PART III

The Nobel Prize & Other Honors, 1945–1980

In Exhibit 3, many of the awards received by Van Vleck for his exceptional contributions to the field of Physics are acknowledged. It also becomes more apparent how his contributions changed the world in which we live.

The Nobel Prize

The supreme accolade that any scientist can receive is the Nobel Prize. Early one morning in fall of 1977, John H. Van Vleck, then 78 years old, still in his pajamas and bathrobe, received a phone call informing him that he was a winner of the Nobel Prize. (**Exhibit 1C**) That year, the prize in Physics was shared among Van Vleck, Philip W. Anderson (a former PhD student under Van Vleck), and Sir Nevill F. Mott.

From the development of laser beams to the tape recorder, from the creation of exotic gadgetry in modern electronics to new industrial uses of glass, much credit rests on his theories of solid-state physics, honored by this award.

The exhibit includes a photo of John Van Vleck's Nobel Prize medal and the original blue case holding Van Vleck's personal diploma. (**Exhibits 2C & 3C**) The Physics Nobel Prize amount awarded in 1977 was Kr7000,000 or $155,763.23. You'll find photos of the Nobel Awards Ceremony held on December 10, 1977 (**Exhibit 4C**), which include King Carl XVI Gustaf of Sweden honoring Van Vleck on behalf of the Royal Swedish Academy of Sciences and the Nobel Foundation.

National Medal of Science

Another of the outstanding moments in his life occurred on February 6, 1967, when John Van Vleck received the National Medal of Science from President Lyndon B. Johnson at The White House. His citation read: "For his many contributions to the development of the theory of molecular structure and for his profound influence, through original contributions and through many brilliant students, on the theory of the magnetic and dielectric properties of materials." (**Exhibit 5C**)

Notes: To see photos and learn more about all of the Physics Nobel Prize winners, visit our Ingersoll Museum hallway display, located just off the 2nd floor lobby in Chamberlin Hall, 1150 University Avenue, Madison, Wisconsin.

All information on Nobel Laureates and prizes taken directly from Nobelprize.org, including Van Vleck's autobiographical sketch.

Selected Honors

The Nobel Prize

- December 10, 1977

Professorships

- Lorentz (visiting) Professor, Leiden, 1960
- Eastman Professor, Oxford, 1961
- Guggenheim Fellow, 1930

Medals

- National Medal of Science (USA)
- Lorentz Medal (Netherlands)
- Cresson Medal (Franklin Institute)
- Michelson Prize of Case Institute of Technology
- Langmuir Award in Chemical Physics, General Electric Foundation
- Chevalier, Legion of Honor

Memberships

- Foreign member, Royal Swedish Academy, Uppsala Academy, Netherlands Academy, Academie des Sciences, Royal Academy of London
- Member, National Academy of Sciences; American Academy of Arts and Sciences; American Philosophical Society; International Academy of Quantum Molecular Science; Honorary Member, French Physical Society; President, American Physical Society, 1952

Honorary Degrees

- Honorary D. Sc. UW Wisconsin 1947 (plus 10 others)

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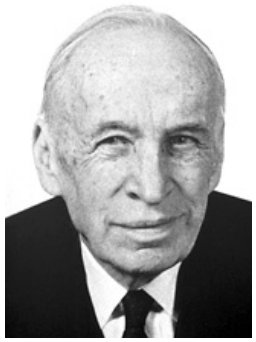
John Hasbrouck Van Vleck

1899–1980



In 1977, the Nobel Prize in Physics was jointly presented to John H. Van Vleck of Harvard, Philip W. Anderson of Bell Labs, and Sir Nevill F. Mott, University of Cambridge for their "***fundamental theoretical investigations of the electronic structure of magnetic and disordered systems***."

John Hasbrouck Van Vleck, the founder of the modern theory of magnetism, was a pioneer in the development of the quantum theory of matter. His applications of quantum mechanics changed physics and chemistry, deepening our understanding of atomic systems from single molecules to crystalline solids (Harvard Gazette).

This exhibit features the life story of John Hasbrouck Van Vleck, a former University of Wisconsin alumnus (A. B. 1920) and faculty member (1928–34) of the UW Physics Department, who grew up (and is even buried) in Madison, Wisconsin. His story is presented through a series of three exhibits, beginning with "The Early Years," followed by "The Research Years," and concluding with "The Nobel Prize and Other Honors."
We hope you enjoy the journey!

PART I

The Early Years, 1899–1922

John H. Van Vleck was born in Middletown, Connecticut on March l3, 1899 to mathematician Edward Burr Van Vleck and Hester Raymond Van Vleck. (**Exhibit 1A**) He was also the grandson of astronomer John Monroe Van Vleck. He spent his early childhood years in Middletown. (**Exhibits 2A & 3A**)

High School & College Years in Madison

When he was seven years old, his father (Edward, whom Van Vleck Hall on the UW Madison campus is named after) accepted a mathematics professorship at the University of Wisconsin, resulting in his family moving to Madison. (**Exhibit 4A**) It was also about this time that Professor Edward Van Vleck took his family on an European trip, during which young John amazed everyone by memorizing all of the European train schedules. (**Exhibit 5A**) As a youngster, he attended Madison public schools and graduated from Madison High School, which later became Madison Central High and eventually the downtown campus for the Madison Area Technical College. (**Exhibits 6A and 7A**)

In 1916, he came to the University of Wisconsin-Madison as a physics undergraduate major. He also had an interest in music from an early age and fulfilled that by playing the flute, eventually becoming a member of the University of Wisconsin Band. (**Exhibits 8A & 9A**) He graduated with an A.B. degree in 1920. (**Exhibit 10A**)

Throughout his life, he maintained his great passion for trains, he even considered a career with the railroad. As a Wisconsin youngster, he loved Badger football. In 1909 when he was ten years old he attended a Badger home football game at which "On Wisconsin" was sung for the first time.

From the postcards in the exhibit, taken from a scrapbook kept by Van Vleck as a child, you can see how Madison looked during the time of his elementary school years. Later, in the University of Wisconsin Badger yearbooks, we find that he has been given the nickname "Has" (short for his middle name of Hasbrouck).

Graduate School at Harvard

After graduating from UW Madison, he headed for graduate school at Harvard University. (**Exhibit 11A**). In his autobiography, he says:

"As a sort of revolt against having two generations of academic forbears, I vowed as a child that I would not be a college professor, but after a semester of graduate work at Harvard, I outgrew my childish prejudices, and realized that the life work for which I was best qualified was that of a physicist, not of the experimental variety, but in an academic environment."

He continues, "At Harvard I took most of my courses under Professor Bridgman or Professor Kemble. The latter's course on quantum theory fascinated me...he was the one person in America at that time qualified to direct purely theoretical research in quantum atomic physics."

"My doctor's thesis was the calculation of the binding energy of a certain model of the helium atom...The results did not agree with experiment for the 'old quantum theory' as it was not the real thing. However, when the true quantum mechanics was discovered...my background in the old quantum theory and its correspondence principle was a great help in learning the new mechanics..." He received his Ph.D. at Harvard in 1922.

The "graduation" gown is the original one worn by John Van Vleck to receive many of his honors throughout his lifetime. His initials are embroidered into the tag. (**Exhibit 12A**)

PART II

The Research Years, 1923–1945

In this exhibit, selected parts of John Van Vleck's life at the three institutions where he spent his career—the University of Minnesota, the University of Wisconsin and Harvard—are displayed.

University of Minnesota (1923–1928)

Van Vleck, known as Van to most people, was offered an assistant professorship at the University of Minnesota in 1923, a year after his Ph.D. at Harvard, with purely graduate courses to teach. He describes this as an unusual move by that institution, as recent Ph.D's were traditionally handicapped by heavy loads of undergraduate teaching which left little time to think about research.

It was also at Minnesota that he met and later married (on June 19, 1927), the great love of his life, Abigail Pearson, who was also a student there.

In this exhibit you will find their wedding photo (**Exhibit 1B**), a group photo of Van Vleck and his peers at the University of Minnesota (**Exhibit 2B**), plus a copy of his first book, "*Quantum Principles and Line Spectra*" which he was just completing when the discovery of the new quantum mechanics by Heisenberg, Schroedinger and Dirac revolutionized theoretical physics.

Van Vleck immediately recognized the potential application of quantum mechanics to magnetism. His predictions of the deviation of the magnetic properties of the nitric oxide molecule from the famous Curie law and its subsequent experimental confirmation marked the beginning of the quantum-mechanical age of magnetism. Our exhibit includes the three papers published in the Physical Review in 1927 in which he laid the foundation of magnetism. (**Exhibit 3B**)

University of Wisconsin-Madison (1928–1934)

In 1928, Van Vleck and his wife Abigail moved to Madison and he became a member of the University of Wisconsin Physics Department. (**Exhibit 4B**) In addition to teaching, Van Vleck continued his line of research. (**Exhibit 5B**) During a trip to Europe, he heard of H. A. Bethe's paper on the application of group theory to the energy levels of atoms exposed to a crystalline electric field. With two post-doctoral students, both from England, William (later Lord) Penney and Robert Schlapp, Van Vleck developed what is now known as the crystal field theory, or more generally called the ligand field theory. This proved to be the cornerstone for his future research. The Wisconsin area of the exhibit contains Van's personal copy of his classic book, "*The Theory of Electric and Magnetic Susceptibilities*," published in 1932, along with several other papers written while a professor at UW. (**Exhibit 6B**)

During the next decade, Van Vleck wrote some 40 significant research papers—on the structure of molecules, the quantum theory of valence, atomic states within crystals, paramagnetism, ferromagnetism, and antiferromagnetism.

Harvard University (1934-69, Emeritus 1969-80)

In 1934, Van Vleck accepted a position at Harvard University and remained there as a faculty member until he became Emeritus in 1969. (**Exhibit 7B**)

He also provided important administrative services to Harvard, serving as Dean of Engineering and Applied Physics from 1951–1957. While at Harvard, he continued his research and became the Hollis Chair of Mathematics and Natural Philosophy.

"During World War II, Van Vleck headed the theoretical group at the Radio Research Laboratory at Harvard, which had been organized to develop countermeasures to radar." He served at the same time as consultant to the Radiation Lab at MIT and to the Harvard Underwater Sound Lab. (**Exhibit 8B**) "A Radio Research Lab report on randomly fluctuating signals became, when eventually declassified, part of modern communication theory and a practical aid to radioastronomy." At the Radiation Lab, when the absorption of certain radio waves in the atmosphere raised unexpected difficulties, Van's understanding of molecular spectra provided the key to the problem. In retrospect this episode marks the beginning of microwave spectroscopy.

"Magnetic Resonance was another branch of experimental physics that blossomed after the war. Its central problems concerning line shape and relaxation processes seemed made for the Van Vleck treatment." Van Vleck produced theoretical tools that were needed plus physical insight that unified phenomona ranging from nuclear magnetism to ferromagnetism. (Harvard Gazette, Jan. 13, 1964, p. 8.)