John G. Trump

John George Trump (August 21, 1907 – February 21, 1985) was an American electrical engineer, inventor, and teacher who designed high-voltage generators and pioneered their use in cancer treatment, nuclear science, and manufacturing. A professor at the Massachusetts Institute of Technology (MIT), he led high-voltage research and co-founded the High Voltage Engineering Corporation, a particle accelerator manufacturer. He was the paternal uncle of President Donald Trump.

As Robert Van de Graaff's first PhD student, Trump worked on insulation techniques that made Van de Graaff's generators smaller and installable at hospitals for x-ray cancer therapy. Later, he developed rotational radiation therapy, a technique to better target tumors. While treating thousands of cancer patients on MIT's campus, Trump's lab continued to improve high-voltage machinery and explore its applications in areas ranging from food sterilization to wastewater treatment.

During World War II, Trump played a major role in delivering radar equipment to allied forces through the MIT's Radiation Laboratory, the war's largest civilian science enterprise. In 1940, he joined the newly formed National Defense Research Committee (NDRC) as an aide to MIT President Karl Compton. Trump helped organize the Rad Lab and became one of its leaders while serving as the NDRC's division secretary for radar. In the last year of the war, he directed the lab's European branches, where he organized radar deployments for D-Day operations and advised American field generals on radar use in the campaign to free Europe from Nazi control.

After the war, Trump assembled a team to found the High Voltage Engineering Corporation (HVEC) and became its first chairman. The company used Van de Graaff and Trump's patents to build compact generators for cancer clinics and manufacturers, then built a line of larger particle accelerators for nuclear science laboratories. HVEC became the first success of the American Research and Development Corporation, the first modern venture capital fund.

President Ronald Reagan awarded Trump the National Medal of Science in Engineering Sciences in 1983 for his work applying radiation to medicine, industry, and nuclear physics. He received war service commendations from both President Harry Truman and King George VI. Many of his contributions remain in use: Trump installed the original Van de Graaff generator at Boston Museum of Science and many of his company's machines remain active in physics laboratories worldwide.

Early life and education

New York years (1907–1931)

Born in the Bronx, New York City, on August 21, 1907, John Trump was the youngest of three children born to German immigrants Frederick and Elizabeth Christ Trump. When the Queensboro Bridge was finished in 1910, the family moved to Queens, eventually settling in the Woodhaven neighborhood.[5] When Trump was 11, his father died in the 1918 influenza pandemic, leaving his mother to support the family.[6]

Like his siblings, Trump attended Richmond Hill High School, where he was a gifted student.[5] He joined Western Electric's Manhattan engineering office in 1923, two years before it became known as Bell Labs.[5]

Both John Trump and his older brother Fred joined their family real estate firm, and their mother hoped that Fred would build homes and John design them.[5] John enrolled at Polytechnic Institute of Brooklyn to study architecture. The brothers' work together ended due to differences in business philosophy: Fred preferred to sell units; John thought they should only sell once finished.[5] By the end of his freshman year, John left the family real estate business and switched his concentration from architecture to engineering.[5]

Selected as valedictorian of his class, Trump graduated from "Brooklyn Poly" in 1929 with a bachelor's degree in electrical engineering.[7]

John G. Trump

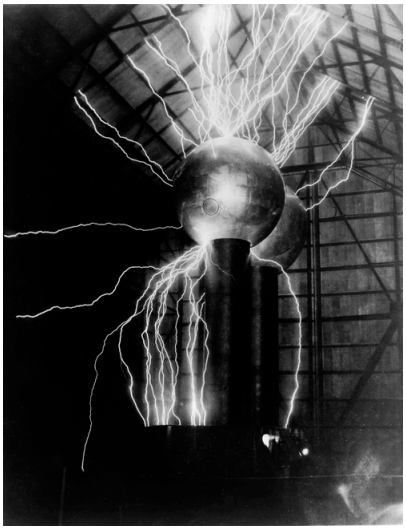
Trump in 1954

Born	John George Trump August 21, 1907 New York City, U.S.
Died	February 21, 1985 (aged 77) Cambridge, Massachusetts, U.S.
Education	Polytechnic Institute of Brooklyn (BS) Columbia University (MS) Massachusetts Institute of Technology (DSc)
Occupation	Electrical engineer
Employer	MIT
Known for	Van de Graaff generator Electron beam

While teaching electrical engineering at his *alma mater*, he earned his master's degree in physics from Columbia University's graduate school in 1931.[8][9]

MIT doctorate (1931–1933)

In fall 1931, Trump arrived at the Massachusetts Institute of Technology (MIT) to pursue a PhD in electrical engineering. When he arrived, MIT's leadership was focused on improving research programs in basic sciences like nuclear physics.[10] Vannevar Bush, dean of MIT's engineering school, advised Trump to work with the young physicist Robert J. Van de Graaff, recently recruited to MIT to improve his new electrostatic generator.[9][11]

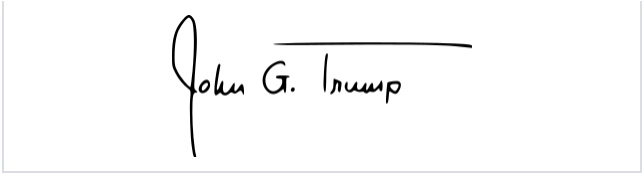


Streamers arcing from the Round Hill generator

In pursuit of high-energy methods to split the atom, Van de Graaff arrived at MIT to build a generator capable of 10 megavolts, a level more than ten times higher than any yet produced.[11] His 43-foot (13 m) Round Hill generator was first demonstrated in November 1933.[12] While newspapers celebrated its dramatic electrical

	sterilization of wastewater[3][4]
Spouse	Elora Sauerbrun
Children	3
Parents	Frederick Trump (father) Elizabeth Christ (mother)
Relatives	Trump family
Awards	King's Medal for Service (1947) President's Certificate (1948) Lamme Medal (1960) National Medal of Science (1983)
Scientific career	
Fields	Electrical engineering
Institutions	MIT
Thesis	*Vacuum electrostatic engineering (https://dspace.mit.edu/handle/1721.1/32556)* (1933)
Doctoral advisor	Robert J. Van de Graaff
Notable students	Jay W. Forrester (BS)[1] Louis Smullin (MS)[2] Mac Van Valkenburg (MS)
Signature	

arcs, they also revealed the generator's fundamental limitation: the breakdown of voltage in air insulation.[13]



During the Round Hill generator's construction, Trump worked on methods to operate a generator in vacuum. He designed a synchronous alternating-current motor to power a vacuum, which proved highly efficient.[11] His dissertation also proposed a method to build vacuum-insulated, long-distance transmission lines for high-voltage direct current.[11] In 1932, Van de Graaff filed to patent components in the transmission system they developed, and Trump filed a further patent in 1937, his first.[14] The newly created Tennessee Valley Authority showed interest in developing these patents for hydropower installations. Seeking more diversified funding during the Great Depression, this interest prompted MIT to develop a patent licensing policy, one of first to allow universities to benefit when scientific discoveries were found to have profitable commercial uses.[14]

Trump received his doctorate of electrical engineering in 1933.[11] His thesis, *Vacuum Electrostatic Engineering*, described these contributions and examined the factors governing voltage-insulation strength in vacuums.[15]

Career

Early applied research (1935–1941)

After graduating, Trump remained at MIT as a research associate, then became an assistant professor in 1936.[16] His research focused on improving high-voltage generators and finding new uses for them in industry.[17]

In 1932, Trump learned about an MIT lecture by radiologist George W. Holmes on medical uses of high-voltage x-rays.[18] Prevailing low-voltage radiotherapy techniques could only target superficial tissues and required long exposures that damaged skin.[19] Because Van de Graaff generators produced steadier high-voltage power than transformer-based generators, Trump hypothesized they could produce penetrating x-rays that could target deeper tumors.[11]

In May 1935, Trump showed that MIT's Van de Graaff generators could produce abundant x-rays.[18] With a grant from the Godfrey M. Hyams Trust, he built a 1-megavolt (MV) generator for Boston's Huntington Memorial Hospital, a cancer treatment center.[8][18][20] In March 1937, Trump's x-ray generator entered service at Huntington.[19] With a room-sized voltage terminal and a long focusing coil snaking into the treatment room below, Trump's machine was described as a

"magnificent monster" by one of its operators.[18] Doctors reported that it provided "increased depth dosages, greater skin sparing, and greater intensity."[21] The first patient treated for skin cancer survived beyond four years.[20][19] However, Huntington Hospital survived only another four years, and the machine was shut down in 1941.[21]

Using pressurized gas, Trump made new generators smaller than the original, air-insulated models. He built a compact 1.25-MV generator for Massachusetts General Hospital in 1940, which treated patients for sixteen years.[9][19] Trump's pre-war x-ray experiments have been acknowledged as precursors to the field of radiosurgery.[22]

With World War II engulfing Europe and Asia, the United States military began expanding its fleet production. Trump investigated practical applications of x-rays in military industry. With Carlton G. Lutts, an engineer at Boston Navy Yard, Trump discovered that his high-voltage generator could detect manufacturing defects in ships and aircraft.[8]

War years (1941–1945)

During World War II, Trump interrupted his research on x-ray therapy to focus on military uses of microwave radar. In early 1940, Vannevar Bush organized the National Defense Research Committee (NDRC) to direct the White House's wartime research investments. Trump joined the NDRC as technical aide to MIT President Karl Compton, head of the committee's radar section.[9][23] A presentation of British innovations in high-power microwave signal prompted the NDRC to choose radar as its first major area of research investment. Committee members pressed Compton to organize a secret research center at MIT. Trump joined the first organizing meeting of MIT Radiation Laboratory or "Rad Lab," which opened in October 1940. The Rad Lab grew rapidly after the United States entered the war, becoming the largest civilian research site. In 1942, Trump became secretary of the NDRC's Microwave Committee, overseeing the Rad Lab and other nationwide radar research.[8]

Employing 4,000 people at its peak, the Rad Lab engineered radar sets for groundbreaking military capabilities, including fire control, early warning systems, and blind bombing. Working from MIT as a liaison to the NDRC, Trump served as an assistant director to Rad Lab head Lee DuBridge.[24] He was also appointed to lead the Rad Lab's Field Service, which cooperated with the U.S. Army and Navy to deploy and maintain radar sets in both theaters of war.[24]

In January 1943, Trump was asked by the U.S. Office of Alien Property Custodian to examine the notes, papers, and artifacts left by the inventor Nikola Tesla, who had died two days prior.[25] U.S. government officials believed the papers might contain designs for Tesla's promised high-voltage

weapons, and were reluctant to have Tesla's nephew bring them to German-occupied Yugoslavia.[25][26] After a three-day investigation, Trump reported that the materials had no military value to the United States, nor would they be a "hazard in unfriendly hands."[25] In his assessment, Tesla's late-career projects were promotional and "did not include new sound workable principles or methods."[26]

Trump driving a Jeep with Rad Lab director Lee DuBridge at the end of WWII

In 1943, NDRC agreed to establish the British Branch of the Rad Lab (BBRL) to coordinate invasion plans with the British Telecommunications Research Establishment (TRE) at Malvern. From February 1944 to the end of the war in Europe, Trump was the director of the BBRL.[8] During the war, Trump also served in the Advisory Specialist Group on Radar, advising USAAF General Carl Spaatz on navigational radar, precision-bombing radar, and also defenses against the German radars found in their night-fighters and in their flak units. Trump worked with all the most important British radar experts, including Sir Robert Watson-Watt, A.P. Rowe, and Bernard Lovell.

In April 1945, Trump conducted debriefing interviews with the leadership of Telefunken, the telecommunications firm that developed Nazi radar and countermeasures. From these interviews, he determined that German radar development had fallen substantially behind British and American war efforts. Trump attributed this to the failure of German military leaders to closely cooperate with scientists and industry experts, as Allied forces had.[27]

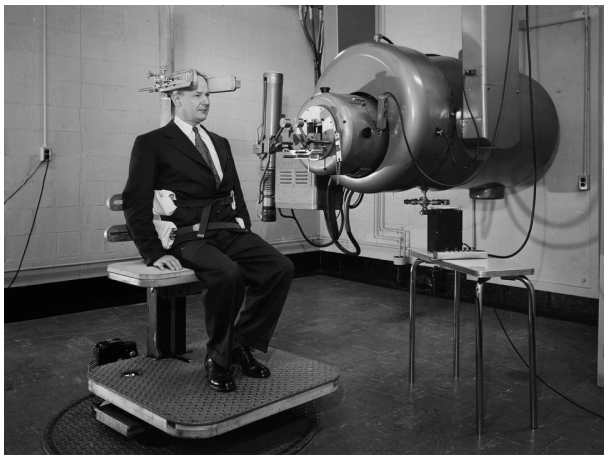
Trump received recognition for his war service from both the United States and the United Kingdom.[16][28]

Post-war cancer research (1946–1973)

After the war, Trump returned to MIT and was appointed director of High Voltage Research Laboratory, a lab pursuing industrial applications of electrostatic energy.[11] Building upon his pre-war collaboration with area hospitals, Trump focused on applying high-voltage engineering to medical challenges, particularly cancer treatment.

Months after the war ended, Trump began work with his Huntington colleagues to treat cancer patients at a 3-MV generator building on MIT's campus.[29] Having discovered a way to reach deep-seated tumors without harming tissues above them, he worked on methods to improve targeting. Trump designed an apparatus to rotate the patient around the beam, allowing x-rays to be cross-fired at the tumor site.[29][30] This technique, known as "rotational radiation therapy," remains widely used.

In 1949, Trump began a two-decade collaboration with the Lahey Clinic, Boston's leading cancer hospital.[31][32] Over the next 22 years, over 500 cancer patients a year received treatment at MIT using Trump's x-ray generator.[33] Trump supervised treatments, improved targeting techniques, and personally trained many doctors in their use.[17] For many years, he taught radiation physics to early-career doctors.[34] The lab also focused on skin cancer treatment, designing a 5-MV electron-beam generator for targeting superficial lesions.[31][33]



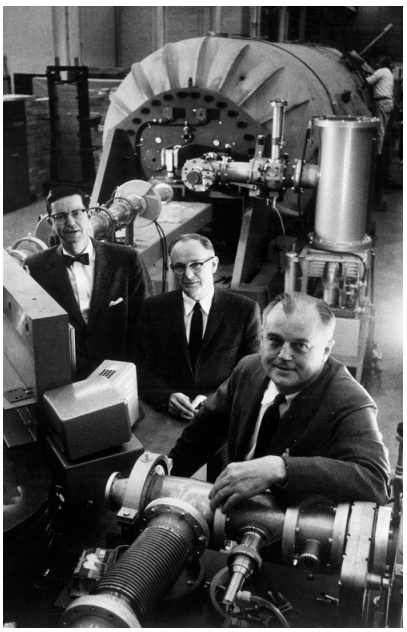
Trump with his 2-MV rotational radiotherapy machine

Despite advances in supervoltage (>1MeV) generators, few hospitals had machinery to allow high-voltage cancer treatment by the 1940s.[30] After receiving many requests from hospitals for his generator, Trump oversaw a commercialization effort to meet demand.[30] He designed a compact, low-cost 2-MV Van de Graaff generator, then founded a firm to build them.[29][30] Between 1948 and 1969, the High Voltage Engineering Corporation manufactured 43 of these 2-MV machines, which treated as many as 1,000 patients a day in the United States alone.[21]

By the time Trump was appointed full professor in 1952, his cancer research devices had received worldwide attention.[30][9][17] He attracted support from the National Institutes of Health and the National Science Foundation, each of which were building major cancer research operations. His 1960 Lamme Medal citation, given for contributions to electrical engineering, observed that Trump had also "remain[ed] faithful to his original goals in the treatment of malignant diseases."[9] In 1963, Trump was appointed to the board of the Lahey Clinic, and became its chair after retiring his professorship in 1973.[31] Throughout this period, he published widely in radiology and scientific instrument journals.

Compact Van de Graaff machines were among the earliest x-ray machines that could target deep tumors with precision. However, their voltages were effectively limited to 3–4 MeV, restricting their targeting depth and extending the required duration of treatment.[18][21] A 1968 global census of radiotherapy devices showed that they were being eclipsed by linear accelerators, or "linacs."[21] Linacs, which have greater beam stability, smaller forms, and higher voltages than their predecessors—are now the most prevalent devices for deep tumor radiotherapy.[18] Trump's innovations influenced this next generation of higher-voltage radiotherapy devices. Ed Ginzton, who built the first medical linear accelerator in 1956, assembled it inside the housing of Trump's 2-MeV model and borrowed its rotational setup.[35]

High Voltage Engineering Corporation



Robinson, Trump, and Van de Graaff (left to right), founders of HVEC

In 1946, Trump approached MIT President Karl Compton about commercializing his gas-insulated Van de Graaff generator for hospital use.[30] Compton, a champion of the Round Hill generator, folded the proposal into post-war plans.[30] Compton had recently co-founded the American Research and Development Corporation (ARD), the first closed-end venture capital fund, focused on forming new American industries from high-tech research.[36][37] ARD president Georges Doriot offered Trump $200,000 to start the High Voltage Engineering Corporation (HVEC), Compton provided an exclusive license to MIT's Van de Graaff patents, and both served on HVEC's board.[30] HVEC would become the second start-up backed by ARD, and later its first successful investment.[36]

The company's original leadership consisted of Trump, Van de Graaff, and Denis Robinson, a British electrical engineer Trump met through the Rad Lab and recruited as HVEC's chief executive.[38] Trump, who held a 13.3 percent stake in the firm, served as its founding chairman and technical director.[17][38] Working out of a Cambridge parking garage, HVEC initially built Trump's compact Van de Graaff for hospitals and manufacturers.[17][37] Although the 2-MV machines sold immediately, they faced competitive threats from other radiotherapy technologies like colbalt-60 machines.[30]

Growing federal support for nuclear sciences enabled HVEC to invest in a higher-margin product: particle accelerators for universities and government labs.[30][39] Initially, its 2-MeV hospital accelerator found customers in nuclear science, and orders came from the Naval Research Laboratory, Brookhaven National Laboratory, and European universities.[30] In 1955, HVEC was contracted to design a 5-MeV tandem accelerator for Chalk River Laboratories in Ottawa. The firm invested heavily in building higher-power tandem machines.[40] Trump and Van de Graaff supplied ideas for increasing their voltage.[41] HVEC would manufacture a further 55 tandem accelerators for research labs around the world.[42] The firm's largest and last successful model, the "MP" or "emperor tandem," debuted in 1963.[42]

In the scientific particle accelerators business, HVEC had little competition, high net earnings, and a full book of orders through the late 1950s.[38][39] Setting up a production plant in Burlington, Massachusetts, HVEC grew to over 1,400 employees and built at least 500 generators across all models.[41][43] HVEC accelerators were prized for their precision, maintainability, and easy-to-upgrade design.[38]

By 1957, HVEC had provided a ten-fold return to early investors.[39] During ARD's first decade, it was the fund's most successful investment and effectively assured its survival.[39][36] HVEC remained profitable into the late 1960s.[41][40] Thereafter, the company was beset with product development issues, competitive threats, and a collapse of federal funding. Labs reported

operational problems with HVEC's emperor tandem and began eyeing competitors' models.[40] The firm invested heavily in Van de Graaff's final design–the enormous 20-MeV "transuranium accelerator"–but the Atomic Energy Commission refused to fund its purchase.[40] After Van de Graaff 's 1967 death, HVEC's MIT leadership began leaving active management, though Trump provided technical advice until 1978.[40][41] After 1971, National Electrostatics Corporation, a competitor founded by Trump's longtime associate Ray Herb, booked all orders for tandem accelerators.[42] Under new leadership, HVEC sold its Burlington plant, divested from the accelerator business, and focused on its conglomerate businesses that manufactured smaller industrial products.[40][41]

Holding HVEC shares until his death in 1985, Trump made no personal fortune from the firm's years of profitability.[38] Denis Robinson, its first chief executive, said the real estate Trump convinced HVEC to buy on Massachusetts Route 128 sold for a value as high as many years of HVEC's profits.[8][17] In 1989, HVEC accepted a buyout from a South African private equity firm.[41]

Wastewater experiments (1974–1985)

In 1972, Congress passed new Clean Water Act standards for secondary treatment of wastewater discharged into oceans and waterways. New rules gave cities five years to make major upgrades to sewage treatment.[44] Trump, who had longstanding interests in sterilization methods, initiated a new program at MIT concentrated on disinfecting wastewater. He researched using an electron beam from a 2-MeV accelerator as the deactivating agent in the treatment of municipal wastewater sludge.[17] The High Voltage Research Laboratory developed a prototype system that was tested at Boston's Deer Island Waste Water Treatment Plant, and it was able to provide bacterial and viral disinfection via continuous on-line treatment.[45]

Trump retired from his faculty appointment in 1973, but continued to running wastewater experiments and teaching MIT students as a senior lecturer.[28] He directed the High Voltage Research Laboratory until stepping down in 1980.[11] Trump remained engaged in wastewater research until the year of his death.[17]

Trump died in Cambridge, Massachusetts on February 21, 1985.[28][46]

Science education

Trump became a trustee of the Boston Museum of Science in 1961.[47] When the museum installed the original Van de Graff generator as a permanent exhibition, he designed electrostatic

shielding that allowed live audience demonstrations.[17] He became a life trustee of the museum.[17]

Legacy

President Ronald Reagan awarded Trump the National Medal of Science in 1983 for his innovative applications of radiation in medicine, industry and atomic physics.[48] Trump died six days before the White House ceremony in February 1985, and his son John, Jr. accepted the medal on his behalf.[16][49] In a posthumous tribute, the National Academy of Engineering described John Trump as "a pioneer in the scientific, engineering and medical applications of high voltage machinery."[16]

In addition to his cancer research, Trump made institutional contributions to the Lahey Clinic. While chair of its board, he advocated for the relocation of the cancer clinic to a new hospital campus in Burlington, Massachusetts. The radiation oncology building of the Lahey Hospital & Medical Center is named for Trump. In 2024, one of his scientific collaborators endowed a fund at Lahey for diagnostic radiation named for Trump.[50]

Disputed claims about career

Refusal to work on weaponry

James Melcher, Trump's successor as HVRL director, claimed that Trump declined to research military weaponry during his career. Melcher, an advocate for nuclear disarmament, stated: "John, over a period of three decades, would be approached by people of all sorts because he could make megavolt beams of ions and electrons – death rays... What did he do with it? Cancer research, sterilizing sludge out in Deer Island, all sorts of wondrous things. He didn't touch the weapons stuff."[51][52] Trump worked on cancer research and sludge sterilization and also tested dual uses of high-voltage radiation and supported the development and deployment of radar-enabled weapons.

Longest-serving MIT professor

President Donald Trump has repeatedly claimed his uncle was MIT's "longest serving professor."[53] John Trump served as an MIT professor for 37 years (1936-1973), retiring at the university's then-mandatory retirement age of 65, then remained a senior lecturer.[16] A research staff appointment before his professorship and senior lecturer appointment after his retirement bookended his MIT career, extending it to 51 years.[16][53]

A fact check published in *Newsweek* disputed President Trump's claim and identified other MIT professors with longer appointments.[53] Gilbert Strang, whose career ended after Congress prohibited mandatory faculty retirement in 1986, was an MIT professor for 61 years.[53][54][55] Doc Edgerton, a contemporary of John Trump, was a professor for 36 years and remained active at MIT for nearly 62 years.[53][56]

Connections to Ted Kacyznski

In 2025, President Trump stated that domestic terrorist Ted Kaczynski was a student of his uncle, and he recounted a conversation they had about Kacynzski's performance as a student. Kaczynski was a student at Harvard University (1959–1962) and the University of Michigan (1962–1967). MIT officials have stated they have no records of Kaczynski's enrollment in MIT courses.[57][58] Additionally, reporters observed that Professor Trump was deceased for over a decade by the time of Kaczynski's identification as the Unabomber and capture in 1996.[58][59] Trump also erroneously credited his uncle with having university degrees "in nuclear, chemical, and math" [sic], rather than in physics and electrical engineering.[58]

Personal life

John G. Trump was a member of the Trump family. He married Elora Sauerbrun (1913–1983), and they had three children: John Gordon Trump (1938–2012) of Watertown, Massachusetts; Christine Philp (1942–2021) of New London, New Hampshire; and Karen Ingraham of Los Alamos, New Mexico; and six grandchildren.[28][60]

The Trumps lived in Winchester, Massachusetts and were members of the Winchester Unitarian Society.[61]

Awards and honors

Trump received a number of awards including:

- 1947: The King's Medal for Service in the Cause of Freedom (KMS), given by George VI[28]
- 1948: The President's Certificate of Merit, presented by Harry S. Truman[28]
- 1950: Fellow of the American Academy of Arts & Sciences[62]
- 1960: The Lamme Medal, given by the American Institute of Electrical Engineers[28]
- 1982: American College of Radiology Gold Medal[63]
- 1983: The National Medal of Science for Engineering Sciences[64][28]

Selected publications

Trump wrote approximately 100 peer-reviewed articles, published across journals in applied physics, nuclear science, radiology and medicine, scientific instruments, and environmental engineering.[16][17]

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