

Chapter 1: ORIGINS OF COMPUTING TECHNOLOGY

INTRODUCTION

In 1965 the government could not have purchased a hand calculator for any amount of money, but the possibility of a computer that could do differential equations existed as far back as 1931. The device, called a "differential analyzer," could only do differential equations, it was mechanical, and it completely filled a room. Computers as we now know them began profoundly impacting us and everything around us starting in the 1980s, but technologies designed to enhance our ability to calculate go back for millennia. In fact, they go back to the very origins of civilization.

Arguably, writing, itself, was a new technology "invented" to facilitate the measure and management of the king's inventory, but the first computing technologies even predate that. Before there were numbers, objects (e.g., fingers, twigs, pebbles) were used for counting things, and before there was arithmetic as we currently understand it, there were counting boards, coin boards, apices, and the abacus (originally called an "abax").

In this section, we examine the history of computing all the way back to the origins of counting. Why a history of computers or even a history of numbers? Understanding how technologies work means comes from a foundation of knowledge of how the technologies got here. The very language we use in our day do day work comes from this foundation. For example, a commonly used explanation for why we use the term "boot" to describe how computers start up is that they are capable of pulling themselves up by their bootstraps. First, that virtually universal explanation is not true. Secondly, even if it were true, why would anybody ever have attributed the ability to pull itself up by its bootstraps to a computer? The answer can be found in the early history of the mainframes.

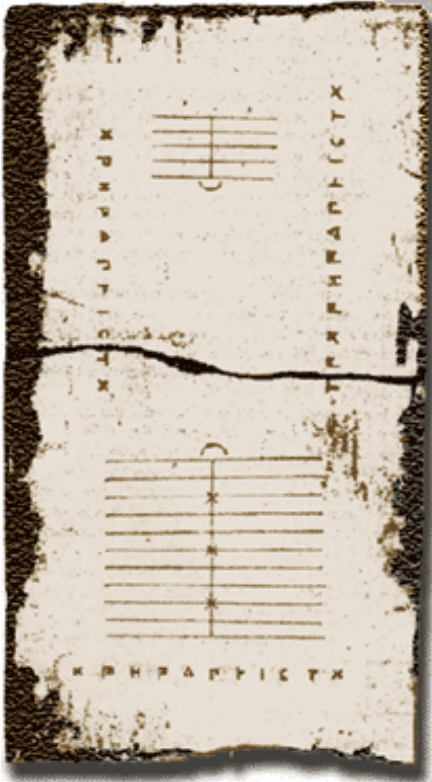
What should you take from this section?
Computers did not simply and suddenly evolve. They evolved as we did. They are a direct result of the way we think, and they describe how we know. People who understand how computers evolved from simple counting machines to the complicated devices we currently use, also understand how contemporary computers think -- and, more importantly, how we think.

GREECE

The first known calculation tool came from the island of Salamis (just off the coast of Greece) in circa 300 BCE. But earlier counting boards and tables date back to the dawn of civilization. Before then people would have drawn grooves in the dirt at their feet and used pebbles as markers to aid their calculations. Merchants are believed to have developed the counting



Greek accountant working at traditional counting table. Counting tables were used throughout the middle East and Europe until the middle of the 19th century. Called "counters" even after nobody counted on them, counting tables became the counters in department stores and our kitchens.

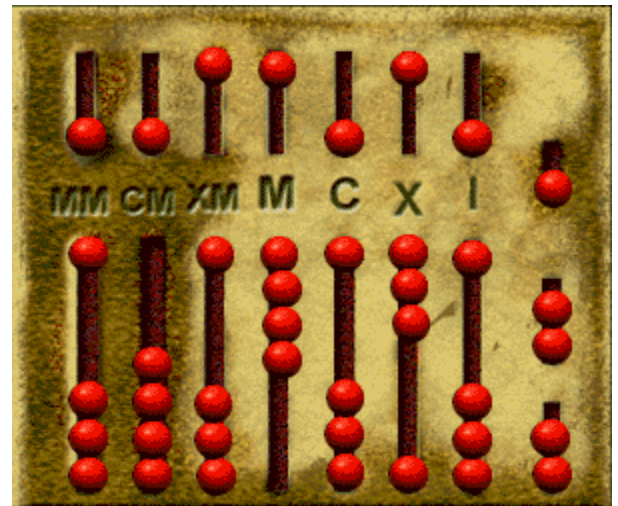


Greek accounting tablet from the island of Samalis. The lines scribed into the stone could be used in conjunction with pebbles or beads to accomplish addition, subtraction, multiplication, or division.

boards to facilitate calculations in their stalls. Historians speculate that the earliest of these were shallow boxes filled with sand. They drew grooves in the sand much as they would draw them on the ground. The Salamis counting board represented the next generation of technology. It was a marble tablet with its grooves already inscribed. With as few as four grooves, it was possible to add and subtract to 10,000.

ROME

Although Roman numerals were cumbersome, Roman math was enhanced by their "pocket calculator." The Roman abacus used dumbbell shaped beads in slots or beads with holes in them threaded on bamboo slivers for manipulating numbers. Only after they found their solutions did they write them down in Roman numerals.



The Roman abacus is based on a Bi-quinary system with four one units (1, 10, 100, 1000, etc.) plus a single five unit (5, 50, 500, 5000, etc.). The number on the abacus at the right is 1,069,181 (note the implied 0 in the abacus).

SUMER

Greece presented us with the first physical evidence of how the ancients did math, and Rome advanced it to a hand held calculator, but if we track the concept back through Greece, we discover that the technologies Greece and Rome used, began in the Middle East more than 9,000 years ago.

Approximately 8000 BCE, Sumerians migrated from the East into the fertile regions of the Tigris-Euphrates river valleys and founded the civilization we call "Sumer." This seems to be the place where they first developed writing and attached it to the tools the Greeks and Romans used (Egyptian disclaimer).

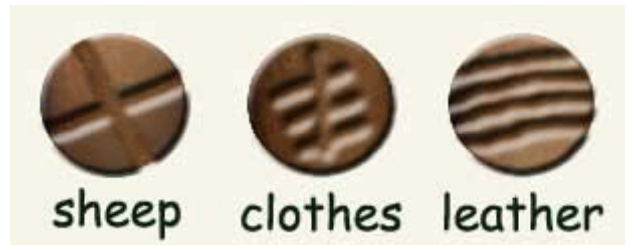
At some point in the prehistoric past, the Sumerians seem to have moved from pebbles to clay tokens. In these tokens, a stick shape equaled 1; a clay pebble equaled 10; a cone equaled 60, etc. Markings on the clay tokens indicated the object being counted.



Replicas of counting tokens from Sumer. The different shapes count as generic numbers. The odd embossings stand for specific objects. The cone shaped object in the foreground is a jar.

A later system made it possible for them to archive the numbers. They put the tokens in a clay sphere and baked them. Markings on the surface of the sphere indicated what was inside (i.e., the nature of the transaction). It was a simple step to convert the sphere into a tablet that described the transaction with no tokens actually involved.

This was not writing in the sense that it transcribed language, but could be considered proto-writing that described transactions. In any case, it represents the origin of numerical notation.



According to some historians, the disks indicated the item being counted. The shapes inscribed in the disks name the items. Not quite a complete, written language, but a beginning.

ASSIGNMENT

Using objects at hand, invent a calculator that you can use to do simple math up to 1 billion. Then test it.

Now, write a complete description so someone else can replicate your discovery. Test your description on five subjects.

Write up a report on your experiment and submit it to the teacher of record at