian construction plans for this site list "two atomic piles." 1944 Austrian train logbooks show that several other suspected nuclear sites sent regular shipments of codenamed products to this Gusen site. The cover letter for a 1946 U.S. Army Air Forces report on this site is prominently hand-labelled "Underground Pile" with three underlines—and the actual report is still classified. After the war, the son of the SS commandant of Gusen stated that the purpose of the facility was to produce atomic bombs.

Of the reported 30-40 kilometers of tunnels at this underground facility, only one small portion is now opened to the public twice per year—and it contains such a high concentration of radioactive gases that it must be thoroughly ventilated before each public opening, visitors cannot remain in the tunnel longer than one hour, and a plastic barrier had to be installed to block even higher levels of radioactive gases coming from the off-limits tunnels beyond. Requests to conduct industrial archaeological excavations at the site have been rejected by the Austrian government.

Other archival documents mention known or suspected wartime fission reactors at Leverkusen, Hamburg, Leipzig, Lichterfelde, Gottow, Unterraderach, Bodenbach (now Decin, Czechia), Königsberg (now Kaliningrad, Russia), an underground installation in Thuringia, and perhaps other sites as well. Once again, detailed reports on those sites remain unavailable to this day.

Most reactors include a moderator material that increases the probability that neutrons released by one fission reaction will cause more fission reactions. The U.S. nuclear program used a graphite moderator in its Hanford reactors and heavy water (oxygen with deuterium instead of regular light hydrogen) moderator in its Savannah River reactors.

It is well known that Germany was receiving shipments of heavy water from the Vemork plant in German-occupied Norway, and that Allied forces and the Norwegian resistance launched several attacks against that plant. Recently rediscovered documents indicated that Germany was also receiving heavy water from at least 24 other plants all over German-controlled Europe. Detailed reports on those heavy water plants remain classified even today. The fact that Germany was producing heavy water at ~25 or more plants despite other urgent wartime needs strongly suggests that the heavy water was required for operational fission reactors or other aspects of a nuclear weapons program.

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In fact, currently available documents show that wartime Germany was also producing enormous quantities of other materials that a serious nuclear weapons program would require: tens of thousands of tons of graphite, thousands of tons each of fluorine, aluminum, calcium, nickel, and cadmium, hundreds of tons of lithium, tons of beryllium and zirconium, and large quantities of boron. Some sites such as I.G. Farben's Bitterfeld facility were producing multiple nuclear-related materials all at the same location. These activities began as early as 1938 and continued as a high priority to the very end of the war in Europe.

In Part 2 next week, we will discuss what recently rediscovered archival documents tell us about the design, construction, and successful testing of German atomic bombs, as well as the transfer of German nuclear technologies and personnel to the United States and other countries after the war.

All of the archival evidence mentioned in these two articles and much more is available for free at: https://riderinstitute.org/revolutionary-innovation/ (Everything discussed there and in these articles is based entirely on unclassified and declassified sources.) If you find this evidence of interest, please use it as a starting point and see how much more evidence you can find in public archives and private collections around the world, or (very carefully, with all appropriate precautions, permissions, and procedures!) at some of the suspected wartime sites in Europe.

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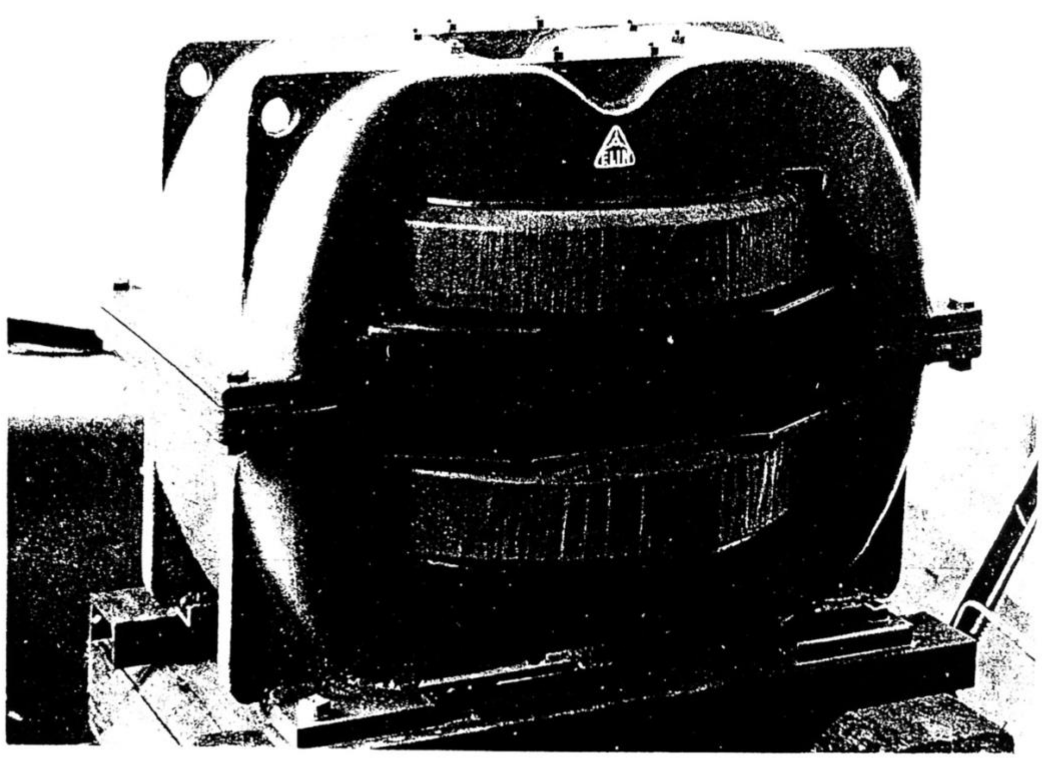
Thanks Todd! What a great start to the insights Dr. Rider has discovered. Look forward to the next part of the story…

Prototype calutron, Manfred von Ardenne, 1941 [Russian archive via Rainer Karlsch].



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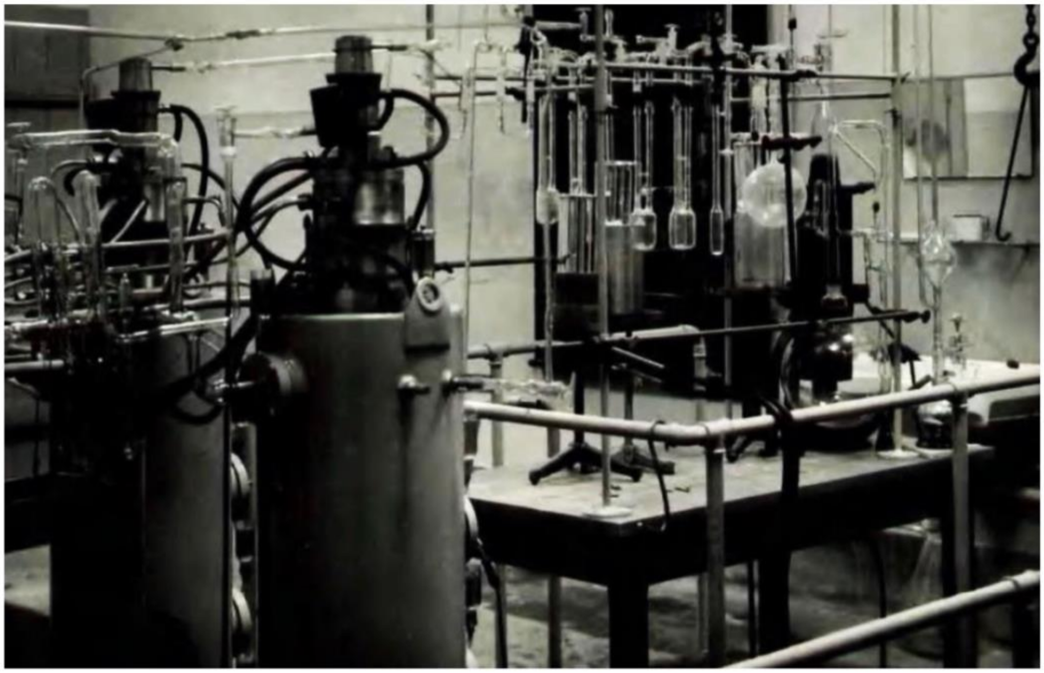
Prototype calutron, Manfred von Ardenne, 1941 (Courtesy of Russian archive via Rainer Karlsch)

Uranium gas centrifuges, Hellige & Co., Freiburg, circa 1943
[Deutsches Museum archive, FA 002/811].



Uranium gas centrifuges, Hellige & Co., Freiburg, circa 1943 (Courtesy of Deutsches Museum archive, FA 002/811)

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Left: March 15, 1945, U.S. aerial surveillance photo of apparent underground reactor complex t St. Georgen an der Gusen, Austria, under construction or operational. Right: April 16, 1945, U.S. aerial surveillance photo of apparent underground reactor complex sealed before U.S. forces arrive. (Courtesy of Air Force Historical Research Agency via Gunther Hebestreit)

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Hitler visiting the Reichswerke Hermann Göring at Linz, Austria on 4 April 1943, surrounded by nuclear scientists (left to right): Kurt Diebner, Werner Heisenberg, Fritz Strassmann, and Rolf Wideröe [Bayerische Staatsbibliothek]. U.S. Manhattan Project General Leslie Groves received reports that this facility was bombed in 1944.

Hitler visiting the Reichswerke Hermann Göring at Linz, Austria on 4 April 1943, surrounded by nuclear scientists (left to right): Kurt Diebner, Werner Heisenberg, Fritz Strassmann, and Rolf Wideröe [Bayerische Staatsbibliothek]. U.S. Manhattan Project General Leslie Groves received reports that this facility was bombed in 1944. (Courtesy of Bildarchiv Preussischer Kulturbesitz 50042721, Bayerische Staatsbibliothek)

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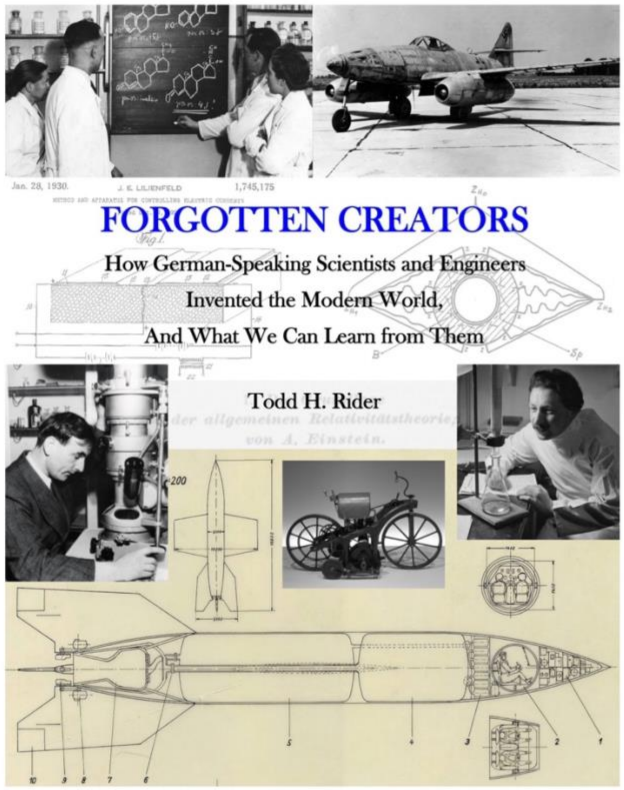

Forgotten Creators: How German-Speaking Scientists and Engineers Invented the Modern World, And What We Can Learn from Them (Courtesy of Todd Rider)

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Dr. Todd H. Rider with the Ohrdruf military base in the background (Courtesy of Lori Rider)