Von Neumann Architecture

The way that the Central Processing Unit and related components are organised was first described by John von Neumann in 1945
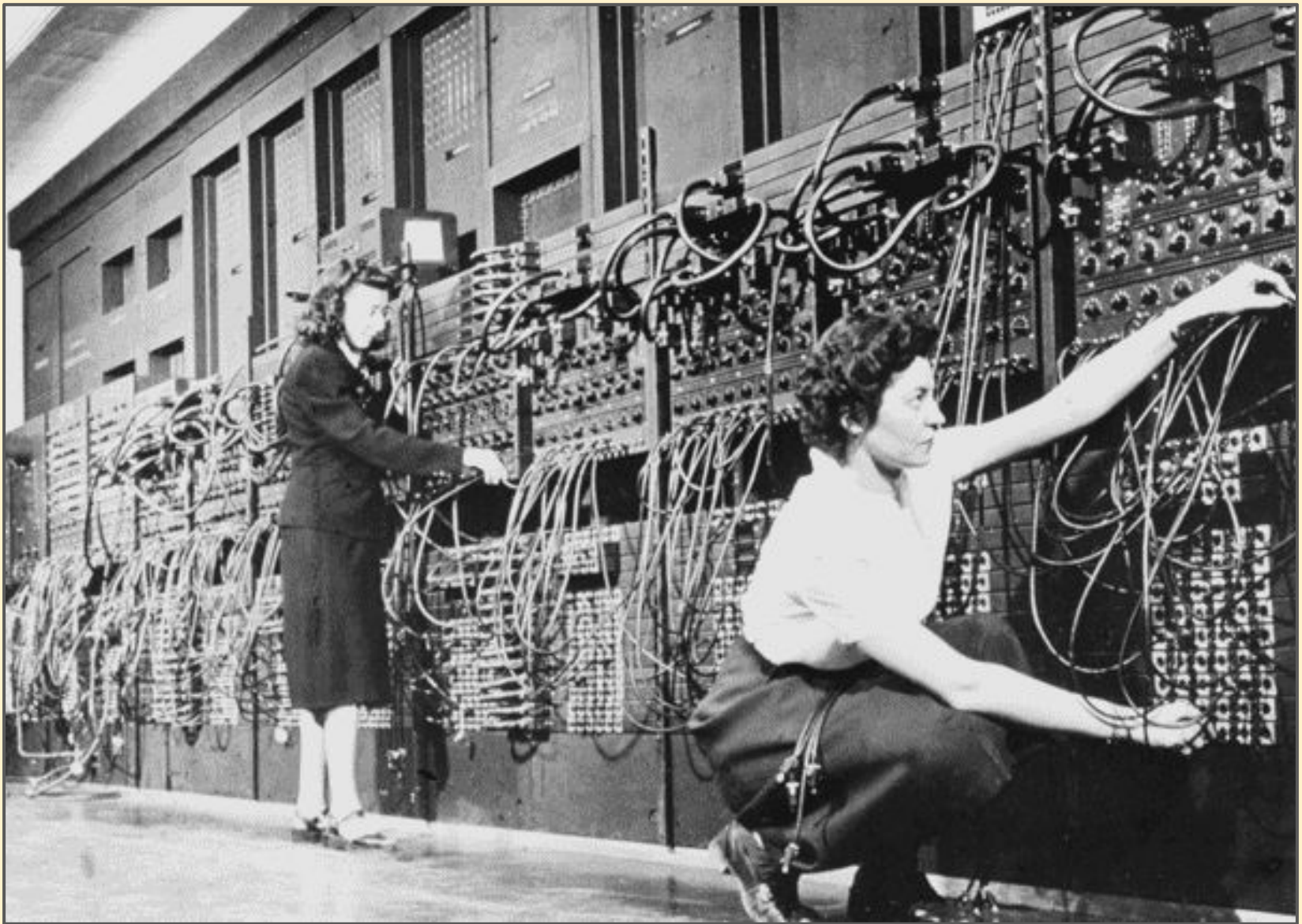
This structure for a computer is called the **von Neumann architecture**
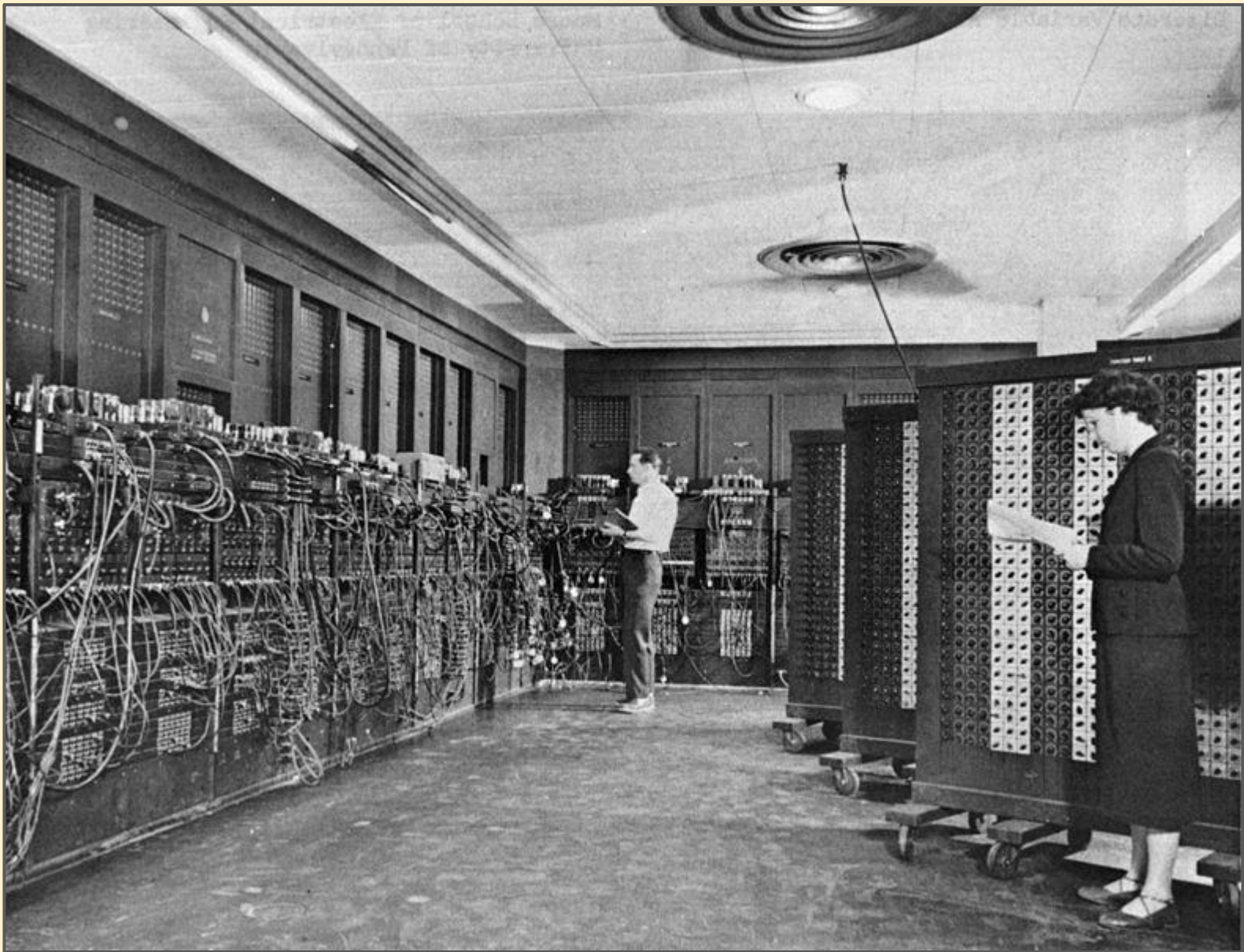
Von Neumann Architecture

At the time von Neumann was working, computers were large machines which ran programs that were hardwired into the circuitry or plug boards

This meant each computer could do one thing - and only one thing

ENIAC - c.1946
https://commons.wikimedia.org/wiki/File:World%27s_First_Computer,_the_Electronic_Numerical_Integrator_and_Calculator_(ENIAC).gif
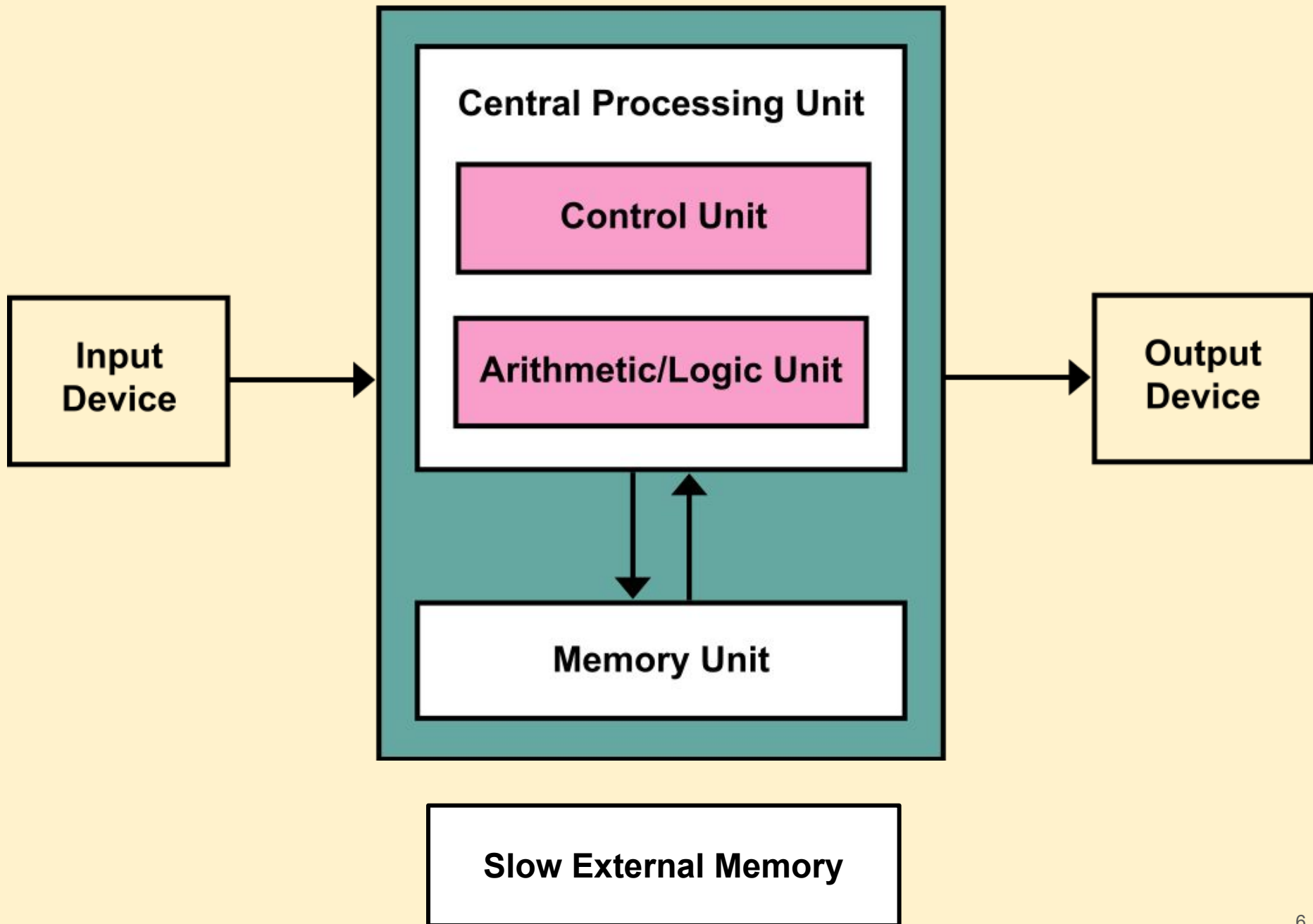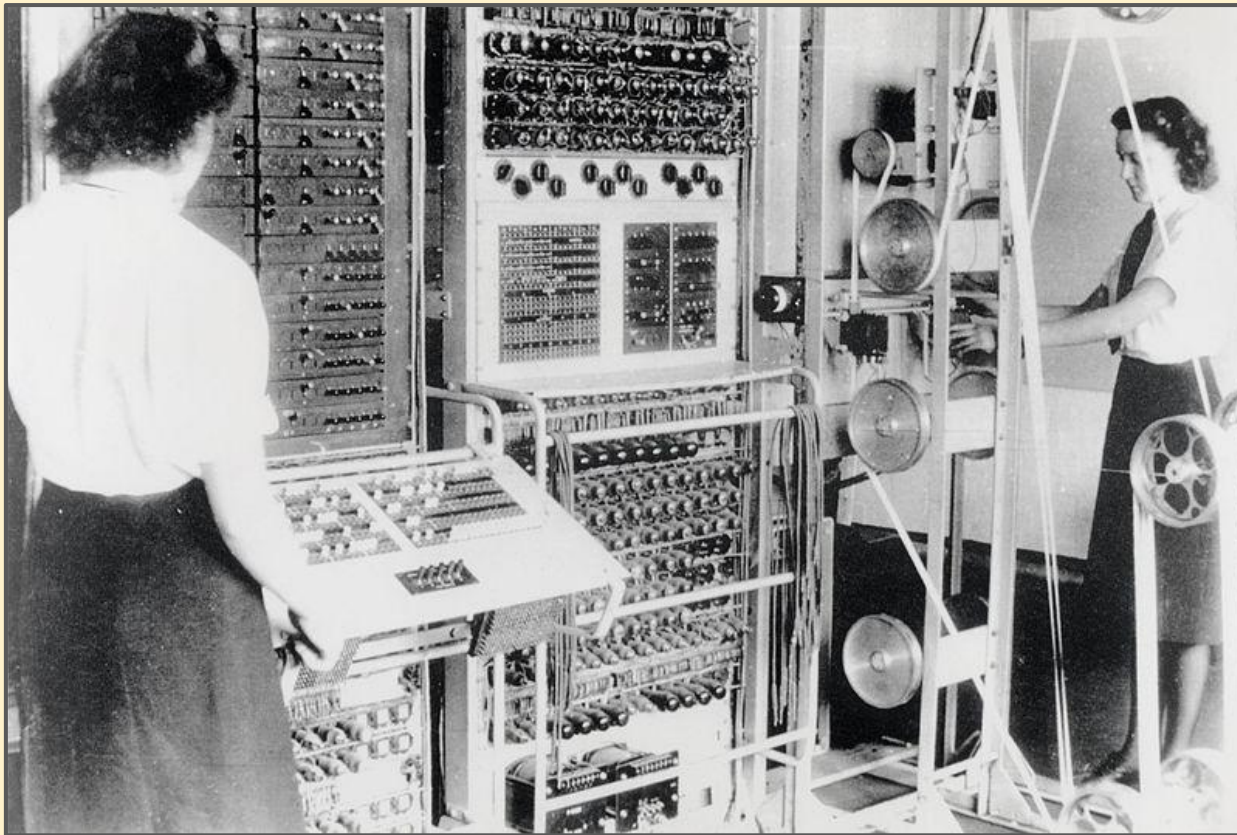
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ENIAC - c. 1946

Von Neumann Architecture

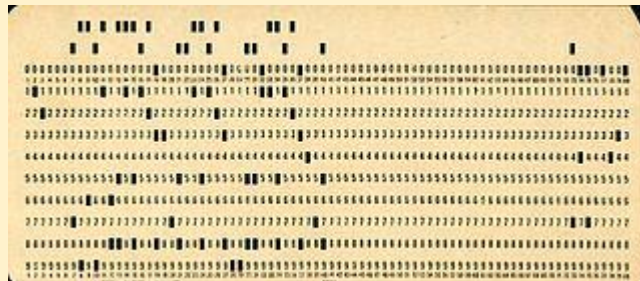Von Neumann's model called for a computer which had:

- Central arithmetic part (CA)
- Central control part (CC)
- Memory (M)
- Input (I), Output (O)
- Slow external memory (R) - punched cards, paper tape etc...

Input Device

Central Processing Unit

Control Unit

Arithmetic/Logic Unit

Memory Unit

Output Device

Slow External Memory

Colossos showing paper tape storage - 1943
https://en.wikipedia.org/wiki/File:Colossus.jpg

Von Neumann Architecture

Von Neumann's architecture introduced the idea of a **Stored Program Computer**

This allowed programs to be stored in **Random Access Memory** rather than requiring them to be wired into the circuitry or plug boards

This allows both **instructions** and **data** to be stored in the **same memory**
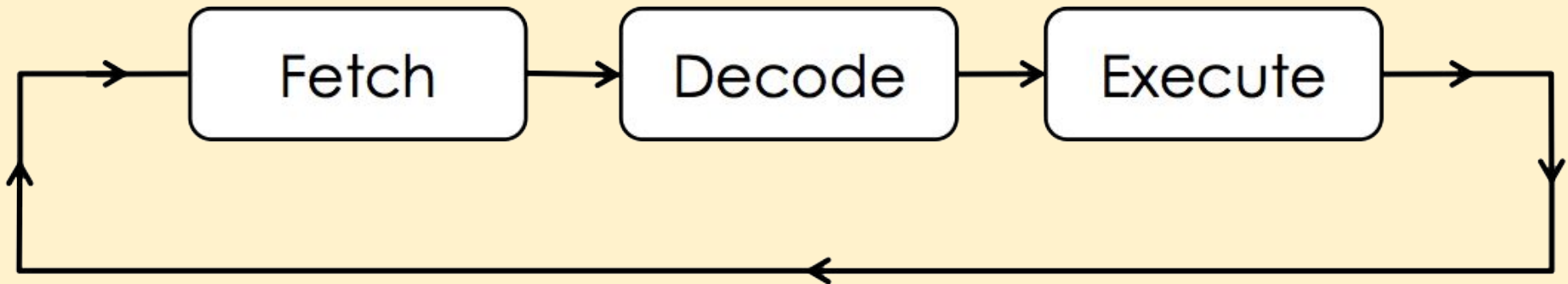
Von Neumann Architecture

This allows computers to be **flexible**. Programs can be loaded and changed easily and memory can be **reused** for different tasks quickly

The von Neumann Architecture enabled the development of the **General Purpose Computer** - one that can be used for **many different tasks**

Von Neumann Architecture

Instructions and data are fetched and executed - the **Fetch-Decode-Execute cycle**

Von Neumann Architecture

- Born in Budapest in 1903
- Mathematical genius - aged 6 could divide two 8 digit numbers in his head and converse in ancient greek
- Eidetic memory
- Polymath
- Moved to the US in 1929 and worked on the Manhattan project
- Died in 1957 from cancer