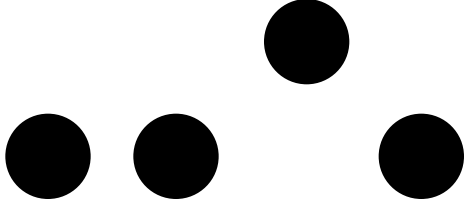


Ka- CHONK!

A Textile → Computing History Zine via Punched Cards



The materiality of punch cards is not beyond our reach. We can maintain a sense of what these cards looked like and felt. We therefore get to experience what data meant, from a tactile and practical standpoint, throughout much of computing history.

The left facing pages of this zine reproduce different punch cards (not always to scale). Arranged chronologically, with photographs, notes from historical sources, and QR codes to videos of these machines at work (where available), this incomplete assemblage helps us see technologies both historical and alive.

Threading this history together surfaces relationships between machines and people, with a visual focus on the interfacing of hands and machines. Gender, labor, and power come to the fore. We begin to see stories of whose hands punched out the data of early computation – who worked, who counted, and who was counted. By stitching together these stories, we put the history of computing back into our own hands.

The Jacquard Mechanism



see how it works! →

"How Was It Made? Jacquard Weaving."
The Victoria + Albert Museum
<https://www.youtube.com/watch?v=K6NgMNvK52A>



Joseph Marie Jacquard invents an automation for storing + weaving textile patterns on industrial looms.

Patterns can be produced with speed, scale, + detail. The below portrait of Jacquard was woven in silk using a Jacquard loom and measures fewer than 20 inches on each side.



image source: <https://www.loc.gov/pictures/item/2002737214/>

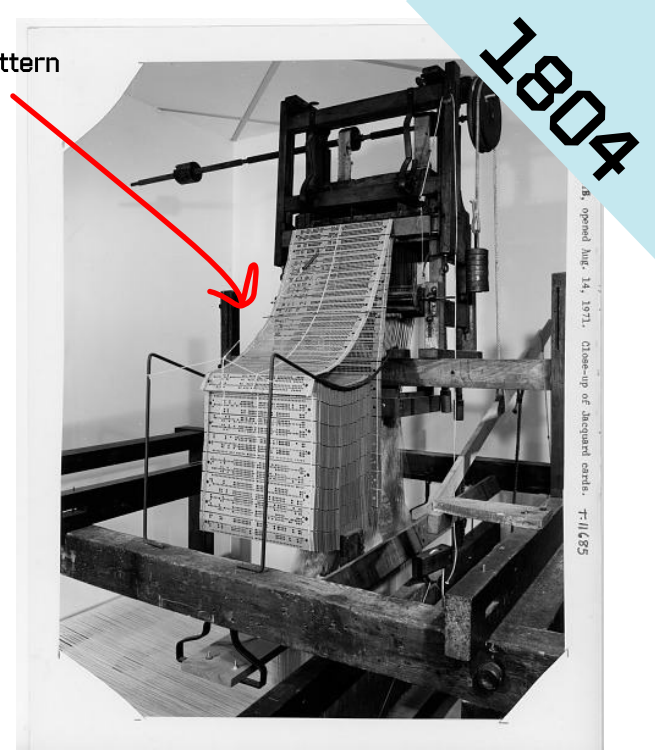
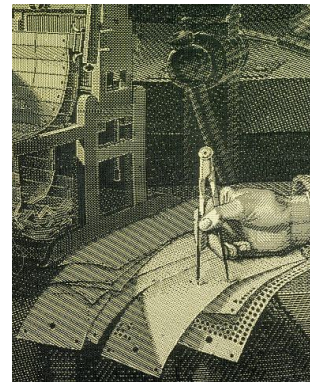


image source: Smithsonian National Museum of American History.
https://americanhistory.si.edu/collections/object/nmah_645517

4

Babbage's Calculating + Analytical Engines



Charles Babbage designed two machines that were meant to use punched cards for mathematical operations: the Calculating and Analytical Engines. While Babbage never finished building either machine, a working version of his Difference Engine now exists, and was displayed at the Computer History Museum. Ada Lovelace's annotations on Babbage's plans are now considered one of the first computer programs.

“

"Instructions and data were entered into the engine using punched cards, with small 'operation cards' specifying the operations to be performed, and larger 'variable cards' defining where the value should be stored."

”

Science Museum Group. <https://collection.sciencemuseumgroup.org.uk/objects/co62248/punched-cards-for-babbages-analytical-engine>



← see how it works!

"Babbage's Difference Engine No. 2." Wired.
<https://www.youtube.com/watch?v=0anlyVGw0I>

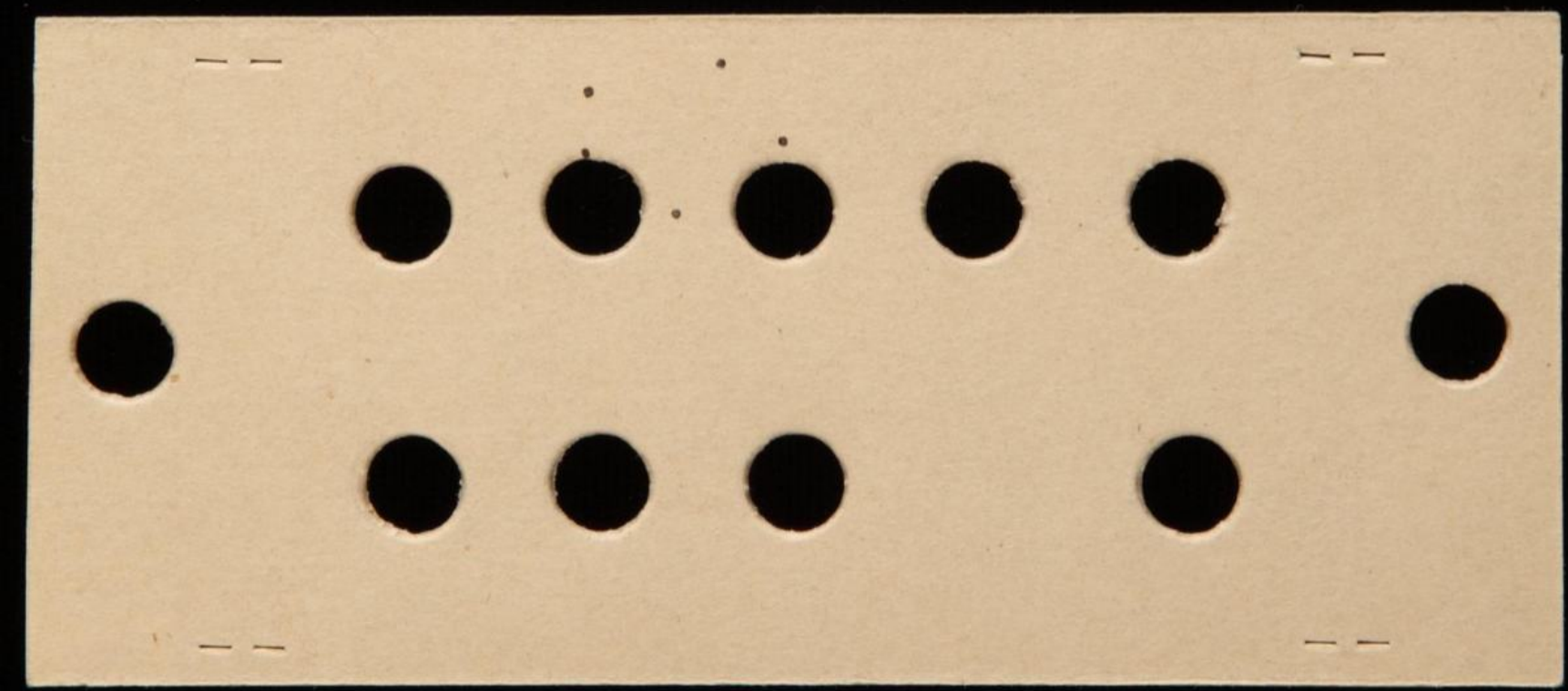
image source (left): Smithsonian National Museum of American History.
https://americanhistory.si.edu/collections/object/nmah_904252

image source (center and right): <https://collection.sciencemuseumgroup.org.uk/objects/co62248/punched-cards-for-babbages-analytical-engine>



6

government
industry
programming
census
textiles
government
industry
programming
census
textiles



5

Binghamton R. R. Co.

TRANSFER.
Good only for this current trip, from point of transfer, on next car over the line punched after time canceled. Subject to Rules of Company.

PICTURE PUNCHED INDICATES TYPE OF PASSENGER.

Issued by
Conductor No. **47**

TRADE-MARK,

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

MANUFACTURED BY
GLOBE
TICKET COMPANY
PHILADELPHIA, PA.

X	X	ROSS	VILLE	LESTER	SHIRE	ASY	LUM
O	HOME	GLEN	WOOD	P. DICK	INSON	DEP	OTS
C	C	WEST	MAIN	NO. CHE	NANGO	S. FO	REST
		BROAD	AVE	LEROY	STREET		

1	1	2	3	4	5
2	1	2	3	4	5
3	1	2	3	4	5
4	1	2	3	4	5
5	1	2	3	4	5
6	1	2	3	4	5
7	1	2	3	4	5
8	1	2	3	4	5
9	1	2	3	4	5
10	1	2	3	4	5
11	1	2	3	4	5
12	1	2	3	4	5

IF BLACK PORTION PUNCHED TIME IS P. M.

7

Punch Card "Photographs"

Punched Card "Photographs" served as one source of inspiration for Herman Hollerith's development of punch card data processing

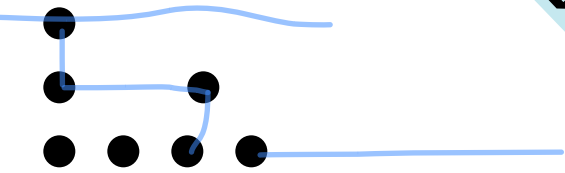
1880s

“Along the margin of the ticket is printed, in a straight column, the following words in small black type:

Male – Female;
Slim – Medium – Stout;
Young – Middle-aged – Elderly;
Eye: Light – Dark; Hair: Light – Dark; Beard –
Moustache – Chin – Side – None.

The passenger is photographed on the ticket bearing his signature by punching out all the words that are not descriptive of him. If for a male, the word "female" is cut out by the punch; if he is slim, the words "medium" and "stout" are punched.”

”



These cards took the use of the punch for rail tickets – tracking stations and time tables – and added a component of tracking people's traits, which would be important to the development of the census.

The Railway News, Vol. XLVIII, No. 1234 (Aug. 27, 1887), Page 360

image source: Jim Strickland, "Hollerith and the 'Punched Photograph'" Computer History Museum.
https://ed-thelen.org/comp-hist/images/VIE_04_003.pdf

8

Baltimore Mortality Statistics

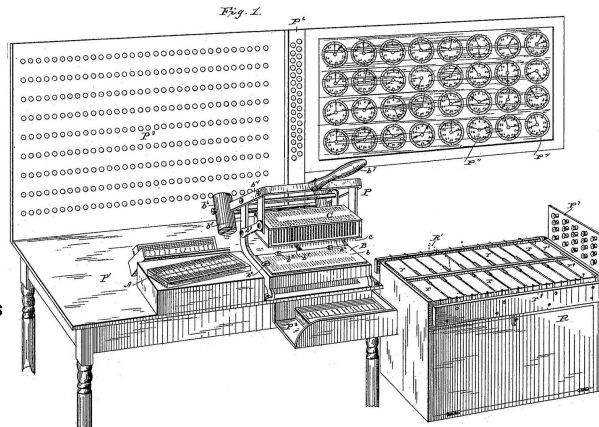
- 1880 – Herman Hollerith, a special agent working at the census, is asked to mechanize the enormous task of storing and processing census data
- 1884 – Hollerith files his first patent for punched card data processing
- 1886 – Hollerith “tests” his equipment on a survey of mortality statistics by the Department of Health in Baltimore.

1886

“Before Hollerith's invention, the Census Bureau had reached the absurd point where it had not yet finished processing all of the previous census's figures when the new one began.”

Dan Bouk, Democracy's Data

Hollerith's full tabulating apparatus as pictured in his 1889 patent



“

Information was read from each card by placing it on a hard rubber mat that contained an array of tiny cups of mercury, so spaced that there was a cup directly under each of the possible hole locations. [...] Where holes had been punched in the card, pins passed through them and made electrical contact with the mercury. Each cup of mercury was electrically connected to a dial with two hands that rotated in a manner analogous to the hands on a clock and were able to record numbers from 0 to 9999. After many cards had been processed, the operator manually wrote down the number incrementally recorded by each dial.

”

Emerson W. Pugh and Lars Heide, "Punched Card Equipment." 2009.
https://web.archive.org/web/20121013053741/https://www.ieeeeghn.org/wiki/index.php/STARS:Punched_Card_Equipment

image source: <https://www.uspto.gov/learning-and-resources/journeys-innovation/historical-stories/count-me>

10

[illegible]

image source: Smithsonian National Museum of American History.
https://americanhistory.si.edu/collections/object/nmah_694416

1	2	3	4	W	M	0	1	5	$\frac{9}{5}$	Un	0	6	12	0	6	12	Me	NH	VT	CHI	MCH	LA	SD	
5	6	7	8	B	F	10	15	18	$\frac{1}{6}$	S	1	7	13	1	7	13+	MAS	RI	CT	IND	WIS	MO	NBR	
1	2	3	4	Ch	20	21	25	30	$\frac{2}{7}$	MO	2	8	14	2	8	N	NY	NJ	PA	ILL	MIN	ND	KAN	
5	6	7	8	Jp	35	40	45	50	$\frac{3}{8}$	MI	3	9	15	3	9	F	MD	VA	MVA	KY	TEN	ALA	CLT	
1	2	3	4	In	55	60	65	70	$\frac{4}{9}$	Wd	4	10	16	4	10	DEL	NC	SC	MIS	LA	TEX	ORE	WSH	
5	6	7	8		75	80	85	90	95+	Un	D	5	11	17+	5	11	DC	GA	FLA	OKL	IT	ARK	IDA	NEV
1	2	3	4	En	OK	0	a	4	17	11	5	Un	15	2	0	US	Un	En	US	Un	En	UTA	ARI	
5	6	7	8	Ot	NR	1	b	5	Ot	12	6	NG	20+	3	1	Gr	Ir	Sc	Gr	Ir	Sc	KM	COL	
1	2	3	4	2	NW	4	c	6	0	13	7	1	No	4	Au	Sw	GE	Wa	Sw	GE	Wa	WYO	MNT	
5	6	7	8	4	0	7	d	7	1	14	8	2	Pa	5	Sz	Nw	CF	Hu	Nw	CF	Hu	ALX	AB	
1	2	3	4	6	12	10	e	8	2	15	9	3	Al	6	Po	Dk	Fr	It	Dk	Fr	It	Au	SEA	
5	6	7	8	8+	Un	g	f	9	3	16	10	4	Un	10	Ot	Ru	Bo	Ot	Ru	Bo	Sz	Po	NS	

The U.S. Census



image source (left): Smithsonian National Museum of American History.

https://americanhistory.si.edu/collections/object/nmah_905318

image source (above): https://www.census.gov/library/photos/1950_08010.html

image source (right): https://americanhistory.si.edu/collections/object/nmah_694411

In 1888, the Census Bureau held a competition for a faster method for processing the census, which Hollerith won.

By 1900, the Bureau of Census was using Hollerith's punch card system to process its data, and would continue to use and refine it over the next 50 years.

“The Census Bureau loved its tabulating machinery, its “robots.” The handbook for new employees waxed poetic about the census’s computing capacities. ‘The tabulation of the enormous mass of data assembled by the Bureau is made possible by the use of punched cards and electric tabulating equipment.’ The people punching those cards or running the equipment, the people who made the tabulation possible – the people reading the handbook – did not warrant a mention.”

Dan Bouk, Democracy's Data



Above, a “pantograph punch” developed by Hollerith to make tabulating census data less physically taxing to the tabulator’s hands.

12

IBM Punch Cards

Hollerith → Tabulating Machine Company → IBM

1896 – Hollerith founds his company, renamed in 1905 to the Tabulating Machine Company

1911 – Tabulating Machine Company is amalgamated to form the Computing-Tabulating-Recording Company (CTR)

1924 – CTR is renamed International Business Machines (IBM)



IBM workers program on desk-sized punch cards

image source (above): <https://www.ibm.com/history/punched-card>

image source (left): Smithsonian National Museum of American History.

https://americanhistory.si.edu/collections/object/nmah_764853

“The card itself was unassuming, a thin piece of stiff cardboard measuring 7 $\frac{3}{8}$ inches by 3 $\frac{1}{4}$ inches comprising 80 columns, 12 rows and a series of tiny rectangular holes. But for almost half a century, IBM cards held most of the world’s stored data.”

“The IBM Punched Card.” <https://www.ibm.com/history/punched-card>

Listen to Bubbles Whiting talk about Hollerith punch cards! →

“Bubbles Whiting – Using Punch Cards – Hollerith and IBM”

The Centre for Computing History

<https://www.youtube.com/watch?v=L7jA0cc9kBU&t=334s>



1930s
IBM punch cards = data

14

government industry programming census textiles government industry programming census

IBM 792040ms-0 IBM 148331

NUMBER OF PIECES FINISHED			
0	0	0	0
1	1	1	111
2	2	2	222
3	3	3	333
4	4	4	444
5	5	5	555
6	6	6	666
7	7	7	777
8	8	8	888
9	9	9	999
10	11	12	

WHAT THE PUNCHED HOLE WILL DO

THE **IBM** CARD DEMONSTRATES THE FIRST STEP
IN **IBM** ACCOUNTING

- 1 It will add itself to something else.
- 2 It will subtract itself from something else.
- 3 It will multiply itself by something else.
- 4 It will divide itself into something else.
- 5 It will list itself.
- 6 It will reproduce itself.
- 7 It will classify itself.
- 8 It will select itself.
- 9 It will print itself on the **IBM** card.
- 10 It will produce an automatic balance forward
- 11 It will file itself
- 12 It will post itself
- 13 It will reproduce and print itself on the end of a card.
- 14 It will be punched from a pencil mark on the card
- 15 It will cause a total to be printed.
- 16 It will cause a form to feed to a predetermined position or to be ejected automatically, or to space from one position to another.

3		1412		S1120		4
DEPT. NO.		EMPLOYEE NO.		PART NO.		OPER. NO.
5		2400		1200		
NUMBER OF PIECES FINISHED		PIECE RATE		AMOUNT		
0	0	0	0	0	0	0
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9
56	57	58	59	60	61	62
63	64	65	66	67	68	69
70	71	72	73	74	75	76
77	78	79	80			

REPRESENTATIVE COMPANY

PRISONERS: 1934
CENSUS BUREAU

ADMISSIONS

Inst. A	State		PA	Line No.		Ad. 12	Offense V V		Def. or Min.		Maximum		Prev. Com.			Sex	Mar. cond.	Age		Race and C of B	
B	X	X	Sheet No.			11	X	X			X	X	Pr.	Juv.	Ot.						
0	0	0	0 0	0	0	10	0	0	0	0	0	0	X	X	X		X	X	X	X	X
1	1	1	1 1	1	1	1	1	1	1	1	1	1	0	0	0			0	0	0	0
2	2	2	2 2	2	2	2	2	2	2	2	2	2	1	1	1	M	S	1	1	1	1
3	3	3	3 3	3	3	3	3	3	3	3	3	3	2	2	2	F	M	2	2	2	2
4	4	4	4 4	4	4	4	4	4	4	4	4	4	3+	3+	3+		Wd	3	3	3	3
5	5	5	5 5	5	5	5	5	5	5	5	5	5					D	4	4	4	4
6	6	6	6 6	6	6	6	6	6	6	6	6	6					LS	5	5	5	5
7	7	7	7 7	7	7	7	7	7	7	7	7	7						6	6	6	6
8	8	8	8 8	8	8	8	8	8	8	8	8	8						7	7	7	7
9	9	9	9 9	9	9	9	9	9	9	9	9	9						8	8	8	8
1	2	3	5 6	7	8	9	9	9	9	9	9	9						9	9	9	9
													16	17	18	19	20	21	22	23	24

11-11408

PRISONERS: 1934
CENSUS BUREAU

ADMISSIONS

Census of Prisoners

Between 1926 and 1946, the US Census Bureau collected statistics on people held in state and federal prisons.

This unpunched card from 1934 appears to be from the Pennsylvania state prison system. The Smithsonian record suggests that the headings are as follows: “institution, state, sheet number, line number, offense, minimum sentence, maximum sentence, previous commitments, sex, marital condition, age, and race and country of birth.”

image source (left): Smithsonian National Museum of American History.
https://americanhistory.si.edu/collections/object/nmah_690156

image source (right): “Advertisement by the Dehomag Company for Hollerith Punch Cards, which were used in the 1933 Census (June 1933).” German History in Documents and Images. <https://germanhistorydocs.org/en/nazi-germany-1933-1945/advertisement-by-the-dehomag-company-for-hollerith-punch-cards-which-were-used-in-the-1933-census-june-1933>

As an instrument of data, and in particular an instrument of tracking people, punched card technology has been used to collect and analyze data towards carceral and eugenicist ends.

In 1933, the Dehomag company released this advertisement for the German 1933 census. Übersicht = survey. Dehomag was a subsidiary of IBM. At this time, IBM cards were still called “Hollerith punch cards.”

Dehomag cards and machines were later used to track prisoners in Nazi concentration camps.



16

Weaving Memory

working women’s labor flowed from textile factories to the work of data and computation

to punch card processing to woven core memory to chip manufacture



“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 process 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.”



Liza Stark, “Hilda Wove All Those Wires.”

See how core memory is made →

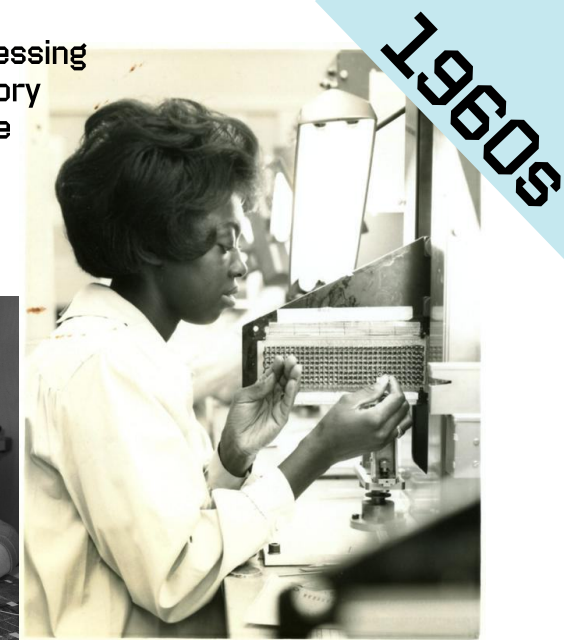
“Fabrication of Apollo Erasable Ferrite Core Memory”
<https://www.youtube.com/watch?v=5P4ZnyJqyro>

“Core Rope Memory”
<https://www.youtube.com/watch?v=D2JfsiWKsKQ>



Image source (above right): <https://www.rightto.com/2019/07/software-woven-into-wire-core-rope-and.html>

Image source (above left): <https://wehackthemoon.com/tech/core-rope-memory-when-computer-science-meets-girl-power>



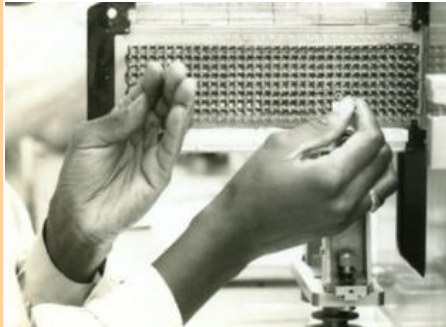
18

“The rope mother is the one that led the development and that was the one in charge of making sure everything came together.”

“In Their Own Words: Dan Lickly on Rope Mothers.”

<https://wehackthemoon.com/people/dan-lickly-computer-engineering>

In the 1960s, workers at MIT and Raytheon created durable computer memory for the Apollo Guidance Computer. This memory was woven by hand using wire and tiny magnetic beads (cores).



Listen to Elaine Denniston talk about working at MIT! →

“Elaine Denniston, Data Key Puncher and ‘Rope Mother’”

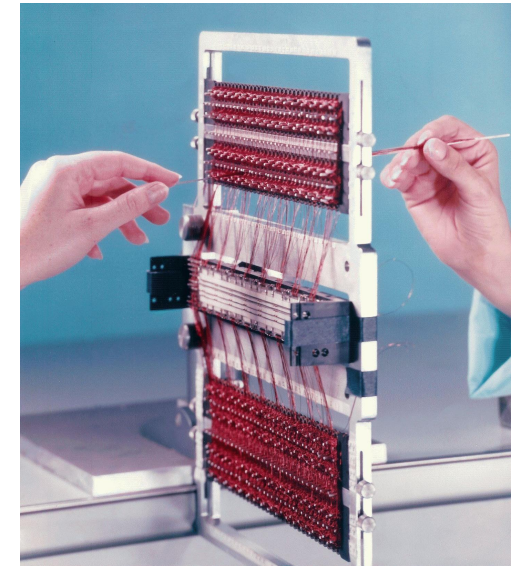
<https://soundcloud.com/hack-the-moon/elaine-denniston>

<https://wehackthemoon.com/bios/elaine-denniston>

Image source (left): <https://www.righto.com/2019/07/software-woven-into-wire-core-rope-and.html>

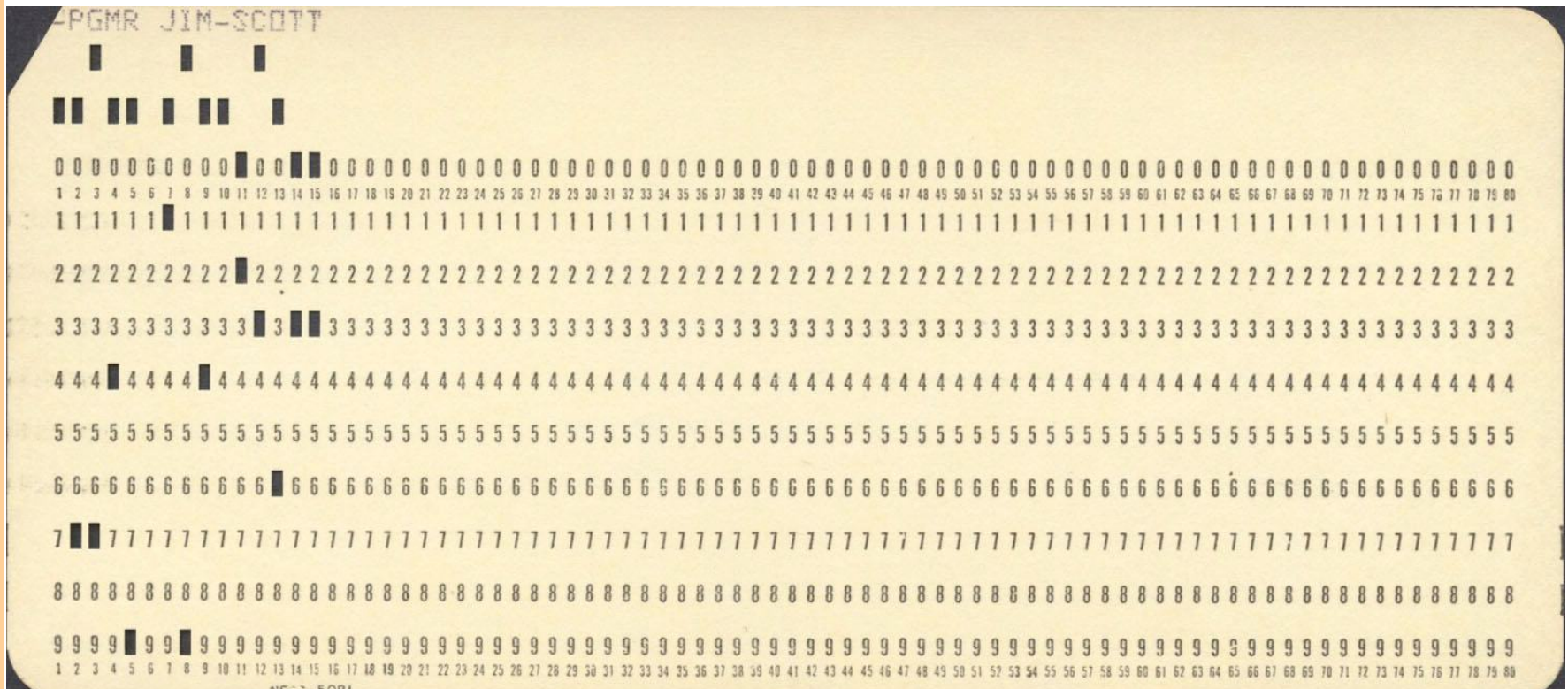
Image source (center + right): <https://wehackthemoon.com/tech/core-rope-memory-when-computer-science-meets-girl-power>

Interlude :



Textile factories → Computing manufacture

17



19

IBM Punch Cards

By the 1960s, punched cards had become more than data storage: they were the medium of computer programming. They were also increasingly common outside of technical spaces.

“ They announced scores on standardized tests, served as a library cards, were part of the proof of mathematical theorems, and kept medical records. Some are printed with the names of users, from university computer centers and computer clubs to the Library of Congress to Bell Laboratories.

“Punch Cards for Data Processing.”
Smithsonian National Museum of American History

IBM was the company of punched cards – so much that they lost antitrust suits over the technology.

In countercultural spaces like Berkeley’s Free Speech Movement, punch cards became a symbol of dehumanization and conformity – people reduced to numbers, to data.

illustration from the W.E.B. DuBois Club newsletter, Berkeley

The 80 column (80 byte) format standardized by IBM continued to be the maximum line length for computer programs long after punch cards were no longer used for programming. The physical card dimensions had remained the same since Hollerith’s original design.



A programmer with a stack of cards containing the program for the SAGE military computer network. 62,500 cards = 5MB of data!

image source (above): Steven Lubar, “Do Not Fold, Spindle or Mutilate”: A Cultural History of the Punch Card.”

image source (left): Jim Scott.

<https://www.jkmscott.net/data/PunchedCards/PunchedCards.html?hidden=true#venerable5081>



image source(above): 1955, MITRE corporate archive
<https://www.computerhistory.org/revolution/memory-storage/8/326/924>

20

The Punch Card Knitting Machine

“ “Punch cards are the source, in something so fundamentally binary that fluency is not hard to come by. (Fluency in binary for almost all other tasks is nearly impossible.) I can repeat a row as many times as I wish. I can change whether my machine ignores the 1s, knits the 1s, purls the 1s, etc. I can perform subsequent operations on the punch card’s outputs with manual manipulation. And I own it. I own my knitting machine, can take it apart and repair it without violating some terms of service, and can hack and modify it and my punch cards to my heart’s content.”

Nichole Nomura, “Vanishing Culture: Punch Card Knitting.”
<https://blog.archive.org/2025/02/12/vanishing-culture-punch-card-knitting/>

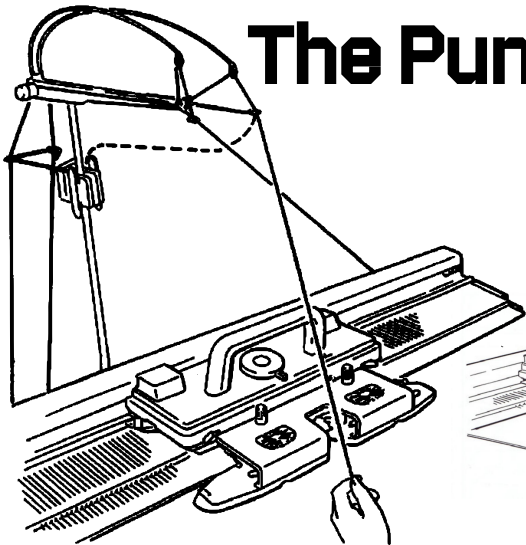
Hilda, the Silver Reed SK280 machine in our lab at MITH (Maryland Institute for Technology in the Humanities), was designed in 1988. Punch knitting machines date back to 1972. Silver Reed, who became known for their knitting machines (alongside Brother), began as a typewriter manufacturer in 1952.

Alice Bi, member of MITH, casts on stitches during a workshop.



1972-
Present

22



Tons of amazing punch card knitters on Youtube!
Just one example →

“Knitting Fair Isle with a Punch Card.”

<https://www.youtube.com/shorts/Lq5grzC7IMU>



images source: Silver Reed SK280 Instruction Manual. <https://mkmanuals.com/silver-reed-sk-280-knitting-machine-instruction-manual.html>

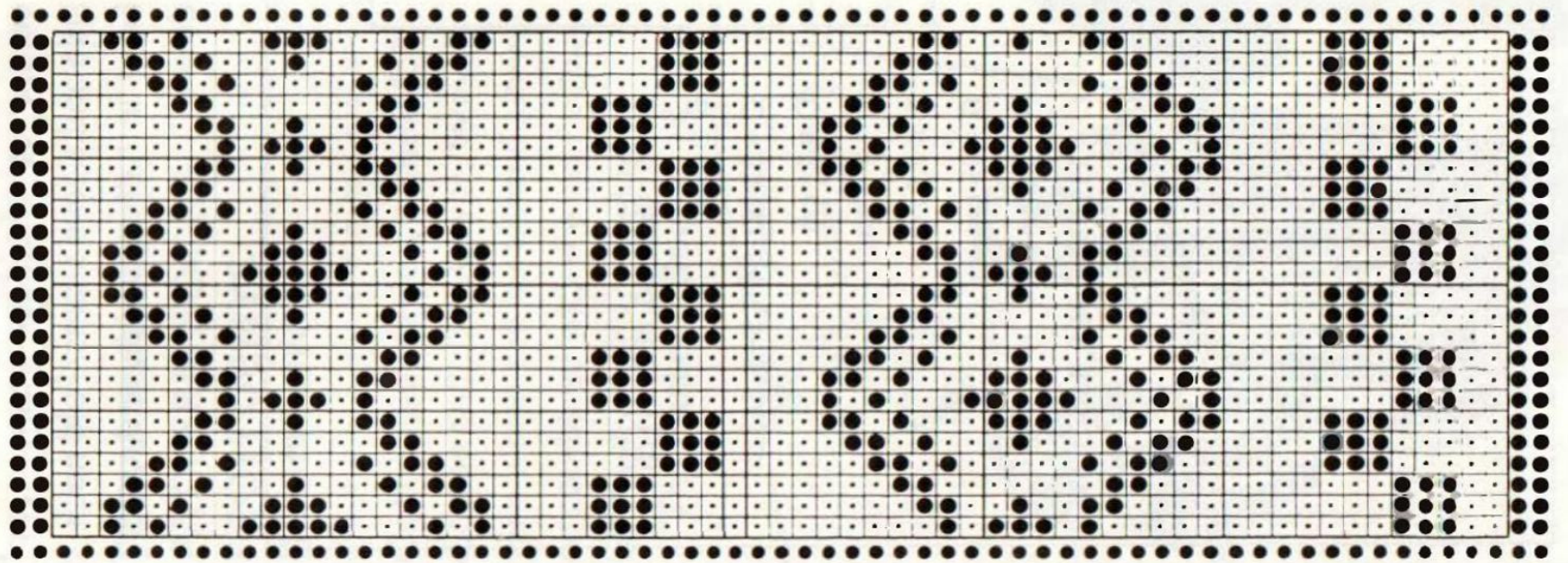


image source: "Modern Machine Knitting Magazine", 1994. Archive.org. <https://archive.org/details/modern-machine-knitting-magazine-1994.02-300dpi-clear-scan-ocr/page/60/mode/2up?q=silver+reed+punch+card>

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Printing instructions

Using the printable PDF, print double sided.

Printing in landscape mode ensures that the pages will flip left to right.

Once printed, cut each sheet of paper along its horizontal center line.

Place the pages in order according to their page numbers.

Bind on the left hand side using staples, stitches, or a hole punch and rings, as you prefer!

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