COURSE 1 - 28.02.2025 refacut mai jos

COURSE 2 - 7.03.2025 refacut mai jos

Recap:

CMB – energy + information in a state of entropy

Appearance of light

Manea about gravitational waves [link]

Some of the stars bursted/exploded (as einstein said, bends the space-time continuoum around it)

Some of the explosion debris swells around healthy stars, forms an own gravitational field and become planets, others remain at the form of asteroids, comets. "cosmos rocks"

How does a planet increase their mass? By pumping asteroids

As we are life forms on terra, evolved life forms, we came to a crossroad in our philosophy regarding the topic of "how life came to this planet". One theory is that one of such rocks hit the earth, but if we look at terra, we can see it is composed of 2 main parts: land and sea. What state of matter is our planetary environment (the biosphere)? Liquid? Only Liquid? It's a mixture of Gas and Liquid. Gas OR Liquid = Fluid. If the ocean is a mixture of water and gas, so is the atmosphere => the atmosphere and the planetary ocean are one thing (we are swimming rn). All the weather-related phenomenons are done by this atmosphere. We as humans have fluids, gasses and "hail" (grindina). The collatz rules mimic what happens to the hail stones in the clouds up until they drop.

Going back to the topic, the hypothesis came to the idea that life began in the sea. We do not know it for certain, but there are many scientific proofs, even though "there is no substantiative evidence" that life did not lie elsewhere before water, as there are limitations in our science.

Aristotle said on a rock that we do history because we get kicks.

Thank you Aristotle.

Debate break

A cool trick about history is to remember it's patterns and not repeat them. One hypothesis about the appearance of life on this blue ball is that life appeared from an asteroid that crashed into the sea and making the building blocks of life. How can we know from earth the chemical composition of the stars from the earth (WE TALKED ABOUT IT?????) pual

Pink Floyd pyramid. What…

What newton proved to everyone is that white light is just a mixture of spectrum of colored lights. If I look at the stars, do I see the lgbtq flag complete or is there something missing? What is light? It is made out of photos. These photons meet obstacles in their way. If these photons do not meet any obstacles, until us, we see the light, which "excites our eyes". The light is not complete as some photons are blocked by the composition of the stars. There is an experiment that can be made which shows that at some exact positions, depending on which element you have put, you can see how the light is blocked by that element's existence. At some points, a star emits nuclei of the star itself, which can intercept the photons coming to the earth.

A lot of ladies mapped the stars on the sky

Radio astronomy was founded I the early 1930s with the work of Karl Jan…

Using this type of analysis, scientists can look from the earth and get the composition of any stars in the cosmos. Therefore, they noticed that these stars have some compositions that would mark the beginning steps of life.

Miller–Urey experiment

- What these guys did was a hypothesis, a play with the unknown. If an asteroid would fall, as we claim it did, and there was a mixture of some chemicals and we put it in a controlled environment, we cool/heat(?) it and then we hit it with a lot of electricity, would that lead to the building blocks of the building blocks of the building blocks of life?

- Did they succeed? They got the nobel prize, so I guess. They zapped it with electricity until they formed aminoacids. Why do we need aminoacids? They create the building blocks of life, which are macromolecules such as RNA (ribo nucleic acids). What is ribo? The ribozone. What is a ribozone? It is an information system. What is the input and what is the output? The input: Energy and the output: RNA, information. Where does energy come from? The powerhouse of the cell, mitochondria. Everything is thermodynamics. How does mitochondria work? Takes sugar (crap), chemicals from the surrounding and creates a exothermic chemical reaction. Did you know the mitochondria is kinda a cell? It has almos everything a cell has, it's a proto cell.

- Who appeared first, the virus or the mitochondria. We do not know. Why is this relevant to CS? Do we know who was asking these questions? John von Neumann.

- Viruses are not considered by us, "life" as "being life". What is life? The problem comes from self observation. Life is life observing itself, or else it would not be life.

Debate break

- The idea of John von Newmann's head was not really about RNA, but about replication of RNA. What is replication? To make something identical. What is a replica? A copy, also known as a clone. The ability of information to clone itself. What is fighting agains replication? Entropy

GATTACA (cica va aparea la examen) – this is how the human genome starts. What data type would you use to hold in the memory of the computer DNA? Linked Lists, but why? What is the operation of an array that are very bad? Insert and remove.

When trying to replicate GATTACA, a lot of things can happen, the addition, deletion, mutation of

something caused by entropy. Claude shannone. Who helped us do it? Why is it called ethernet? Why is it called "ether"? what was ether? A substance that people up until the late 19s some people thought that permeated outer cosmos. Why did they need something to be there in their minds?. Because everything we knew about mechanics and physics was Newtonian mechanics. Since light was moving, it had to latch on to something for it to make sense in Newtonian mechanics. The "culprit" was thought to be this ether. There is no ether in the cosmos, only after Boltzmann and his ideas appeared did people start looking at some other aspect and turned away from the idea ot "ether". Once we dropped this hypothesis and we contemplated the idea that nothing was there, only then did we stsart working with our collective minds throughout the years and get hypothesis such as einsteins "that you have a time-space continuum and stars bend this time-space". However, the universe is booming with radioactive crap

Do we know about error detection mechanisms?

The birth of modern computers

Somehow, nature founda way to perfectly replicate RNA. You can see it happening, by a way of cloning genetic information in an almost perfect manner. If you put a proteic epsilon on top of it, you get a virus. The only flaw a virus has is that it has no metabolism. The goal of a virus is such to insert it's own code as an input to the ribozone, such that it recreates the input of the virus and not that of the ribozone.

What was first, the creation of RNA or metabolism? In order to have life you need both.

Newmann replicated a cell and called it "software", and then called "hardware" chloroplast.

The touring machine. What was wrong with it/. It was slow. Why? Because most of the energy was lost as mechanical work force. It was not effective from an energy point of view. What happened to john von newmann. He created a computer to mimic the cell based on the questions he was asking itself.

His analysis of the structure of self replication preceeded the discovery of the structure of DNA. While thinking about the beginning of life, he implemented his thoughts in the computing machine. What is a computing machine. A machine that performs computations on what? Arithmetical and logical operations. What is the smallest form of operation? A bit. Addition gives us an extra bit, multiplication doubles the amount of bits

$0 + 0 = 0$ (and) 0 (xor)

$0 + 1 = 01$

$1 + 0 = 10$

$1 + 1 = 11$

What is xor? Can it be written in a disjunctive normal form? Xor is the bad boy of ai?

A and NOT B or NOT A and B

With these 3 operations, not, and, or, we can build a machine.

What do we need to achieve these 3 operations? Semiconductors

How transistors run code? – core dumped

Who came up with the notion of logic gates being able to do computation? Claude Chenn. Who invented the notion of logics? Aristotle. What is the principle that logics is based upon? The law of the excluded middle. In the beginning there was one.

2001 SPACE ODYSEY

Someone(?) invisione a machine with an infinite amount of bits. What is a bit? Is it a state or does it have a state? A bit is an entity that can have exactly 2 states that you move from one to another by "not". What you cannot do in a bit is to be stuck in between the 2 states. Who decided that? Aristotle. He wrote the book on logic called Logica (comes from logos which means word). What was the best outcome to come out of this? Contradiction. You could have not contradicted a mf before Aristotle, People could say that P could be true and then say not P be true and nobody could catch that bullshit.

Why is Aristotle considered the best philosopher in ancient times? Because he took his newfound tool which is Logica, took all the wisdom coming dfrom the predecesors, Socrates, Platos, etc. and put them through this newfound weapon and thus eliminated all contradictions which lead to him understanding the surrounding of the universe. As sherlock holmes said, once you leave the impossible, whatever remains has to be the truth

The notion of a bit stands from the idea of Aristotle that there are no more than 2 states. Principiul tertului exclus. George Boole comes up (mathematicion from the Victorian period of Britain).

Why the first computers were made out of light bulbs – veritasium

***discussion about cpu and memory = ram(done by magnets) + storage(done by electrons)

This model was proposed in the 50s. What is the computer von newmann and turring worked on and was used during the ww2? ENIAC. ENIAC was a couple of rooms filled with electronic devices that ran on machine code (byte code). You had a room in which you flipped switches or gave perforations on a carton card (as input), and then a room in which the input was being processed and then another room that returned an output as a punch card or (?). Where have we seen this? In the beginning of the flinstones.

COURSE 3 - 14.03.2025

- Discutie despre Inna, "THE NEXT LADY GAGA" (?????)

- "Yuo guys are in for a treat this class"

- We have come to the inflexion point

- Discutie despre tricoul Spiderman al unui baiat

- Ecranul au ramas pe acelasi video ca data trecuta

- Lasa-l pe gabi sa fie un special little snowflake, a working class hero….

- We have come to a pivotal moment in the development of hardware

- RECAP:

- "let's make it a discussion about sexes" oh no

- Coming back to the discussion of the ribozon

- John Von Newmann – invented the Von Newmann machine and perfected the ideas and collaborated with Turring, in order to create the ENIAC

- Let's talk about (biological) *sex*: Mihnea is not ready. Is sex important to problem solving? What is sex? Where does the name come from? It comes from the word "section", which is another term for dycothomia. When has sex appeared in nature? Why has it appeared, from a biological perspective. The most evolved species were the ones developing a sex, as they were the most adaptable to their environment. This has to do with genetic material and the ability to recombine them (the genes). In order to become complete cell, you need chloroplast, aka energy, and ARN with protein.

- Newmann was the Messi of Computer Science. The guys who worked with him at MIT and bell Labs said that "this guywas going into his mind palace, imagining the model of a quantum fluctuation inside his mind". He then came to them and convince those guys to run his experiments and he most of the time proved to be right. All the scientists did up until now Is to climb on top of the former people of the world. The first computer used light bulbs

- What is sex? What does it mean that you create a section.

- You might have heard there is a way to get the dna of ancient people, Can you find the dna of the debunct? From the marrow of the bone? No

- What is DNA?

- ARN – replacitation, protected by a coat of proteins is called a virus. If the membrane of the cell is not around arn it will disintegrate and decompose.

- In star there were the first mass object, atoms of hydrogen and helium. It's positively charged the nucleus. In our current "atom model", we have electrons (the quantum thingy - wave particle duality) that can only be found at integer multiples of some constant, which means they can onlhy move from an electron layer to another by eliminating a photon to which we can calculate the energy of. If another electron emts a photo and we are on the other side of the nucleus, some part of the spectrum will be blocked by the nuclei that form the star. *talk about colors from light*. By analyzing the color structure of the light, we can analyse the chemical structure.

- In the 19th century in the British empire there were guys who used this spectrum analysis. Ada Lovelace was the first informatician but she had to collaborate with a dude in order to be mentioned, Charles Babbage. Razboi de tesut = war loom bravo Octavian. They added some sort of programable loom. You could create a pattern mechanically by telling the machine (the loom). Ada Lovelace was the daughter of Lord bayren(?).

- Who invented the engine was James watt.

- Knowing the "barcode" for all elements means we can get the "barcode" for more complex elements

- The muller hypothesis was that maybe life appeared on an asteroid that smashed into the sea in a warm environment with high energy. The macromolecules of life appeared and then disappeared, due to RNA.

- Our mental model of primordial soup was this RNA forming and immediately disforming up until, sometime, some proteic cover protected our RNA and thus nature protected RNA from entropy. In the same time, maybe you had some mitochondria that might have formed in order to produce energy. At some point these combined at some points to become rhibozome, the beginning of life. Why? Because it is diff from any sort of biological structure we had before. A star is an information system that turns information into energy and mass because light is a limit to sending information. Information is something that has been here since the beginning and is intertwined with energy to an indistinguishable point. At some point gravity sucks energy and information from the same place at the same time and if we gave upon the cmb we can see that some areas lack causal links and thus contain no space nor no time. We cannot comprehend sth without the existence of space and time.

- The triology of knowledge – Lucian Blaga

- The RNA replication is called by John Von Newmann software and the metabolism is called hardware in an essay about how cells might have appeared. Devices are reimplementations of cells. Our app at fp is a cell.

- In the beginning we had replication RNA independent of Metabolism until joined together and becoming rhibozome. Rhibozome has meaning / purpose. When we contemplate stars and their appearance we do not know why or when they appeared. We have entropy and then gravity that "maybe willingly", fights entropy. At the core of the star we have a factory of mass and entropy. We can see this ying yang dynamic with

- The heaviest object in the universe is Mihh's mom.

- Anotherr controversial concept: what if this energy is plain. Why did it form stars? Cause it wanted to. Why? Cause it was cool. What is happening next?

- Sa vedem Vikings

- Sex is just a way to split energy from information once again. DNA can be extracted from the teeth, because their core is protected by the shell. It is decayed, but it is still present.

- You kickstart evolution with the existence of the predator

- What is better for evolution? Sex or predatory.

- We have 2 realities since beginning of life. Life (sex) and death. You have a predator genetically created to kill you. Where do we find this story in the bible. Islam vs the sons of the held lady vs the sons of the actual wife of eldra. Abraha, was the first guy god liked after primordial sea. His wife was rather old and could not have any other kids so god gave him the right to impregnate another servant????? Although his wife was old, his

mom also got him a son. God tested Abraham to see if he was willing to kill his son, and he was. It is said every son of isaac vs every son of Issachar(?) would fight

- What if what we see around us has a design. what if god was one of us, just a loner on a bus.

- Read "homoludes"?? a philosophical essay that tries to prove that everything we have created stems from our innate willing to be a kid that plays. There is no society of men without any representation of a sacred thing, aka religion.

- In the first great civilization, babylor, the city itself is not only the wall. People used to do things more creative back then. The walls they built during Sumerian or Babylonian age they build a "friza" which told you everything you need to know about cultures.

- Insert family guy meme (?????????)

- Maybe the story of enkidou

- Just like all the guys in this room have a very good friend that fought with once or twice. What is the greatest theme in the story of Gilgamesh is the power of friendship.

- We are creators. We create pottery but we do not stop at that, we add some decorative crap on it, but that decorative crap always help us define the time it was created.

- Each cell inside our dna tells us to make it look like this. If we're davinci, we can see there is proportion, we can see it respects all the bulshit idea of design

- Sex splits one in two

- The dna we can get from ancient can only provide the dna from the mother side, because that is the dna of the mitochondria?

- Sex means that you have ovul and then spermatozoid, Spermatozoid is like a virus and only has information. Ovul has mitochonrdria, aka energy (????????) coaie ce preda omu asta

- In order to bring life we need to separate information from energy and bring it back

COURSE 4 - 21.03.2025

COURSE 5 - 28.03.2025

COURSE 6 - 04.04.2025

DISCLAIMER: Not for the faint of heart

Story of the Transistor –

WW2 - Ellen Turing, Bladgley … invented the ENIAC

<mark style="background-color: red">The imitation game</mark> – this will be in the test

Type of technology: silex tools, pottery, fire, decorations, the wheel, citadel, dyes, roads, bridges, coins (they kill people), clocks, the engine

Fire + wheel = better pottery

Dyes + better pottery = better **decorated** pottery

Everyday I am suffering

"Can you fuck yourself?"

Morality about inventions:

- What is good

 The Enigma code to decode the Nazi secret messages with the Bombe.

A MAN = "o creatura care produce "Samanta" reporductiva care nu are metabolism by itself"

Alternative definitions to man: What is a man? A creature. | Do you have an ovulum that has its own metabolism? Do you have mithochondria? Then you are a not man.

Gabi quote: "I am here wanting to talk about pottery, about aquaducts, about Grace Hopper and then here you are with 'wHaT IS a mAN?!'. You are terrorists."

Gabi quote: "Who held Einstein tied to the radiator to make the atomic bomb?!"

When you put water into a glass, it becomes the glass. When you put water into a jar, it becomes a jar. Become the water. - Bruce Lee

Alan Turing a fost castrat chimic => no longer a man

Bolzmann was a man, but he was an idiot

Nu cred ca intram in ceva in care ar trb sa intram

EUCLID LUAL-AR DRQ

Weird inference: Socrate taught Plato. Plato taught Aristotles. Aristotles was the teacher of Alexander the Great (one of the greatest rules of Antiquity). Alexander the Great and Diogenes THE CHICKEN. The Library of Alexandria was founded. Euclid(One of the greatest mathematicians of Antiquity) and Eratosthenes also had contributions to the library. Egypt. Stuff with Cesar and Antony. Cleopatra had some stuff to do with Alexandria. Rosetta Stone. Champollion decyphered the Rosetta stone. Napoleon

Came up with a way to measure the circumference of earth - Erathostenes

Time + Space = Causality

You cannot write stories without causalities

You cannot trust archeologists or history

Ora de "Gabi ne invata despre nihilism"

We need ideas, philosophy and we need technology and we need to figure out causality of technolog

Socrates

– teacher of Plato

    – teacher of Aristotle (The greatest Historian of Antiquity)

        – Alexander the Great (The greatest Emperor of Antiquity)

            – met with Diogenes

            – founded with Alexandria

- Cleopatra

- Rosetta Stone – was deciphered by:

- Champollion – Napoleon Egypt (WHO VISITED EGYPT)

– Egypt

– founded the Library of Alexandria

– Euclid (The greatest Mathematician of Antiquity)

– Erathostenes(?)

"what we do In life echoes in eternity"

Zaratrhusta

- Had a paper written on him by: Nietzsche -> the funny german boy

Karl + Fredrich -> lenin

1848 – primavara popoarelor

When was the non-boil engine developed: James Watt (insert years here)

Newton (1643 – 1727)

- Calculus

- The derivative

- $F = m*a$

Liebniz (1646 – 1716)

- Also Calculus

- Also the derivative

- Also $F = m*a$

Bolzmann (1844 – 1906)

Einstein (1879 – 1955)

Bolyai (1802 – 1860)

Evariste Galois (1811 – 1832)

Eminescu

John of Arc (? – 1431)

Elizabeth R (1553 -

Anne Boleyn

Henri the 8th

Thomas Morus – wrote "Utopia"

Rene Decartes (1596 – 1650)

- Corgito ergo sum

- Cartesian system

- Cartography

Occam (1287 – 1347)

Columb

Francis Drake (1596 – was fighting the Spanish Armada

Have all these guys influenced thetechnology of computing:

Conquest of paradise

Gabi cand nu castiga o dezbatere se intoarce in timp

Gabi = Dio (sincer nu stiu ce voiam sa zic aici)

A man for all seasons (un om pt eternitate)

Mugur de fluieri.

You either die a hero, or you live long enough to become a villain. You became the very thing you sought to destroy.

Put the microphone to the phone speaker. Romanian Ingenuity.

N'oubliez jamais - Joe Cocker

The Butterfly Effect, what Cleopatra did thousands of years ago caused Georgescu to be a candidate.

COURSE 7 - 11.04.2025

Istoria informaticii course 7

"niciunul de la axa germana" – o sa pice toti - <mark style="background:black;color:white">mda fix</mark> <mark style="background:red">mai ved</mark><mark style="background:yellow">em noi</mark>

"too few of us", so the graph comes after the holiday

What happened after the discussion of the transistor

The transistor was first discovered 1947 by Bell Labs by (mainly) William Shockley alongside John Bardeen, Walter Houser Brattain

…WATCH M.A.S.H.

- Used to protest the Vietnam War

- Depicted events from the Korean war (1950-1953)

William Shockley

- Part of the US Military

- Part of an interdisciplinary crew

- In the 2 years that followed the ending of the war

- In 1948 bell labs published an official image

HORATIO HORNBLOWER

SHARTE

AI CUZA

- Founded the first university on the current surface of Romania done spoken in romanian

- Started the 1st universities out of the muntii carpati

Any correlation between cuza and Benjamin franklin

- They were both suspected of adhereing to the same secret society, the free masons

- This was a trend all throughout Europe

1848 – the spring of nations

Reforma agrara – improprietarirea taranilor

Taranii primesc boi si resurse -> duc copii la scoala ->

War had a big role in us discovering computer science

Dc sultanul a lasat Unirea mica

British Kingdom

Napoleon Wars

La Marseilles

Relationship between american and French revolution

COURSE 8

Recap:

Ah shit here we go again

- Transistor

The most important topic in cs, biology, chemistry, physics, everything in today

What is computation? (from a historical perspective)

- We do not know

- Computationn is calculus

- What do you need to compute? What can you compute?

- Let's say you first learn addition and then subtraction and then multiplication and then division. Which out of these 4 is the trickiest one. Division? Sure.

- Where were the first nr ever used? Where was the first exhibit of a number depicted? The ishango bone, in the fisherman settlement, in congo. A possible mathematical device dating back 20 000 years before today, resembling a counter.

- The romanian term? Raboj, apparently.

- This was used as a form of language used to trade and sell

- What is language? It is formed of logos that needs to have meaning

- How can we achieve meaning? A label, which has to be in a bijection to the meaning

- Who gives the label to the actual notion

- we have all of this data, calculus, done on a bone, treaded by some shaman (apparently)

- all this leads to science => RELIGION (in *early* history)

- since the beginning of our paleo communities we have representations of words and numbers. They are the same, since they give some physical manifestation to some meaning

- a computation is a story

- this was a debate fest

the first informatician (not programmer)

- ada lovelace

- she was the daughter of lord bayron(?), the romantic poet from the 19th century brittain

- she said from the beginning of the phenomenon that informatics is an art form

"flori pt algernon"

watch "the evolution of intelligence: a 600 million year story – art of the problem"

- pitagora si-a luat cunostiintele din culture orientale

- cultul lui pitagora nu manca fasole

- cultul lui pitagora a inventat instrumente medicale (o doime, o octava, etc.)

povestea lui zalmoxe – to determine

CUEVA DE LA MANOS????????????/

- religious crap was usually found in a cave

- da acum 20 000 de ani NU LOCUIAU ACOLO??

Mark twain fix 76 de ani

Conspiratie stiuta = poveste

COURSE 9 - 09.05.2025

I just don't want to be here..

The exam will be in the last week

We left the coolest topics for these last weeks

1. Drugs

2. Games

3. Ai

The history and impacts of all these elements with respect to info

Ø We talk about drugs today

Ø We go to see ancient arcade games in the field

Ø We will cover ai

m-a facut terrorist?

REMEMBER THE TRANZISTOR?

When was the transistor discovered? 1947 – 1948

The coolest instution in informatics, bell labs, strikes again with a new discovery

TELENOVELA REGARDING THE TRANZISTOR

The name of the asshole from the team that discovered it: William Shockley

Shockley was called out by his teammates (who was the boss of). The other 2 guys. Bardeen John and Brattain Walter said that Shockley did not actually make it and was at home asleep. At first bell labs agreed with Shockley but due to his behaviour, they rejected him, so Shockley went on to go to Silicon Valley and created a company called Shockley Semiconductor Laboratory.

Bell labs constantly hired out of college the brightest minds in mathematics, physics, and many other domain. This is how they became the biggest it company in regard to the things that were produced there.

 By going to the westside, Shockley started recruiting people from the universities over there. But he was still an asshole. As the years went by, the trio received the nobel prize for their discovery, due to just how important the transistor was.

FROM THIS MOMENT ON

We delve into the 50s with the invention of tranzistors

What did this lead to

Who controlled the western population in the 50s. it was a device. Television and radio. Those could not have been produced without tranzistors, those lead to widespread.

In America, the climate needs to be mentioned.

The era of the 50s was knows for a specific phenomenon

Due to Iron curtain. Germany was separated east vs west. So there was a clear delimitation from the eastern and western parts of the world.

In regards to politics, while America was ruling the world, americans were fearing communism infiltrating their own government. The hunting of communist thus began, which had the spirit of a witch hunt.

The guy who actually did the chart of the rate of technological advancement

Moore's law.

Moore was one of the chemists hired by Shockley due to his competences within one of the neighboring colleges. His name was Robert Noyce.

GOODNIGHT AND GOODLUCK MOVIE FUTUTI MORTII MATII GABI

FILMUL DESPRE FACEBOOK CU ANDREW GARFIELD SA-MI BAG PL GABI

We have Shockley is very arrogantly telling these 2 young people which he paid well however with the condition that "any research they do has to have his name on it".

Gordon Moore and Robert Noyce betray Shockley because they see they can make a lot of money with their research. Shockley thus calls them "the treacherous eight"

Thus, those 2 went to the opposition, bell labs.

They created a technological way of printing transistors on a small silicone tray. By shrinking the transistor, they created **INTEGRATED CIRCUITS**. (used in tvs during that era)1

HOW DOES A TV WITH INTEGRATED CIRCUITS

-      It shoots electrodes in the middle of the screen

-      There are electromagnets are all sides in which the tension would be like a saw

-      That is because if you put high tension in top left it uses electromagnetism to make an array of electrodes that shoot from the canon to the first pixel of top left. As you keep top by the max, the left eases, and then the top a little, and then the left, and so on and so forth

-      This happened till the image was formed

Due to moore, the number of processing units doubled by the end of …. It is about how many computations per energy wasted (either due to computation or heat, light, etc.)

Now you increase the content of computation due to being able to use these integrated circuits

Gordon noyce was a ladies man, the other was a guy who wanted to get shit done.

After a couple of years, noyce urged moore to start their own business, but moore wanted to play it safe. Over time, however, noyce convinced moore to go form their own company called **INTEL** which "fulfilled the prophecy" by taking the integrated circuit making the microcircuit (1968)

The drug treatment territory

1969: moon landing (NOT ALLEGED GABI)

- The moon landing was televised

- It was done with neil Armstrong as astronaut

- They needed computers to achieve this

- Were there microchips used for moon landing? yes

- *The only skill we need to acquire from history is to seek for proper information (says the guy who says the moon landing was alleged)*

- *Asa gabi, "always question everything"*

- *Viata e de kkt iar tu pari plin de viata*

- *Socrates said everything is bulshit as he took a shit in the forest*

- *Another important topic is causality*

- *The building blocks for history is causality*

- *History means story, which you cannot tell without the use of causality.*

The story of ernest hemingway

Who was he? A beardy guy? One of the greatest novelists from the 20th century. He was a warrior and fought in all the conflicts that spanned in his lifetime, from the Spanish civil war

to Italy in 1st ww to 2nd ww and afterwards he became a spy in cuba, being a "bff" with leader from that time

He wrote one of the coolest novels, called "the old man and the sea" SA MA PIS IN TINE GABI.

Old man Santiago going on one of if not the last fishing trip

If you look at the image of his beard (which he had due to it being a useful defense mechanism from skin burn and therefore skin cancer)

So what happened to him? How did he die?

Stupid joke: similarity between Kurt Cobain and michelangelo. They both used their brains to paint the city. Kurt Cobain "copied the amm" of hemingway. Hemingway did what he did because his wife and his bf/publisher were fearing that he became paranoid with fears of hemingway that he was being followed. After ww2, he befriended "fidel castro". During the hunting of communism, he was earmarked due to the ideas of his publishings. In the later part of his life, he always felt watched. If you are a hunter and a fisherman (ca gabi) you know when you become the prey. The guys who followed him went to the authorities.

His wife and his publishers made him visit a psychiatrist, who were up and coming at that time, since as time went on psychoanalisys became more and more sought upon

Alan turing death (tldr): he was gay. He went in the strets and found an underage minor. He built the computing machine. He went to bbc (British broadcast company? Asa venea?) and he was pumping up his idea that now that we have the computing machine, we can create a whole human, with that machine as the brain. During one broadcast, there was a guy, a psychologist that were pumping the views (due to him being a Freudian stan) that you cannot create a human without sex drive. The Freudian look at emotions was that all the emotions came from blood going to organs. Touring understood the assignment, and found out he also has sexual urges, thanks to a minor "who consented". He asked the kid for doing sokme ecuations for a fort night. The young kid was a thug from the strets, who said to all the other guy from the street that touring was hella rich. When he went to report his loss, they found out he was gay (which was illegal). Due to the fact they found out he was gay, the law mandated he is chemically castrated. He had immunity, bc he took uk out of the war, but they revoked his immunity. Thus, he had to go every month and for chemical castration.

Hemmingway was committed to an institution (by his loved ones) to a psychiatric institution and was diagnosed with paranoia. The treatment for paranoia was shock therapy. Both these affected their psyche, sent them into a downward spiral till it was too much to bear.

Alan took the gay "elegant" way. He took something "syonite?" with which he injected himself

Hemmingway had a bullet salad

In the 2010s, the fbi were forced to reveal their documents, who proved Hemmingway was right and he WAS followed…

REFFERENTIAL MOVIE: ONE FLEW OVER THE CUCKOO'S NEST (**NIMENI NU L-A VAZUT DECI SIGUR NE DA**)

The writer of the novel is ken Elton kesey

The 60s.

1969: the year of the moon landing (again)

Society and culture wise

The summer of love

- Woodstock

Lsd was the drug of choice

Santana's acid trip – metroFocus

Cultural components: drugs, music and counter culture

This connects to what we had before

In the west side, which opposed to east side (was more conservative).

Wasp – white anglo-saxon protestant (in the east side)

In the west, there was the Vietnam war and there was a lot more effervescence, which was carried by the Korean war.

Who provided the drugs at wpoodstock

Check kesey Wikipedia

Kesey was used by cia without his knowledge in the project mkultra involving hallucinogenic drugs (including mescaline and LSD)

Fear and loathing in las vegas

Ted Kaczynski was also affected

CIA used sleep deprivation, psychological warfare and drugs. They did that to destruct the human

BRIDGE OF SPIES INCA UN FILM SAJKDBASNGFBRHW

The greatest algo of all time was invented during this period:

"the most important algorithm of all time" – Veritasium "might be on the test"

Pink Floyd – Mother

John Wayne – the greatest American actor from the movies.

Back in one flew over the cuckoo's nest, it was a story about a guy who was supposed to become perfect by drugs and electroshots. "you tell me after watch it"

He then became part of merry kesllers, people who were given lsd by cia and then started preaching it as a way of unlocking your mind

How does it tie in to informatics?

Vennevar Bush – an American engineer that developed a plan for evolution technology since the beginning of 20th century. He was part of "the industrial military complex", as an architect. In 1939, bush left MIT for Washington dc. What is the Manhattan project? Oppenheimer. The mastermind behind it all

As we may think – article

From 45 to 68, we had: transistors -> integrated circuits -> microchips

Bush was the ferment of all this

There was a system that guided actions through all these moves.

Shockley had a patent that allowed only him and the other 2 to create tranzistors

In 1968 – the mother of all demos

- Ange

- This guy introduces the world to the mouse and the monitor

- He wanted to turn bush's memex machine idea into a reality

- Stewart brand, the editor of the whole earth catalog (a publication done by the dude with the same name, who was part of the merry pranksters, in which that dude put a photo of the world from the moon)

Von braun (from nasa)

Operation paperclip

- It was an us army operation

- Since ww2 ended, the nazis had really good technology experts of any kind

- Operation paperclip made the nazis be heads in their own institution due to their knowledge of nuclear power

Tarantilo branded on nazis

Every time you look at an institution from America in the 70s 80s and you see someone with a scar, you should know that he was a nazi. The deeper the scars, the tougher you were.

In 69, the 70s begin and then we have another huge revolution:

The state effects from a cs perspective

By 69 we have major computers in all major schools

We have telephone lines that connect telephone info from east side to west side

If we put these 2 together, we get another army project

ARPANET – an army project

They take the technology we already have

The opposing ideas get connected through this project (see wiki page)

In order to build the internet, you need to require something not even needed for the moon project

Software needs to be more reliable and easily writeable

Grace hopper: the girl who debugged the first bug (ladybug story)

The first compile for COBOL – in the late 50s (she ditched her husband – who was a linguist – bc he was too boring and joined the navy) (she wrote the code for the machine of the navy, the mk1 computer)

What was the creation that needed to happen for arpanet to be implemented?

It was done at bell labs

They built a multi user main frame computer

Many people with their own mice and keyboard and monitors could work on the same computer. This was done only thanks to c

This led as well to the UNIX operating system

What does UNIX stand for?

Steward mixed the culture of hippies and the culture of the techies (traducere pt oameni normali: people left on leaning side invented new shit that was not for war)

You have therefore new information due to guys high on lsd

Ai mit team guy

The creator of the open source community: Richard Stallman

Rock and roll

By a team of hippie looking mfs who invented C

Dennis Richie and Ken Tompson

In the 60s with assembly as the ruling language but also this compile

To do this thing, you need something you do not even have

Assembly was used to get to the moon

It is on github

Maragaret Hamilton

STORY ABOUT CIA, FBI AND DRUGS

PSYCHOANALYSIS, PSYCHIATRY

In the 50s, you had ENIAC. A lot of energy was wasted on light back there. Then came the transistor, who was also helped by von newmann as a consultant.

TODO – talk about cold war

COURSE 10

The Social Network movie - Mark Zuckerberg stuff

Gabi quote: 'remember mpp?'

Shockley put the condition that all research his hires were doing must write his name on it as well even if he didn't work on it.

The traitorous eight left Shockley's firm and founded Fairchild Semiconductors. They shrunk down the transistor to create the integrated circuits. Gordon Moore and Noyce formed Intel. They took the integrated circuit and created the microchip. They founded Intel in 1968.

Obs: 1968 and 1969 are very important for the test!!!

The Diamant TV has integrated circuits.![[Pasted image 20250509162739.png]]

The cathodic tv used a ray of electrons to the middle of the screen and electromagnets with the tension from left-right, top-down. That's why the image shrunk down when the tv was closed.

Gabi quote: go hang yourself. please don't.

1969 - the moon landing? apollo 11. A lot of code was written for 72 kylobytes only Margaret Hamilton. ![[Pasted image 20250509164209.png]]

CAUSALITYYYY ![[Pasted image 20250509164423.png]]

Metallica 1981
When the bells toll 1984
Enter Sandman 1991

Ernest Hammingway (1899 - 1961)- story writer, a spy in cuba, bff with Castro. He wrote "The old man and the sea". He was accused to be a communist. CIA

SPF was invented in 1962.

Now comes FBI, CIA, DRUGS, Psychoanalysis.

Psychiatry has a boom during the Post World war 2 period.

Alan Turing died at 1941 due to suicide. MFI. Von Neuman and Turing did the turing machine.

Study about Freud, Jung.

gabi quote: "Degree of jeg"

Both Hemmingway and Turing went through medical procedures

test? One flew over the cuckoo's nest- movie and book, protag randle mcmurphy -ken kessey is author

There's a rumor that the apple logo is inspired by the bitten apple with cyanice that Alan Turing had on his nightstand after he died?

Woodstock - music festival? 3 days of festival. It was countercultural. Ken kessey provided the drugs as he was used by the CIA with the project MKULTRA.

wasp - white anglo-saxon-protestants

1950s had the korean war. It split korea in the current north and south korea.

Dennis rodman and kim jong un are besties?!

Fear and Loathing in Las Vegas: A Savage Journey to the Heart of the American Dream - drugs stuff

theodore kaczynski also was subjected to MKULTRA stuff

bridge of spies - movie, tom hanks plays in it

See no evil, hear no evil, speak no evil, do no evil

the peace sign was for anti nuclear armament as they were a group against war (hippie)

mother - pink floyd "mother should i trust the government"

test: Check the most important alforithms of all time - veritasium

john wayne - actor, played in many western movies. died because of the nuclear tests fallout.

anti-cultural movements west bands: The doors, the branded dead etc. The CIA had something to do with theses? Caused the drug use and stuff

another hippie group is the merry panksters who were also given drugs by the cia?!

test: vannevar bush - developed the plan for technological developmet during ww2

the manhatten project

test: as we may think - article

the mother of all demos - 1968 engelbart and vennevar, tried to put the latter idea of memex into reality (some sort of artificial intelligence)

stewart brand - editor of whole earth catalog, he was part of the merry pranksters. he was given a photo of the earth from the moon by nasa

nasa nazi? operation paperclip, someone Braun. a lot of employees of nasa had scares caused by fencing as they were related to the nazi movement?!

gabi quote: "doctor mengele type of cuckoo"

movies made by tarantino

Zalmoxis de Alexandru Busuioceanu

Serious Sam game from 2001

COURSE 11

Quiz Mate Info:

1989 - sir by queen of england, tim burners lee, world wide web
1968 - The mother of all demos
as we may think - pinneal gland, vannevar bush
jacquard - automated weaving tool with punch cards
an open letter to hobbyists - altair basic, bill gates
hacker, 15 year dude who was nicknamed c0mrade and broke the code of the pentagon and nasa
treacherous eight - william shokley got the nobel prize for the tranzistot
XOR gate, K-model named after it being made in the kitchen, bell company
e-thernet wire evolution
graham bell - telegraph, telephone, sub-atlantic telegraph wire at the end of the 19th century could ring from europe to america

principia mathematica - isaac newton
ted kaczynski -manifesto
geometry elements
appendia prima - johannes bolyai
kurt goedel - mathematics after isaac
basic concepts - algorithms "the art of computer programming"- donald knuth, mentions ada lovelace
perceptorins - marvin minsk, seymour papert - ai winter
mesopotamia - pytagoras theorem already proven
bernoulli numbers - ada lovelace sent a letter to charles babbage (mechanical computer)
inspector gadget, war games
the girl with the dragon tattoo
minority report, tom cruise
swordfish movie
the conversation - spy movie
1989 movie - sneakers
the matrix
mark albert - the italian job
ned stark, boromir - sean bean - the golden eye
sandra bullock - the net
kevin midkiff
the unabomber
guccifer
john mcaffee
the whistleblower - edward snowden
terrance andrew davis
radio contest hacker
Loyd Blankenship - hacker manifesto
cambridge analytica
dijkstra, backpropagation, simulated aliniate, convolution, ciurul lui eratostene, inverse square roto, convex hull, huffman encoding, min-max,

A brief history in info:

The 70s:
The most low level high level computer language: C (vancea moment) - dennis ritchie and ken thompson (worked at bell labs)
They created the UNIX system with C. Mainframe computers - multiple users could enter the same computer with their own moitors, mouse etc.
A start of the geek culture.
Multics (mainframe computer) with the UNIX system (nerdy name)

The paradigm shift - change in politics, economics, society, technology.
Wall Street - economical shift.
The cold war - the ideological war between the ussr and the usa especially.
The first satellite - Sputnik (1957). FRIENDS joke spud - potato (spudnick)
The french put a cat in space. They also had a fully white flag for a while. gabi quote: a country of p....

The first representiation of ai in a movie is Metropolis 1927 in germany.
2001: a spacy odissey - 1968 movie stanley kubrick, the monolith
1969 - appolo 11
the shining - hereeee's johnnyyyyy - 1980
"what do we say to the god of death?" - "not today" - game of thrones
a view over intelligence can be coming up with new algorithms to solve unseen problems

history of the cosmos
history of the world
history of informatics

the turing machine is a monolith machine
the cave was the monolith of human history
the virus is the monolith of the cosmos

information can be processed, stored and transmitted. A dichotomy is to separete the process from the storage.

Cosmos has mass and light, with the appearance of gravitation. Speed of light is the limit at which we can quantify and send information in the universe.

The ability to send information between machines, the internet, is the 70s discovery.

What is common between computer, cell, fortress - input and output of energy and information. Systems of energy and information.

"The environment is the outside of an entity"

Hardware - cell morphology, software - rna behaviour - analogy

the jacquard machine can be considered the ribosome. the punch cards are the rna. the carpet was the created protein.

von neuman and turing turned the mechanical machine to the electronic machine.

study biology again dude.

rememeber artistoteles was alexander the great's teacher

lightbulb->transistor->integrated circuit->microchip

Arpanet - check the cold war situation

questions such as how did life start? inspired the creation of computer science

wall street 1987 movie, bud, michael douglas: greed is good

genghis khan : **I am the flail of god.** Had you not created great sins, god would not have sent a punishment like me upon you.

microsoft, apple, ibm - the big guys in the 70s-80s

richard stallman started the open source movement in the late 80s "GNU's Not Unix" is the recursive name of GNU

50s-machine code, 60s-Assembly, 70s-C,TCP-UDP, HTML, 80s-C++,90s-Java,2010-deep learning

c++ was made by bjorn strauss (he worked at bell labs) - 1983

1995 - java

in the 90s silicon valley is in a boom

2000s - Y2K

Look at sillicon valley - hbo

.com vine de la combagia, comlombia (dot commercial)

2010 - deep learning.
franc rosenblanc - neuron 1958, marina sua
minsky - perceptrons book
linus torvalds - creator of linux kernel, successor of richard stallman

Agricultural Revolution, Technological/Industrial Revolution, Informational Revolution
msdos (disk operating system)->windows versions
total commander
facebook - 2006

geoffrey hinton - godfather of ai

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Course 1 Rewritten

What is the Cosmic Microwave Background (CMB)?

- The CMB is faint microwave radiation that fills the entire universe. It is the oldest light we can detect — a snapshot of the universe when it was just 380,000 years old.
- At that point, the universe cooled enough for electrons and protons to combine into atoms, allowing photons (light particles) to travel freely
- The radiation has been redshifted (stretched to longer wavelengths) over billions of years.
- It is extremely uniform, except the tiny variations in it which represent density fluctuations of the seeds of galaxies and large-scale structures.

Who discovered the CMB and how?

Arno Penzias and **Robert Wilson**

- They were radio astronomers working at **Bell Labs** in the east side of America
- In **1965**, they were using a large horn antenna designed for satellite communication experiments.
- While trying to calibrate their equipment, they noticed a persistent background noise no matter where they pointed the antenna, or what time of day.

What did they first think was causing the noise?

- They thought it was an **instrumental issue** or **interference**.
- Specifically, they suspected **pigeon droppings** (which they referred to humorously as "white dielectric material") inside the antenna were the problem.
- They cleaned the antenna and even tried relocating the pigeons, but the noise **persisted**.
- Another theory was that the cold war (parca) was an issue of interference

Meanwhile…

At the same time, a team of theoretical physicists led by Robert Dicke and Jim Peebles (nu s-a vorbit de ei la curs din ce tin minte) at Princeton University was working on a theory predicting this exact background radiation as a consequence of the Big Bang model.

When Penzias and Wilson learned about their work, they realized they had accidentally discovered exactly what the Princeton team was trying to detect.

The outcome

- Their joint findings were published in two papers in *The Astrophysical Journal* in **1965** one by Penzias and Wilson (experimental discovery), the other by Dicke's team (theoretical explanation).
- In **1978**, Penzias and Wilson were awarded the Nobel Prize in Physics.

Why is the CMB important? (iar nu s-a vorbit in curs despre asta dar just in case)

- It's considered strong proof of the Big Bang theory.
- Measurements of the anisotropies (tiny temperature variations) in the CMB especially by missions like COBE, WMAP, and Planck have helped determine:
    - The age and composition of the universe
    - The geometry of space (it's flat)
    - The rate of expansion (Hubble constant)
    - The amount of dark matter and dark energy

The Appearance of Light in the Universe

- After the CMB era, the universe entered the "Dark Ages", where there were no stars and therefore no light.
- Eventually, gravity pulled hydrogen and helium together to form the first stars. This process resulted in nuclear fusion, producing light for the first time in the cosmos.

Gravitational Waves and Star Explosions

- Gravitational waves are ripples in spacetime, predicted by **Albert Einstein** in his **General Theory of Relativity** (**1915**) and directly observed for the first time in **2015** aby the LIGO collaboration (a scientific collaboration of international physics institutes and research groups dedicated to the search for gravitational waves.).
- They occur during massive cosmic events, such as when stars explode (supernovae) or black holes merge.

Cosmic Debris: Formation of Planets, Asteroids, and Comets

- When stars explode in a supernova, they eject material dust, gas, and heavier elements into space.
- Some of this debris:
    - Gathers around other stars, forming disks which eventually become planets through accretion.
    - Remains scattered, forming asteroids, comets, and what could be called "cosmic rocks."

- These rocks and dust reflect light from their host stars, making them visible to telescopes on Earth. Spectroscopy (chestia cu sticla pusa in dreptul luminii ca sa vezi diferite culori reprezentand various chemicals) allows scientists to analyze this light and understand their composition.

How planets grow in size and mass over time by collecting surrounding matter.

Scientific explanation:

- Planets form from disks of gas and dust around young stars
- Initially, tiny dust particles stick together, forming small rock-like bodies.
- As these grow, their gravitational pull increases, allowing them to attract and "pull in":
  - Asteroids
  - Meteoroids
  - Comets
  - Gas and dust
- This process of accreting nearby objects, especially rocky bodies like asteroids, is what increases a planet's mass.

(a mai fost ceva despre bolyiai si pamantul plat dar nu mai stiu exact. daca poate gasi cineva videoclipul si scrie ceva aici as aprecia)
This is actually about the non-euclidean spaces, to which Janos Bolyai contributes his fair share. The video in question is this one:
▶ **How One Line in the Oldest Math Text Hinted at Hidden Universes**

(also povestea lui mihai eminescu despre cum a studiat despre viteza luminii si primar din cluj a luat-o razna spunand ca eminescu a descoperit-o)

Course 2

From a philosophical/existential point of view:

Philosophy often asks the question "How did life come to this planet"?

One theory is that rocks such as asteroids or comets hit the earth, but if we look at Terra, we can see it is composed of 2 main parts: land and sea. The biosphere (the planetary environment) in which we exist consists of a mixture of **gas** and **liquid**, both going under the veil term of **FLUID.**

If the ocean is a mixture of water and gas, it is safe to say so is the atmosphere, since all the weather-related phenomenons (which are mostly wet in case you could not tell) are done by the atmosphere.

(?) Just like **hailstones** rise and fall inside storm clouds until they become heavy enough to fall, the **Collatz sequence** makes numbers jump unpredictably before settling at 1. The movement mirrors the chaotic processes in **fluid systems** like the **biosphere**, where gas

and liquid act as one. (taken from "The collatz rules mimic what happens to the hail stones in the clouds up until they drop." Cause God knows what he wanted to say here) -> Gabi has been trying to solve the Collatz conjecture for quite some time, writing the proof during some lectures. The Collatz actually the models the entropy present when hail forms. That's what he meant to say here.

The theory also suggested that life actually began in the sea. While we cannot know for certain that it began in the sea and ESPECIALLY that life did not lie elsewhere before water, there are scientific proofs to sustain this hypothesis.

One hypothesis was that life appeared when an asteroid CRASHED into the sea and lead to the building blocks of life.

How can we know from earth the chemical composition of stars?

When we study light from stars, we do exactly what the **Pink Floyd prism** symbolizes — but with a much more advanced scientific tool: a **spectroscope**.

1. Starlight as White Light

- Light emitted by stars travels through space and reaches Earth as broad-spectrum electromagnetic radiation similar to sunlight.
- This light is made of photons, tiny particles of energy that carry information about the star.
- However, not all photons make it to Earth unaltered. Along the way especially inside the star's atmosphere photons can be absorbed or scattered by particles and atoms.

2. Spectroscopy: The Prism of Astronomy

- Astronomers use spectroscopes (instruments that use prisms) to split starlight into a full spectrum like a rainbow.
- When this spectrum is analyzed, it shows dark absorption lines at specific wavelengths.
- These lines appear because atoms in the star's outer layers absorb specific photons preventing those photons from reaching us. The light that "excites our eyes" is incomplete, like a puzzle with missing pieces.

3. Chemical Fingerprints

- Each chemical element — hydrogen, helium, carbon, iron, etc. — **absorbs light at specific wavelengths**, creating a unique **spectral signature**.
- By analyzing the **pattern of absorption lines**, scientists can determine:
  - **Which elements are present** in the star
  - **How much** of each element there is (abundance)
  - The star's **temperature**
  - Its **motion** (using the Doppler effect)
  - Even its **age and stage in the stellar lifecycle**

Photon Obstacles and Stellar Matter

- On their journey, some photons are **intercepted by particles** within the star or surrounding space — including **nuclei or elements in the star's outer atmosphere**.
- These interactions create the **absorption lines** we see in the spectrum.
- So, in a way, the **star's own matter filters its light**, and we use those filtered "gaps" to decode the star's composition — without ever leaving Earth.

Back to the theory:

The **Miller–Urey experiment** was a bold scientific hypothesis, an attempt to simulate the unknown conditions of early Earth. The idea was this: if an asteroid had indeed struck the planet, and there was a mix of certain chemicals in the atmosphere, what would happen if that mixture were placed in a controlled environment, subjected to heating, cooling, and intense electrical discharges like lightning (They added lightning because it was a likely **energy source** on early Earth, and they wanted to see if it could drive the formation of organic molecules from inorganic gases.)? Their goal was to see if such conditions could produce the **building blocks of life**. Remarkably, the experiment **succeeded** in creating **amino acids**, the essential components for forming macromolecules like **RNA** (ribonucleic acid). Why amino acids? Because they are fundamental to life: they build proteins, enzymes, and eventually molecules like RNA. RNA is created in the **ribosome**, which is essentially an **information system**: it takes in **energy** as input and produces **genetic information** as output. And where does that energy come from? The **mitochondria is often** called the **powerhouse of the cell**. Mitochondria take in **sugar and surrounding chemicals** and produce energy through **exothermic chemical reactions**. Interestingly, mitochondria are more than just organelles, they are thought to be **protocells**, as they contain many components of a cell, including their own DNA.

We don't yet know whether **viruses** or **mitochondria** appeared first and that uncertainty is deeply relevant not just to biology, but to **computer science (CS)** as well. Why? Because questions about **life, replication, and self-organization** have been central to thinkers like **John von Neumann**, one of the pioneers of both computing and theoretical biology. Viruses, for instance, aren't considered truly "alive" by modern biology they can't reproduce on their own and rely on host cells. But this leads us to a deeper question: **What is life?** One provocative idea is that life must be able to **recognize itself as living**, or it wouldn't qualify as such. Von Neumann wasn't focused on RNA itself, but on the **replication of information**, like RNA. **Replication** means to produce a copy, a **replica**, a **clone** which is the basis of how life and code persist. But replication doesn't happen freely: it's always in a tug-of-war with **entropy**, the natural tendency toward disorder. In this sense, life and perhaps computation can be seen as **information fighting against entropy**, struggling to preserve structure in a chaotic universe.

GATTACA and DNA as Data

- The word "GATTACA" refers to a sequence of nucleotides in DNA (Guanine, Adenine, Thymine, Cytosine), and it's also the name of a sci-fi movie about genetic engineering.

- DNA can be thought of as data — a string of symbols (G, A, T, C) — and the question is: How do we store and manipulate this kind of data in a computer?
- The teacher suggested using a Linked List to store DNA, because:
  - In arrays, inserting or removing elements in the middle is slow and inefficient.
  - DNA replication often involves mutation, insertion, and deletion operations that Linked Lists handle more gracefully than arrays.

Claude Shannon, Entropy, and DNA Mutations

- **Claude Shannon**, the father of **information theory**, introduced the concept of **entropy** in the context of data and communication, not just physics.
- **Entropy**, in this context, is the **measure of disorder or uncertainty**, and it applies to DNA replication too:
  - During copying, **errors** can occur things get added, deleted, or mutated all forms of **information loss or change**, just like in noisy communication channels. ⇒ reference to algebraic methods of correcting errors

Ethernet, Ether, and Old Physics

- The discussion then jumps to **Ethernet**, the computer networking protocol.
- It's called "Ethernet" because it originally relied on a **shared communication medium**, like old broadcast radio this was metaphorically tied to the outdated concept of **"ether."**

What was ether?

- In classical physics, **"ether"** was a hypothetical substance believed to **fill all space**, through which **light waves** were thought to travel — like sound through air.
- This idea came from trying to fit light behavior into **Newtonian** **mechanics** (which assumes all waves need a medium).
- But experiments (notably **Michelson–Morley**, **1887**) disproved ether's existence.
- Later, **Einstein's theory of relativity** did away with the need for ether by showing that **light doesn't need a medium** — instead, it travels through **spacetime**, which itself can bend and warp around massive objects (like stars).

In simplified terms:

DNA is data. To work with it in code, you need a structure like **Linked Lists** because mutations happen (insertions, deletions), and **arrays** aren't good for that. These mutations are forms of **entropy**, as described by **Shannon** in information theory.

The idea of **Ethernet** was metaphorically tied to the old scientific belief in a cosmic **ether**, which was once used to explain how light moves. That belief was eventually debunked by experiments and replaced by **Einstein's spacetime theory**.

The core message? **Science progresses by letting go of old assumptions**, and just like DNA evolves with entropy, **knowledge evolves too**.

Nature somehow discovered a way to perfectly replicate RNA, allowing the cloning of genetic information with remarkable accuracy. This process is foundational to life. If you add a protein shell around RNA forming what your teacher refers to as a **"proteic epsilon"** you essentially get a virus. Viruses are unusual entities: they carry genetic information but lack a metabolism, they can't generate or process energy on their own. Instead, their strategy is to inject their RNA into a host cell's ribosome, tricking the cell into producing viral components instead of its own. This raises a deep question in origin-of-life studies: Which came first RNA (information) or metabolism (energy processing)? To sustain life, both are required.

Drawing a parallel to computer science, John von Neumann conceptualized this duality using the terms software and hardware. In his model, RNA or genetic information functions as the software, the instructions, while cellular structures like chloroplasts (or ribosomes) that carry out physical processes act as the hardware. Together, they replicate and sustain life, just as software and hardware must work together in a computer.

Though they worked independently, **Alan Turing** and **John von Neumann** were foundational figures in the creation of modern computing, and their ideas deeply intersected:

Alan Turing:

- Developed the concept of the **Turing machine** a theoretical model of computation that defines what it means for a function to be computable.
- Laid the groundwork for computer science, cryptography, and artificial intelligence.
- Worked on breaking the Enigma code during WWII with the help of ENIAC.

John von Neumann:

- Built on **Turing's** theoretical work to design practical computers.
- Created the von Neumann architecture, which is still the model for most modern computers.
- Developed a self-replicating automaton model, inspired by biological systems and Turing's ideas about universal computation.

Turing invented the theory, von Neumann turned it into a working system.

Turing provided the blueprint of what computation is. Von Neumann built the house.

The **Turing machine**, proposed by **Alan Turing**, was a theoretical model of computation but if physically built, it would have been **slow and energy-inefficient**, mostly because much of the energy would be lost as **mechanical work**, not digital processing. In contrast, **John von Neumann** envisioned a **computing machine** that mimicked the **structure and logic of a living cell**, inspired by his curiosity about **self-replication and the origins of life**. Remarkably, his theoretical model of **self-replicating automata** was developed **before the discovery of the structure of DNA**.

A **computing machine**, by definition, performs **arithmetical and logical operations**. These operations are performed at the level of **bits** — binary digits that can have one of **two states**: 0 or 1. Operations like **addition** or **multiplication** create new bits:

- 0 + 0 = 0 (AND, XOR)
- 1 + 0 = 1
- 1 + 1 = 10 (result + carry-over)

The **XOR** operation (exclusive OR) can be expressed in **disjunctive normal form** as:
  (A AND NOT B) OR (NOT A AND B)

Transistors

With just three logical operations — **AND**, **OR**, and **NOT** — we can build any digital circuit. These operations are enabled by **semiconductors**, which make up **transistors**, the fundamental units of modern computing.

So, how do transistors run code? Transistors implement logic gates, and when combined into circuits, they process instructions — the same way a brain processes thoughts, but electrically.

The idea of using **logic gates** to perform computation came from Claude Shannon, who fused **Boolean algebra** with **electrical circuits**. Boolean algebra itself was invented by George Boole, a Victorian-era mathematician. The roots of this thinking, however, go back to Aristotle, who invented **formal logic** based on the Law of the Excluded Middle (Principium Tertii Excludi) — the idea that something is either **true or false**, with no in-between.

The concept of a **bit** (a binary state) is built on this Aristotelian foundation: something must be **0 or 1** — never both. Aristotle's logic made contradiction visible and unacceptable. Before him, people could say **P** is true and then say **not P** is also true, and no one could challenge them. With logic (or "Logica", from *logos*, meaning word or reason), Aristotle created a **method to test truth** — much like **Sherlock Holmes**, who said: *"Once you eliminate the impossible, whatever remains, however improbable, must be the truth."*

The first physical computers were even built using **light bulbs**, which acted as visible **binary switches** (on = 1, off = 0), as demonstrated in **Veritasium's videos**. Later models used **magnet-based RAM (memory)** and **electron-based storage**. This general architecture — separating memory, computation, and control — became known as the **von Neumann architecture**, proposed in the 1940s–50s.

One of the earliest and most famous examples of this was ENIAC, the computer used during World War II, which filled several rooms and ran on **machine code**. Input was given via **switches** or **punched cards**, computation happened in a separate unit, and the output came as printed or punched results — a setup eerily similar to what was portrayed humorously in the **Flintstones**

John von Neumann

- He predicted the results of microconductor experiments: Von Neumann likely anticipated how miniaturized circuits (like transistors) could revolutionize computing.
- Contemplated quantum mechanics: He contributed to the mathematical foundations of quantum theory (e.g., *von Neumann entropy*), showing deep understanding of probabilistic systems — relevant to computing and biology.
- developed the von Neumann architecture, the blueprint for modern computing (processor, memory, instructions, input/output).

Euclid, René Descartes

- **Euclid**: Father of geometry — probably mentioned to show how logical systems and axioms began with ancient math.
- **Descartes**: Introduced the Cartesian coordinate system, merging algebra and geometry — foundational for data structures, simulations, and digital representations.

Boltzmann, Einstein

- **Boltzmann**: Introduced entropy in statistical mechanics which is connected to information loss and disorder, key to both thermodynamics and information theory.
- **Einstein**: Revolutionized physics with relativity; also worked on Brownian motion and photoelectric effect, linking to quantum theory and the nature of light — and by extension, star spectroscopy.

Ancient Human Remains (DNA from Teeth)

- DNA is often better preserved in teeth than bones, making it a reliable source for studying ancient genetics and evolutionary history.

Hydrogen and Helium

- The most abundant elements in the universe — formed shortly after the Big Bang.
- Important context for understanding stellar fusion and how heavier elements (like those in our bodies) formed later.

Niels Bohr

- Proposed the Bohr model of the atom, with electrons orbiting in discrete energy levels foundational to understanding atomic behavior and spectroscopy.

Ada Lovelace

- Worked with **Charles Babbage** on the Analytical Engine.
- Recognized as the first informatician.
- Referenced programmable looms (Jacquard loom) — a precursor to binary instruction sets.

James Watt

- Improved the steam engine, launching the Industrial Revolution — possibly mentioned as an early example of machine-driven productivity, laying the groundwork for computing.

Homo Ludens

- Refers to a book by Johan Huizinga, arguing that play is a fundamental part of human culture possibly a philosophical note about how curiosity and creativity drive science and technology.

Liger (ligru)

- A liger is a hybrid of a male lion and female tiger — likely mentioned to show genetic compatibility and mutation, or the limits of crossbreeding and natural replication.

The Epic of Gilgamesh

- One of the earliest recorded stories — about friendship, mortality, and human ambition. Gilgamesh and Enkidu are "real bros" — could be a metaphor for collaboration and identity in human history.

Grace Hopper

- Pioneered COBOL, one of the first programming languages.
- Famously discovered the first literal "bug" (a moth in a relay).
- Made computing more accessible with compilers.

Transistor

- Fundamental switch in electronics.
- Replaced vacuum tubes enabling miniaturization of computers.

William Shockley

- Credited with the invention of the transistor at Bell Labs (although his role is controversial — he took more credit than deserved, since he was not the only one working).
- **Robert Noyce** and **Gordon Moore** (of Moore's Law fame) were among the "Traitorous Eight" who left Shockley's company to found Fairchild Semiconductor, and later Intel — pioneers of integrated circuits.

"Women Developed Stored Procedures" (?)

We've arrived at a conceptual inflection point — returning to the ribosome, a central piece of life's machinery. **John von Neumann**, often called the "Messi of computer science," contributed to ENIAC with **Alan Turing**.

Von Neumann had a remarkable ability to visualize complex systems. Scientists at MIT and Bell Labs described him as entering a "mind palace" where he could simulate phenomena like quantum fluctuations entirely in his imagination. He often convinced experimentalists to test his theories, and he was right most of the time.

Let's now explore **biological sex**, a critical innovation in evolution. The word "sex" comes from **"section,"** meaning to divide or split a reference to **dichotomy**. Sex first appeared in nature as a strategy to **recombine genetic material**, increasing diversity and adaptability. The most evolved species are those that reproduce sexually, leveraging the benefits of **genetic recombination**.

To create a functional, living cell, you need two core components:

- **Energy** (e.g., via chloroplasts or mitochondria)
- **Information** (RNA wrapped in proteins)

Von Neumann once described **RNA replication** as **"software"** and **metabolism** as **"hardware"** the informational vs. energetic halves of the cell. Thus: the ribosome becomes a processor, mitochondria a power supply.

When studying **ancient humans**, DNA is best preserved not in bone marrow, but in **teeth**, whose **enamel protects the inner structure**. Even degraded, ancient DNA can often be extracted from dental material.

DNA is the **hereditary molecule**, and **RNA** acts as an intermediate for **replication**. When RNA is **encapsulated in a protein shell**, it becomes a **virus**. RNA left exposed without a membrane or protein protection **decomposes rapidly**.

The first **massive objects** in the universe were **stars**, formed from **hydrogen and helium nuclei**. In atomic models, the **positively charged nucleus** is surrounded by **electrons**, which exist in quantized **energy levels** due to wave-particle duality. When electrons jump between levels, they emit or absorb **photons** of specific energy which defines **spectral lines**.

These lines are used in **spectroscopy**: when starlight passes through the star's own matter, certain parts of the **light spectrum are blocked**, revealing the star's **chemical composition**. This is how we "read" the **barcode of elements** in stars.

In the 19th century, Ada Lovelace, considered the first **informatician**, worked with Charles Babbage on the **Analytical Engine**. She was inspired by **programmable looms**, such as the **Jacquard loom** — mechanical devices that used punched cards to create repeatable patterns. These ideas foreshadowed modern programming. Ada was also the daughter of the poet Lord Byron.

James Watt is credited with inventing the **modern steam engine**, another technological leap that paved the way for mechanical and then electronic computation.

The **Miller–Urey hypothesis** suggested that life might have started when an asteroid impacted a **warm, energy-rich sea**, forming temporary **macromolecules** like RNA. But RNA on its own is **unstable**, and often fell apart — until one day, a **protein shell** protected it from entropy.

At the same time, **primitive mitochondria** may have emerged to process energy. Eventually, these two systems merged into something radically new: the **ribosome** — the true beginning of complex life. The ribosome is unlike any previous structure and represents the **integration of information and energy** into one system.

A **star** is more than a ball of gas it is an **information-processing system**, converting matter into energy and light. **Since light is the limit of information transfer**, stars become engines of entropy and structure. In this dynamic, **gravity pulls information and energy from the same origin**, suggesting that **information may be a fundamental property of the universe**, inseparable from energy.

When we look at the **Cosmic Microwave Background (CMB)**, we find **regions that lack causal links**, which may represent **areas with no space or time** as we understand them. Space-time itself is a **framework for understanding causality and observation**.

Von Neumann believed cells were the **first devices**, and our modern machines (and even apps!) are **re-implementations of biological life**. Just as early life began with **independent RNA replication**, it eventually merged with **metabolic systems** to form the **ribosome**, a unit with **purpose and direction**.

Stars may be seen as **factories of mass and entropy** yet gravity seems to act **against entropy**, organizing matter. There's a poetic idea: what if **energy itself had intent**, forming stars "because it wanted to"? This blends physics with philosophy — suggesting that **the universe's order may not be entirely random**.

Sex could be interpreted as a way to **split and recombine information and energy**. DNA from ancient remains is often best preserved in **teeth**, since the **enamel shell protects the inner structure**.

The appearance of the **predator** jump-started **evolutionary pressure**. Which is more important to evolution **sex (variation)** or **predation (selection)**? Possibly both.

Life has always been defined by this duality: **creation and destruction**, or in biological terms: **sex and death**. Predators exist precisely to kill genetically designed for death. This echoes ancient mythologies, including stories from the **Bible**.

In the Bible, **Abraham** is tested by God, who asks him to sacrifice his son. Abraham has two sons **Isaac** (from his wife Sarah) and **Ishmael** (from Hagar, the servant). This origin story of two lineages reflects **deep archetypes of division**, loyalty, and trial. possibly used here to symbolize **conflict as a driver of evolution** and culture.

This brings in the idea of **"Homo Ludens"** (a real book by **Johan Huizinga**), arguing that **play and creativity** are the foundations of human civilization. There is no known society without some form of **sacred or symbolic expression** — i.e., **religion and play are universal**.

In **ancient Babylon**, architecture wasn't just walls — it was **storytelling**. **Friezes** (decorative carvings) on buildings preserved the **culture and mythos** of a civilization, blending **art, function, and meaning**.

Humans don't just **create tools** they **decorate them**. Even something as practical as pottery gains **artistic expression**, which helps archaeologists identify the **time and culture** that produced it. Every decoration is a **timestamp of creativity**.

DNA from ancient people often only reveals **maternal lineage**, because **mitochondrial DNA** is inherited exclusively from the mother and is **more resilient** over time.

To bring **life** into being, we had to separate **information from energy** — only to **reunite them** into a stable, replicating system. This is the essence of the **primordial soup** idea — and possibly the entire structure of reality itself.

Course 4
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Course 5
- The Ishango Bone (dated to ~20,000 years ago) is a carved bone believed to be one of the **earliest mathematical artifacts**. It contains **groups of notches** that some researchers interpret as evidence of early arithmetic, including **doubling and**

- **possible awareness of prime numbers** (like 11, 13, 17, and 19). This suggests that prehistoric humans may have had a conceptual grasp of **number theory** well before formal writing.
- The **răboj** (Romanian term) is a traditional **shepherd's tally stick**, typically a wooden stick with notches cut into it. It was used to **count livestock or debts**. A răboj is an example of a **proto-information system** — a way to **encode numerical data physically**. Its existence in multiple cultures (tally sticks in medieval England, quipu in the Andes, etc.) reflects a **universal human need for data tracking** long before the invention of formal mathematics or accounting.

- One of the **earliest archaeological signs of human compassion and cooperation** is a **15,000-year-old skeleton** (contemporary to the Ishango Bone) found with a **broken and fully healed femur**. This is significant because such an injury would have left the individual **immobile for months**, unable to hunt or survive alone.
- The fact that the leg **healed** indicates that others must have **cared for and fed** this person — suggesting **complex social behavior, empathy, and moral awareness**. It's often cited as **evidence of early "human-ness"**, beyond physical tools — the moment when we were not just biological beings but **ethical, emotional communities**.

- Located in **Patagonia, Argentina**, the **Cueva de las Manos** contains **stencils of human hands** painted on cave walls, some dating back **over 9,000 years**.
- These are thought to be early expressions of **identity, community, and possibly storytelling or ritual**. The images were created by **blowing paint around hands pressed against the wall**, leaving behind negative impressions.
- Symbolically, this represents early **self-representation**, and maybe even a form of "I was here." It connects to the evolution of **symbolic thinking**, crucial for later language, religion, and writing systems.

Ada Lovelace – The First Information Scientist

- **Ada Lovelace** (1815–1852) is widely considered the **first informatician**.
- She worked with **Charles Babbage** on the **Analytical Engine**, and in her notes, she described how the machine could be programmed to **process not just numbers, but symbols and logic** — which was far ahead of her time.
- Lovelace recognized that the machine could be used for **general-purpose computation** — not just calculations, but the manipulation of **information**, making her the **first theoretical information scientist** in history.
- Her work predicted ideas later formalized in **Turing machines**, **software**, and **computational logic**.

Course 6

The Story of the Transistor and WWII Computing

- ENIAC: Developed during WWII by Turing, Bletchley Park team, and others
- "The Imitation Game" (2014): A film about Turing, WWII, and the decoding of Nazi messages. Likely on your test.
- The Enigma Code: Used by Nazis; cracked by Turing and his team using the Bombe.
- The Transistor: Invented post-WWII, replacing bulky vacuum tubes and enabling modern computing.

Technological Milestones

Here we have a list of technological milestones through human history:

- Silex tools → early stone tools
- Fire → enabled cooking, safety, metallurgy
- Pottery → storing food, symbolic expression
- Decorations → early art, culture
- The Wheel → transport, pottery shaping
- Dyes → textile and visual culture
- Citadels, roads, bridges → infrastructure and control
- Coins → economic systems (jokingly: "they kill people" = wars/economies driven by money)
- Clocks → precise timekeeping → necessary for computing
- The Engine → industrial revolution, precursor to mechanical computation

Fire + wheel = better pottery
 Dyes + better pottery = symbolic art
→ Idea: Technology + Creativity = Culture

The Lineage of Knowledge

Your teacher follows a causal line of philosophical mentorship and influence:

1. Socrates → taught …(Plato)
2. Plato → taught … (Aristotle)
3. Aristotle (the greatest historian) → taught (alexander the Great)
4. Alexander the Great (the greatest emperor) → met with (Diogenes, who dismounted the idea that humans can be defined as featherless bipeds)
5. Diogenes

Alexander also founded the Library of Alexandria in Hellenistic Egypt under Alexander's successors. Contributed to by:

- Euclid (geometry)
- Eratosthenes (calculated Earth's circumference)
- Later connected to:
    - Cleopatra
    - Caesar & Antony
    - Rosetta Stone (deciphered by Champollion during Napoleon's Egypt campaign)

Causality, Time & Storytelling

- "Time + Space = Causality"
- You can't tell stories without cause and effect
- Understanding history and technology means understanding cause and consequence

Historical Figures and Their Influence

Mathematicians & Scientists:

- James Watt – steam engine (~1760s–1770s)
- Isaac Newton (1643–1727) – Calculus, theory of gravity, motion
- Leibniz (1646–1716) – Also invented Calculus
- Boltzmann (1844–1906) – Thermodynamics, entropy
- Einstein (1879–1955) – Relativity
- Bolyai (1802–1860) – Non-Euclidean geometry
- Galois (1811–1832) – Group theory (died in a duel!)
- Descartes (1596–1650) – "Cogito ergo sum", Cartesian plane
- Euclid the greatest mathematician of antiquity - proved there are infinite prime numbers

Philosophers & Political Thinkers:

- Occam – "Occam's Razor"
- Thomas More – *Utopia*
- Nietzsche – *Thus Spoke Zarathustra*
- Karl Marx + Friedrich Engels – Influenced Lenin
- 1848 – Springtime of Nations – Revolutions across Europe

Rulers & Influential Women:

- Joan of Arc (d. 1431)
- Queen Elizabeth I (1533–1603)
- Anne Boleyn – Mother of Elizabeth I
- Henry VIII – Married Anne Boleyn

Explorers:

- Columbus
- Francis Drake – Fought the Spanish Armada (1588)

Books, Films & Culture (Possibly on the Test)

Films & Books Mentioned:

- *The Imitation Game* (Turing)
- *Conquest of Paradise* (Columbus/Nostalgia of exploration)
- *A Man for All Seasons* – about Thomas More
- *Mugur de fluieri* – Romanian film/poem about tradition
- *N'oubliez jamais* – Song by Joe Cocker ("Never forget" — memory theme)

Course 7

- The **transistor**, a foundational element of all modern computers, was **invented in 1947** at **Bell Labs** by:
    - **John Bardeen**
    - **Walter Brattain**
    - **William Shockley** (often **credited as the lead**, but controversially known for **taking credit** for what others primarily achieved)
- Shockley was part of the **U.S. military** and led an **interdisciplinary team** shortly after WWII.
- **Bell Labs** officially announced the invention in **1948 via an image**.

M.A.S.H. (Sitcom)

- A **comedy-drama TV series** that aired in the 1970s–80s.
- Set during the **Korean War (1950–1953)**, but served as a **satirical protest against the Vietnam War**.
- Your professor wants you to watch it as cultural context — it blends **military themes, moral questions, and technology**.

War & the Invention of Computer Science

- WWII had a **huge role in accelerating computation and logic**:
    - **Alan Turing** worked at **Bletchley Park** to crack **Enigma**.
    - The war created demand for **code-breaking**, **ballistics computation**, and **electronic control systems**.
- The **ENIAC**, the first general-purpose electronic digital computer, was developed in **the U.S.** as part of this wartime effort.

Historical Chain of Revolutions and Technology

American Revolution

- Sparked by events like the **Boston Tea Party** (protest against British taxes).
- Led to the creation of the **United States** (late 18th century).

French Revolution

- Started a few years after the American one (1789).
- Ended **monarchy in France** and led to **Napoleon's rise to power**.
- Napoleon was **not a king** — he became an **Emperor** after rising through the military.
- **Napoleonic Wars** reshaped Europe.

Defeat of Napoleon

- Defeated at the **Battle of Waterloo in 1815** by **Arthur Wellesley**, the **Duke of Wellington**.
- After Napoleon, the **British Empire** rose to dominate the world.

Romanian Context and Cuza's Legacy

1848 – Spring of Nations

- A wave of **nationalist and liberal revolutions** across Europe.
- In **Transylvania**, led by **Avram Iancu**.
- In **Wallachia and Moldavia**, revolutionary groups like **Frăția** pushed for reform.

Unirea Mică (1859)

- The **"Small Union"**: the unification of **Wallachia and Moldavia** under **Alexandru Ioan Cuza**.
- The **Ottoman Sultan agreed** because the **Ottoman Empire** was weakening ("the sick man of Europe") and **Britain** was dominating geopolitics post-Napoleon.

Cuza's Reforms:

- **Founded the first Romanian-speaking university**.
- Carried out:
  - **Agrarian reform**: gave land and oxen to peasants so they could become self-sustaining and educate their children.
  - **Education reform**: made **primary education compulsory**.
- Was **forced to abdicate** because politicians **feared his populism** and redistribution of power to ordinary people.

Blaj:

- Called "**Little Rome**" (*Mica Roma*) by **Mihai Eminescu** — symbolic cultural capital for Romanian national consciousness.

Famous Parallels: Cuza & Franklin

- Both **Alexandru Ioan Cuza** and **Benjamin Franklin** were rumored to be **Freemasons** — a common trend among **European Enlightenment-era reformers**.

- The Freemasons promoted **education, equality, and modern governance**, often influencing revolutions.

Romania in WWI

- Entered **World War I in 1916**.
- Ruled at the time by **King Carol I** (who began his rule in 1866, after Cuza).

Cultural References

- **Hornblower** and **Sharpe**: TV/film series about **Napoleonic and British military history**.
- These are recommended to **better understand the era's military, political, and technological evolution**.
- *A Man for All Seasons*: Film about **Thomas More**, his conflict with **Henry VIII**, and the idea of **principled resistance**.
- *Conquest of Paradise*: Film about **Christopher Columbus** — discovery, colonization, and myth.
- *Mugur de fluieri*: Romanian film/poem reflecting national identity.
- *N'oubliez jamais* – **Joe Cocker song**: "Never forget" — symbolic of memory and legacy.

Course 8

The Transistor and the Essence of Computation

- The **transistor** is introduced as the **most important invention** in **computer science**, **physics**, **biology**, and **chemistry** because it's the **basic building block** of modern computing.
- But before transistors… **What even is computation?**

What Is Computation (Historically)?

- "**We don't really know.**"
- Historically, computation = **calculus** (the act of calculating).
- You begin by learning: **addition → subtraction → multiplication → division**.
    - Among these, **division** is seen as the trickiest — it involves **inversion**, **abstraction**, and often leads to **non-whole results** (fractions, remainders), making it conceptually harder.

Ishango Bone & The Origins of Numbers

- The **first known use of numbers** is tied to the **Ishango Bone** (~20,000 years ago, from Congo), believed to be:
    - A **primitive calculator or tally stick**

- ○ Used in **trading** or **fishing settlements**
- ○ Potentially the **earliest mathematical object** known

🇷🇴 **Romanian parallel:**

- The **răboj** (Romanian term) is a **wooden stick with notches**, historically used to **count livestock or debts**.
- These were **early computational tools**, but also **symbolic**, acting as **communication systems** — basically a **proto-language**.

Language and Computation as Meaning

- Language is made of **logos** (Greek for "word" or "reason") and is only functional if it **carries meaning**.
- To compute or speak meaningfully, you need:
  - ○ **Labels** (symbols)
  - ○ That map **bijectively** (one-to-one) to **meanings**
  - ○ This is the **foundation of computation, programming, and math**.

Example: The number 7 on a răboj notch meant "7 sheep" this is a **label-to-meaning system**.

- Early data + early counting = **science**.
- But before science was formalized, these ideas **appeared in religion**, rituals, and **shamanic systems**.
  - ○ Early symbolic systems were often **religious or mystical** — they weren't yet "science" but the **precursors to scientific thinking**.

Computation = Storytelling

"A computation is a story."

- Just like **stories have structure and logic**, so do **computations**:
  - ○ Inputs → Processes → Outputs.
- In early societies, **numbers, symbols, and myths were all mixed together** — computation wasn't separated from **meaning, identity, or ritual**.

Ada Lovelace – First Informatician

- She understood that machines could **manipulate not just numbers but also abstract symbols informational art**.
- She was the daughter of **Lord Byron**, the famous Romantic poet, and **believed informatics was an art form** from the start.

Cultural & Cognitive References

Flowers for Algernon

- A novel about **artificially enhanced intelligence** and its **moral/emotional consequences**.
- Possibly mentioned to **reflect on the cost of intelligence and computation** — how data and emotion can clash.

The Evolution of Intelligence: A 600-Million Year Story **(YouTube documentary recommendation)**

- Shows the **evolutionary path of intelligence**, linking **biology** to **information systems**.

Pythagoras and His Cult

- **Pythagoras** was not just a mathematician — he led a **spiritual/mystical cult**.
  - Learned from **Eastern cultures**
  - **Refused to eat beans** (for symbolic/religious reasons)
  - His group invented or worked with **musical and medical instruments** based on math (e.g. **octaves, harmonics**) — where **ratios became healing tools**

Zalmoxis (To Be Expanded)

- Referenced as part of **proto-Daco mythology**.
- Possibly connected to **rituals, medicine, afterlife beliefs**.
- A mystical figure whose legend blends **spirituality and proto-philosophy**.

Cueva de las Manos ("The Cave of Hands")

- A prehistoric cave in **Argentina** with **stenciled handprints** from ~15,000 years ago.

Mark Twain: Fix 76

- Possibly a fun fact: **Mark Twain was born and died under Halley's Comet** (1835–1910) — and lived **exactly 76 years**.
- A poetic example of **cosmic symmetry** — something a Romantic mind (like Ada's or Byron's) might have loved.

Conspiracies = Stories We Know Are False

- "A known conspiracy is a story."
- Maybe an ironic way to say: when we **narrativize the past** — myths, religions, conspiracies — they become **shared cultural code**, regardless of truth.
- Relevant to **computation and data**: all systems are **symbolic**, but some are **true**, others are **stories**.

Course 9

REMEMBER THE TRANZISTOR?

When was the transistor discovered? 1947 – 1948

The coolest institution in informatics, **bell labs**, strikes again with a new discovery

The name of the asshole from the team that discovered it: William Shockley

Shockley was called out by his teammates (who was the boss of). The other 2 guys. Bardeen John and Brattain Walter said that Shockley did not actually make it and was at home asleep. At first bell labs agreed with Shockley but due to his behaviour, they rejected him, so Shockley went on to go to Silicon Valley and created a company called Shockley Semiconductor Laboratory.

Bell labs constantly hired out of college the brightest minds in mathematics, physics, and many other domains. This is how they became the biggest IT company with regards to the things that were produced there.

 By going to the westside, Shockley started recruiting people from the universities over there. But he was still an asshole. Even still, as the years went by, the trio received the nobel prize for their discovery, due to just how important the transistor was.

FROM THIS MOMENT ON

We delve into the 50s with the invention of tranzistors

What did this lead to

Who controlled the western population in the 50s. it was a device. Television and radio. Those could not have been produced without tranzistors.

In America, the climate needs to be mentioned.

The era of the 50s was knows for a specific phenomenon

Due to Iron curtain. Germany was separated east vs west. So there was a clear delimitation from the eastern and western parts of the world.

In regards to politics, while America was ruling the world, americans were fearing communism infiltrating their own government. The hunting of communist thus began, which had the spirit of a witch hunt.

The guy who actually did the chart of the rate of technological advancement

Moore's law.

Moore was one of the chemists hired by Shockley due to his competences within one of the neighboring colleges. He had a coworker and his name was Robert Noyce.

Shockley had a patent that allowed only him and the other 2 to create tranzistors

GOODNIGHT AND GOODLUCK MOVIE

FILMUL DESPRE FACEBOOK CU ANDREW GARFIELD

We have Shockley who is very arrogantly telling these 2 young people which he paid well however with the condition that "any research they do has to have his name on it".

Gordon Moore and Robert Noyce betray Shockley because they see they can make a lot of money with their research and found Fairchild Semiconductor. Shockley thus calls them "the treacherous eight"

Thus, those 2 went to the opposition, bell labs.

They created a technological way of printing transistors on a small silicone tray. By shrinking the transistor, they created **INTEGRATED CIRCUITS**. (used in tvs during that era)

HOW DOES A TV WITH INTEGRATED CIRCUITS work?

- The cathodic tv used a ray of electrons to the middle of the screen and electromagnets with the tension from left-right, top-down. That's why the image shrunk down when the tv was closed.

-        It shoots electrodes in the middle of the screen

-        There are electromagnets are all sides in which the tension would be like a saw

-        That is because if you put high tension in top left it uses electromagnetism to make an array of electrodes that shoot from the canon to the first pixel of top left. As you keep top by the max, the left eases, and then the top a little, and then the left, and so on and so forth

-        This happened till the image was formed

Due to Moore, the number of processing units doubled by the end of …. It is about how many computations per energy wasted (either due to computation or heat, light, etc.)

Now you increase the content of computation due to being able to use these integrated circuits

Gordon Noyce was a ladies man, the other was a guy who wanted to get shit done.

After a couple of years, noyce urged moore to start their own business, but moore wanted to play it safe. Over time, however, noyce convinced moore to go form their own company called **INTEL** which "fulfilled the prophecy" by taking the integrated circuit making the microcircuit (1968)

The drug treatment territory

1969: moon landing

-        The moon landing was televised

-        It was done with neil Armstrong as astronaut

-        They needed computers to achieve this

-        Were there microchips used for moon landing? Yes (silicon IC chips)

-        *The only skill we need to acquire from history is to seek for proper information (says the guy who says the moon landing was alleged)*

-        *Another important topic is causality*

-        *The building blocks for history is causality*

-        *History means story, which you cannot tell a story without the use of causality.*

The story of ernest hemingway

Who was he? A bearded guy? One of the greatest novelist from the 20th century. He was a warrior and fought in all the conflicts that spanned in his lifetime, from the Spanish civil war to Italy in 1st ww to 2nd ww and afterwards he became a spy in cuba, being a "bff" with leader from that time

He wrote one of the coolest novels, called "the old man and the sea", about Old man Santiago going on one of if not the last fishing trip

If you look at the image of his beard (which he had due to it being a useful defense mechanism from skin burn and therefore skin cancer)

So what happened to him? How did he die?

Stupid joke: similarity between kurt Cobain and Michelangelo. They both used their brains to paint the city. Kurt Cobain "copied the way" of hemingway. Hemingway did what he did because his wife and his bf/publisher were fearing that he became paranoid due to fears of being followed. After ww2, he befriended Fidel Castro. During the hunting of communism, he was ear marked due to the ideas of his publishings. In the later part of his life, he always felt watched.

His wife and his publishers made him visit a psychiatrist, who were up and coming at that time, since as time went on psychoanalisys became more and more sought upon

Alan turing death (tldr): he was gay. He went in the strets and found an underage minor. He told him he built the computing machine. He went to bbc (British broadcast company) and he was pumping up his idea that now that we have the computing machine, we can create a whole human, with that machine as the brain. During one broadcast, there was a guy, a psychologist that were pumping the views (due to him being a Freudian stan) that you cannot create a human without sex drive. The Freudian look at emotions was that all the emotions came from blood going to organs. Turing understood the assignment, and found out he also has sexual urges, thanks to a minor "who consented" (we can get through this, just a little longer!). He asked the kid for doing some equations for a fortnight. The young kid was a thug from the streets, who said to all the other guy from the street that touring was hella rich. When he went to report his loss, they found out he was gay (which was illegal). Due to the fact they found out he was gay, the law mandated he is chemically castrated. He had immunity, bc he took uk out of the war, but they revoked his immunity. Thus, he had to go every month and for chemical castration.

Hemmingway was committed to an institution (by his loved ones) to a psychiatric institution and was diagnosed with paranoia. The treatment for paranoia was shock therapy. Both these affected their psyche, sent them into a downward spiral till it was too much to bear.

Alan took the gay "elegant" way. He took something "syonite?"(cyanide, most probably) with which he injected himself

There's a rumor that the apple logo is inspired by the bitten apple with cyanide that Alan Turing had on his nightstand after he died?

Hemmingway had a bullet salad

In the 2010s, the fbi were forced to reveal their documents, who proved Hemmingway was right and he WAS followed…

REFERENTIAL MOVIE: **ONE FLEW OVER THE CUCKOO'S NEST** (NIMENI NU L-A VAZUT DECI SIGUR NE DA)

The writer of the novel is ken Elton kesey

The 60s.

1969: the year of the moon landing (again)

The Summer of Love, Woodstock, and the Counterculture Movement

- **The Summer of Love (1967)** and **Woodstock (1969)** were key cultural events that symbolized the **hippie movement** in the U.S.
- These events represented a **rejection of traditional values** (especially East Coast conservatism) and embraced:
    - **Peace, love, and anti-war ideals**
    - **Psychedelic drugs**
    - **Rock music and spiritual exploration**

Cultural Components:

1. **Drugs** (especially **LSD**)
2. **Music** (Santana, Jimi Hendrix, Janis Joplin, etc.)
3. **Counterculture** (opposing war, capitalism, conformity)

East vs. West Ideological Divide (Within the U.S.)

- **East Coast** (e.g., New York, Boston):
    - More conservative, elite-driven, **WASP** (White Anglo-Saxon Protestant) culture.
    - Traditional values, formal power structures, often aligned with government and industry.
- **West Coast** (e.g., California):
    - More experimental, spiritual, artistic, rebellious.
    - The Vietnam War stirred **political dissent**, leading to activism, communes, and **psychedelic exploration**.

Who Provided the Drugs? → Ken Kesey and MKUltra

- **Ken Kesey**:
    - Author of *One Flew Over the Cuckoo's Nest* – "it was a story about a guy who was supposed to become perfect by drugs and electroshots"
    - Key figure in the **psychedelic movement**.
    - Organized the **Merry Pranksters**, who traveled around promoting **LSD use** as mind-expansion.

○ Was **unknowingly used by the CIA** in **Project MKUltra** — a secret program testing **psychedelic drugs** for psychological manipulation.

Project MKUltra:

- A **CIA operation** from the 1950s to 70s.
- Used **LSD**, **mescaline**, **sleep deprivation**, and **psychological torture** to experiment on human minds.
- The goal: **mind control, psychological warfare**, breaking and rebuilding human subjects.

1950s had the korean war. It split korea in the current north and south korea.

Dennis rodman and kim jong un are besties?!

Santana's Acid Trip (Woodstock)

- At **Woodstock**, guitarist **Carlos Santana** famously performed while **tripping on LSD**.
- In a *MetroFocus* interview, he said he saw his guitar turning into a **giant snake** and had to "tame it."
- This moment symbolizes how deeply **drugs and music were fused** in the 60s counterculture.

Ted Kaczynski (The Unabomber)

- **Ted Kaczynski** (mathematician turned domestic terrorist) was also a **victim of CIA experiments**.
- As a student at **Harvard**, he was subjected to **MKUltra-style psychological tests**, including **humiliation and mental stress**.
- His later writings show deep mistrust of technology and institutions — partly shaped by this traumatic experience.

The Greatest Algorithm of All Time: Fast Fourier Transform (FFT)

- The **Fast Fourier Transform** (FFT) is often called *"the most important algorithm ever"* (Veritasium even has a video titled this — likely on your test).
- It efficiently transforms signals between **time and frequency domains**, enabling:
  - **Image and audio compression**
  - **Signal processing**
  - **Digital communications**

- It was rediscovered in 1965 by **James Cooley and John Tukey**, though its mathematical roots go back centuries.

Connection: Pink Floyd – "Mother"

- Likely cited to reflect the **psychedelic, mathematically layered music** of the 60s/70s, enabled by FFT-based audio engineering.

Culture of the 1960s–70s: LSD, CIA, and Counterculture

One Flew Over the Cuckoo's Nest

- Referenced as a **cultural mirror** of the era's institutional control, individual rebellion, and **psychiatric manipulation**.
- Actor **Ken Kesey**, who wrote the novel, became a **leader of the Merry Pranksters**, a group promoting LSD use.

CIA, MKUltra, and Mind Experiments:

- The **CIA**, through **Project MKUltra**, tested drugs like **LSD** and **mescaline** (often without consent) to:
    - Explore **mind control**, **psychological warfare**
    - Break down and reconstruct human consciousness

LSD was both a **tool for the counterculture** and a **weapon for the state**.

Vannevar Bush and the Origins of Information Technology

- **Vannevar Bush** was a top engineer and visionary:
    - Led the **Office of Scientific Research and Development** during WWII
    - Helped launch the **Manhattan Project**
    - Left MIT for Washington dc. **(1939)**
    - Wrote the prophetic 1945 article **"As We May Think"**:
        - Described the **Memex**, an early vision of **hypertext, personal computing, and information retrieval** — a conceptual ancestor of the web.

By 69 we have major computers in all major schools

We have telephone lines that connect telephone info from east side to west side

If we put these 2 together, we get another army project

From Transistor to the Internet (1947–1969)

Timeline of Key Developments:

- **1947**: Transistor invented (Shockley, Bardeen, Brattain)
- **1950s**: ENIAC replaced by smaller, faster computers
- **1959–60s**: Transistors → **integrated circuits** → **microchips**
- **1968**: The "mother of all demos" — by **Douglas Engelbart**
    - Introduced **mouse, monitor, hypertext, and collaborative computing**
    - Goal: turn **Bush's Memex** into a real system

Stewart Brand and the Hippie-Tech Convergence

- **Stewart Brand**, a Merry Prankster and editor of the **Whole Earth Catalog**, bridged:
    - **Hippie counterculture**
    - **Early computer technology**
- The **photo of Earth from space** (Apollo mission) he used helped shift culture toward a **global consciousness** influencing **eco, tech, and open-source movements**.

· He got from NASA the first image of Earth seen from the Moon

Cold War Projects & Tech Advancement

Operation Paperclip

- Post-WWII U.S. operation that **recruited Nazi scientists** (e.g. **Wernher von Braun**) for American space and military programs.

· Tarantilo branded on nazis

· Every time you look at an institution from America in 70s 80s and you see someone with a scar, you should know that he was a nazi. The deeper the scars, the tougher you were.

ARPANET (1969)

- Military-funded network → **precursor to the Internet**
- Connected major U.S. universities
- Required **reliable, modular software** – more advanced than even the Moon landing systems
    - *Software was harder than rockets.*

Software Innovations & Cultural Shifts

 Grace Hopper (she ditched her husband – who was a linguist – bc he was too boring and joined the navy) (she wrote the code for the machine of the navy, the mk1 computer)

- Pioneer of **compiled languages** (COBOL)
- Worked on **Harvard Mark I**
- Helped introduce the concept of **debugging** (first literal bug: a moth)

Multi-user Operating Systems

- **Bell Labs** developed a **multi-user computer** system using **C** and keyboards/mice → UNIX was born.(It was a **pun on "Multics"** (Multiplexed Information and Computing Service), a much larger and more complex operating system developed earlier.)

UNIX & Open Source

- **UNIX** (1970s) — elegant, portable OS written in **C**
- Developers:
    - **Dennis Ritchie** (C language)
    - **Ken Thompson** (UNIX)
- **Richard Stallman** later launched the **Free Software Movement** open source ideology born from **academic + counterculture fusion**

Margaret Hamilton & the Moon

- Led the **software team for NASA's Apollo missions**
- Developed **assembly code** that ran the **Apollo Guidance Computer**
- Her work is now available on **GitHub**

Spacewar: first computer game? - 1961

BRIDGE OF SPIES INCA UN FILM

Course 10

"Our Journey of Discovering Informatics"

 Entering the 1970s

- **Bell Labs** returns to the spotlight by introducing:
    - **The C programming language**, created by **Dennis Ritchie** and **Ken Thompson**. - Described as the **"most low-level high-level language"**.
    - **UNIX**, the first multi-user operating system, was written in C.

- A **"diss track" to Multics**: whereas Multics was overly complex and scattered, UNIX was clean, elegant, and unified.
- The "X" in UNIX was just because it "sounded cool."

Paradigm Shift: Wall Street & Capitalism

- The 1980s shift wasn't just technological it was **economic**.
- Wall Street culture embraced a new ideology:
  - "Greed is good" – *Wall Street* (1987 film).
  - Capitalism vs. socialism defined much of the East vs. West divide during the Cold War.

The Space Race & Early AI

- **Space Race** as a Cold War battleground:
  - 1957: **Sputnik** ("travel companion") – first satellite by USSR.
  - First human in space: **Yuri Gagarin**.
  - First animal: **Laika**, the dog.
  - U.S. catches up with the **moon landing** (1969).

Early AI in Cinema:

- 1927: *Metropolis* – first depiction of AI.
- 1968: *2001: A Space Odyssey* – HAL 9000 (AI) questions human judgment.
  - Conspiracies around the moon landing and *The Shining* (Kubrick allegedly hinting he filmed the moon landing) are discussed ironically.

What Is Intelligence?

- "What do we say to the god of death? Not today."
- Intelligence is the **ability to adapt, create algorithms in real-time**, and **solve problems from scratch**.
- History unfolds in **three interconnected paths**:
  1. The **history of the cosmos** (energy and matter)
  2. The **history of life** (biological information systems)
  3. The **history of informatics** (coded, artificial systems)

Monoliths and the Turing Machine

- The **first computers** were **monoliths** — large, singular-purpose machines.
- A **monolith = a unified block**, like:
  - A **Turing machine** (abstract monolith of computation)

- ○ A **cave** (shelter + first "structured environment")
  - ○ The **Jacquard loom** (precursor to computers using punch cards = RNA)
- John von Neumann, inspired by biological systems, made the **first true stored-program computer** (ENIAC).

Cells as Computers

- A **cell** is a perfect analogy for a computer:
  - ○ **Ribosome** = CPU (executes instructions from RNA)
  - ○ **DNA/RNA** = software
  - ○ **Mitochondria** = power source
  - ○ **Cell wall** = case/membrane
- In cities (like Greek citadels = *polis*), you had:
  - ○ **Energy input** (bread, labor)
  - ○ **Information storage** (tablets, walls)
  - ○ **Output** (culture, defense)

All systems are **energy-information architectures**, whether biological, urban, or digital.

The Dawn of Movement and Consciousness

- In oceans, early life had to move to survive:
  - ○ Movement = evolution (flagella, cilia).
- In humans: **horses changed the game** — the first major tech that increased movement speed.
- **Intelligence = reaction to entropy** (constant change, threat of decay).
- Predators catalyze evolution:
  - ○ Ancient myths = predator vs. prey stories.
  - ○ Macedon (Alexander the Great), taught by **Aristotle**, unified East and West through **knowledge and military might**.
  - ○ He didn't just conquer; he **preserved** — like building the **Library of Alexandria**.

The Rise of the Internet

- **1970s**:
  - ○ **ARPANET** (Pentagon project) connected university computers via telephone lines the prototype of the **Internet**.
  - ○ Required **multi-user systems** → led to:
    - ■ **C language**
    - ■ **Sockets**
    - ■ **UNIX**

Key figures:

- **Grace Hopper**:
  - Debugged the first literal computer "bug"
  - Created **COBOL**, first high-level language for business. (1959)
- **Richard Stallman**:
  - Founded the **GNU project** ("GNU's Not UNIX") after being denied access to UNIX source code.
  - Led the **open source movement**: gcc, g++, MinGW.

You now have a **yin-yang**: those who **sell software** vs. those who **share knowledge**.

Miniaturization & Personal Computing

- Computers shrink:
  - Building → Room → Wardrobe → **PC**
- **1968**: Intel (Noyce + Moore) creates the **microchip**.
- The **neural metaphor** is complete:
  - Roads = axons
  - Cities = neurons
  - Networks = synapses

Software Economics & AI Foundations

- The new paradigm: **selling information** (software) just like physical goods.
  - **Microsoft, Apple, IBM** lead this shift.
  - **Bill Gates' open letter**: software isn't free; it's a product.
- The **open source backlash** leads to:
  - **GNU**
  - **Linux**
  - **Community-driven codebases**

The Web Revolution

- **1989**: **Tim Berners-Lee** creates:
  - **HTML** and **HTTP**
  - Launches the **World Wide Web**
- **1990s**:
  - The web explodes.
  - **Java** becomes dominant:
    - Portable
    - Compiles to bytecode
    - Runs on **JVM** across all machines

Language Eras:

Decade	Dominant Language
1960s	Assembly
1970s	C + UNIX
1980s	C++ (object-oriented)
1990s	Java (cross-platform)

- Need for platform-independent software → Java dominance.
- **.com boom** (late 90s):
  - **E-commerce explosion**
  - HBO's *Silicon Valley* dramatizes this

2000s and the AI Revival

- **Y2K bug**: panic over computers failing to interpret the year 2000.
- **Deep Learning** resurfaces:
  - **1958**: **Frank Rosenblatt** creates the **perceptron**
  - Term "hacker" born at **MIT** AI lab — originally pranksters
- **AI Winter**:
  - **Marvin Minsky** criticizes the perceptron
  - Funding dries up for decades
- **2010s**: GPUs built for gaming turn out to be perfect for training neural networks.

Deep Learning and the Modern Era

- **Geoffrey Hinton** (born 1947) helps revive deep learning.
- **ReLU activation** replaces sigmoid → better training
- **Social networks (like Facebook)** provide the **data fuel** for AI.
- **Python** replaces Java as dominant AI language.

Three Historical Breakthroughs:

1. **Agricultural Revolution** – energy control
2. **Industrial/Technological Revolution** – machine power
3. **Information Revolution** – knowledge as capital

Others

🧵 The Jacquard Loom – The First Programmed Machine (1801)

The Jacquard loom was a **mechanical loom** that could **weave complex patterns** using **punched cards** to control which threads were lifted during each pass of the shuttle.

- Invented by **Joseph-Marie Jacquard** in France.

- It didn't "compute" in the modern sense but used **binary logic** (hole = yes / no hole = no) to automate instructions.

- The punch card system directly inspired **Charles Babbage**, who envisioned using punched cards to control **the Analytical Engine** (which Ada Lovelace later helped theorize).

- This loom was effectively the **first reprogrammable machine**: to change the output (pattern), you just had to switch cards.

📌 Babbage kept a silk portrait of Jacquard, woven by one of these looms, in his office — to remind people that **hardware and software were already merging** even in textiles.

👩‍💻 Jean Bartik and the Forgotten Women of ENIAC (1940s)

When WWII demanded faster ballistic calculations, the U.S. military built **ENIAC**, one of the first electronic computers.

- **Six women** were recruited as the first computer programmers: **Jean Jennings Bartik**, Betty Holberton, Marlyn Wescoff, Ruth Teitelbaum, Kathleen McNulty, and Frances Bilas.

- Their job: figure out how to make ENIAC compute using **plugboards and switches**. No screens, no manuals — just logic.

- They essentially **invented software programming** by developing early subroutines, loops, and debugging methods.

- For decades, they weren't credited; people thought they were just assistants or "receptionists" in photos.

💥 They were pioneers of **coding, logic design, and software structure**, but only recognized much later due to systemic gender bias in science history.

🧠 Homebrew Computer Club – Birthplace of Personal Computing (1975)

In the mid-70s, before personal computers were mainstream, a group of Bay Area hobbyists met in garages and university basements to **share, hack, and build computers from scratch**.

- Called the **Homebrew Computer Club**, it included future legends like **Steve Wozniak** and **Steve Jobs**.

- The idea was simple: "Let's build our own machines and share the schematics."

- Wozniak designed the Apple I to present to the club — Jobs saw its potential to **package and sell** it.

- The spirit was **open-source before open-source**: people freely shared code, circuits, and knowledge.

🔧 The personal computer revolution wasn't born in corporate labs — it came from **DIY, communal innovation**, and passion-driven tinkering.

🌐 TCP/IP and the Internet – A Decentralized Dream (1970s)

The book deeply explores the **birth of the internet** not just as a military or academic project, but as a **collaborative and philosophical movement**.

- **Vint Cerf and Bob Kahn** developed **TCP/IP**, a communication protocol that broke data into packets and reassembled them at the destination.

- This made it possible for **networks to talk to each other** even if they were built differently.

- The beauty: it was **decentralized and permissionless**. No central authority controlled who could connect.

- It became the backbone of **ARPANET**, and later, the Internet.

🌍 The Internet wasn't just a tech achievement — it was a **political statement about openness and resilience**. No single node could take it down.

👨‍💼 Richard Stallman and the Hacker Ethic (1980s–90s)

At MIT in the 1980s, Richard Stallman noticed a worrying trend: **software was becoming closed and proprietary**.

- He believed software should be **free as in freedom**, not necessarily free as in cost.

- Stallman started the **GNU Project**, aiming to build a full operating system that respected user freedom.

- His **Free Software Foundation** laid the moral groundwork for **open-source development**.

- Wrote the **GNU General Public License (GPL)**, a legal tool to keep code open and shareable forever.
  Later inspired projects like **Linux** (by Linus Torvalds), creating the first full open-source OS.

🔓 Stallman viewed coding as **activism**, and believed **users should have control over their computers** — not the corporations.

👩‍🚀 Vint Cerf & Bob Kahn – Architects of the Internet (1970s)

While ARPANET connected a few government and academic computers, it needed a **universal language** to grow into the Internet.

- **Vint Cerf and Bob Kahn** created **TCP/IP**, a communication protocol that could break data into packets, send it across diverse networks, and reassemble it at the end.

- It was **modular and decentralized** — meaning you didn't need permission from a central authority to join the network.

- Adopted officially on **January 1, 1983**, when ARPANET switched from NCP to TCP/IP — considered the "birth of the internet."

- Their system allowed any computer or device to "speak the same language" — enabling the Internet of today.

🌐 Their work wasn't just technical — it was **philosophically radical**, pushing for open connectivity, resilience, and **freedom from centralized control**.

🧭 Marc Andreessen & The Browser Boom (1990s)

While Tim Berners-Lee invented the **World Wide Web** (HTML, HTTP, URLs), it was **Marc Andreessen** who made it usable by the public.

- In 1993, as a student at the University of Illinois, he helped build **Mosaic**, the first graphical web browser.

- Mosaic's innovation: users could **see images and text on the same page**, click hyperlinks, and navigate visually — it felt intuitive.

- Andreessen co-founded **Netscape**, the first major web browser company, which exploded during the **dot-com boom**.

- Netscape's IPO in 1995 signaled the **commercialization of the web** and the beginning of the "Internet Gold Rush."

💻 Before this, the web was an academic tool. Andreessen helped **turn it into a public platform**, opening the door for Amazon, Google, etc.

👩‍🎓 Linus Torvalds and Linux – Power to the People (1991)

Inspired by Stallman's GNU project, **Linus Torvalds**, a Finnish student, wrote the **Linux kernel** — the missing piece of a free operating system.

- Linux combined with GNU tools = the first complete **free and open-source operating system**.

- He didn't try to control it; instead, he let the community contribute and improve the code — creating a new **collaborative development model**.

- Today, **Linux powers most servers, phones (Android), and cloud infrastructure** — yet remains free.

🐧 The Linux mascot, Tux the penguin, symbolizes a friendly rebellion against closed systems.

💻 The Open-Source vs. Proprietary Software War (1990s–2000s)

As open-source movements grew (Linux, Apache, MySQL), **commercial giants like Microsoft pushed back**.

- Microsoft CEO Steve Ballmer famously called Linux "a cancer" — afraid it would disrupt their software empire.

- Meanwhile, **developers, universities, and startups** embraced open-source tools for flexibility and freedom.

- The rise of **GitHub (2008)** further accelerated this movement, allowing global collaboration on code.

⚔️ This era was marked by a **cultural clash**: openness vs. control, community vs. corporation — a modern echo of the hacker ethic vs. profit-driven tech.