

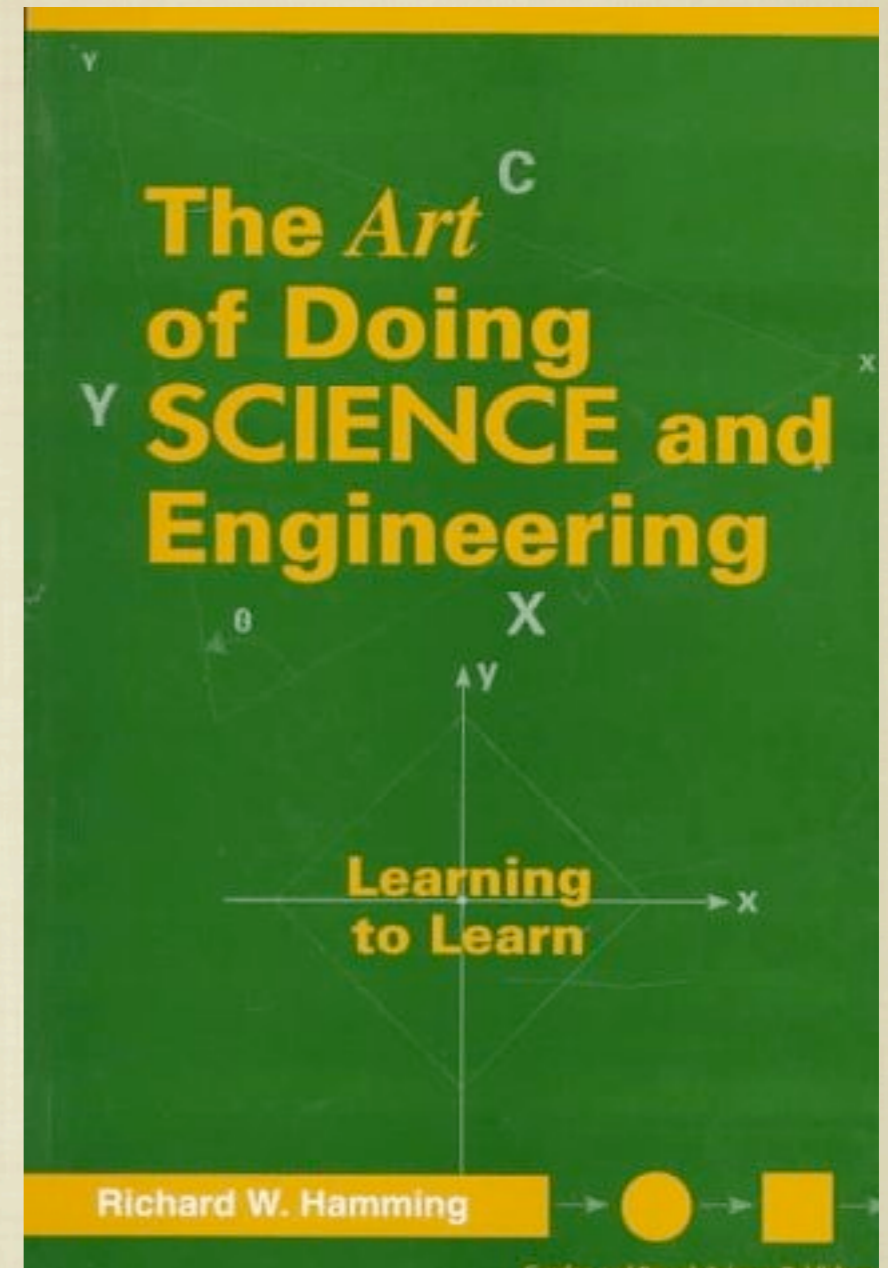


THE ART OF DOING SCIENCE AND ENGINEERING

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OUTLINE

- **LECTURE 1: ORIENTATION**
- **LECTURE 2: FOUNDATION OF THE DIGITAL REVOLUTION**
- **LECTURE 3: HISTORY OF COMPUTERS - HARDWARE**



(1) ORIENTATION

- PURPOSE OF THE COURSE
 - PREPARE FOR **TECHNICAL FUTURE**
 - **“STYLE” OF THINKING** - CAN'T BE TAUGHT USING NORMAL WORDS
- CREATE YOUR OWN STYLE: BECOME **LEADER VS. FOLLOWER**
- **EDUCATION VS. TRAINING**
 - EDUCATION IS WHAT, WHEN AND WHY TO DO THINGS.
 - TRAINING IS HOW TO DO IT.

(1) ORIENTATION

- SINCE NEWTON'S TIME, SCIENTIFIC / ENGINEERING KNOWLEDGE HAS **DOUBLED EVERY 17 YEARS.**
- BOOKS PUBLISHED - # EMPLOYEES - # SCIENTISTS
- **90 %** OF SCIENTISTS (EVER LIVED) **ARE ALIVE**
- VERIFIED BY **“BACK OF THE ENVELOPE”**
- ESTIMATE RETIREMENT
- CONCENTRATE ON FUNDAMENTALS

(1) ORIENTATION

- “IN SCIENCE IF YOU **KNOW** WHAT YOU ARE DOING YOU SHOULD **NOT** BE DOING IT.”
- “IN ENGINEERING IF YOU **DO NOT KNOW** WHAT YOU ARE DOING YOU SHOULD **NOT** BE DOING IT.”

(1) ORIENTATION

- HISTORY: LONG TERM GUIDE
- FUTURE PREDICTION
- “UNFORESEEN TECHNOLOGICAL INVENTIONS CAN COMPLETELY UPSET THE MOST CAREFUL PREDICTIONS”
- **DRUNKEN SAILOR PROGRESS**
- COURSE TASK: **CREATE VISION OF YOUR FUTURE**
- **HUMAN VS. COMPUTERS**

(1) ORIENTATION

- “YOU OUGHT TO **TRY TO MAKE SIGNIFICANT CONTRIBUTIONS TO HUMANITY** RATHER THAN LIVE COMFORTABLY.”

(2) FOUNDATIONS OF THE DIGITAL REVOLUTION

- **SIGNALING WITH CONTINUOUS SIGNALS**
- **SIGNALING WITH DISCRETE PULSES**

(2) FOUNDATIONS OF THE DIGITAL REVOLUTION

- **WHY THIS REVOLUTION?**
- **(1) CONTINUOUS SIGNALING - REQUIRES AMPLIFICATION**
DISCRETE SIGNALING - REPEATERS USED
- **(2) INVENTION OF TRANSISTORS AND ICs.**
- **(3) MATERIAL GOODS SOCIETY VS. INFORMATION SERVICE SOCIETY**

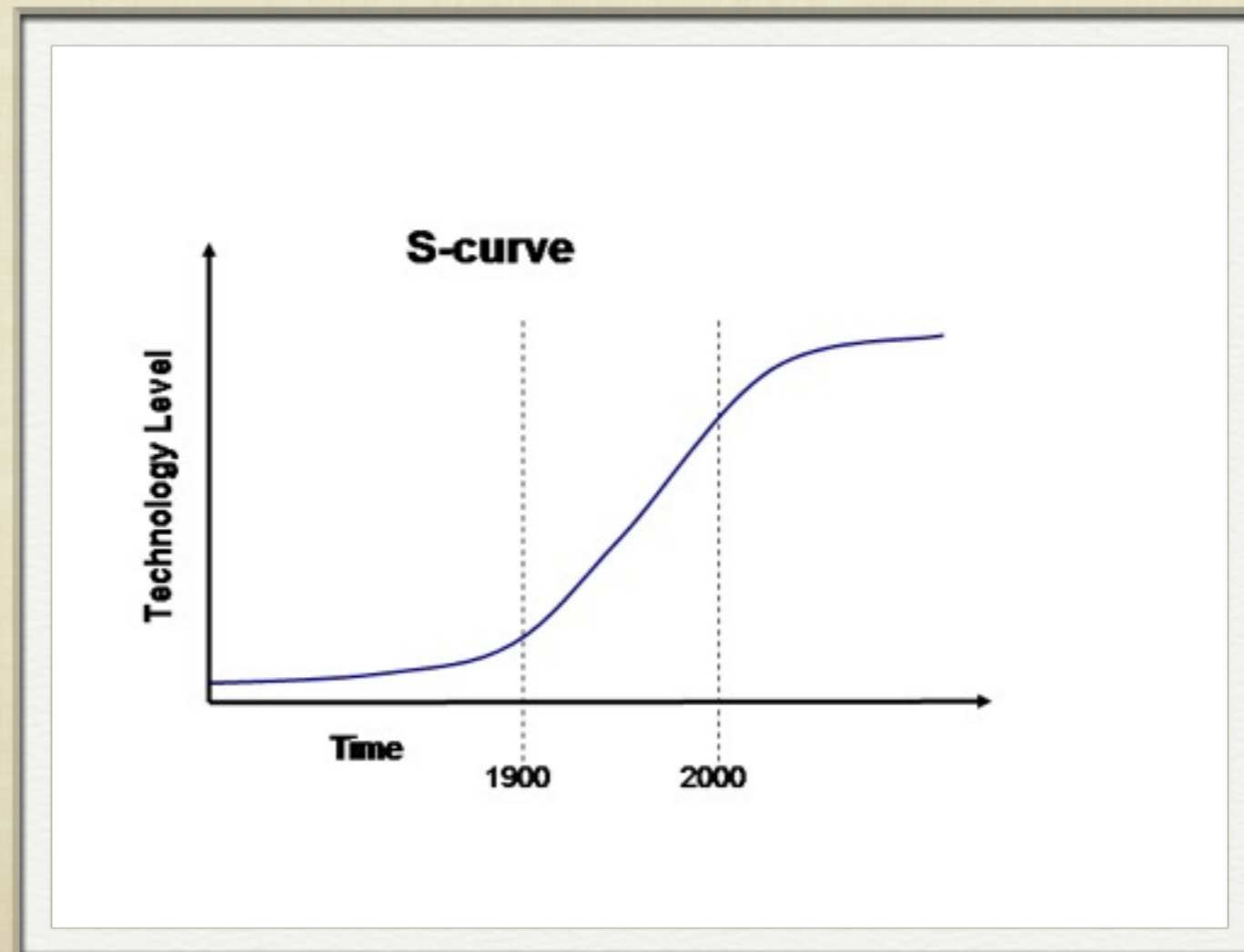
(2) FOUNDATIONS OF THE DIGITAL REVOLUTION

- (4) **ROBOTS** - BETTER, CHEAPER, DIFFERENT PRODUCTS
- (5) **SCIENCE** - SIMULATION OF ATOMIC BOMB (LOS ALAMOS)
- (6) **ENGINEERING** - DESIGN THE HIGH SPEED OBJECT DETECTION ON AIRPLANES
- (7) **MICROMANAGEMENT**
- (8) **ENTERTAINMENT** - SEX, MARRIAGE, SPORTS...
- (9) **MILITARY**

(2) FOUNDATIONS OF THE DIGITAL REVOLUTION

- RATE OF EVOLUTION

- “S” CURVE



(3) HISTORY OF COMPUTERS - HARDWARE

- PRIMITIVE MAN USED **PEBBLES**



(3) HISTORY OF COMPUTERS - HARDWARE

■ SUAN PAN AND ABACUS



(3) HISTORY OF COMPUTERS - HARDWARE

- INVENTION OF LOGARITHMS (NAPIER 1550-1617)
- **SLIDE RULES**



(3) HISTORY OF COMPUTERS - HARDWARE

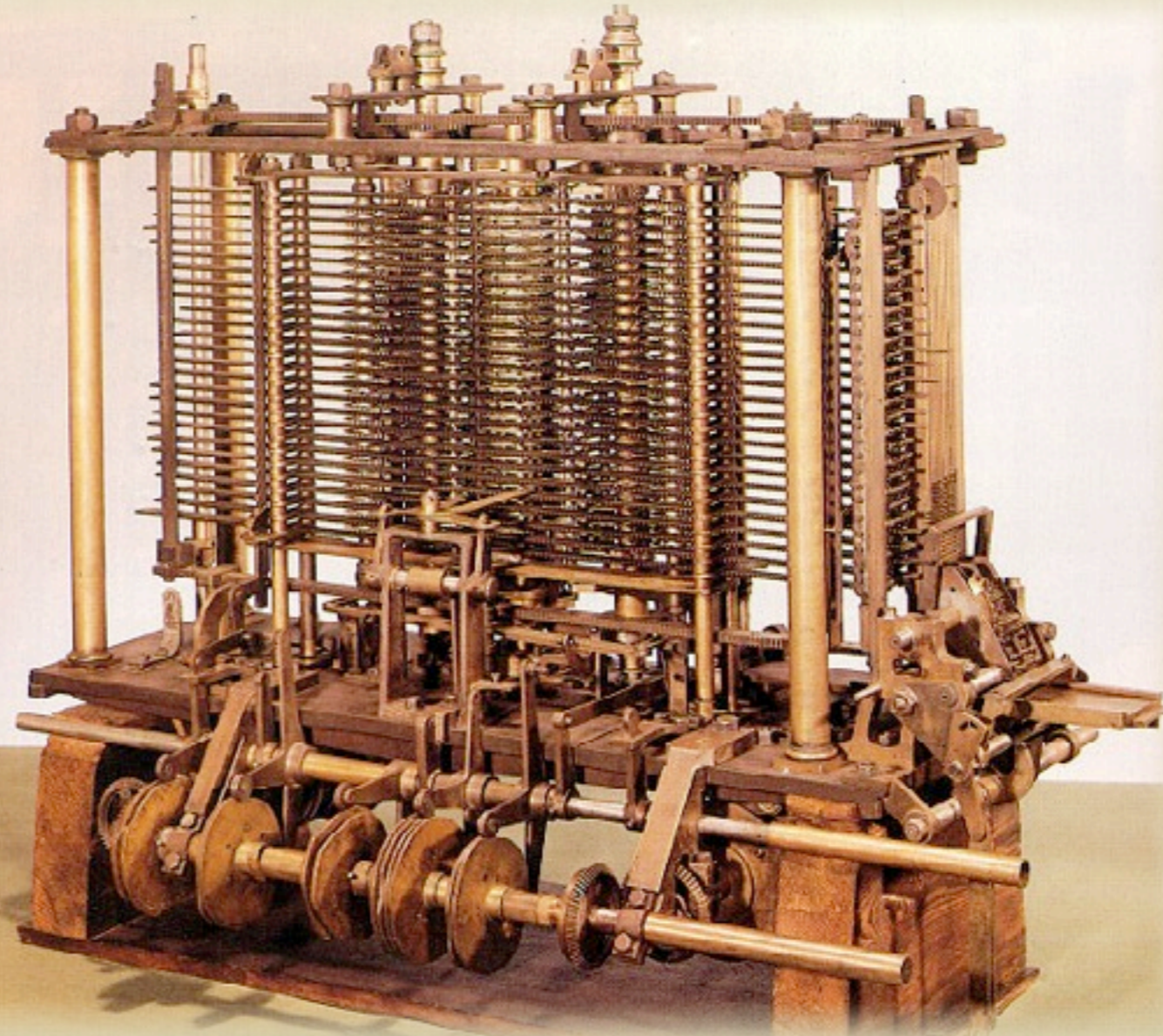
■ NAPIER BONES - MULTIPLY NUMBERS EASILY

The image shows a photograph of a Napier's Bones calculator, which is a grid of numbers used for multiplication. The grid is 10 rows by 10 columns, with the top row representing the numbers 1 through 9. Each cell in the grid contains a number, and the numbers are arranged in a way that allows for easy multiplication. The numbers in the grid are as follows:

1	1	2	3	4	5	6	7	8	9
2	8	4	2	0	2	4	6	8	6
3	2	7	9	3	1	2	3	6	9
4	6	4	1	6	4	8	1	2	3
5	1	2	5	2	5	0	5	1	0
6	2	1	6	3	6	6	2	4	6
7	5	4	3	4	9	7	2	8	7
8	5	1	2	6	4	8	3	2	8
9	7	2	9	8	1	9	3	6	9
0									

(3) HISTORY OF COMPUTERS - HARDWARE

- **BABBAGE (1791 - 1871) DIFFERENCE AND ANALYTICAL ENGINE (FATHER OF MODERN COMPUTING)**



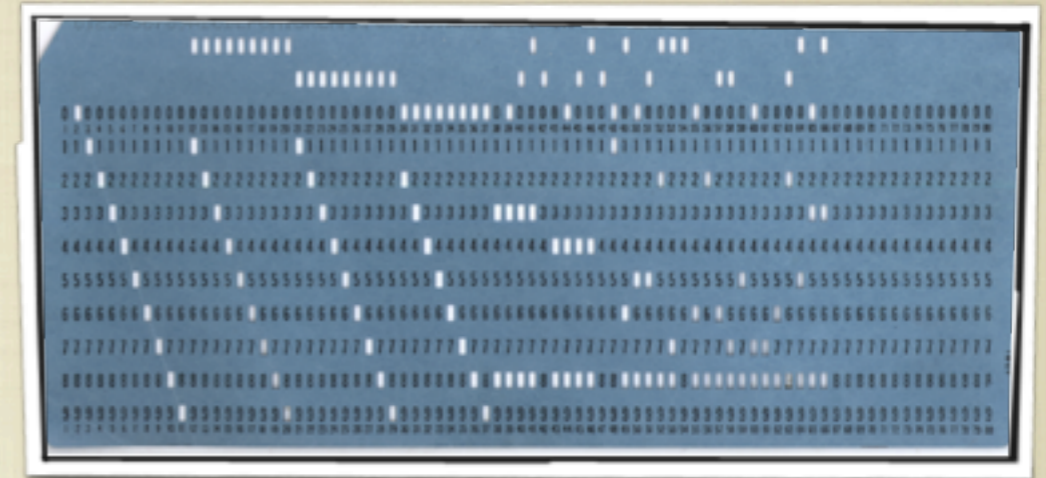
(3) HISTORY OF COMPUTERS - HARDWARE

■ **COMPTOMETER**



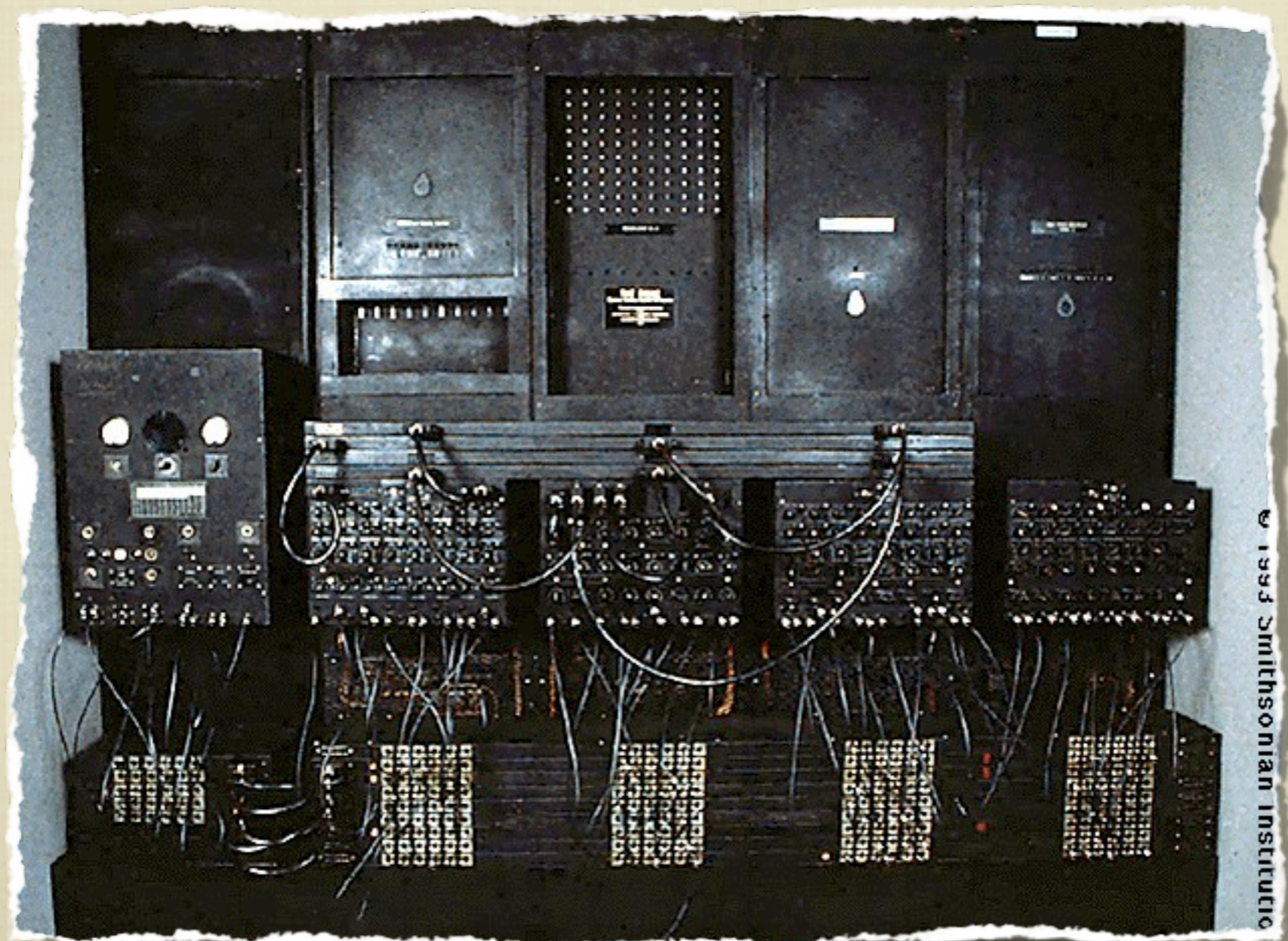
(3) HISTORY OF COMPUTERS - HARDWARE

■ PUNCH CARD MACHINES



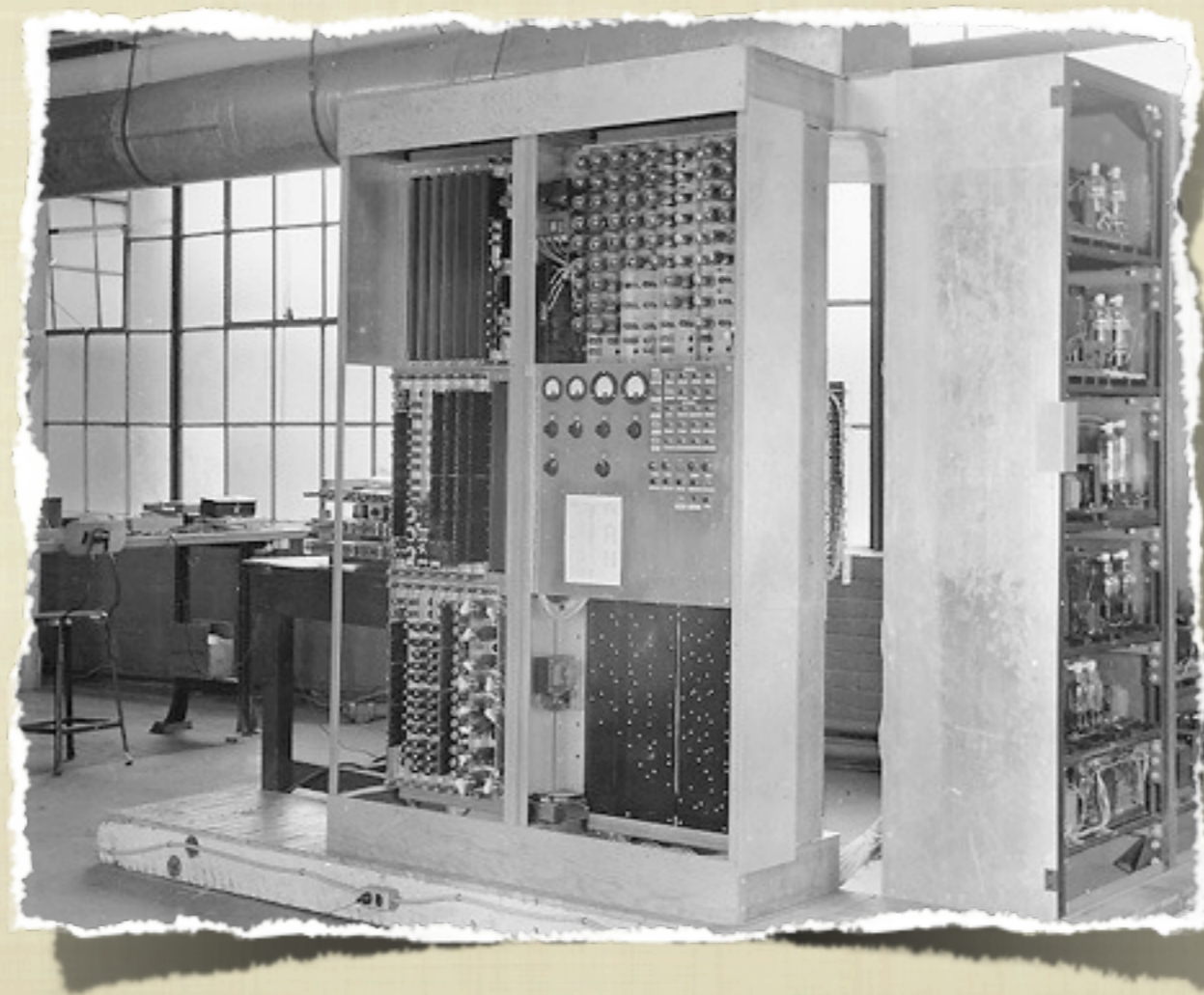
(3) HISTORY OF COMPUTERS - HARDWARE

■ ENIAC (ELECTRONIC AGE - 1946)



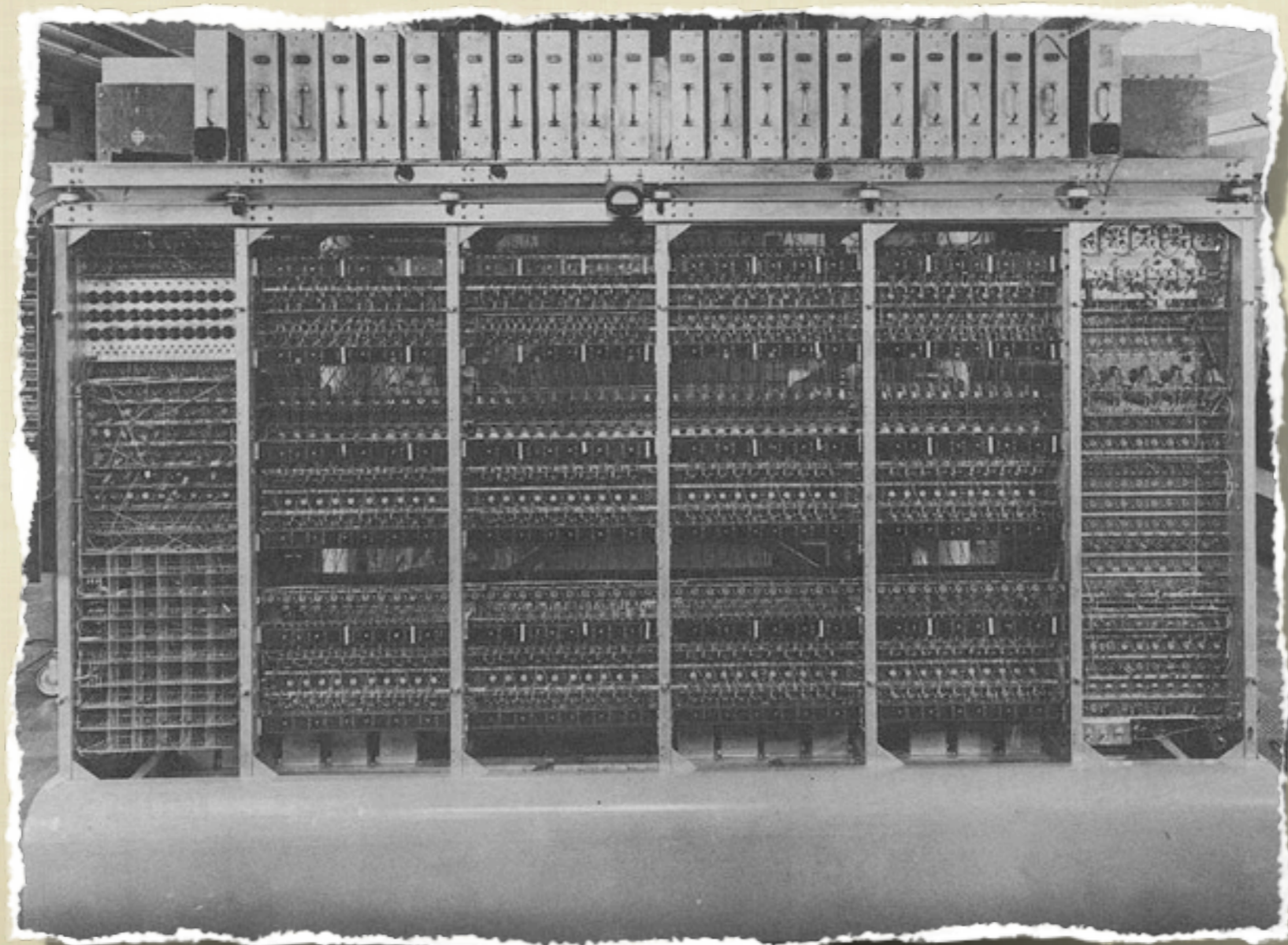
(3) HISTORY OF COMPUTERS - HARDWARE

- **EDVAC** (MAUCHLY AND ECKERT; CONSULTANT - VON NEUMANN)



(3) HISTORY OF COMPUTERS - HARDWARE

■ MANIAC - I, II, III (GET RID OF IDIOTIC NAMING)



(3) HISTORY OF COMPUTERS - HARDWARE

■ **IBM 701's** (FIRST COMMERCIAL PRODUCTION)



(3) HISTORY OF COMPUTERS - HARDWARE

- **“CHANGES IN SPEED THAT I HAVE HAD TO LIVE THROUGH SHOULD GIVE YOU SOME IDEA AS TO WHAT YOU WILL HAVE TO ENDURE IN YOUR CAREERS”**

THANKS!

