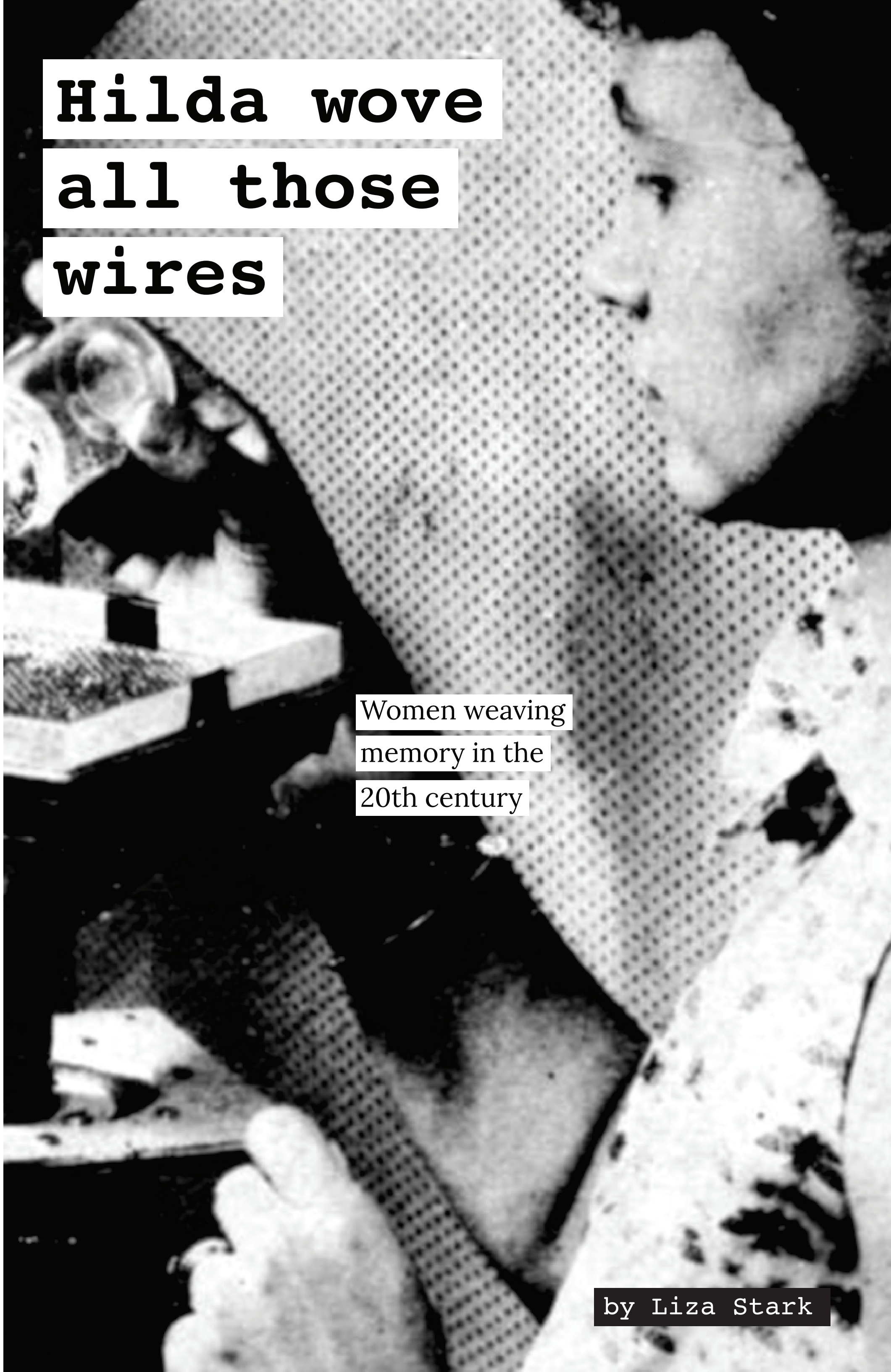


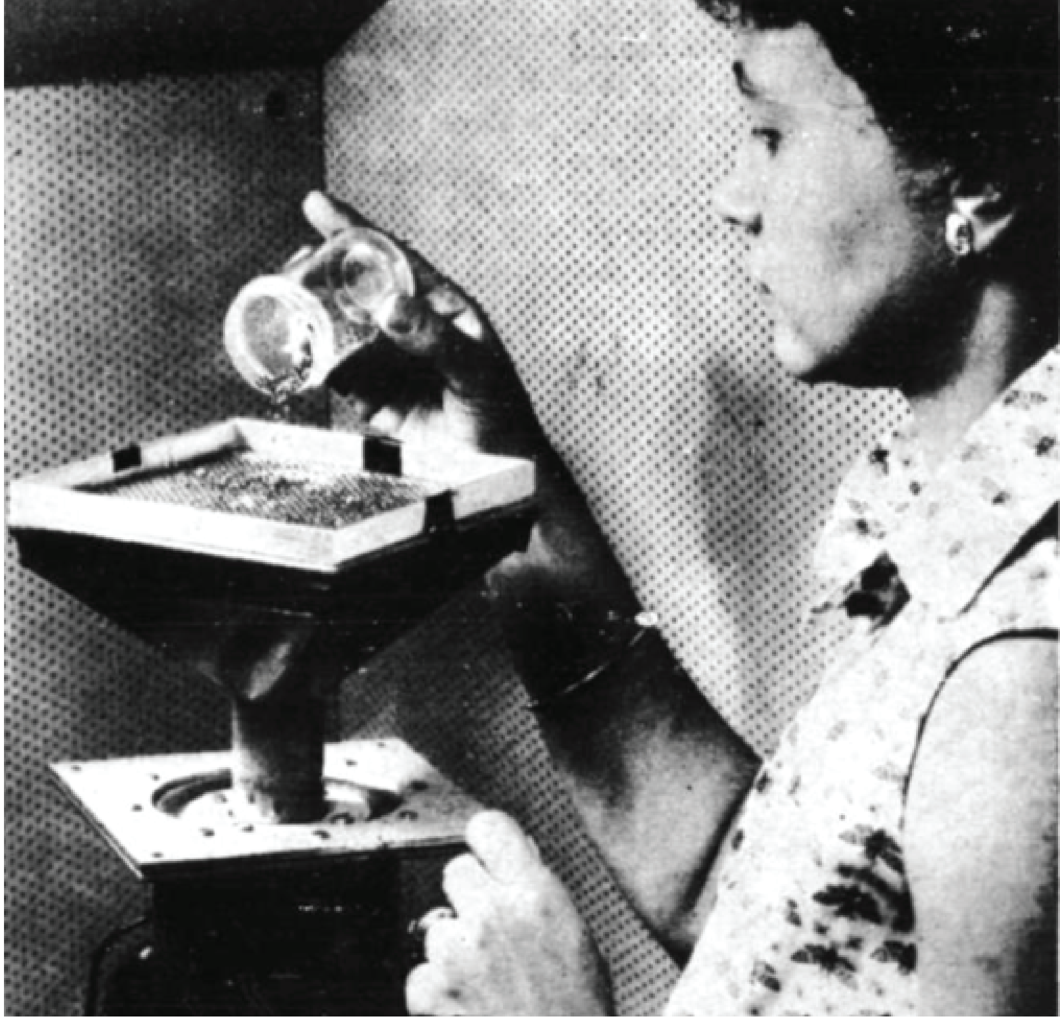
Hilda wove all those wires

Women weaving memory in the 20th century

by Liza Stark

“This all had to be hand-wired. All the wiring in this memory plane was done by a woman who was a technician working in the lab. I don’t remember her last name. But her first name was Hilda. And Hilda wound all these memory planes. It’s like knitting....Hilda wove all those wires. It’s like weaving.”

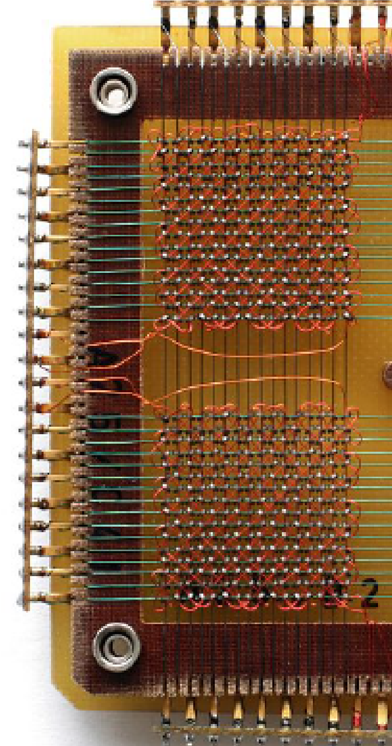
Bernard Widrow,
MIT graduate student in the Memory section of Project Whirlwind



In 1953, Hilda G. Carpenter used tiny magnetic rings, fine wire, and a loom to weave a new type of computer memory.

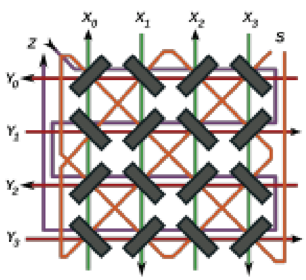
It was called core memory and it would eventually store the programs that navigated Apollo missions to the moon. Like so many other women - especially women of color - who propelled the computing industry in the 20th century, her story remains untold.

In the early 1950s, the US decided to overhaul its computing infrastructure. The Cold War was in full swing and the government sought to secure its defensive (and offensive) capabilities against the Soviet threat. Project Whirlwind was a flagship project, housed in Lincoln Laboratory at MIT. One of the major innovations that came out of it was in computer memory storage: core memory.



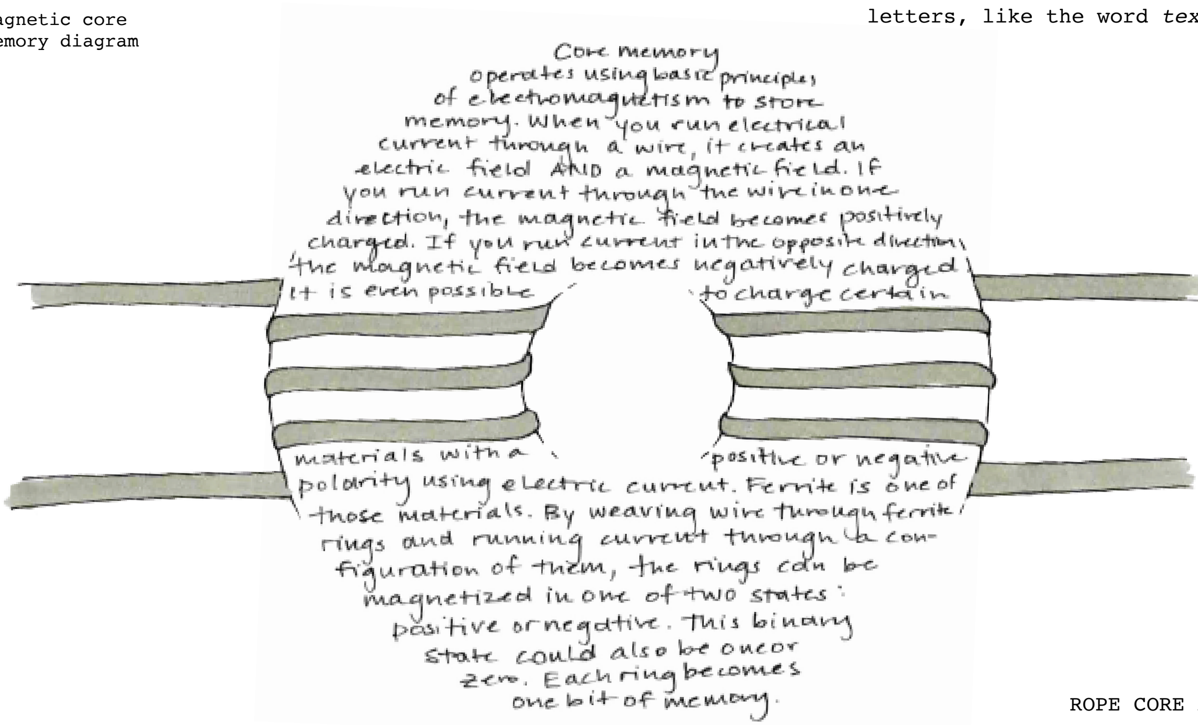
MAGNETIC CORE MEMORY
Women would carefully weave wires through an array of tiny ferrite cores. Four wires had to pass through each core: driving (X and Y), sensing, and inhibiting. In this type of memory, programmers could read bits of data and write new information to them.

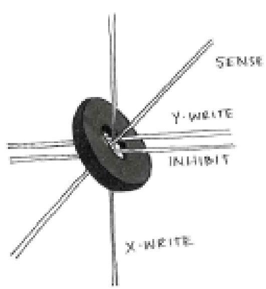
Each core plane was a 64x64 grid of wires with 1024 cores (i.e. bits). Its capacity was 8 bytes, so it could store eight letters, like the word *textiles*.



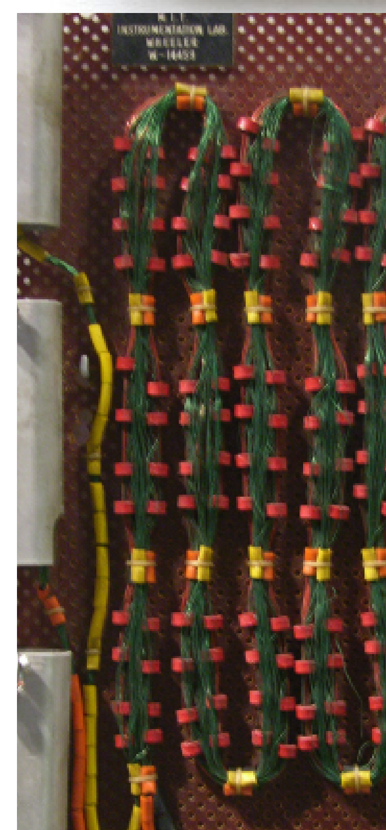
Magnetic core memory diagram

core memory





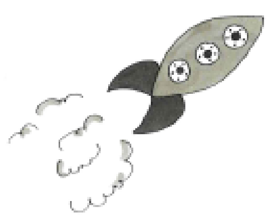
Detail of magnetic core memory wiring

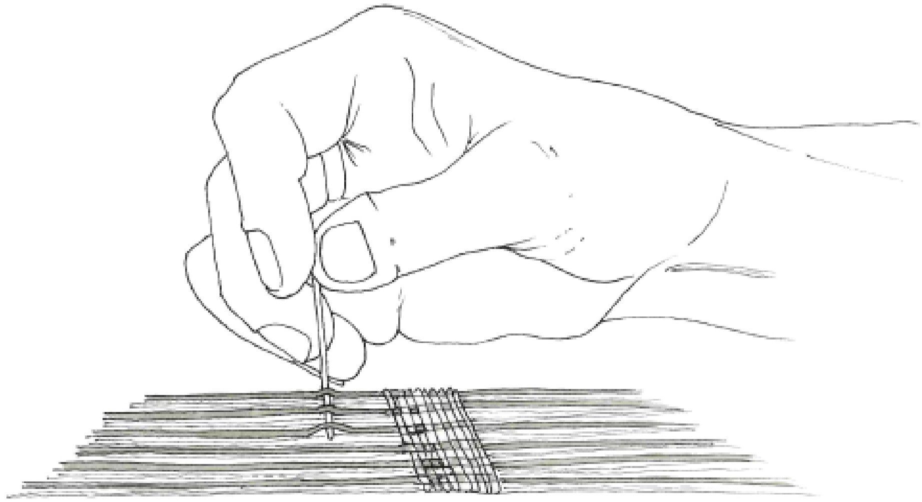


ROPE CORE MEMORY
Women wove wires through a core to create a positive bit (one) and around cores to indicate a negative bit (zero). You can only read bits of information from this type of memory - the program is hard-woven based on the threading configuration.

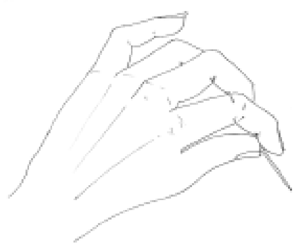
This type of memory could withstand incredibly harsh conditions and still retain its program. Rope core memory is the hardware that stored navigational programs that successfully landed people on the moon.

The critical thing about this type of memory is that it is non-volatile: you can still retreive the information you stored even after you've turned it off and back on again. The charge of the ring stays the same even if you remove the electrical current.





This type of memory was the foundation for computing in the late 1960s and 70s. It was incredibly time consuming to make: one plane of magnetic core memory took 40 hours to weave.



The competencies required to create core memory planes included a variety of craft skills often sequestered to the realm of women's work: weaving, needlework, and embroidery.

Corporate attempts to automate this prcess proved more costly than employing human hands to perform these intricate actions. In need of cheap "unskilled" labor, retired or laid-off female workers from the mills of a dying Massachusetts textile industry were hired to weave the memory.

Their male managers bestowed the title LOLs or little old ladies to describe this new production process. There are few (if any) first person accounts of their process.

LOLs

Nimble Fingers

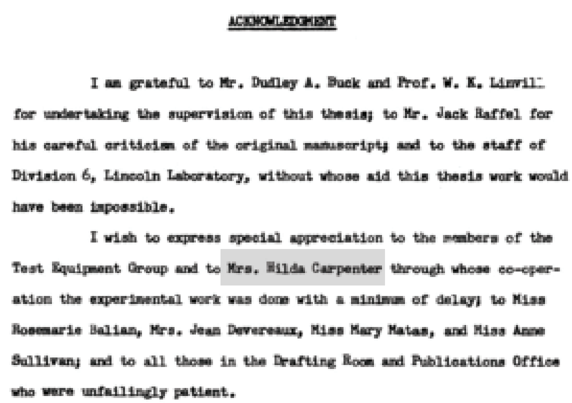
It was assumed (and to a certain extent, still is) that women were ideally suited for this type of work as they had smaller hands, more attention to detail, and a better constitution for repetitive work. The "nimble fingers" that propelled the textile industry were now called on to fabricate the hardware that would lead to the coming computing revolution. Companies would soon insource nimble female fingers from Navajo reservations then outsource them from Asia.

hilda in bits

Of all these nameless little old ladies, Hilda was the first. She appears in bits throughout the digital historical record, but not enough to stitch together a narrative documenting her full contribution to modern computing. Below are the publically available digital remains found after weeks of research.

"She was active in promoting technological advances for systems and projects nationwide and was among the founders and builders of the very first magnetic computer. She is a member of the M.I.T. Lincoln Laboratory Library. A picture of Mrs. Carpenter working on that computer can be seen at the Smithsonian Institution in Washington, D.C."

Mrs. Carpenter's obituary



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I wish to express special appreciation to the members of the Test Equipment Group and to Mrs. Hilda Carpenter through whose co-operation the experimental work was done with a minimum of delay; to Miss Rosemarie Balian, Mrs. Jean Devereaux, Miss Mary Matas, and Miss Anne Sullivan; and to all those in the Drafting Room and Publications Office who were unfailingly patient.

Nov. 13, 1915
Hilda is born in New York City

1953
She began work at MIT's Lincoln Laboratory as a lab assistant and technician.

Jan. 19, 1954
Hilda received an acknowledgement in graduate student Richard di Nolfo's final thesis document.

1962
A team photo shows Hilda in the Laboratory Instrument Computer (LINC) development group.

...?
She eventually moved to Jacksonville, Florida where she raised a family.

Aug. 12, 2013
Hilda passes away. She was a lifelong member of the NAACP.

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