

LEARNING FROM RICHARD WESLEY HAMMING

**An invited presentation for the
graduate course MV4000 at the Naval
Postgraduate School (NPS),
Monterey, CA
on 8 MAY 2020 (via ZOOM)**

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Guest Lecturer, NPS**

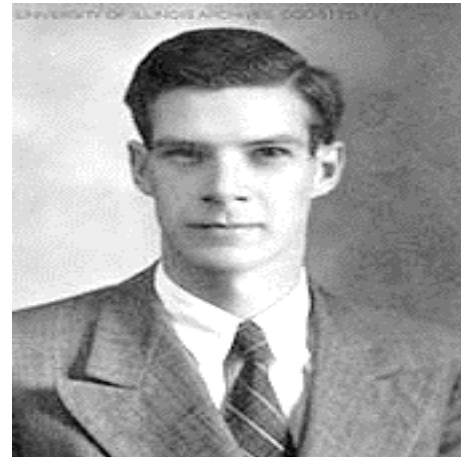


Figure 1: 25-year Richard Wesley Hamming when he entered the PhD program at the University of Illinois, 1940.



Figure 2: Wedding Picture of Wanda and Richard Hamming, Chicago, 1942.



Figure 3: Richard Wesley Hamming during his highly productive years at Bell Labs, 1956.

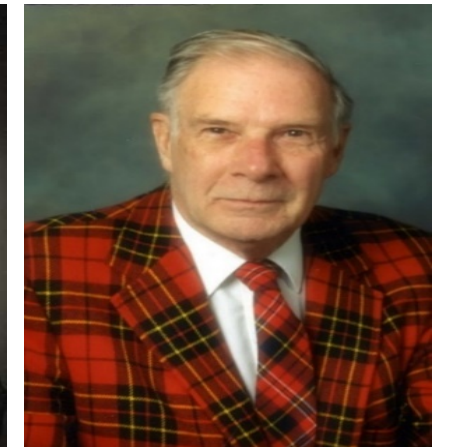


Figure 4: Richard Hamming, while teaching at NPS 1982.

AGENDA



1. **My reflections on Richard Wesley Hamming.**
2. **Discussion of the biography *Richard Wesley Hamming, Man, Mathematician, and Mentor*, 2018**
3. **Why you should want to understand what he was trying to do.?**
4. **What are your questions about Hamming and his work**
5. **What would he say to you if he were here today?**
6. **Great Thoughts Time.**

Footnote: Source of my understanding regarding Richard Wesley Hamming. He was my Doctoral Advisor at NPS between October 1978 and June 1982. I have been researching Hamming as part of a Legacy Project that I started in February 2017. I recently finished a Biographical Book *Richard Wesley Hamming: Man, Mathematician, and Mentor*, 2018.

RICHARD WESLEY HAMMING



From modest Midwest origins, Hamming demonstrated some important traits:

- Ambition to not be “As poor as my parents”
- Drive to Understand,
- Dedication to Succeed, and
- Commitment to provide help to others.

During his life, education, and career, he developed additional traits that drove his work.

- Focused on Accumulation of Knowledge, Development of Wisdom resulting in Insight.
- Focus on Important Problems, and the Application of Innovation

OVERVIEW OF THE BIOGRAPHY



Chapter 1: Introduction describes an overview of the book.

Chapter 2: Man describes Hamming's heritage, family upbringing, social development, role models, education and early academic career.

Chapter 3: Mathematician details Hamming's early conceptual challenges starting with the responsibilities that he was given and the world-class scientists with whom he would work on a classified government project to help end World War II, followed by his 30 years as a Research Mathematician at AT&T Bell Labs.

OVERVIEW OF THE BIOGRAPHY (CONTINUED)



Chapter 4: Mentor explores Hamming's choice to focus on helping and empowering many others through his professional work, books, articles, teachings, philanthropy, and mentoring.

Chapter 5: Hamming Ripples proposes a legacy for Richard Wesley Hamming, based on a fundamental philosophical and pragmatic understanding that learning creates more learning, inspiration more inspiration. It discusses those individuals who influenced Hamming and those that he influenced in turn, who are continuing to influence successive future generations for good. The book closes with my recollection of my last correspondence with Hamming and my closing tribute to him.

DISCUSSION AND FINDINGS ON HAMMING: THE MAN



Discussion: My research efforts on were able to document Hamming's heritage, family upbringing, environment, social development, role models, education and early academic career.

- He grew up in “interesting times”
- His family and friends were all trying to live the “American Dream”
- Hamming quote - “He did not want to be rich, but he did not want to be as poor as his parents.”

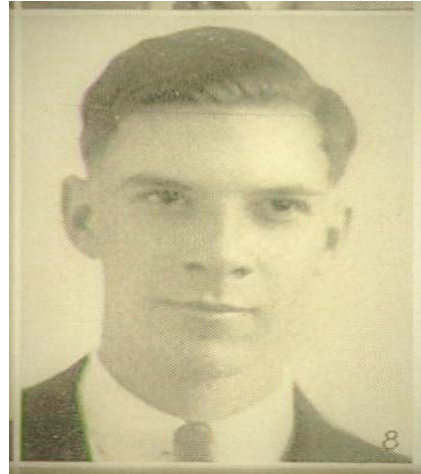
Some Findings:

- Hamming was significantly influenced early in life by many **role models**, including his father, mother, brother, maternal grandfather (Casper Lavater Redfield), friend Nicholas Metropolis, future wife Wanda Mae Little, and his doctoral advisor Waldemar J. Trjitzinsky from the University of Illinois.
- At age 30, he was influenced by the world-class scientists at Los Alamos, and starting the following year he was influenced by many more scientists and mathematicians at AT&T Bell Labs.
- His focused pursuit of education , knowledge, and insight helped prepare Hamming for the challenges and opportunities he would face in his life, the world-class individuals from whom he would learn, and the big questions on which he would ultimately focus.
- “Luck favors the prepared mind” – Louis Pasteur
- “Success is 90% Preparation and only 10% Opportunity.” – Seneca, Roman Philosopher

PHOTOGRAPHS ABOUT RICHARD WESLEY HAMMING (1915 - 1942)



Baby photograph of Richard Wesley Hamming, 1915.



High School yearbook picture of Hamming, 1933.



Nicholas Constantine Metropolis.



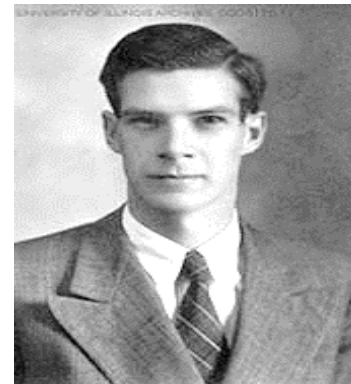
Hamming earned a B.A. in Mathematics, 1933 - 1935



Richard Wesley Hamming, age 21, and Wanda Mae Little, age 16.



Hamming earned a M.A. in Mathematics, 1935 - 1937



25-year Hamming when he entered the PhD program at the University of Illinois, 1940.

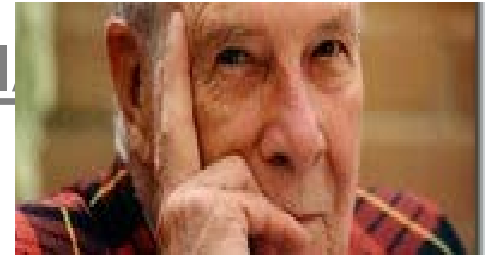


Hamming earned a Ph.D. in Mathematics, 1940 - 1942



Master of Art Degree Graduation picture of Wanda Mae Little, 1942.

DISCUSSION & FINDINGS ON **HAMMING**: THE MATHEMATICIAN



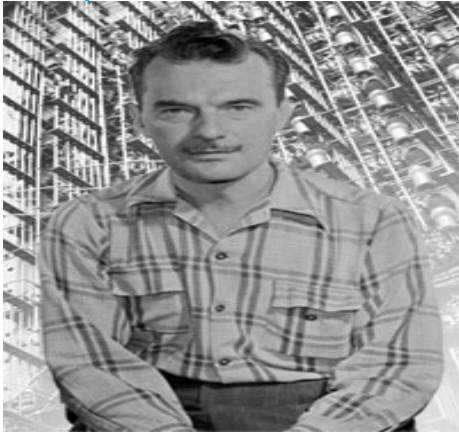
Discussion: My research efforts on “**Hamming: The Mathematician**” were able to:

- Document his early conceptual challenges and the world-class scientists with whom he would work on a classified project to help end World War II – The Manhattan Project at Los Alamos.
- Document some of his work during the 30 years as a Research Mathematician at AT&T Bell Labs, including his early dedication to helping others succeed. His focus and reputation for excellence resulted in him being recruited to work with many of the world’s best and brightest scientists, engineers, and mathematicians. Instead of only doing the work or being in awe of his colleagues, Hamming sought to understand the factors that drove these individuals to success and, by so doing, developed his own special insights and expertise.

Some Findings:

- Hamming’s traits, abilities, and dedication to excellence helped him get these job. The freedom at Bell Labs resulted in his being able to work on very important problems. This placed him in the position of being able to create important results that not only earned him mathematics’ highest awards, but it also enabled and enhanced the work of others at Bell Labs, various colleges, and professional organizations (IEEE, AMA, ACM, AAAS, NAE, etc.).

FROM 1945 – 1946, HAMMING WORKED ON THE MANHATTAN PROJECT AT LOS ALAMOS, NM.



Nicholas Constantine Metropolis.



Photo of Los Alamos Project Main Gate, Los Alamos, NM

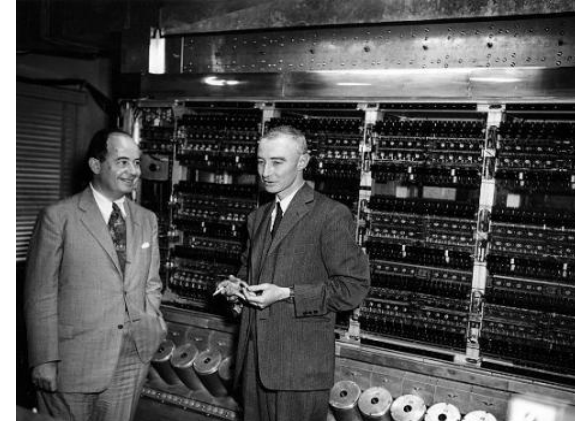


Photo of Enrico Fermi (left) and Robert Oppenheimer (right) at Los Alamos, 1945.



Photo of one of the hand-operated calculators used on the Manhattan Project.

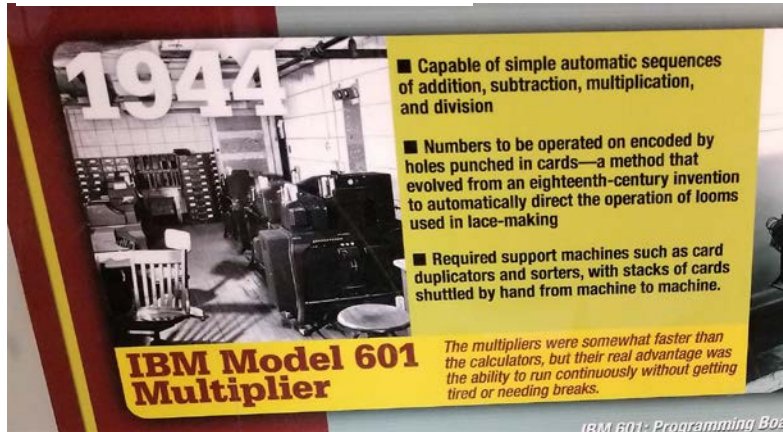


Photo of IBM Model 601 Multiplier Digital Computer used on the Manhattan Project..



Photo of Dr. Hans Bethe, 1945.



Photo of Richard Feynman, 1944.

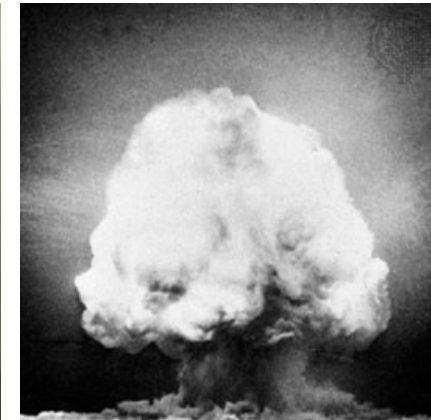


Photo of the first atomic bomb test, Alamogordo, NM, 16 July 1945.



Photo of the Manhattan Project silver lapel pin, 1946

FROM 1946 - 1976: HAMMING WORKED AT AT&T BELL LABS



Photo of AT&T Bell Labs Building in Murray Hills, NJ.

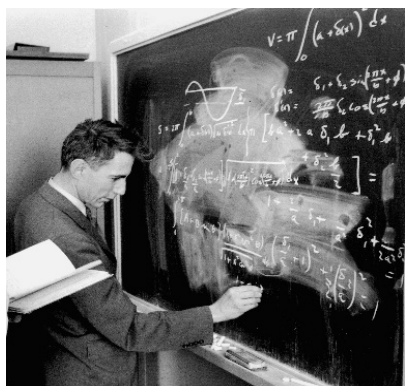
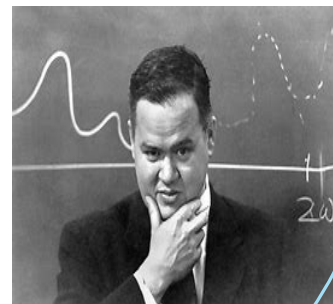
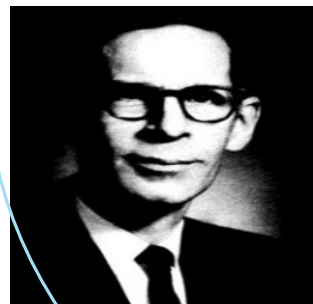


Photo of Claude Shannon at Bell Labs (date unknown, circa 1942 – 1955).



The Bell Labs "Younger Turks". Clockwise from top and then center - Shannon, Tukey, McMillan, Ling, and Hamming.



Richard Hamming helping Mrs. Wanda Mammel on a math problem.



Richard Hamming demonstrating Error Correcting Codes to Bernard Holbrook, 1950.



Photo of ACM Turing Award Medal given to Richard Hamming, 1968.



Richard Hamming at ATT computer center, 1975.

1976 - 1998: RICHARD HAMMING TAUGHT AT THE NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA



Wanda and Richard Hamming, Monterey, CA in 1980.



Richard Hamming in his NPS office, 1982.

DISCUSSION & FINDINGS ON HAMMING: THE MENTOR



1. My research efforts on explores Hamming's choice to focus on helping and empowering many others through his professional work, books, articles, teachings, philanthropy, and mentoring. It included my own story about the significant benefits that I received from knowing and being mentored by Hamming as his doctoral student between 1978-1982.
2. I interviewed 15 individuals who knew, interacted with, and were helped by Hamming. Their personal comments and written recollections demonstrate Hamming's positive impact, and their stories helped grow the vision I had this for this project.
3. Hamming chose early in life to developed the traits and skills to effectively mentor others. There was no half-way with Hamming – It was “All or Nothing”. His published articles, lectures, and books were all aimed at teaching other how to learn. This was his gift to us.

WHAT WOULD RICHARD WESLEY HAMMING SAY TO US IF HE WAS HERE TODAY?



MIGHT IT BE?

- 1) The Purpose of Computing is Insight - not numbers.**
- 2) It is better to do the right problem the wrong way than the wrong problem the right way.**
- 3) What are the most important problems in your field?**

What are you working on? Why are they not the

GREAT THOUGHTS TIME



- 1. If you are going to work on important problems, you must devote enough time.**
- 2. What are the most important problems for the next 5, 10, and 20 years in your field?**
- 3. Let's talk about them, NOW!**