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# Who was Amelia Frank, forgotten UW contributor to Nobel Prize winner?

**Peter Jacobson and Beck Wise**

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Peter Jacobson

John H. Van Vleck, who **grew up in Madison** and attended and taught physics at the University of Wisconsin, won the Nobel Prize in 1977 for his work on magnetism. In his **Nobel lecture**, amid a discussion of rare earth elements, one sentence leaps out:

“Miss Frank and I made the relevant calculations.”

Who was Miss Frank? Van Vleck credits her with key work on the quantum mechanics of magnetism, but she is almost absent from the history books.

Beck Wise

Amelia Frank published a handful of scholarly papers which are well-cited for the time. Yet histories of physics mostly mention her only as the wife of Eugene Wigner, who was awarded the physics Nobel in 1963.

Why don't we know more about Frank, and why aren't her contributions recognized? When we searched through the archives, we found a remarkable scientific life unfolding at the dawn of quantum mechanics.

## Pursued quantum frontier at UW

Born in 1906, Amelia Z. Frank grew up a junkyard owner's daughter in Adrian, Michigan. **Local newspaper reports** paint her as a bright, accomplished teen and an independent thinker.

As an undergraduate at a leading women's university, Goucher College, Frank joined the physics club. Her **senior yearbook relates that her presentation on the Compton effect** — a description of how light interacts with electrically charged particles, named after Arthur Compton — was both highly technical and engaging.

Nine months later, **Compton** gained wide public recognition with the award of the **1927 Nobel prize** for demonstrating that X-rays could behave like particles. Frank clearly had her finger on the pulse of the quantum mechanical revolution then occurring in physics.

Where many scholars intrigued by the quantum frontier pursued their study in Europe, Frank went to the University of Wisconsin. There, she met the recently recruited Van Vleck.

Arriving in Madison in 1928, Frank had placed herself at the American center of quantum innovation.

Amelia Frank stands for a group picture with other members of the University of Wisconsin Physics Department in Madison in June 1930.

UW-Madison Archives

At that time, quantum mechanics could describe isolated particles or atoms. But understanding the behavior of solid materials was proving difficult.

Magnetism was the perfect test bed because it can only be explained by quantum mechanics, not classical physics. Frank, supervised by Van Vleck, turned to rare earth elements, where magnetism is strong and existing theories were insufficient. Could quantum physics resolve this conundrum?

Frank's thesis, partially **published in Physical Review in 1932**, focused on the element samarium. It showed quantum mechanical corrections were needed to explain the experimental data and contains a plot that appears in Van Vleck's Nobel lecture, labelled "V.V. & F."

## Money slowed work during hard times

After her Ph.D., Frank worked as a tutor at the University of Wisconsin and continued her research. Her **1935 article on crystal field theory** showed how samarium's energy levels shift due to neighboring atoms.

Colleagues described her as a promising scholar and her publication record was good. But she faced barriers that slowed her work.

Money was one issue. Frank was supporting her younger sister, an undergraduate chemistry student, and it was the middle of the Great Depression.

In an unpublished 1935 letter we found in Box 12, Folder 214 of the **J. H. Van Vleck papers** held by the American Institute of Physics in the **Niels Bohr Library and Archive**, Frank told Van Vleck she'd had to take another job to survive:

"Our finances were in such bad shape that I suggested to various people that I'd be interested in typing … and so I have taught classes, tutored, typed and cooked, but I have not finished my paper," Frank wrote.

Van Vleck was seeking positions for Frank, but jobs were scarce. And as a Jewish woman in that era, Frank would have faced multiple forms of discrimination.

Ultimately, Frank left physics, resigning from the University of Wisconsin around October 1936. When Van Vleck asked why, Frank let him in on a closely guarded secret: She had started a relationship with a new UW colleague, **Eugene Wigner**.

The pair married shortly before Christmas. Wigner described himself as astonished by his love for her.

But their happiness didn't last. Just weeks after the wedding, Frank fell ill. Wigner said it was her heart. Others said it was cancer. Either way, Frank's condition was grave.

After months in the hospital, she returned to Michigan. She died in her parents' home on Aug. 16, 1937. She was 31.

## Enduring contribution for women in science

Frank's untimely death is one reason why she isn't recognized much today. But it is not a sufficient one.

Frank kept company with other trailblazing women across the country. Her roommate in Madison was **Mary Bunting**, who was later president of the women-only Radcliffe College and oversaw its integration with Harvard.

Frank's ambition, intellect and drive took her to the frontiers of knowledge. There, Van Vleck's support kept her in physics long enough to make lasting, if overlooked, contributions.

Ninety years have passed, but Frank's life exemplifies women's ongoing experiences in physics, good and bad.

Women remain drastically under-represented in quantum physics. A 2023 survey, for example, found **87.5% of full-time Australian quantum researchers were men**.

Women remain more likely than men to have caring responsibilities that increase financial stress and reduce research time. Mentorships and recruitment remain vital to bringing women into the field — and keep them there.

In the end, this may be Frank's most enduring contribution to quantum physics. Recovering her story is important because it allows her scientific contributions to be appropriately recognized. Perhaps more important, her story reminds us that women have belonged in quantum physics from the beginning.

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