



History of the Large Van de Graaff Generator at Smith College

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Introduction

This poster is dedicated to the large Van de Graaff generator which has made Smith special in the Physics education and research fields. The generator, having resided in the McConnell Hall basement unused for years, is currently being refurbished by our Early Research group. The restoration process includes repairing, building, reordering and assembling different parts of the machine.



Current picture of the Large Van de Graaff generator undergoing restoration in McConnell Hall.

Robert Jemison Van de Graaff at MIT had developed an electrostatic generator whose half-million volts of electricity. This technology allowed for "atom-smashing" research done by several members of the Smith physics department. The eight-foot-tall Van de Graaff generator, the first in the Connecticut Valley and the first at any women's college, was built during 1939-40.

When the restoration is completed, the generator will be used for physics demonstrations. The following information is collected from faculty members, publications and documents in the Smith Archive.

Press Releases

April 8, 1940 [Smith College Press Board]

Smith College to do "Atom Smashing"

Smith College authorities announced today that the institution would become for first women's college to provide facilities for "atom smashing" with the installation of a Van de Graaff electrostatic generator. The apparatus, which will have a half-million volt capacity, will be completely installed within a month, and will be used primarily to disintegrate atoms for the production of radioactive materials.

The Van de Graaff generator at Smith was: The only machine of its kind in any college of the Connecticut Valley. Only 5 other institutions have similar models then: Notre Dame, Harvard, Purdue, MIT, U Wisconsin. Expect to make Smith a center for the study of nuclear physics in

women's colleges and in widespread usage of the instrument by physicists of the Connecticut Valley interested in nuclear problems

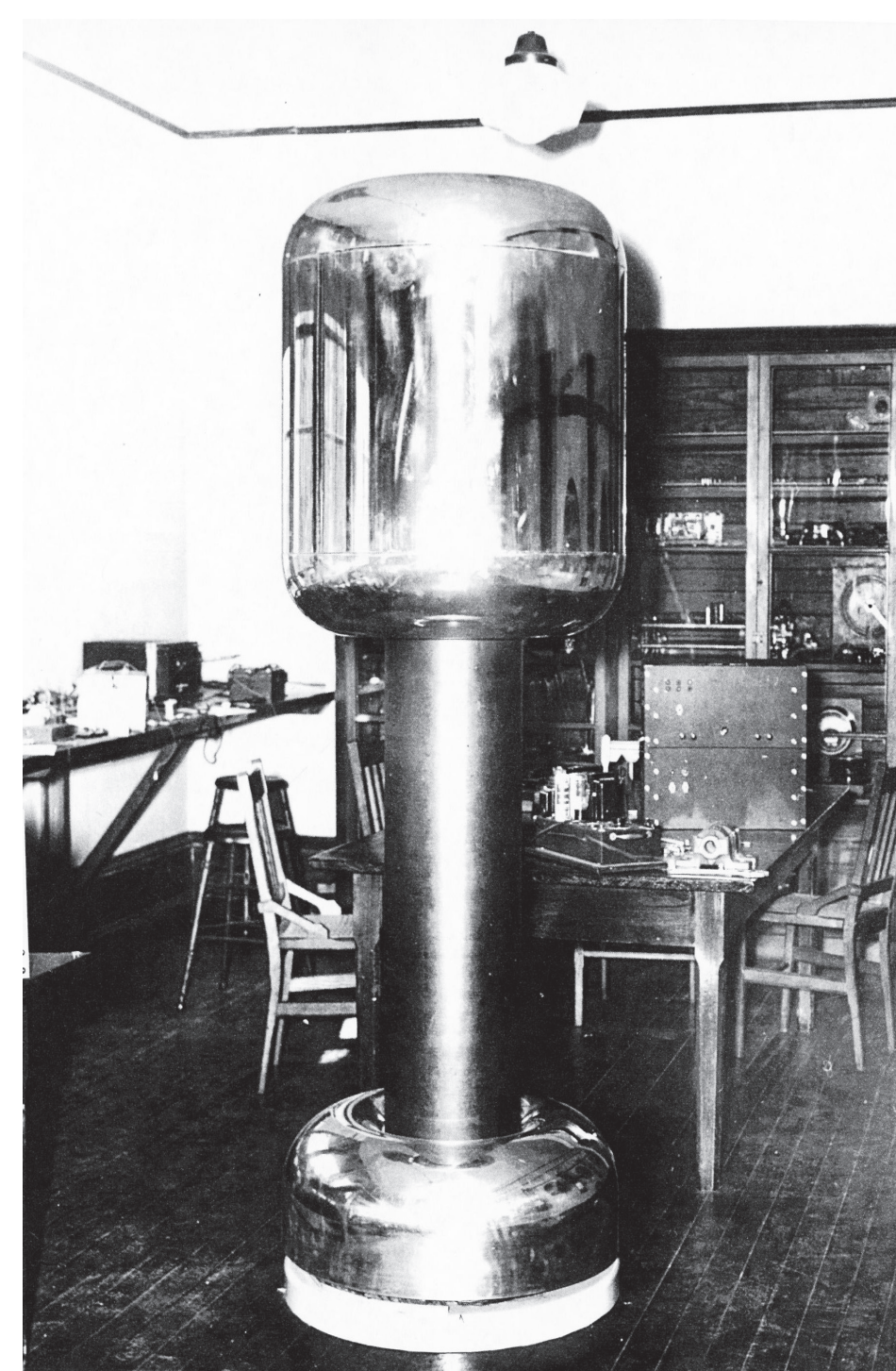
Oct 21, 1940 [Smith College Press Board]

Atom Smasher Demonstration

Demonstration of the 500,000 volt effect of the new atom smasher were given, in 15-minute interval from 5:30 to 7:30 and from 7:30 to 9:30 by Douglas H Ewing in Lilly Hall .

An unusual odor, ozone, noticeable during the demonstration, was released during the mounting up of the extremely high charge. Sparks were produced between the ground connection and the generator, and between the upper and lower parts of the generator, indicating a potential of some 600,000 volts. An experiment was done with a flame on one side and some distance away from the apparatus. The effect of the field of this field was to flatten the flame. If sufficient voltage were obtained, the flame would be entirely extinguished. The charge forced Mr Ewing's hair to stand up straight and each individual hair tend to repel each other, when combed back.

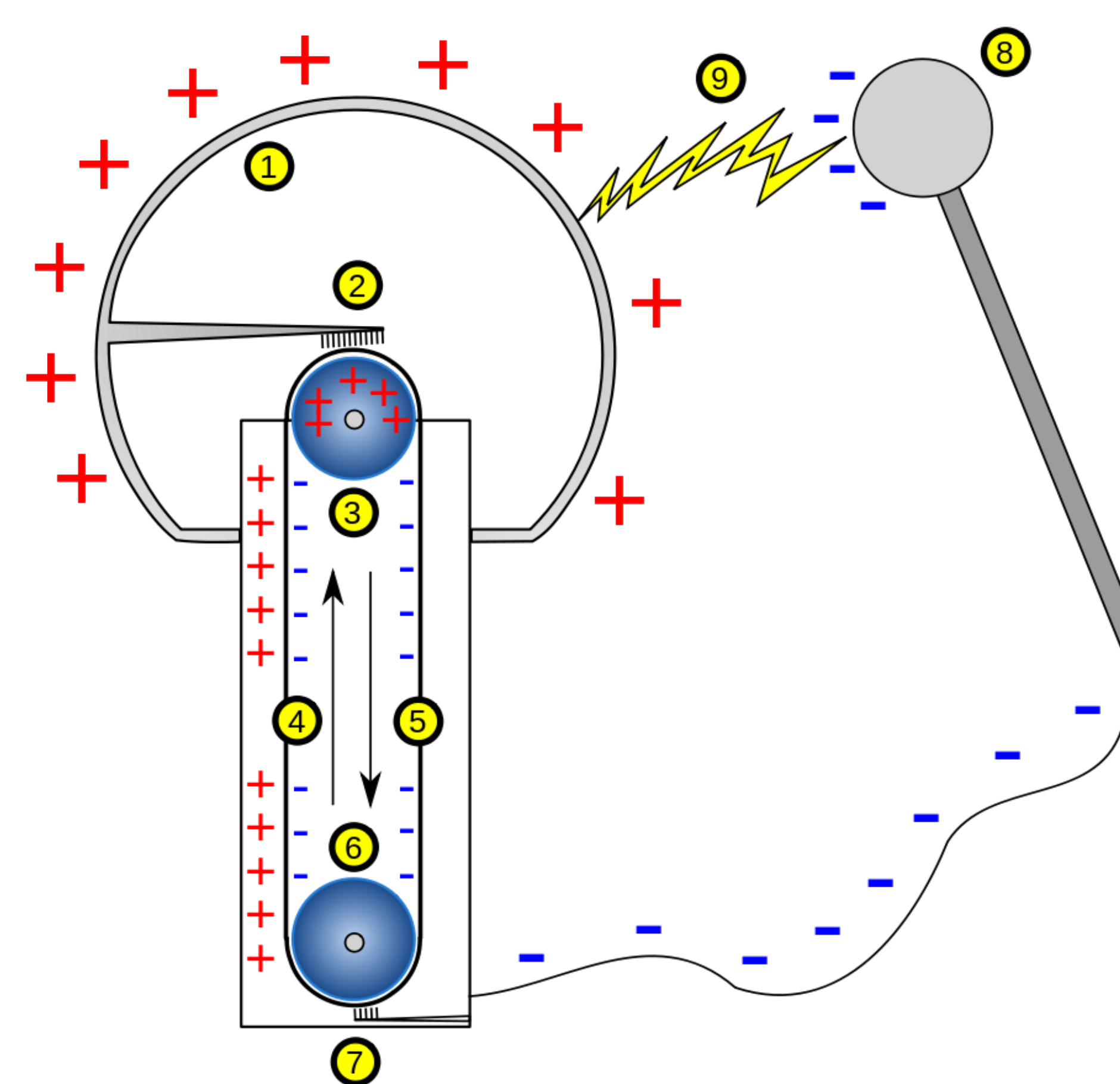
About the Machine at Smith



Atom Smasher purchased in 1940, in process of installation at Smith College

The Van de Graaff generator was designed in 1933 by Robert J Van de Graaff, professor of Physics at MIT; its form closely resembles the design of the Getting and Fisk model at Harvard. The machine was installed under the direction of Douglas H Ewing, instructor of Physics, assisted by Russell Douglas, technician in Physics at Smith. The 8-foot-tall generator is composed of a grounded electrode 30 inches in diameter and 15 inches high, a three foot column of General Electric Textolite insulating material, and a high voltage electrode 30 inches in diameter and 34 inches high that connects them. It was reported that the cost was expected to not exceed \$1000 for the high voltage installation in the labs at Lilly Hall.

Basic Workings of a Van de Graaff generator



Schematic diagram of a standard Van de Graaff generator.

A Van de Graaff generator is an electrostatic generator which uses a moving belt to accumulate very high amounts of electrical charge on a hollow metal globe on the top of the stand. A pulley [6] drives an insulating belt [4,5] near a sharply pointed metal comb [7] which has been given a positive charge by a power supply. Electrons are removed from the belt, leaving it positively charged. A similar comb at the top [2] allows the net positive charge to spread to the inside of the dome [1]. Once the charge is on the inside of the dome, electrostatic force "pushes" the charge to the outside of the dome creating a very high potential.

Faculty members involved at Smith College

Gladys A Anslow--- Formed a research team at Smith to create a stimulating research environment in the Smith physics department by adopting the focused group research method of UC Berkeley. The large Van de Graaff generator was among the plethora of detection instruments and special equipment designed and built for this research group in high-energy physics.

Worked on atom smashing as a research fellow at Berkeley in the radiation laboratory of Nobel Lauriat Ernest Lawrence

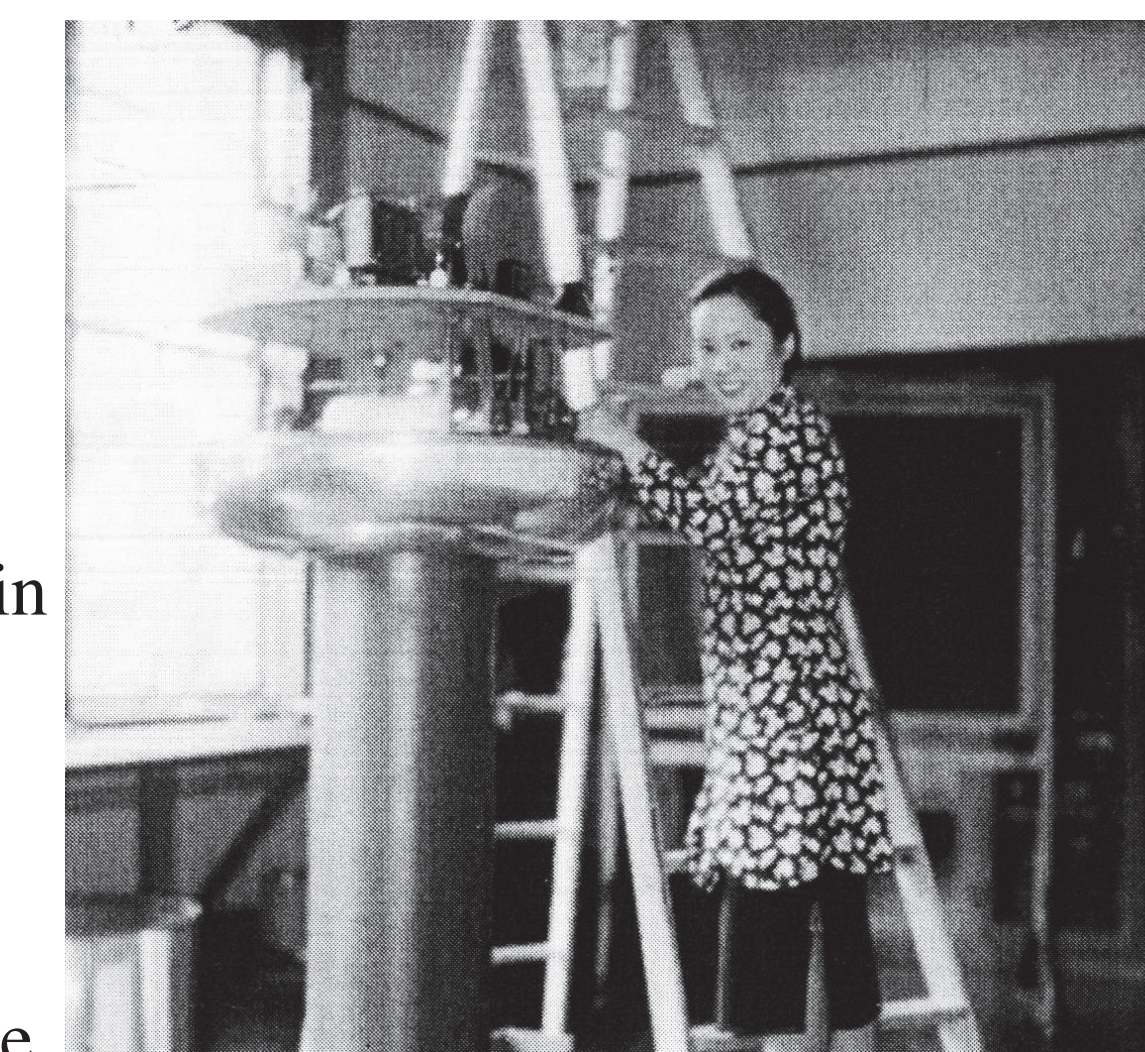
Douglas H Ewing--- Was in charge of the installation of the generator at Lilly Hall, and held demonstrations of the generator for faculty, students, and the public.

Worked with cyclotron in the Department of Physics at U of Rochester

James F Koehler--- Spent a sabbatical leave at Caltech identifying mesotrons in cosmic rays

Nora M Mohler--- Studied nuclear phenomena at the Cavendish lab in Cambridge, England.

Chien-Shiung Wu--- Helped confirm experimental elements of Fermi's beta decay hypothesis; assisted Tsung-Dao Lee and Chen-Ning Yang with their Nobel-winning research; gave them the suggestion of using a specific type of polarized molecule Worked on the Manhattan Project; helped create procedure for separating U235 from U238 Became the first women to get a tenured position in Columbia University physics department (1952), and first women elected as president of the American Physical Society (1975) Taught as an Assistant Professor of physics at Smith 1942-43



Smith's first Chinese instructor, Chien-Shiung Wu, who is quite at home with the Atom Smasher having been Dr Laurence's assistant at the Radiation Laboratory of the U of California.



Nora Mohler, Professor of Physics 1927-62, teaching students about the atom smasher

Acknowledgments

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