

Electronic
Computers

Computers are *useless*. They can only give you answers.

— *Pablo Picasso* ¹

¹ Pablo Picasso Quotes. (n.d.). BrainyQuote.com. Retrieved August 28, 2018, from BrainyQuote.com Web site: https://www.brainyquote.com/quotes/pablo_picasso_102018

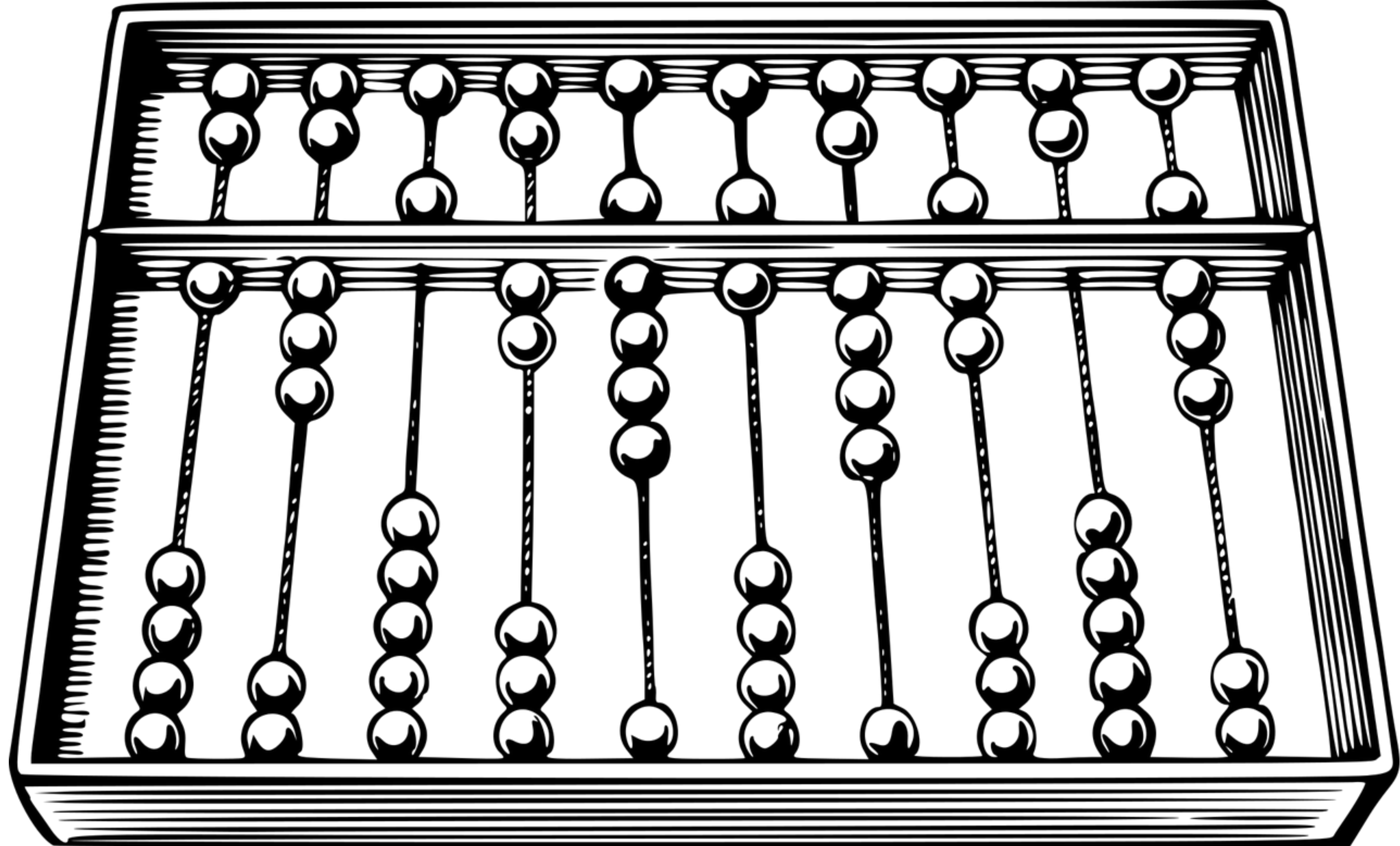
Outline



Counting & **Early** Computing

Counting

https://en.wikipedia.org/wiki/History_of_computing_hardware



ORIGINAL-ODHNER

10 9 8 7 6 5 4 3 2 1

0 0 0 0 0 0 0 0 0 0

0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9
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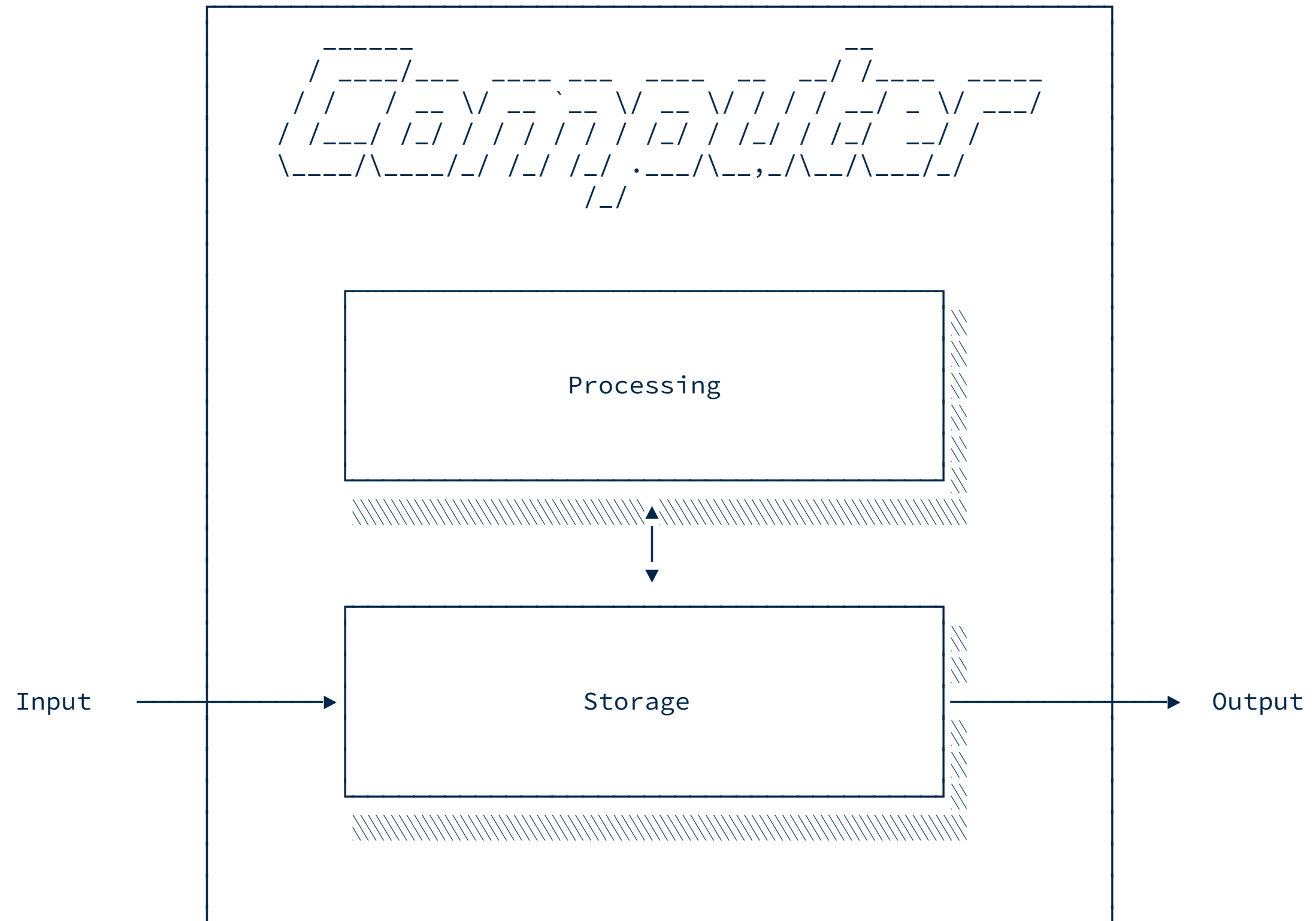
10 9 8 7 6 5 4 3 2 1
12 11 10 9 8 7 6 5 4 3 2 1

3 4 0 6 5 9 4 2 5 2 0 0 0

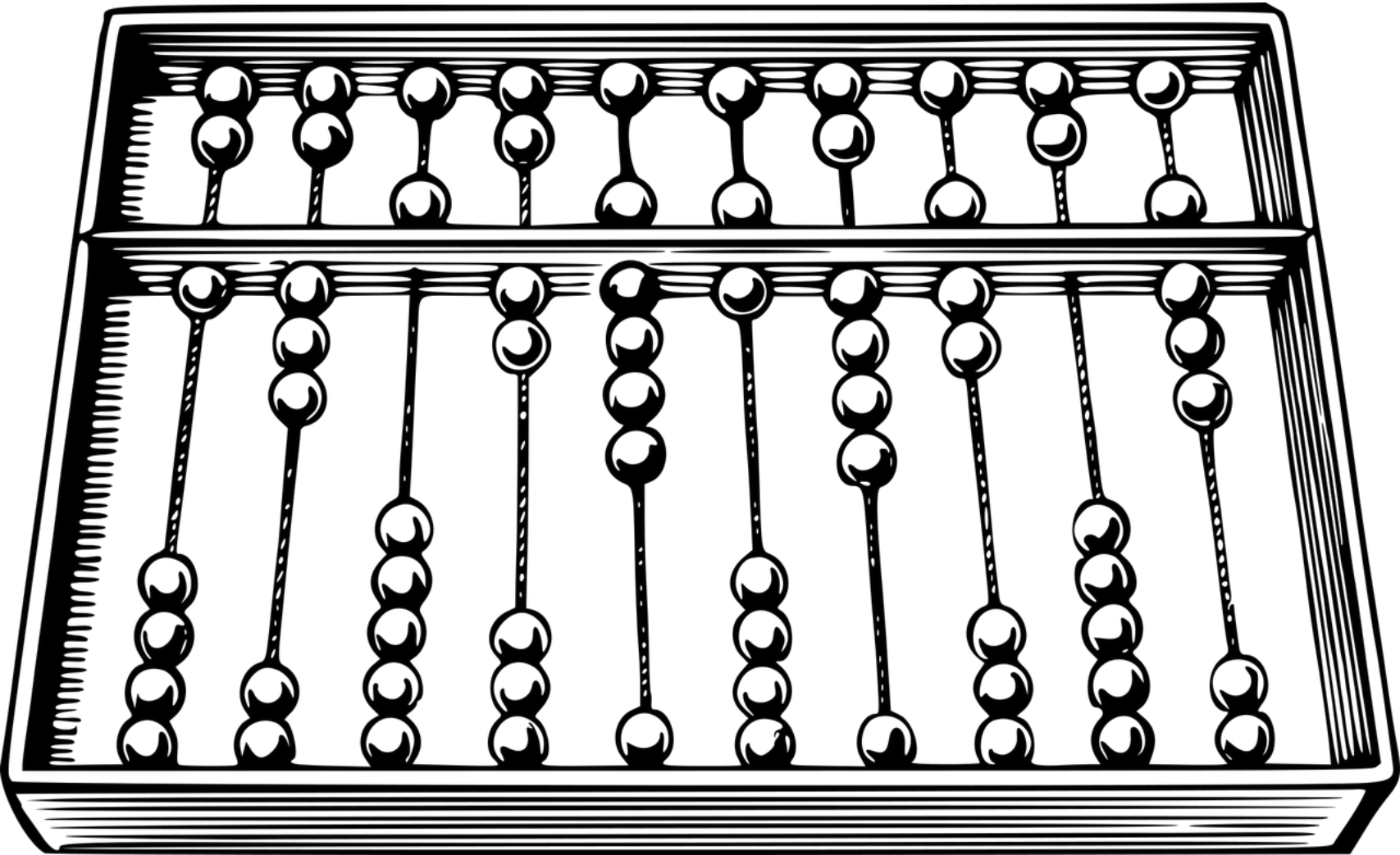
8 7 6 5 4 3 2 1

0 0 0 0 0 0

Fundamental Computer Elements



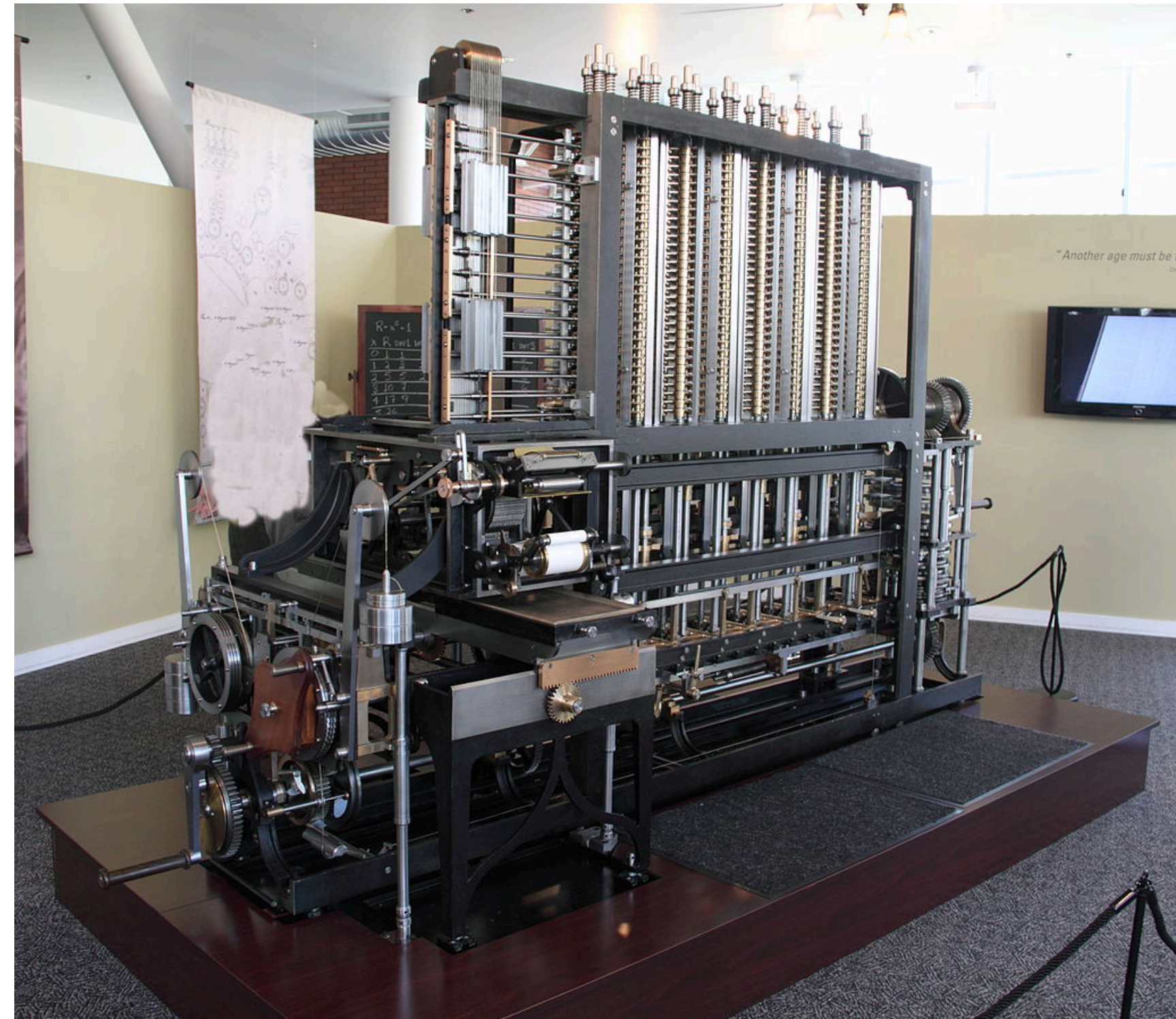
Early Computing Devices



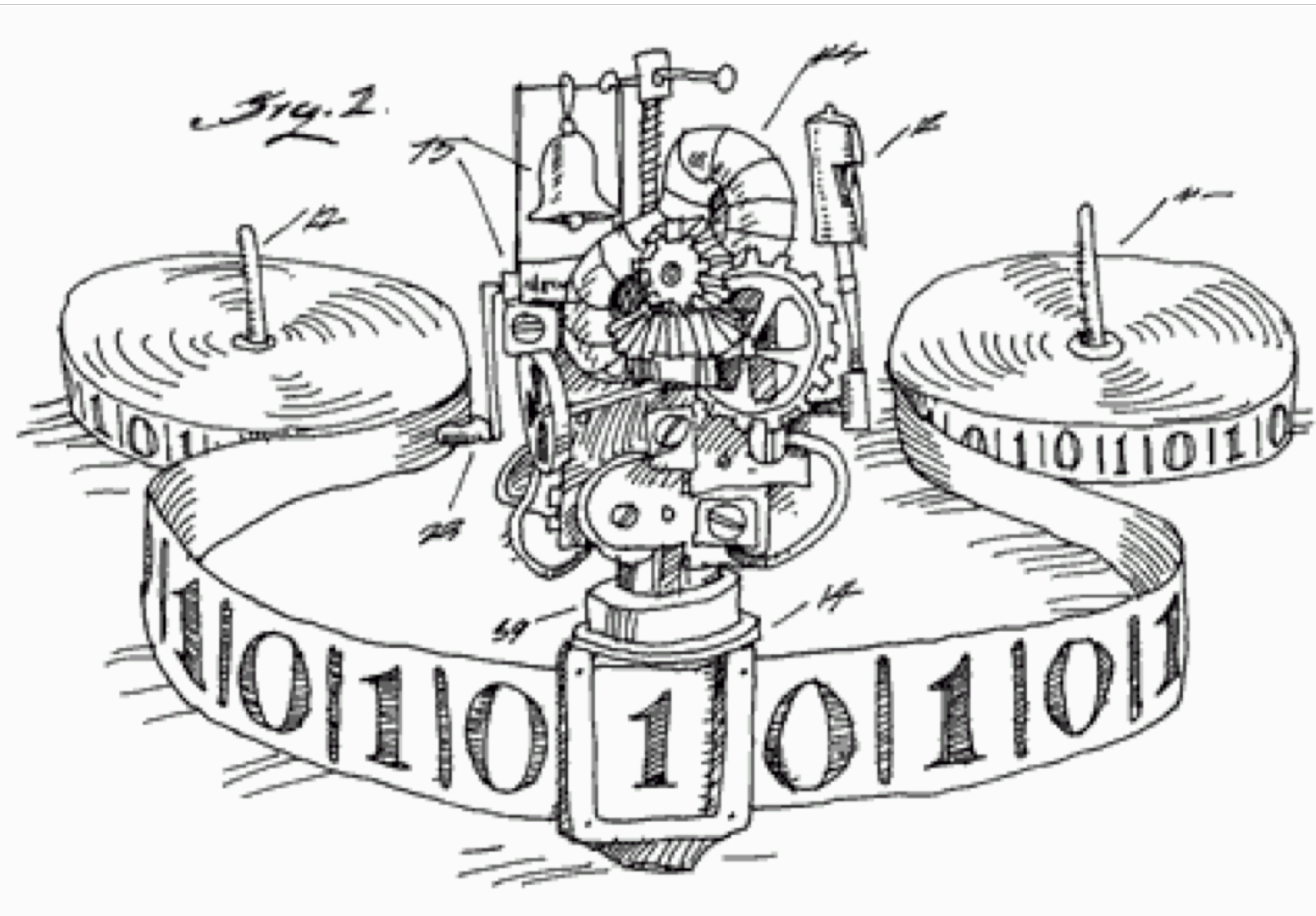
- Input / Output?
- Storage?
- Processing?

Babbage Engine

- Input / Output?
- Storage?
- Processing?



Turing Machine



- Input / Output?
- Storage?
- Processing?

Electronic

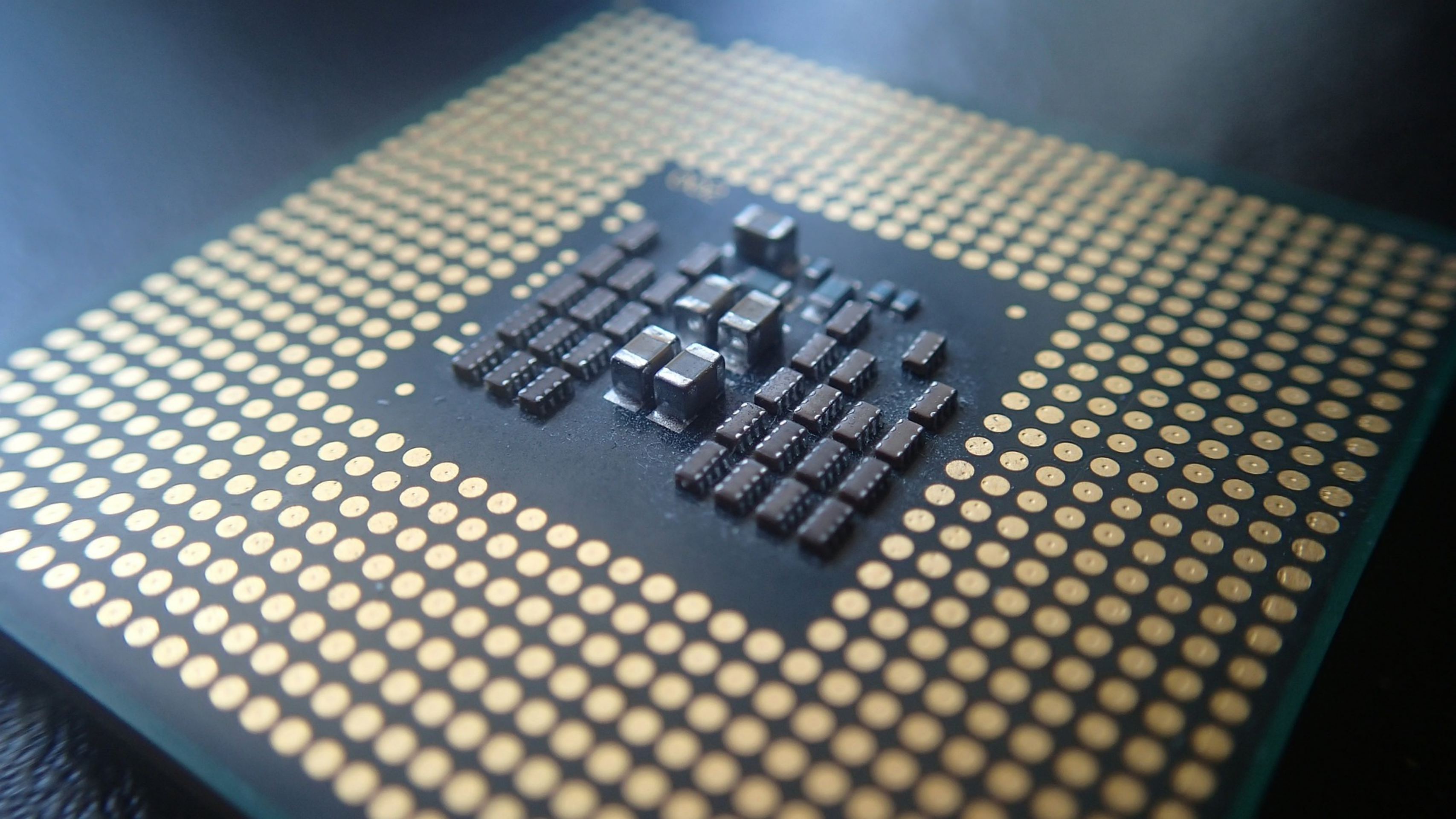
Computers (again)

Computers as **Fractals**

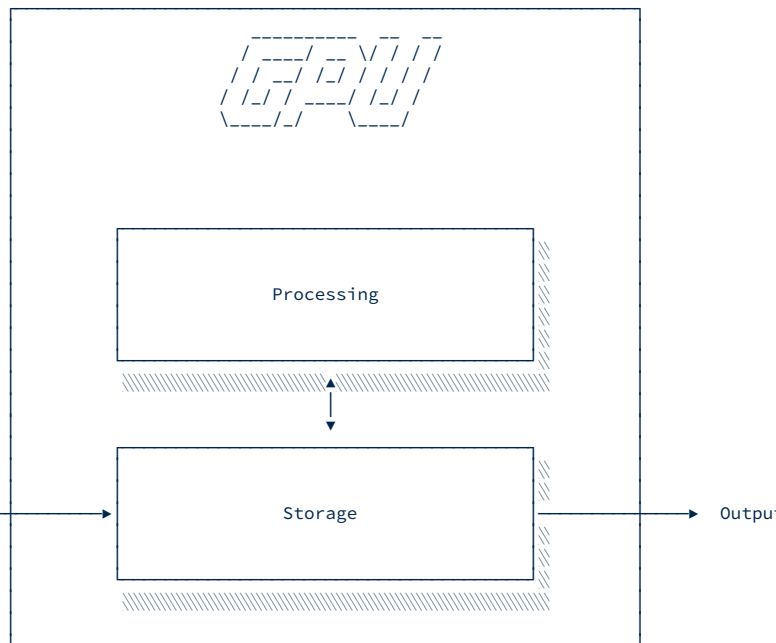
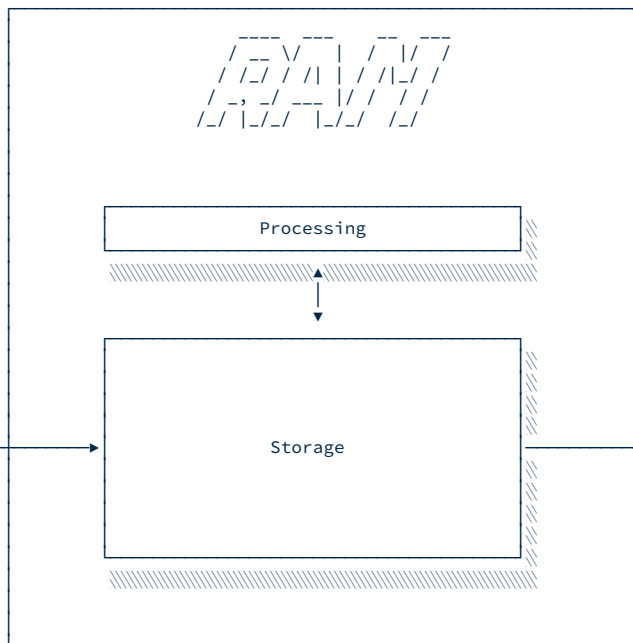
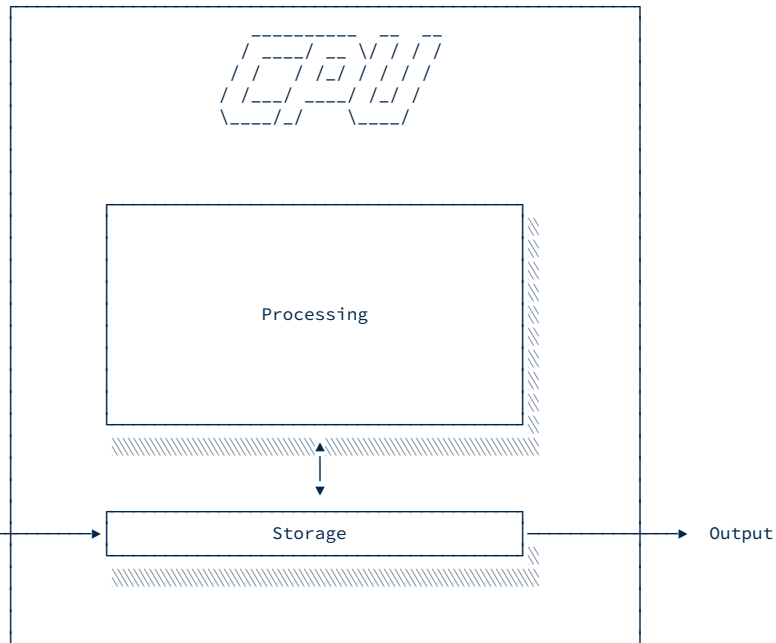
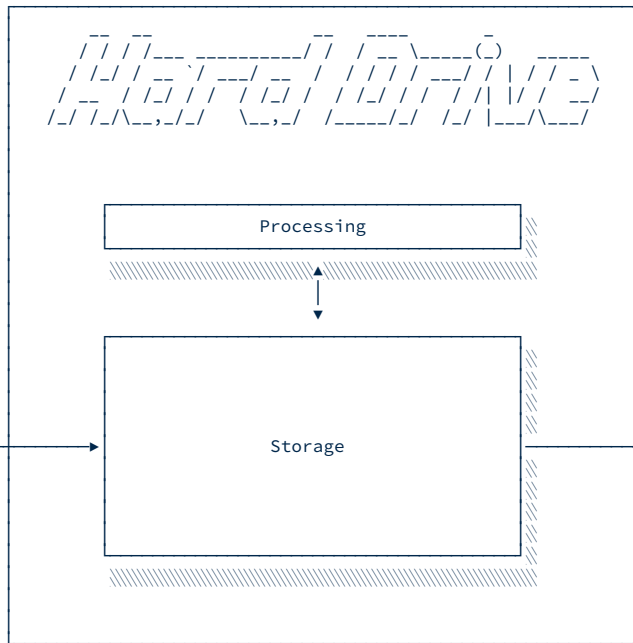
Modern Computer

- Input / Output?
- Storage?
- Processing?

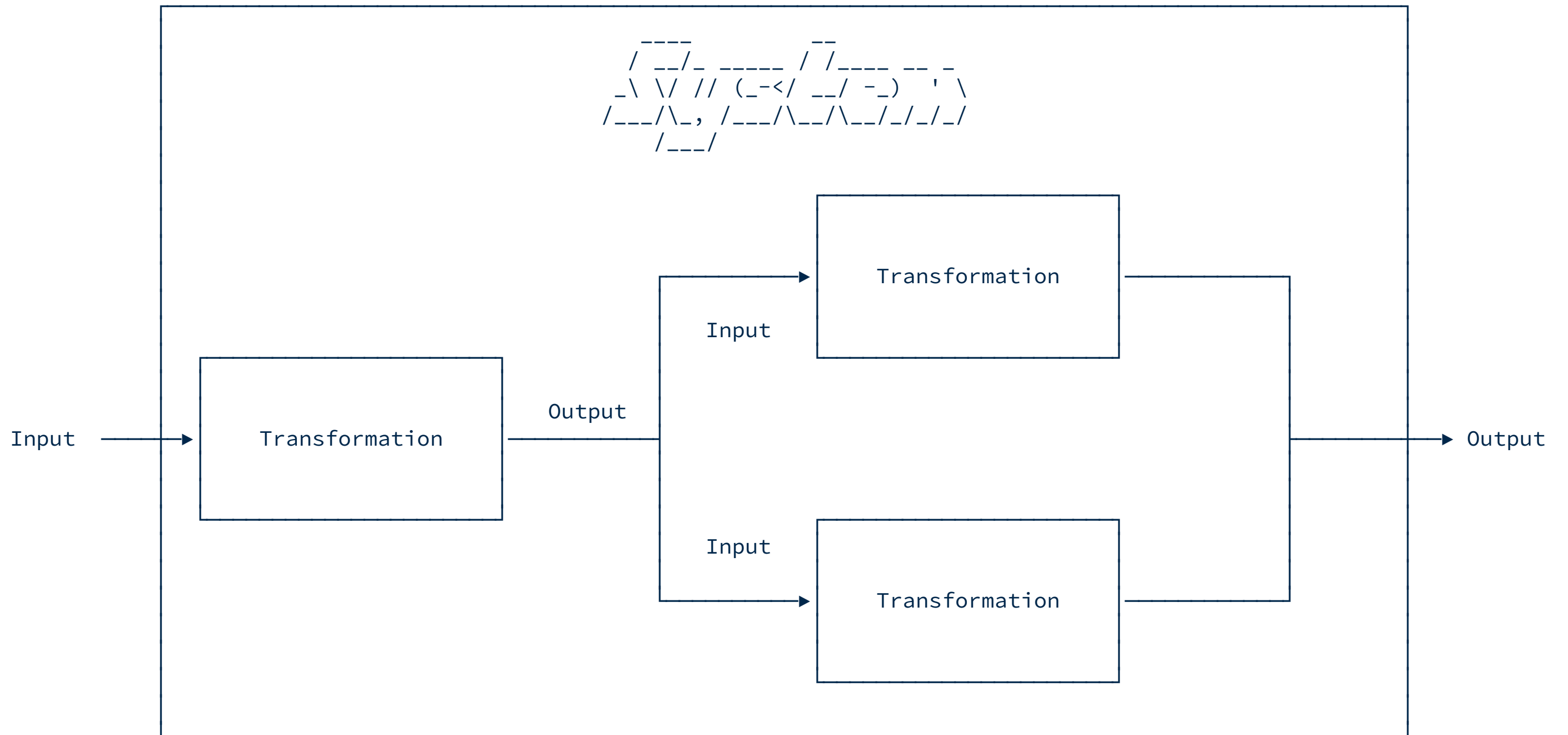




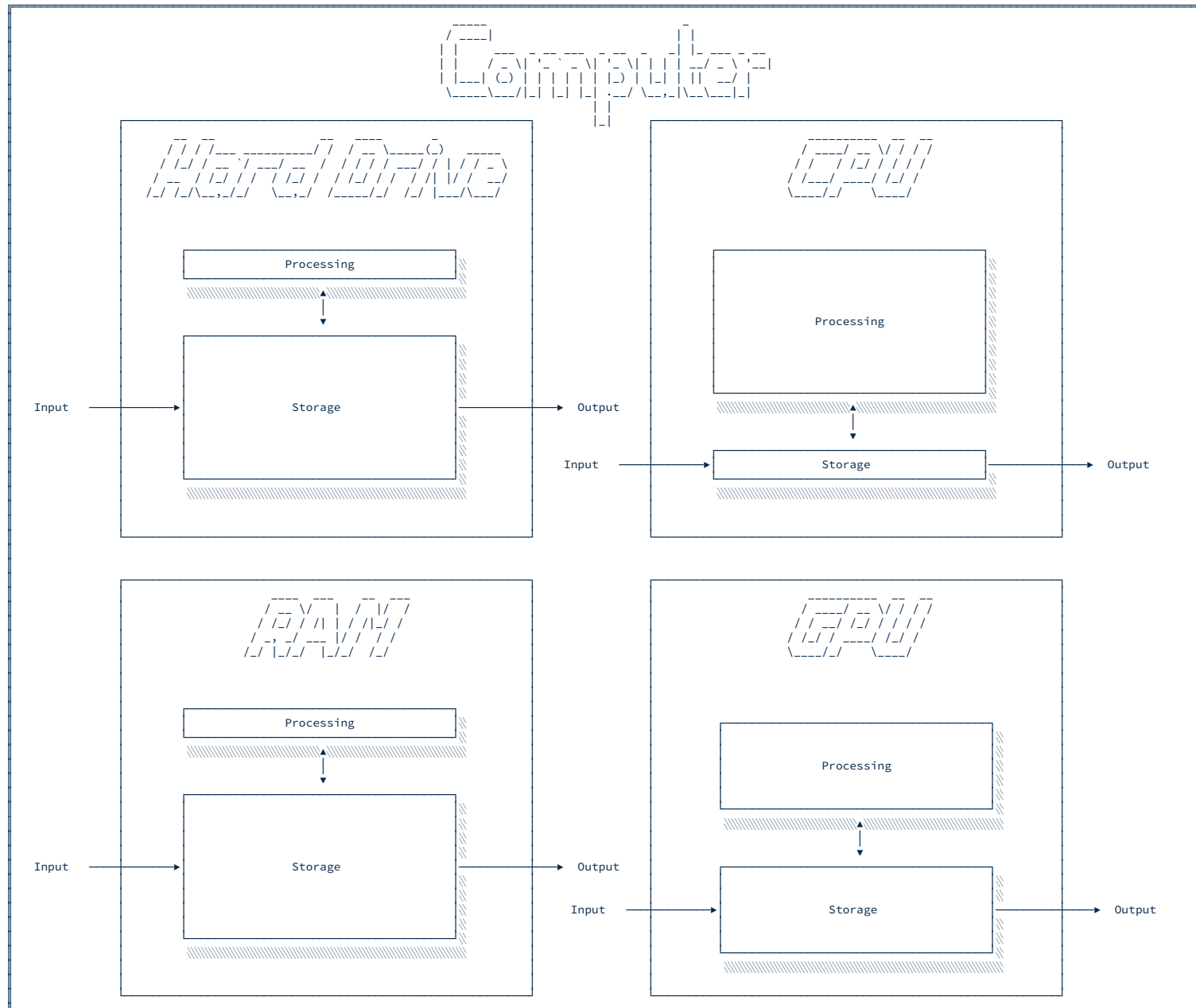
Computer



Where have we seen this **before**?



Computers are *Fractal*



Computers **Everywhere**

