IT KOLLEDŽ
TALLINNA TEHNIKAÜLIKOOL

# Infotehnoloogia ajalugu

## Sissejuhatus infotehnoloogiasse ja riistvarasse ICA0012

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https://wiki.itcollege.ee/index.php/User:Edmund#eesti_keeles

# Arvud

Arvud kontidel:

- periood 20,000 - 30,000 aastat tagasi Cro-Magnon

**inimese ilmumine**

- Babüloonia: positsiooniline 60-süsteem 1900 kuni 1800 BC
- Maiade arvusüsteem

Null:

- Babüloonia 300 BC
- India 600 AD

Abakus:

- Babüloonia 1,000 BC kuni 500 BC,

# Loogika olemus

- Klassikalisest kreeka keelest sõnast λόγος (logos), algtähendusega sõna ehk mida räägitakse.
- Loogika on teadus mõtlemise alustest.
- Loogika uurib mõtlemise *paratamatuid* aspekte ehk seda, mis üldse teeb mõtlemisest mõtlemise ehk õige mõtlemise ehk seda, mida ja kuidas üldse mõelda saab.

- Informaalne loogika: teatud vaidlusmeetodite analüüs.
- Formaalne loogika:
  - reeglisüsteemid ja algoritmid nö mehaaniliseks järelduste tegemiseks
  - reeglisüsteemide kui matemaatiliste objektide uurimine.
- Arvutid on mõtlemise masinad.

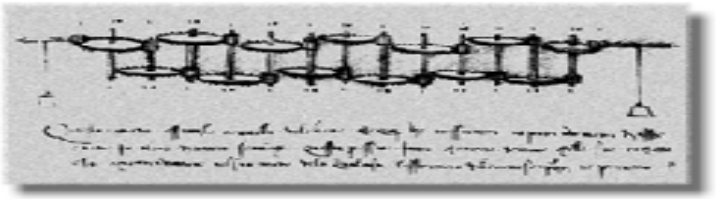
# Loogika teke

- Parmenides (5 sajand e.m.a.) : kasutas pikki loogilisi põhjendusi.
- Zenon Eleast (5 sajand e.m.a.) - apooriad/paradoksid
- Sofistid - Sokrates (470-399 e.m.a) - Platon (428/427 - 348/347 e.m.a):

**Aristoteles: väidete struktuur kui iseseisev uurimisobjekt**

# Leonardo da Vinci

- ca 1500
- Kalkulaatori joonis:

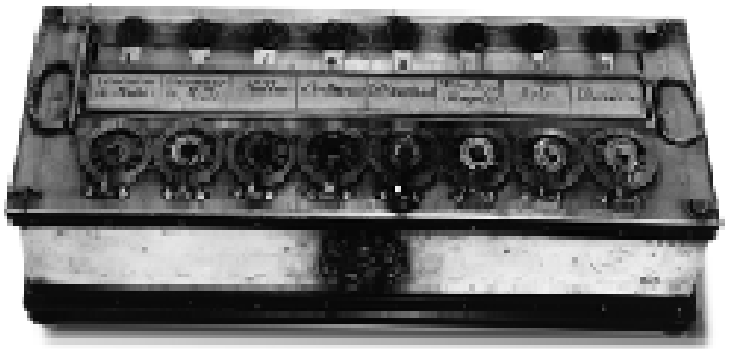


- Hiljem ehitatud katseeksemplar

# Schickard & Pascal

- Schickard 1625: väitis ehitanud olema liitva, lahutava, korrutava, jagava masina
- Kristlik filosoof Blaise Pascal 1640:

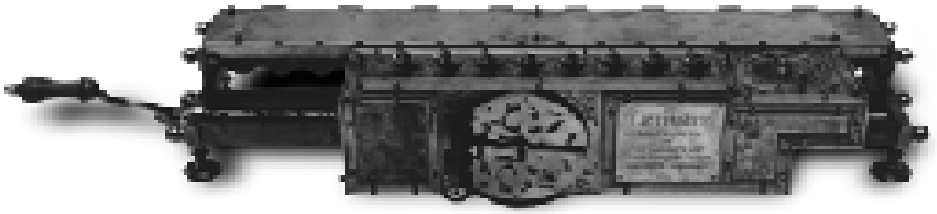
  aritmeetiline masin: ainult liitis ja lahutas



- Ehitas ca 50 tükki

# Gottfried Wilhelm Leibniz

- Saksa filosoof 1646-1716
- Leibnizi arvuti (1671) liitis, lahutas, korrutas, jagas



- Leibniz lõi Boole'ga sarnaneva loogikasüsteemi, mis vajus unustusse
- Leibniz püüdis luua universaalset sümbolkeelt (*lingua characteristica universalis*) ja seda keelt kasutava nn "arutlemise aritmeetika" (*calculus rationator*)

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

# Kirjutusmasin

- Inglise patent, Henry Mill, 1714, ei ehitatud
- Ameerika patent: 1829 William Austin Burt Detroidis
- 1867, Christopher Latham Sholes, Carlos Glidden, Samual W. Soule leiutis: “Type-Writer“
- Remington:  1874 (jalgpedaaliga!)
- Sholes’ klaviatuur ca 1874:



- Dvoraki klaviatuur ca 1936

# Kirjutusmasin püssitehasest

- Remington Typewriter Co. model No. 2

**The invention of interchangeable parts.** Machines which would produce, from a preshaped mold, the various components needed to build a standard infantry rifle, and workers on an assembly line who would construct it. The North, eager to experiment and willing to try anything that smacked of economic progress, decided to test the waters of this inviting new method of manufacture.

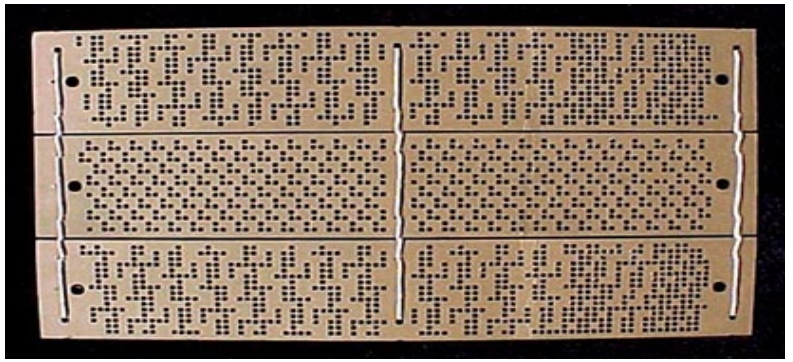
- Civil war:

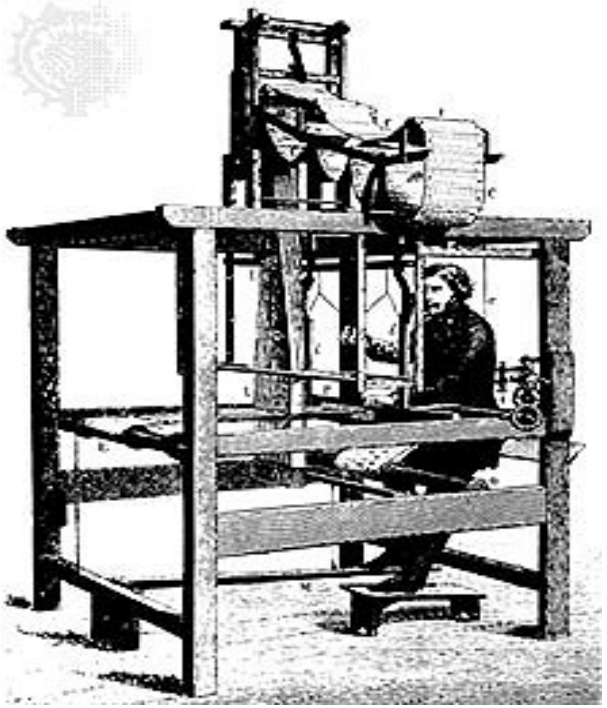
"In all history, no nation of mere agriculturists ever made successful war against a nation of mechanics. . . .You are bound to fail"

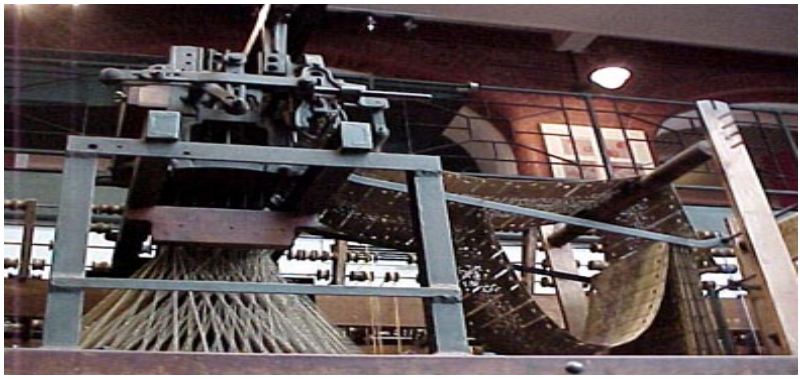
-Union officer William Tecumseh Sherman to a Southern friend.

# Perfokaardid

- ca 1800, Jacquard

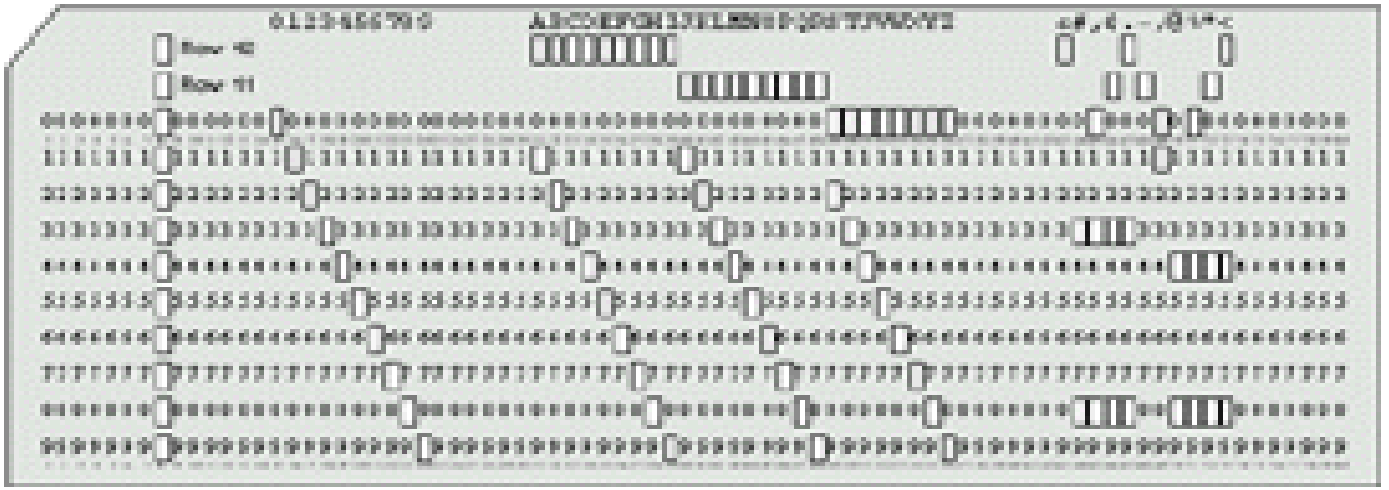




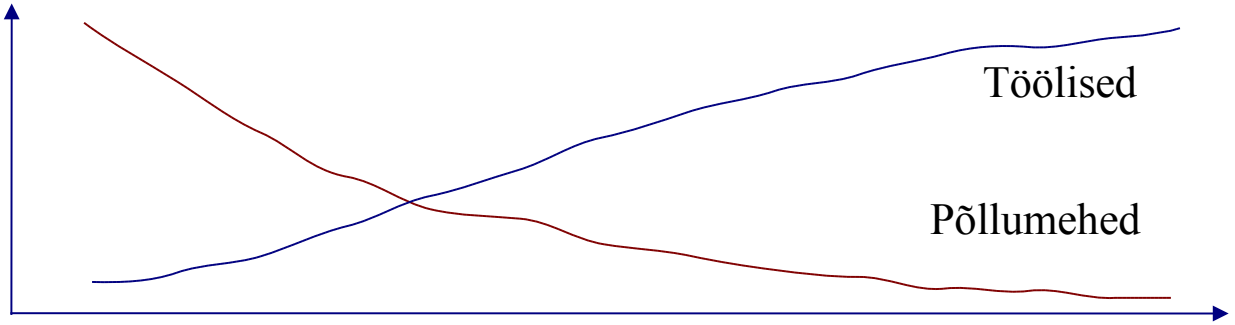
# Perfokaardid

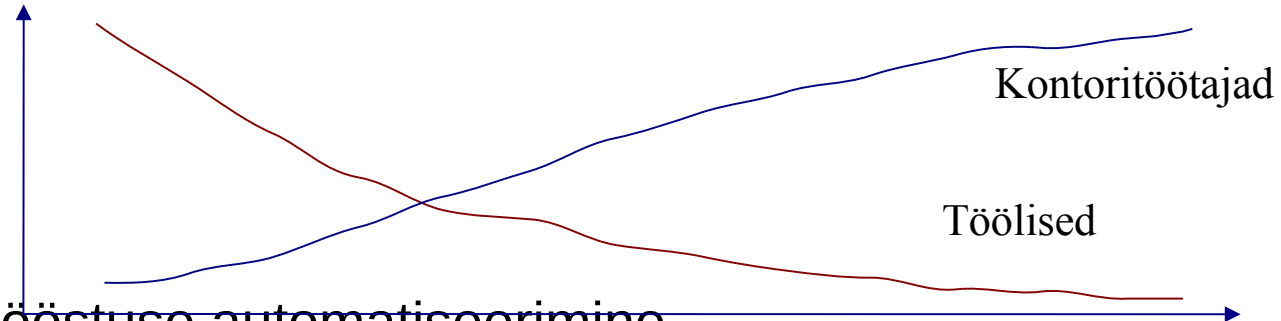
- IBM-i perfokaart:



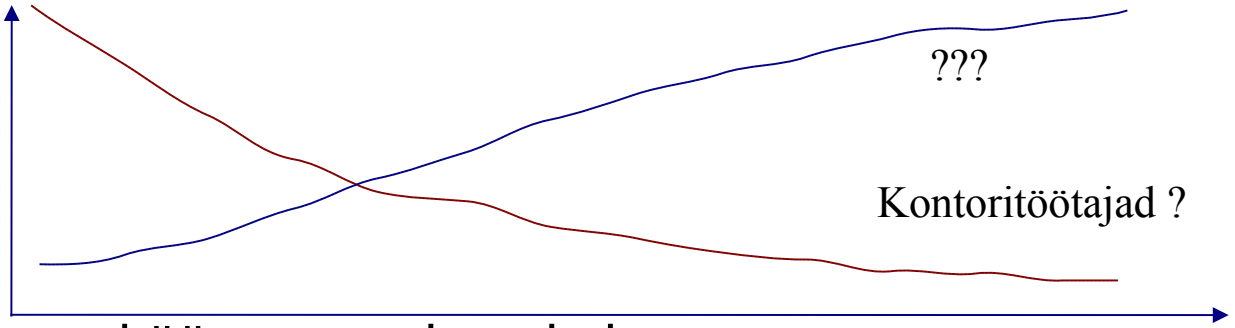
# Industrialiseerimisest

- Tööstuse teke ja põllumajanduse mehaniseerimine




- Tööstuse automatiseerimine

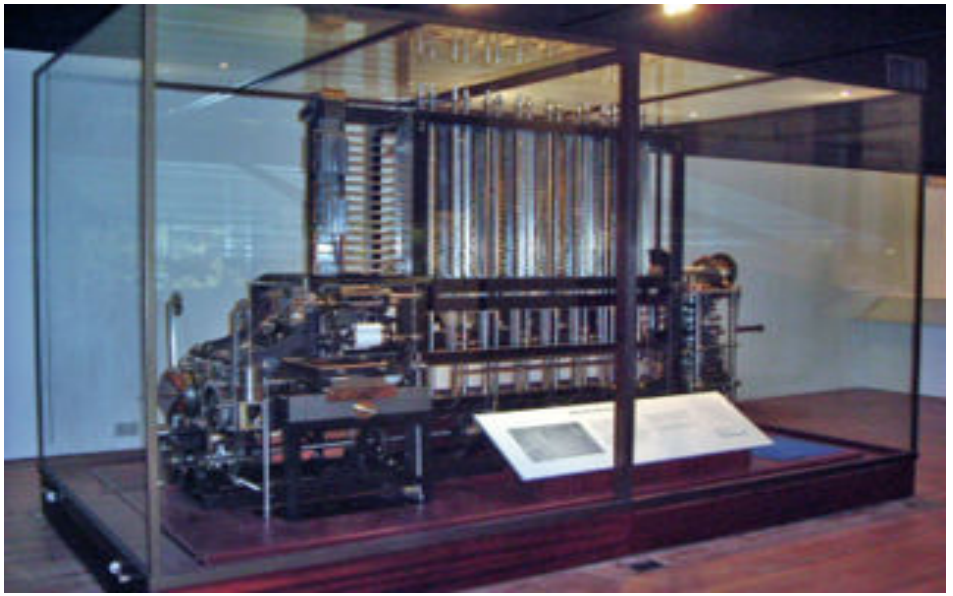



- Kontoritöö automatiseerimine

# Charles Babbage

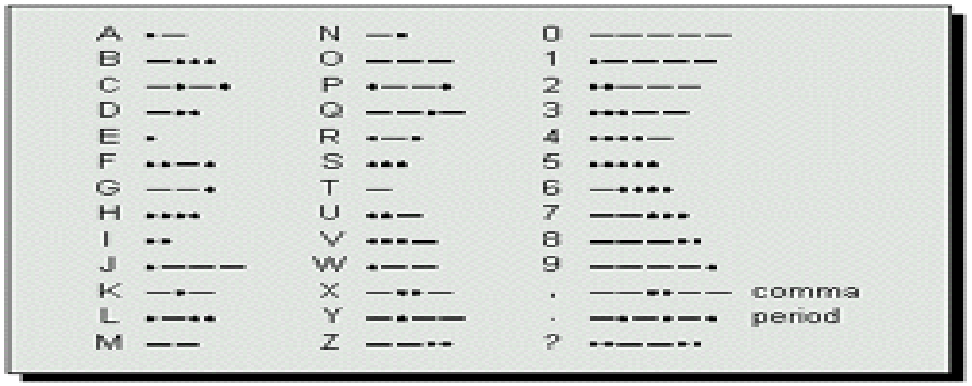
- 1822: Difference Engine, jäi pooleli
- Idee: Analytical Engine
- esimene programmeerija: Ada Lovelace

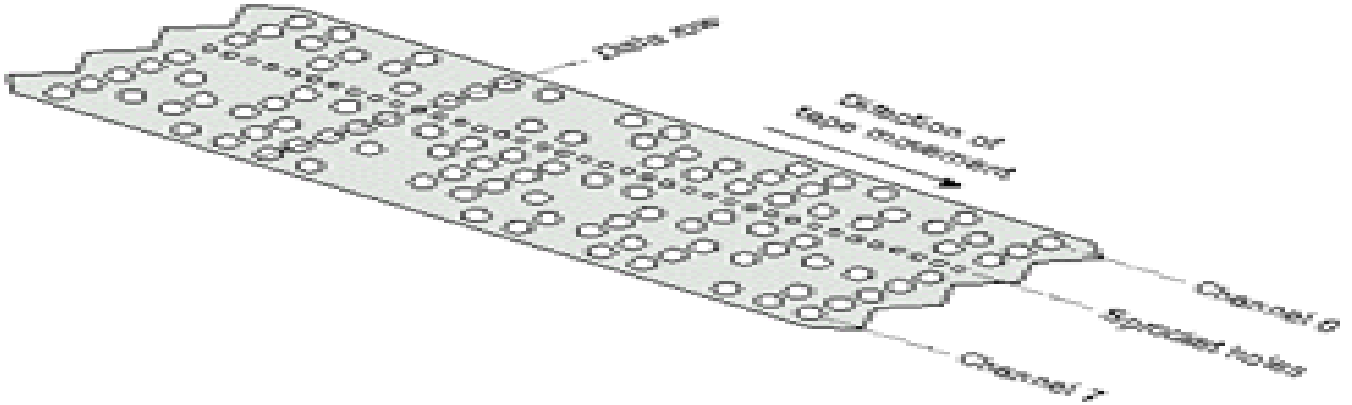
# Charles Babbage: difference engine



# Telegraaf

- Morse 1837: elektritelegraaf
- Wheatstone 1857: perfolint
- Arvutite perfolint
- 1902-1910: teleprinter



# George Boole, Augustus de Morgan

- Loogika (lausearvutuse) alused 1847-1854
- Matemaatilise algebra ideede kasutamine loogika jaoks
- Loogika algebra:

**1A = A, 0A = 0, A+0 = A, A+1 = 1**

**A+B = B+A, AB = BA, AA = A**

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

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

# Hollerith’i perfokaardid

- 1890: Herman Hollerith: perfokaartidega masin USA rahvaloenduse andmete töötlemiseks

- Hollerith’i firmast tekkis IBM

# Claude Shannon

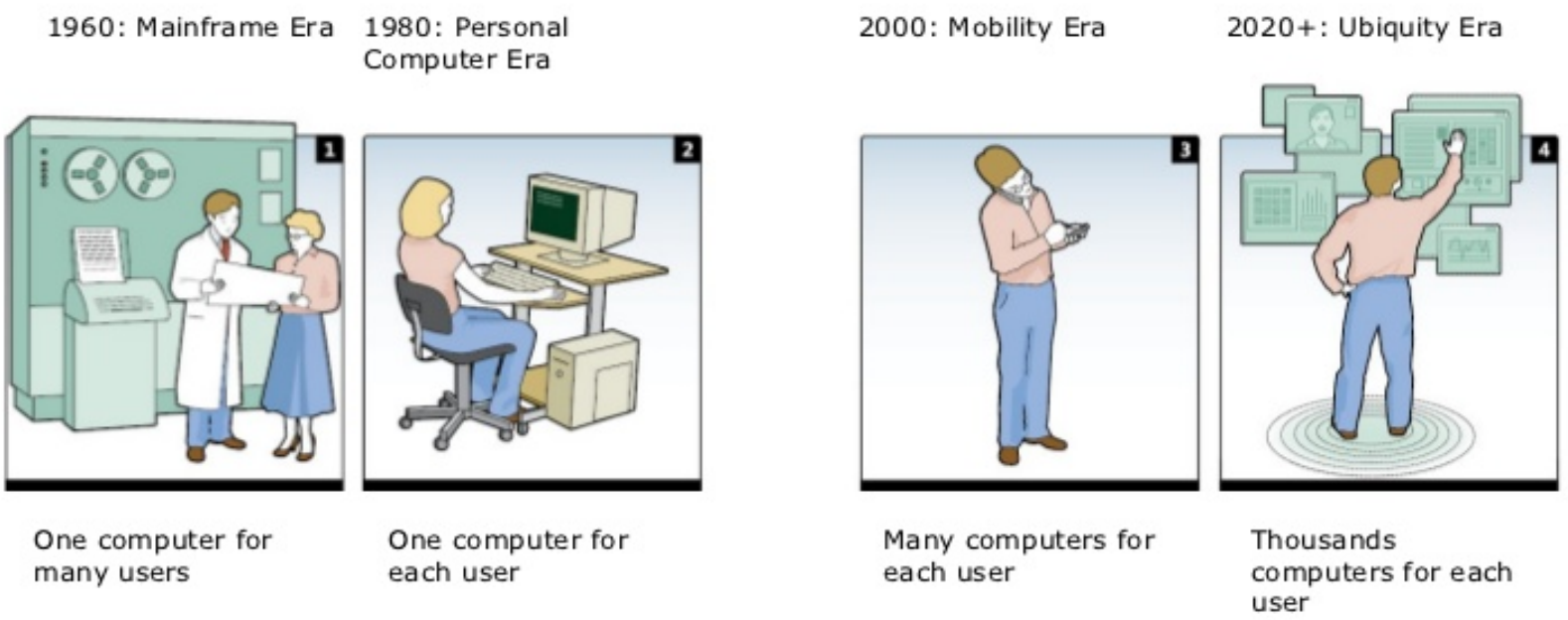
- MIT, 1938, Shannon’i magistritöö sidus:
  - Boole’i algebra
  - Elektrilülitid ja -skeemid
  - Bitid ja info kodeerimine
  - Info otsimise algoritmid

# Arvutite põlvkonnad

- 1.põlvkond 1946-1954
- 2.põlvkond 1954-1965
- 3.põlvkond 1965-1971
- 4.põlvkond 1971-1981
- 5.põlvkond 1981-1991
- 6.põlvkond 1991-…
- 7.põlvkond 2000-… kvantarvutid

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

# Arvutite põlvkonnad




Source: Abigail Sellen, Yvonne Rogers, Richard Harper, Tom Rodden: *Reflecting human values in the digital age*. Commun. ACM 52(3): 58-66 (2009)

http://www.computerhistory.org/timeline/computers/

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

# Perioodid

- enne 1945 – periood enne salvestava programmiga arvuti kontseptsiooni kasutusele võtmist (elektromehhaanilised, releedega arvutid)
- 1945-1954 periood enne kõrgkeelte kasutuselevõtmist (lamparvutid)
- 1955-1970 periood enne integraallülituste kasutuselevõtmist (transistorarvutid)
- 1971-1980 periood enne personaalarvutite ilmumist (integraallülitused)
- 1981-… tänapäeva arenguperiood

Esimesed 3 perioodi eristuvad selgelt, edasine eristamine on keerulisem. Edasised erinevused seisnevad mikrolülituste integratsioonitasemes ja arhitektuursetes lahendustes.

Omaette uus teema on kvantarvutid...

# 1. põlvkond - lamparvutid

**ENIAC** – 1945 (Pennsylvania ülikool), loetakse kõige esimeseks universaalseks elektronarvutiks

- 18 000 elektronlampi
- 30 m pikk
- programm pistikutega

# ENIAC (1943-1946)

- Electronic Numerical Integrator And Computer
- mõeldud mürskude trajektooride arvutamiseks – arvutas 30 sekundiga trajektoori, mis inimesel võttis 20 tundi (2400x kiiremini)
- esimesed arvutused termotuumarelva teostatavuse kohta
- ~1000 korda kiirem kui varasemad elektromehaanilised masinad
- maksumus ~487000$, 2016a vääringus 6 816 000$
- töötas kuni aastani 1955, mil kaalus ~27 tonni ja tarbis 150 kW elektrit


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

# 1. põlvkond jätkub...

**SSEM** ehk **"Baby"** (The Small-Scale Experimental Machine)

- Manchesteri ülikool, Inglismaa
  - 21. juunil 1948 töötas esimest korda edukalt.
  - Esimene masin, mis suutis elektroonilisse mällu salvestada mitte ainult andmeid, vaid ka lühikest programmi.

# 1. põlvkond jätkub...

**EDSAC** – 1949, Cambridge'i ülikool

- 3000 lampi 12 riiulil
- mälu – elavhõbedatorud
- 650 op/sek
- sisendseade – perfolint
- esimene töötav programm leidis arvude 0-99 ruudud 2 minuti ja 35 sekundiga
- "valmis" masin – juhtmeid ega lüliteid polnud vaja uute arvutuste jaoks ümber ühendada/lülitada
- esimene arvuti, mida kasutati teaduspublikatsiooni aluseks olevateks arvutusteks (geneetik R. Fisher)

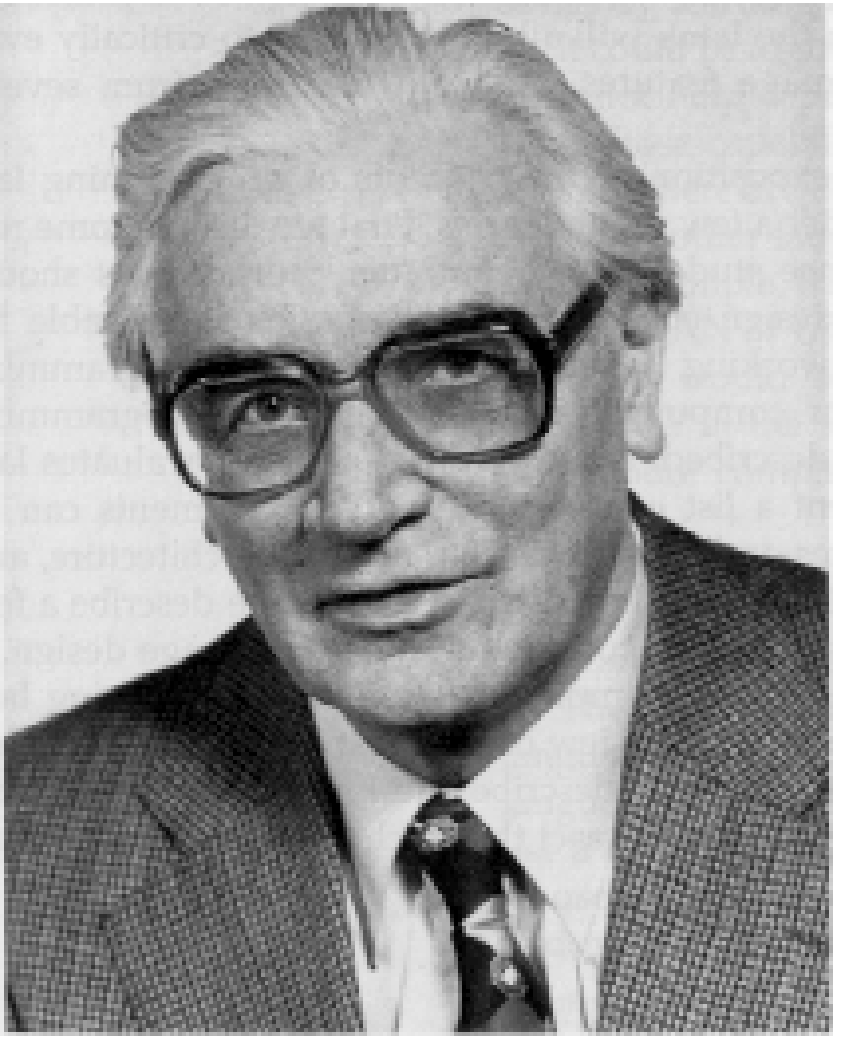
# 1. põlvkond jätkub...

**ACE** (Pilot Model Automatic Computing Engine) – 1949, London

- idee autor Alan Turing
- 1945 kavand ja mõned masinkoodis programmid
- 10. mail 1950 esimene töötav programm
- taktsagedus 1 MHz, oli mõnda aega maailma kiireim arvuti

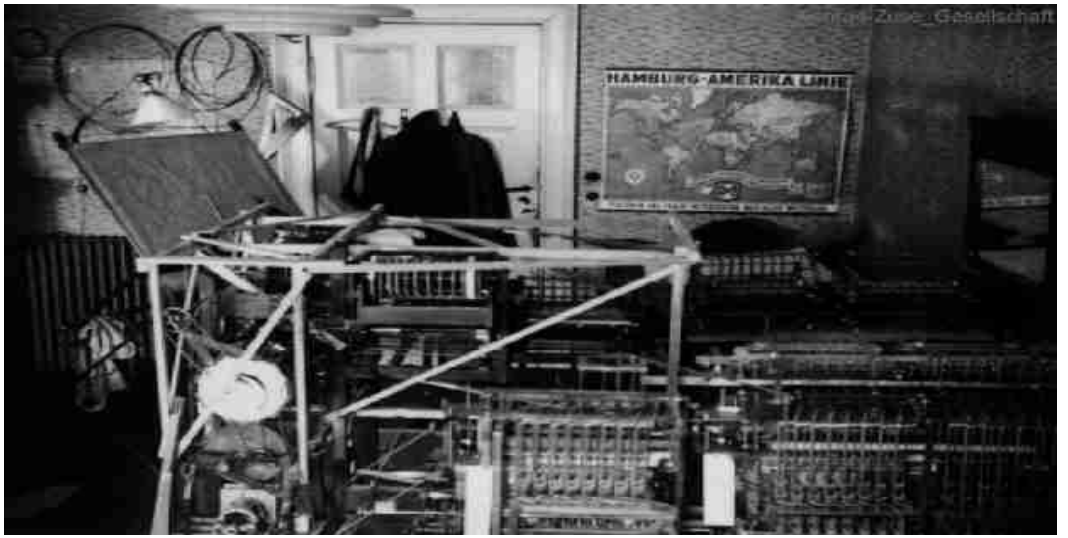
# Konrad Zuse (1910-1995)

- programmeeritavate arvutite pioneer Saksamaalt
- 1936-38: Z1: puhtmehaaniline
- 1938: Z2: rehkendus releedega
- 1941: Z3 perfolindiga, universaalselt programmeeritav (esimene programmjuhtimisega arvuti)
- 1944-50: Z4: kommertsiaalne digitaalarvuti Zürichi tehnikaülikoolile:
  - Releedega rehkendus
  - Mehaaniline mälu
- 1950-1967: Z5 ... Z64
- Aastaks 1967 oli Zuse KG ehitanud kokku 251 arvutit. Finantsprobleemide tõttu müüdi ettevõte Siemensile.

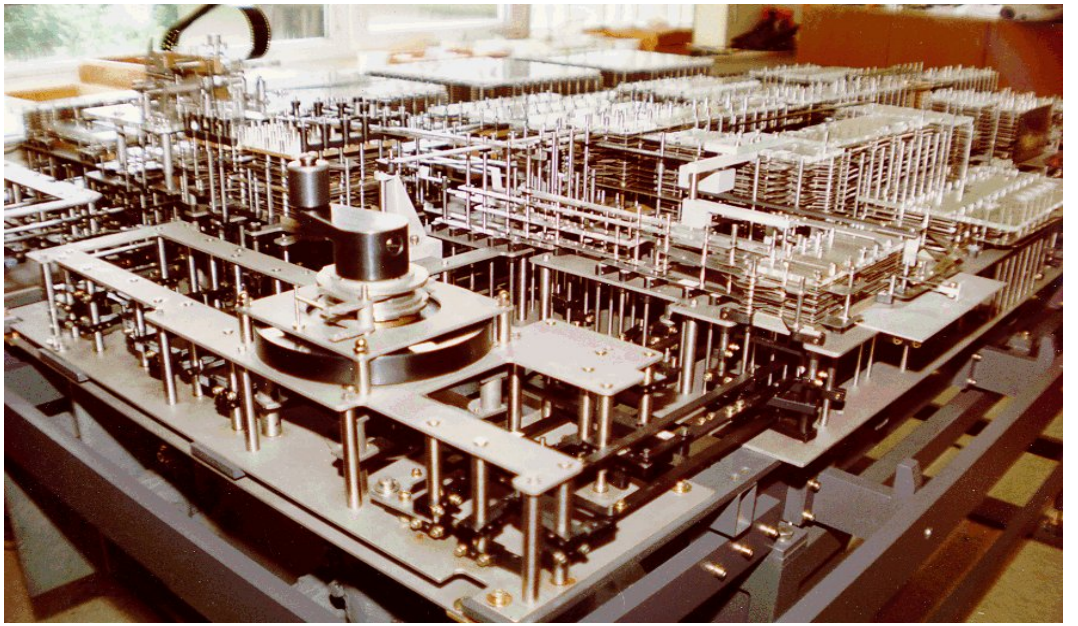


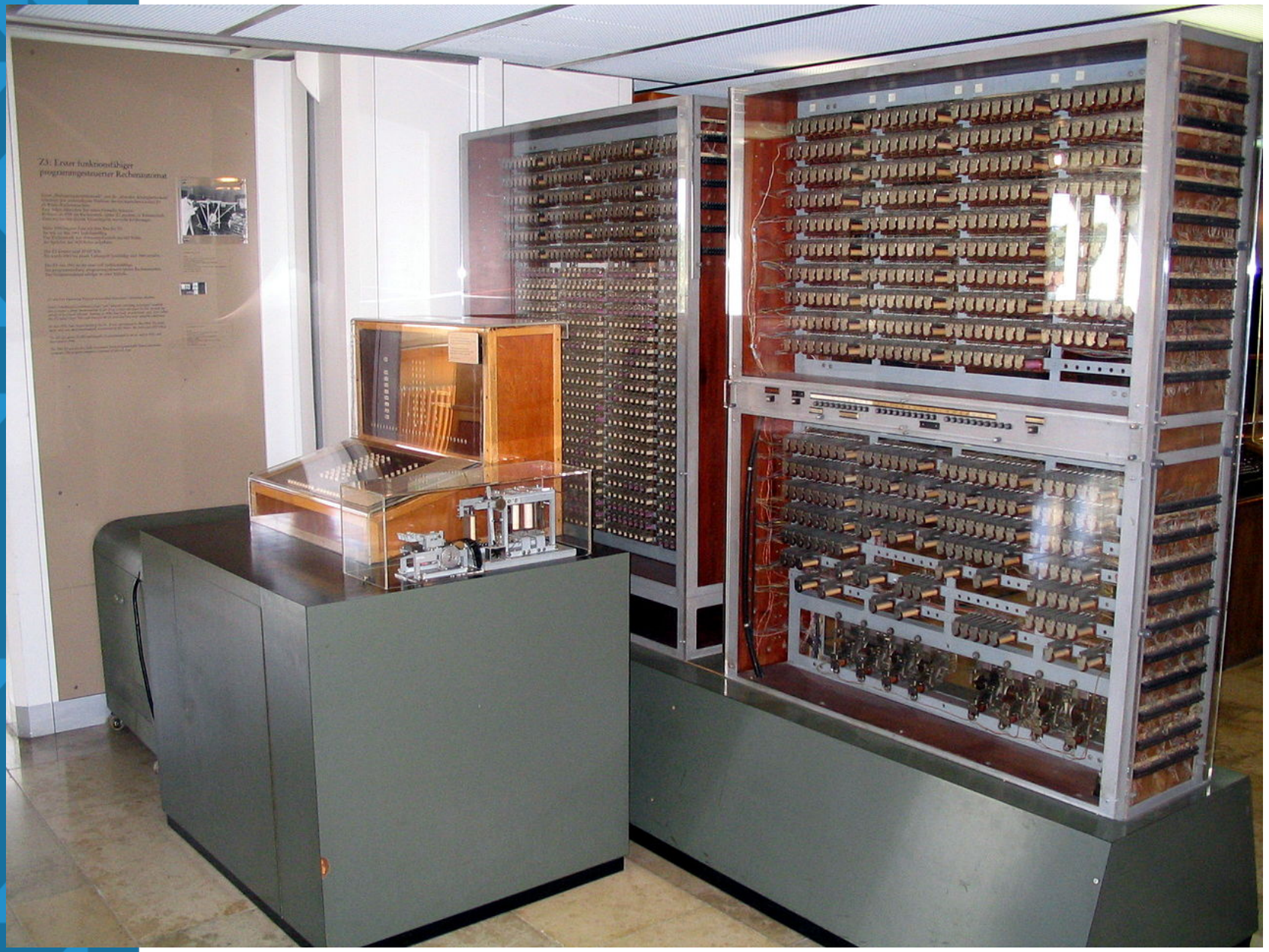
https://en.wikipedia.org/wiki/Konrad_Zuse
https://en.wikipedia.org/wiki/Z3_(computer)

# Zuse arvutid




Z1
1936-1938

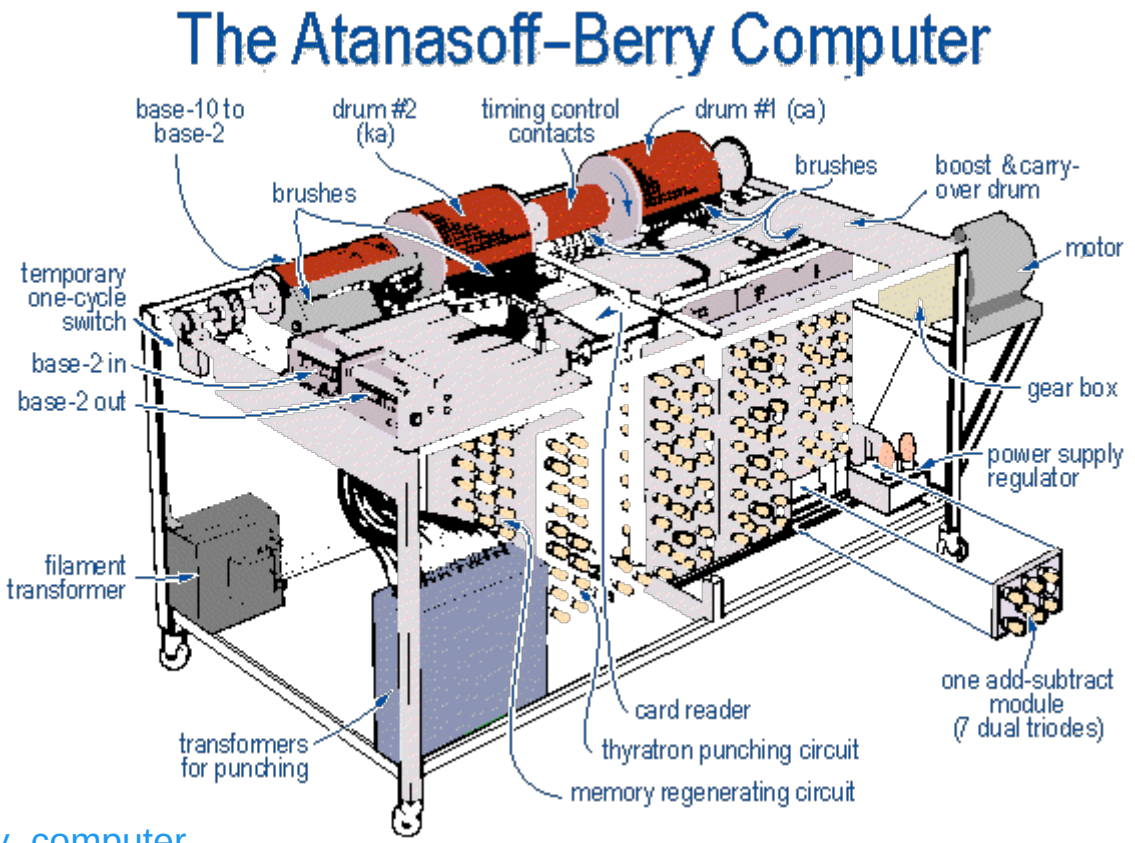





Z3 Saksa muuseumis Münchenis

# Atanasoff’i arvuti

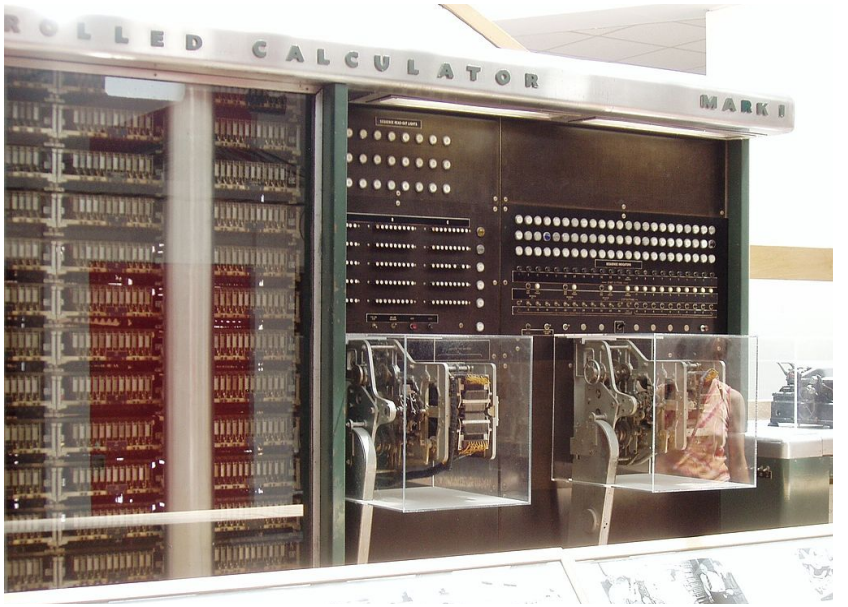
- John Vincent Atanasoff
- 1939-1942: esimene elektronarvuti?




https://en.wikipedia.org/wiki/Atanasoff–Berry_computer

# Harvard Mark I (1937-1944)

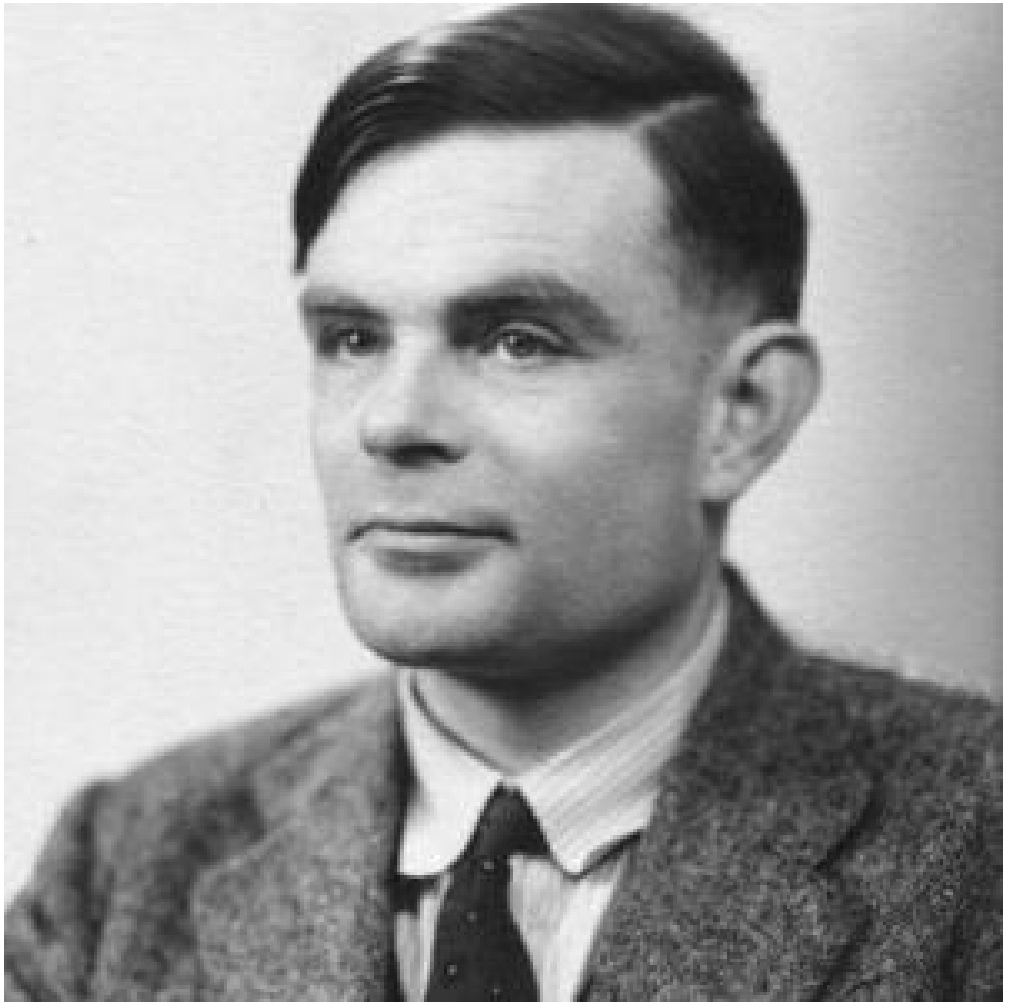
- elektromehaaniline arvuti
- kasutati II maailmasõjas
- esimesed arvutused John von Neumanni poolt 1944 tuumapommi plahvatama panekuks, mida 1945 kasutati
- 4500 kg, põhiarvutuste moodulit käivitas 5 hj (3,7 kW) elektrimootor
- pidas meeles kuni 72 numbrit (23-kohalist)
- korrutamine 6s, jagamine 15,3s; logaritm, trigonomeetria üle minuti


https://en.wikipedia.org/wiki/Harvard_Mark_I
https://en.wikipedia.org/wiki/Harvard_Mark_II
https://en.wikipedia.org/wiki/Harvard_Mark_III

# Alan Turing (1912-1954)

- panustas Enigma lahtimurdmisesse
- avaldas 1950 “Computing machinery and intelligence”, millest sündis Turingi test
- Turingi masin – idealiseeritud arvuti, mida reaalsest arvutist eristab lõpmatu sisemälu ja eksimatus. See koosneb lõpmatust lindist, lugevast ja kirjutavast peast, sisemälust ja käskude tabelist.



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

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

http://www.radiolab.org/story/193037-turing-problem/

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

# John von Neumann (1903-1957)

- 1945 avaldas artikli andmete elektroonilisest sorteerimisest (*merge sort*)
- Von Neumanni arhitektuur arvutite ehitamiseks

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

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

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

# Esimesed seeriaarvutid

- 1951 **Univac – 1** (USA)
- 1953 – IBM 701
- 1955 – NORC (60 000 op/s – maailma-rekord kiiruses)
- 1953 – Strela (NSVL)
- 1954 - Ural

# 2. põlvkond - transistorarvutid

- 1947 leiutati transistor e. pooljuht (Belli laborid, USA)
- 1950ndate keskel algas transistoride kasutamine arvutites
- Esimesed transistorarvutid:
  - 1958 Philco 2000
  - 1959 IBM 7090
  - 1959 Sirius (Inglismaa firma Ferranti)

+ väikesed mõõtmed, väike energiatarve, suurenenud töökindlus

# William Shockley (1910-1989)

- üks transistorite leiutajatest aastal 1947
- 8 tema töötajat läksid tööle ettevõttesse Fairchild Semiconductor

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

# FAIRCHILD'S OFFSPRING

**1955 Shockley Labs***
William Shockley, eight others

Co-inventor of the transistor, Shockley recruited eight young men from East Coast labs to develop the technology. They left because of Shockley's erratic management style and became the founding cadre for the West Coast semiconductor industry.

**1957 Fairchild Semiconductor***
(From left) Gordon Moore, Sheldon Roberts, Eugene Kleiner, Robert Noyce, Victor Grinich, Julius Blank, Jean Hoerni, Jay Last

Founded by "The Traitorous Eight" from Shockley, Fairchild was the first company to work exclusively in silicon. It spawned more than 30 Silicon Valley companies, including Intel, Advanced Micro Devices, and National.

**1969 Four Phase***
Lee Boysel, Jack Faith

**1972 Kleiner Perkins Caufield & Byers**
Eugene Kleiner

**1980 LSI Logic**
Wilfred Corrigan

**1969 AMD**
W.J. Sanders III, seven others

Flamboyant Sanders left Fairchild to found this up-and-down rival to Intel. The swing is up right now.

**1983 Cypress**
T. J. Rodgers, Lowell Turiff

**1967 National Semiconductor**
Charles Sporck, two others

After leaving Fairchild, Sporck ran National for 24 years, building it into a giant in analog and digital chips.

**1961 Signetics***
(now Philips Semiconductor) David Allison, David James, Lionel Kattner, Mark Weissenstern, two others

**1968 Computer Microtechnology***
John Schroeder, Jack Schmidt, two others

**1968 Intel**
Robert Noyce, Gordon Moore

The king of PC microprocessors, Intel is now the largest chip company in the world, with revenues topping $20 billion. Most Intel execs stay on board instead of launching startups.

**1981 SEEQ**
Gordon Campbell, George Perlegos

**1985 Cirrus Logic**
Michael Hackworth, Kamran Elahian, five others

**1973 Synertek***
Robert Schreiner, R. Barringer, six others

**1981 Linear Technology**
Robert Swanson, Robert Dobkin

**1993 NeoMagic**
Kamran Elahian, Prakash Agarwal

**1979 VLSI Technology**
Jack Baletto, Dan Floyd, Gunnar Wetlesen

**1974 Zilog***
Federico Faggin, Ralph Ungermann

**1985 Chips & Technologies***
Gordon Campbell, Dado Banatao, two others

**1985 Atmel**
George Perlegos, Tsung-Ching Wu

**1983 Sierra Semiconductor**
James Diller, four others

**1996 Planet Web**
Kamran Elahian

**1984 Xilinx**
Bernard Vonderschmitt

**1989 S3**
Ron Yara, Dado Banatao

**1994 3Dfx**
Gordon Campbell, Scott Sellers

**1983 SDA Systems***
James Soloman

**1983 Wafer Scale Integration**
Eli Harari

**1986 Synaptics**
Federico Faggin, Carver Mead

# 2. põlvkond jätkub...

- 1961 Stretch (IBM), kiirus 700 000 op/s
- 1962 Atlas (Ferranti)
- Hakkas arenema arvutitööstus Prantsusmaal, Saksamaal, Jaapanis
  - 1961 Razdan-2 (NSVL)
  - Ural-11,14,16
  - 1967 Robotron 300 (Saksa DV)

# 3. põlvkond - integraalarvutid

- Elektroonikalülituste põhikomponendiks on ühe pooljuhtkristallplaadikese pinnale elementidest ja ühendustest monoliitsena moodustatud elektroonikalülitus.
- 1958 - J. S. Kilby ja R. Noyce valmistasid (teineteisest sõltumatult) esimese integraallülituse
- 1960. aastate lõpul suudeti ühele kristallile moodustada **mitu tuhat transistori**.

# 3. põlvkond jätkub...

- Uued lahendused arvuti **struktuuris** ja **tööviisis** (multiprogrammeerimine, ajajaotus, virtuaalmälu).
- Esindajad:
  - 1965- **ühilduvad** arvutid (pere IBM/360)
  - IBM/360 eeskujul on tehtud vene EC-tüüpi arvutid.
- **superarvutid** (põhiline on kiirus) vs. **miniarvutid** (esikohal töökindlus ja vastupidavus)

# 4. põlvkond - suurel arvul (≥100 000) integraallülitustel põhinevad arvutid

- Pooljuhid ka arvutite põhimälus
- **Mikroprotsessor** – arvuti kesksеadme (CPU) kõik elektronlülitused mahutatud ühele kristallile.
- 1971 IBM 370
- **kiip** (*chip*) – väike pooljuhtmaterjali (enamasti räni) kristall, millele on tekitatud integraalskeem.
  - väiksem kui 0,5 $cm^2$
  - sisaldab miljoneid transistore.
  - Kiibid monteeritakse jalgadega varustatud plastmassist korpustesse.
  - Tavaliselt mõeldaksegi kiibi all mitte kristalli ennast, vaid juba korpusesse monteeritud valmistoodet.
  - Arvutid sisaldavad tervet hulka trükkplaatidele monteeritud kiipe.

# Inteli protsessorite võrdlus

Mahukam Wikipedia artikkel

| Mikro-protsessor | Valmi-nud | Sõna-pikkus(bitti) | Transis-tore | Kiirus (MHz) | Märkus |
|---|---|---|---|---|---|
| 8080 | 1974 | 8 | 5 000 | 2 | |
| 8086 | 1978 | 16 | 29 000 | 5-10 | |
| 8088 | 1979 | 16 | 29 000 | 4.77 | matem. |
| 80286 | 1983 | 16 | 175 000 | 8-12 | |
| 80386 | 1987 | 32 | 275 000 | 16-33 | |
| 80486 | 1989 | 32 | 1 200 000 | 25-50 | |
| Pentium | 1993 | 64 | 3 100 000 | 60-166 | |
| Pentium Pro | 1995 | 64 | 5 500 000 | 150-200 | |
| Pentium II | 1997 | 64 | 7 500 000 | 233-300 | MMX |
| Pentium III | 1999 | 64 | 9 500 000 | 350-1000 | |
| Pentium IV | 2000 | 64 | >42 000 000 | 1300-3800 | |

# Veel 4. põlvkonnast

- 1980ndad - superarvutite võidukäik USA-s ja Jaapanis, kiirus 1-3 miljardit op/sek
- 1981 personaalarvuti IBM PC

# 5. põlvkond

- 1981 Jaapani valitsuse projekt 5. põlv-konna arvuti loomiseks. 1991. aastaks pidi valmima arvuti, mis...
  - Asendab keskmise intellektiga inimest.
  - Täidab suulisi juhiseid ja jäljendab võimalikult täpselt inimmõtlemist.

→ tehisintellekt, loogiline programmeerimine, keeletehnoloogia ...

# 5. põlvkond - järg

- 1985 loobus Jaapani valitsus sellest projektist.
- Teistsuguse arhitektuuriga, loogilist programmeerimist toetav arvuti ei õigustanud ennast.
- Aga… Teadvustati inimese-arvuti suhtluse hõlbustamise vajadust → intellektitehnika ja keeletehnoloogia kiire areng

# 5. põlvkond - järg

- Fifth Generation Computer Corporation (FGC) kavandab ja ehitab mitmeprotsessorilisi serverarvuteid (MP Servers) ja kõnetuvastusarvuteid, kasutades eesrindlikke mitmeprotsessori- ja kõnetuvastustehnoloogiaid. Kasut. näiteks telekommunikatsioonifirmade poolt.
- pideva kõne tuvastus reaalajas
- FGC asutati 1980ndate alguses New Yorkis

# 6. põlvkond (1990-...)

- Paralleelarvutused - nii riistvaraline kui tarkvaraline tugi
- Interneti plahvatuslik levik
  - rakendatakse sadu ja tuhandeid protsessoreid paralleelselt
  - arvutivõrgus jagatakse ülesanne tööjaamade vahel

Protsessoride võrdlemine

Teinegi protsessorite võrdlemise leht

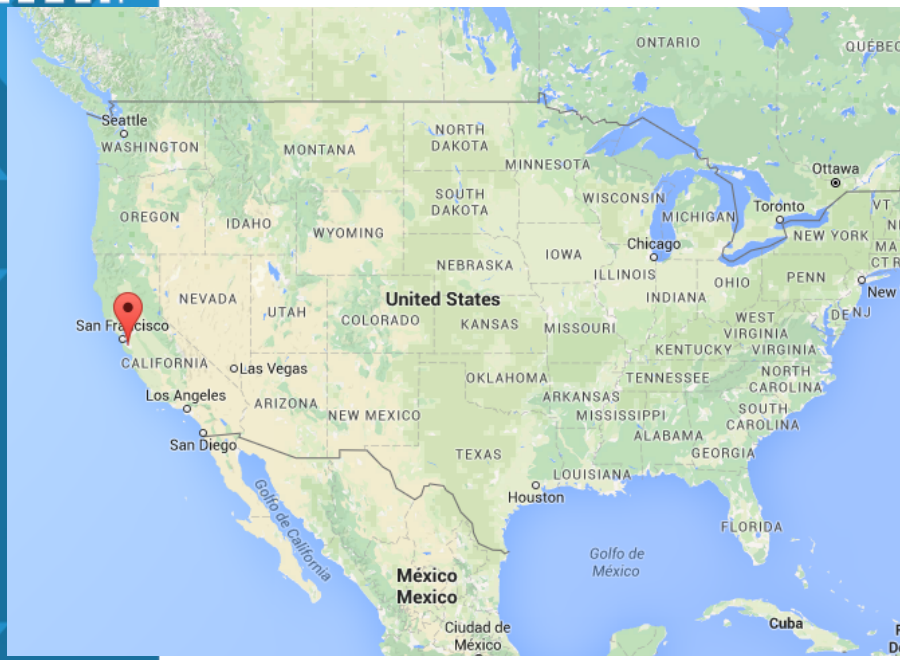
Arvutitega seonduvad võrdlemised

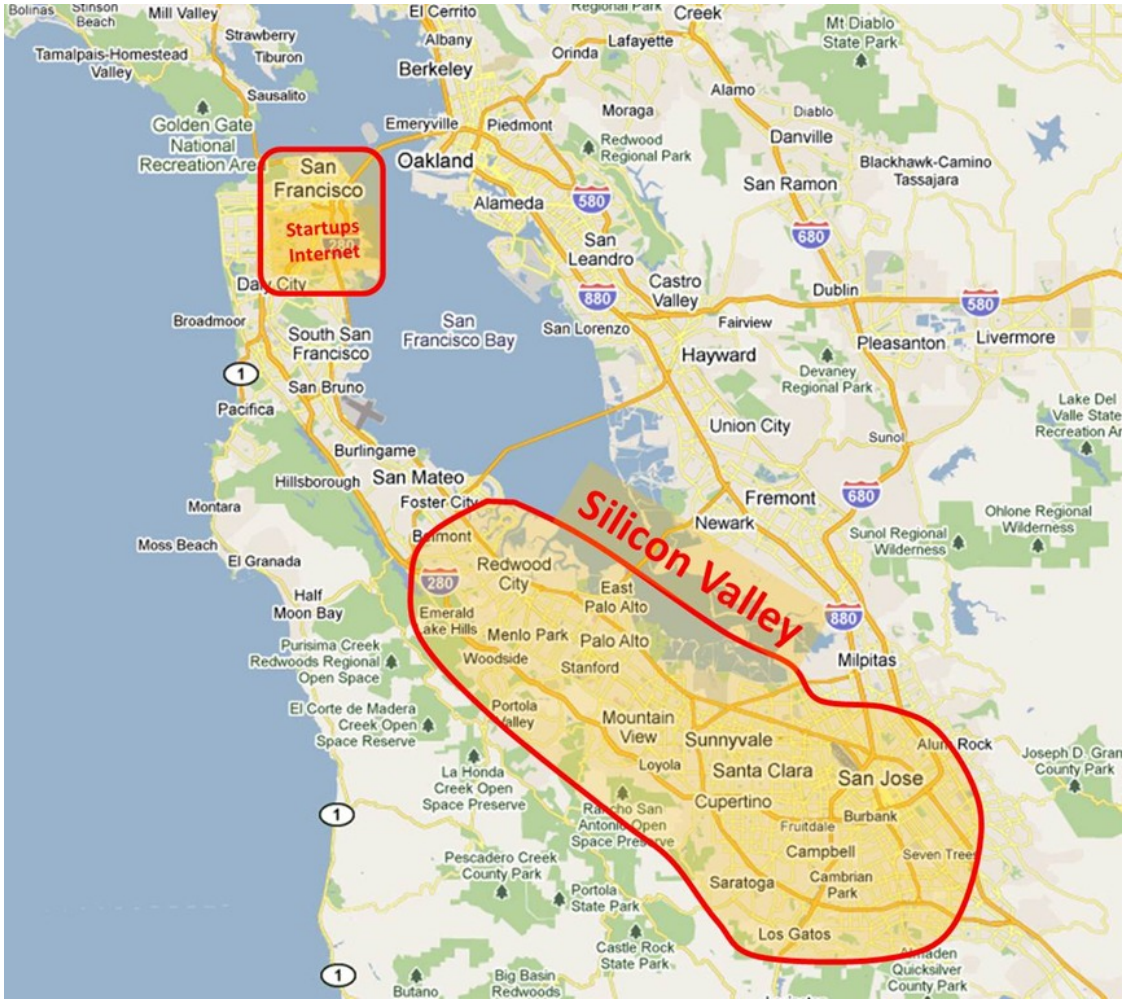
Parimad lauaarvutid

Sülearvutite võrdlus, jne

Parimad koduarvutid

# Arvutiteaduse, -äri häll – Silicon Valley (Räniorg)



# Arvutiteaduse häll – Silicon Valley (Räniorg)

# Silicon Valley juured

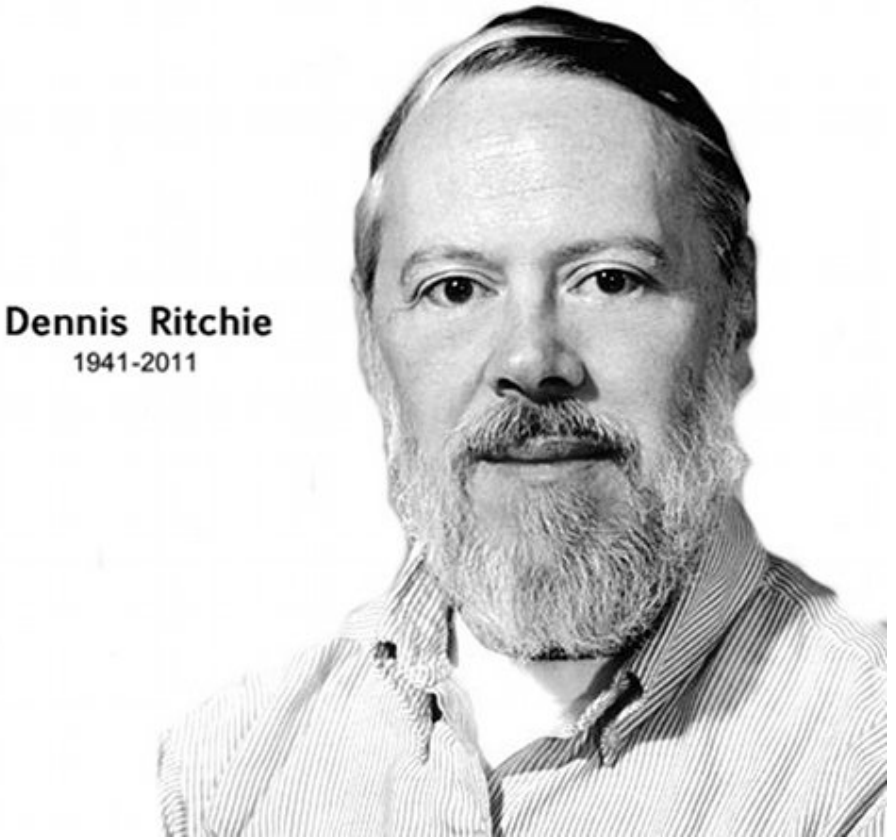
- raadioamatöörid, telegraaf, sõjatehnoloogia
- Stanford Industrial Complex (radarikomponendid)
- vastuseks vene satelliidi Sputniku üleslaskmisele 1957 loodi ettevõte Fairchild Semiconductor – esimene pooljuht ränitransistorite tegija (germaanium)
- saadaval riskikapital uute ideede teostamiseks
- ränitransistor
- Homebrew Computer Club
- Stanfordi Ülikool

https://en.wikipedia.org/wiki/Silicon_Valley
https://en.wikipedia.org/wiki/Fairchild_Semiconductor
https://en.wikipedia.org/wiki/Homebrew_Computer_Club
https://en.wikipedia.org/wiki/Sputnik_1
https://en.wikipedia.org/wiki/Stanford_University


IBM

# Dennis Richie (1941-2011)

- tuntud kui programmeerimiskeele C looja
- operatsioonisüsteemi UNIX kaasautor 1970-ndatel
- kauaaegne teadlane Bell Labs'is

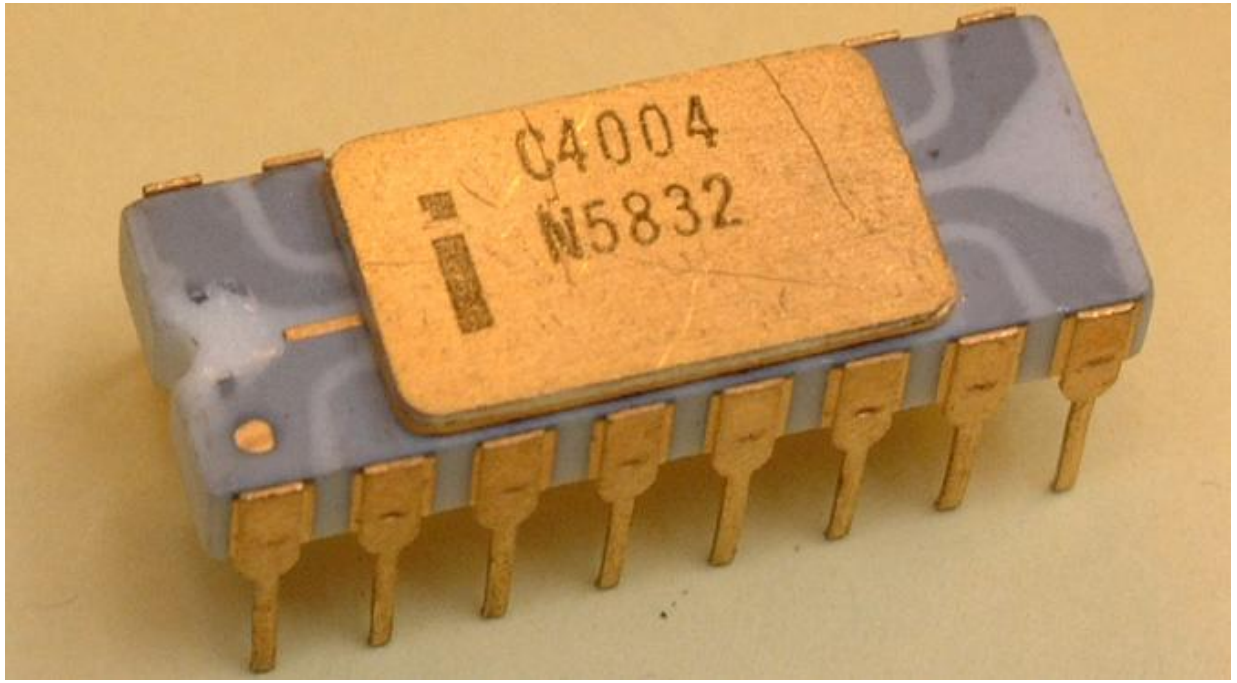



https://en.wikipedia.org/wiki/Dennis_Ritchie

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

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

# Intel 4004 mikroprotsessor (1971)




-2300 transistori
-10 µm detailide mõõtmed
-10 $mm^2$ kiip
-108 kHz

https://en.wikipedia.org/wiki/History_of_general-purpose_CPUs
https://en.wikipedia.org/wiki/Microprocessor_chronology
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https://en.wikipedia.org/wiki/Instructions_per_second
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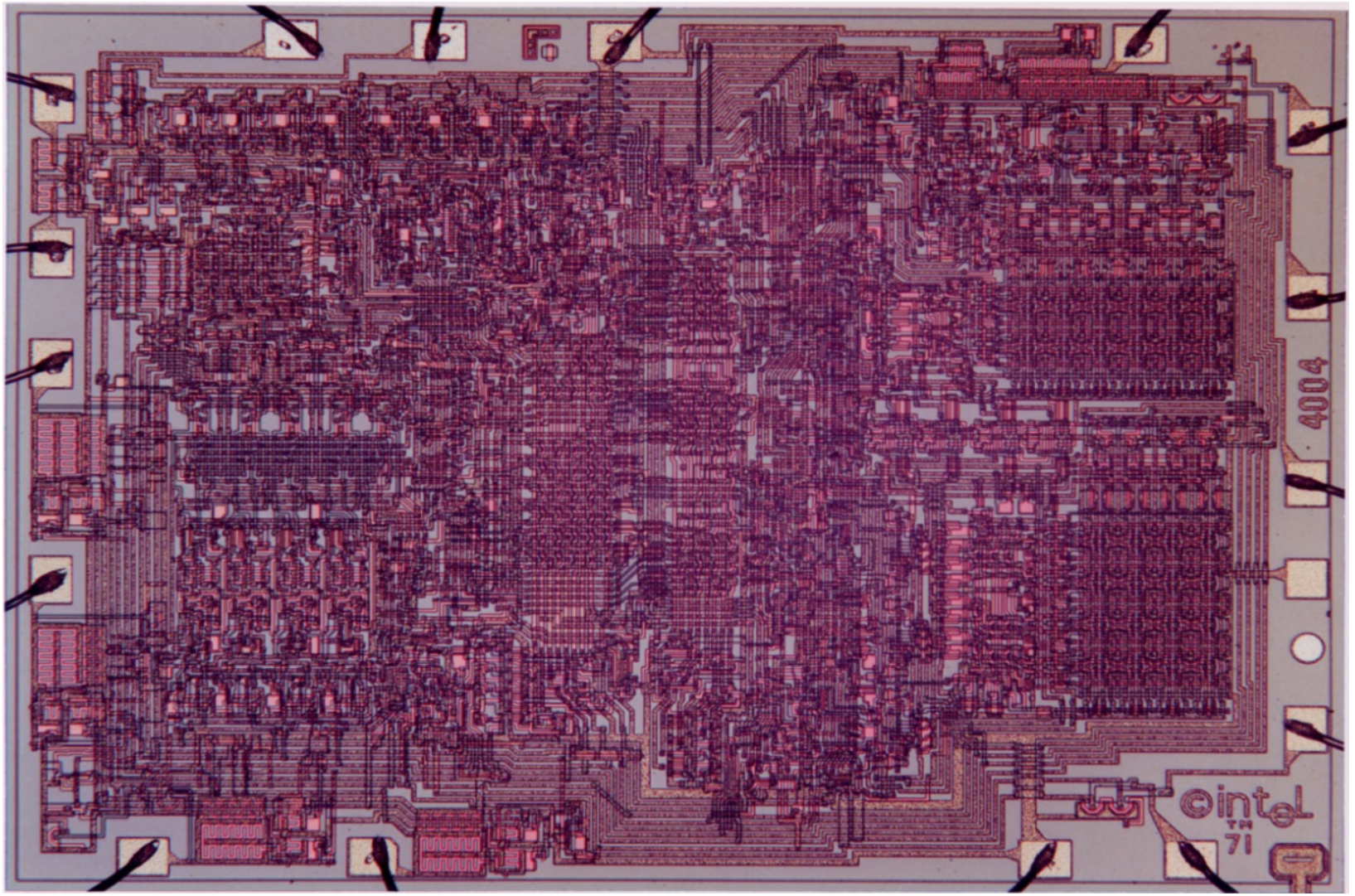
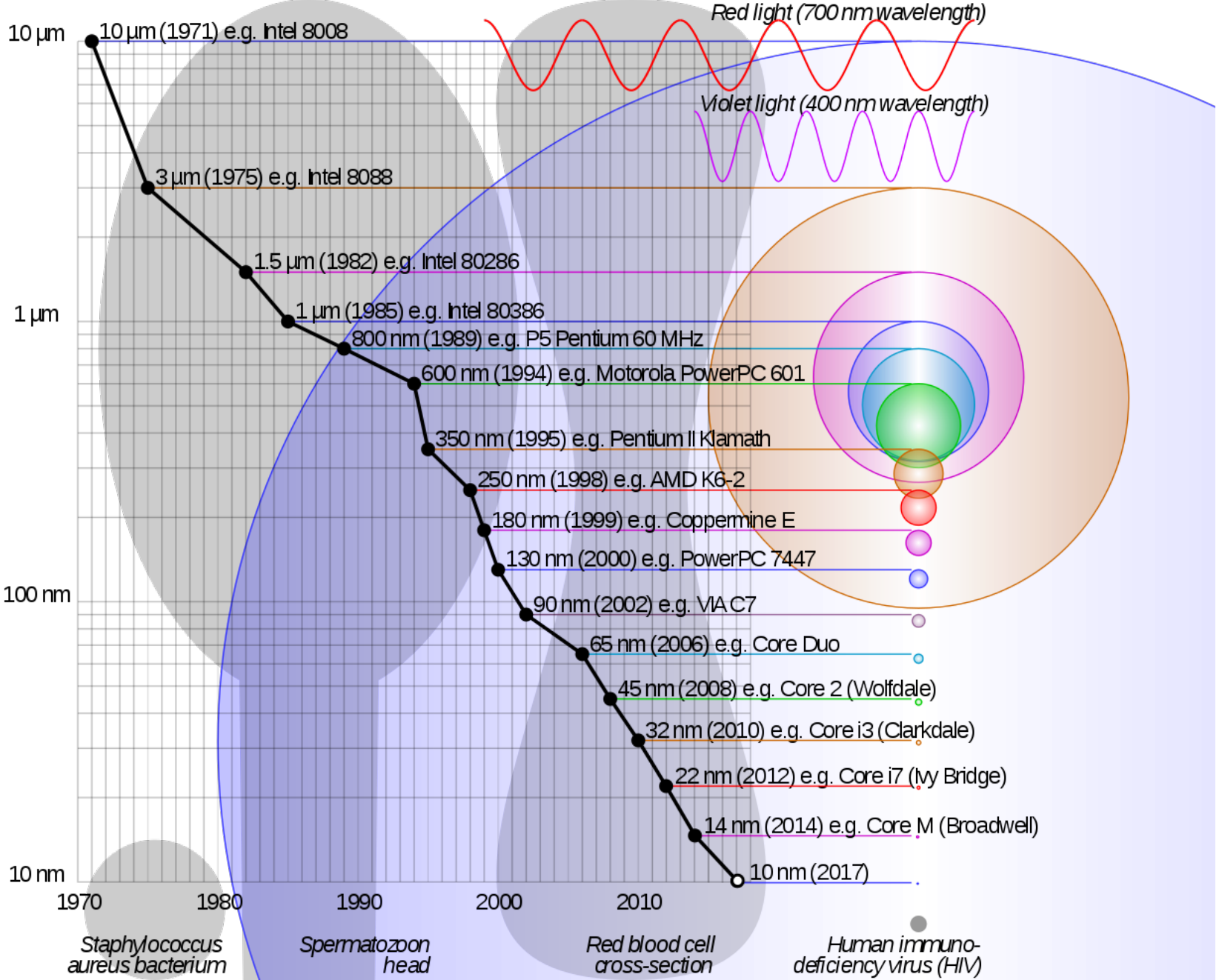
https://www.extremetech.com/computing/105107-4004-to-sandy-bridge-40-years-of-intel-cpus

# Intel 4004 mikroprotsessor (1971)






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

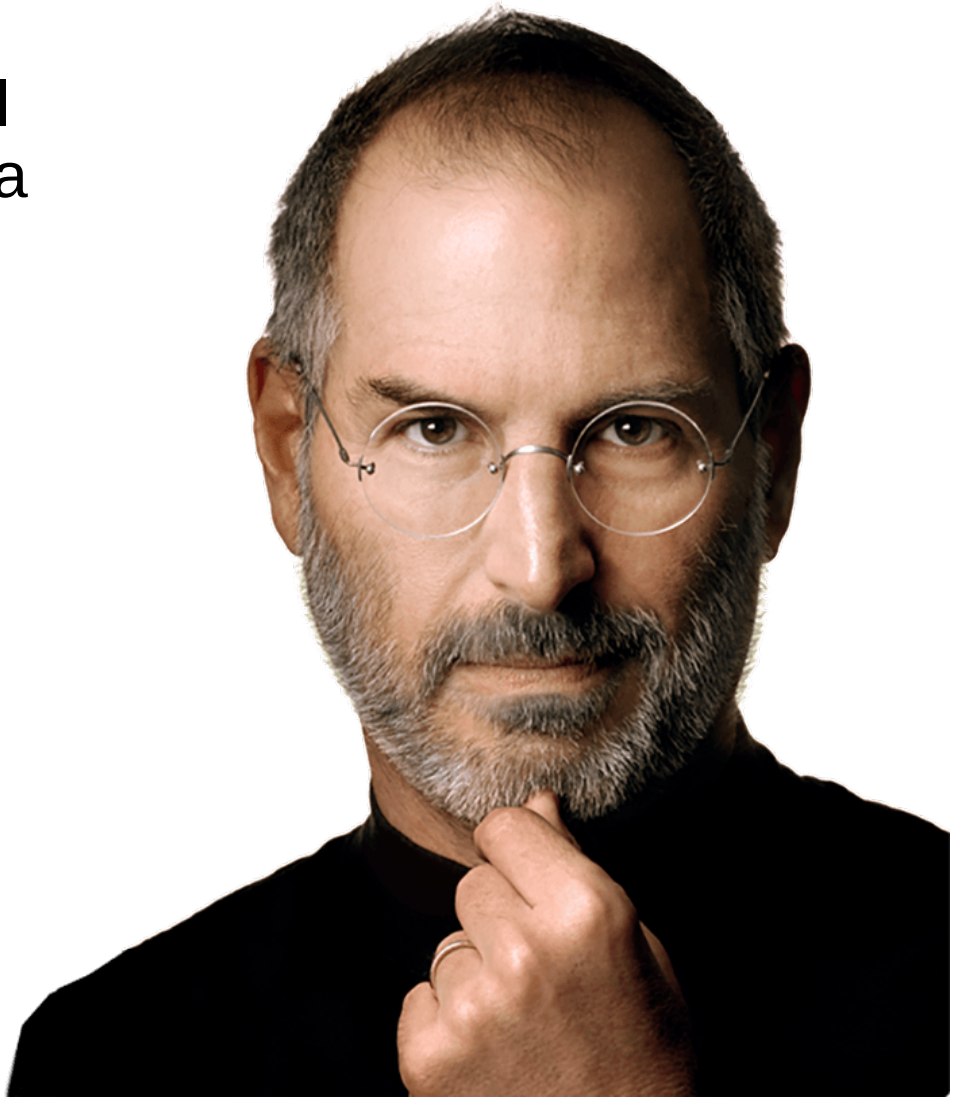
# Bill Gates (1955)

- asutas ettevõtte Microsoft 1975 koos Paul Allen’iga
- müüs MS-DOS’i litsentsi IBM’ile

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

# Steve Jobs (1955-2011)

- asutas ettevõtte Apple aastal 1976 koos Steve Wozniak'iga
- Macbook, iPhone, iPad jne disain



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

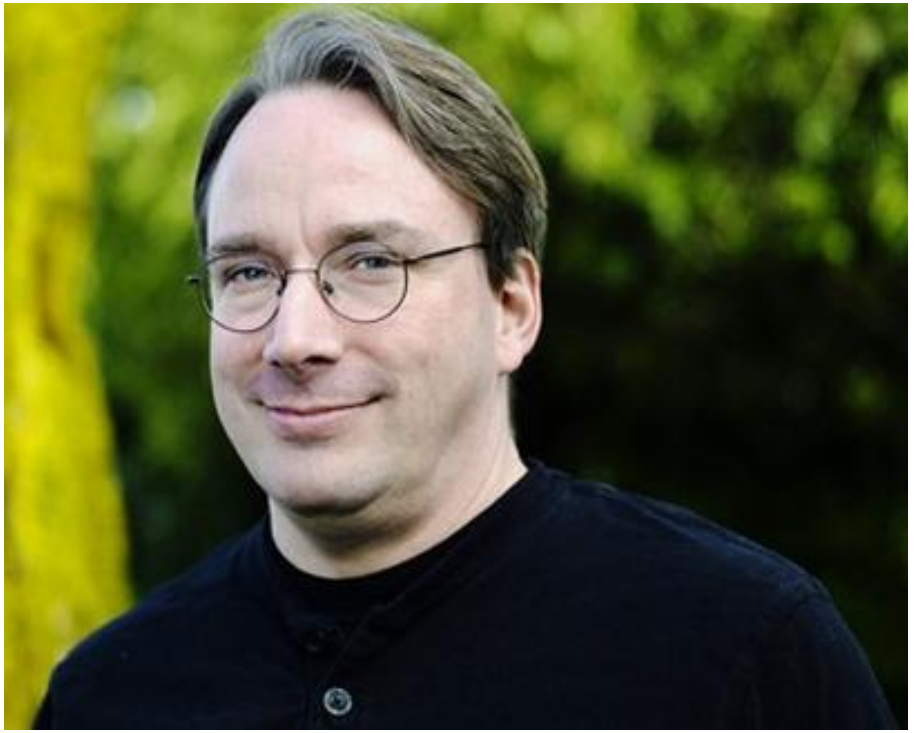
# Richard Stallman (1953)

- 1983 käivitas projekti GNU
- 1985 Vaba Tarkvara Fondi asutaja
- kirjutas GPL-litsentsi
- 1976 Emacs tekstiredaktor
- 1987 GCC – GNU C Compiler
- mitmete algatuste ja kampaaniate autor

https://en.wikipedia.org/wiki/Richard_Stallman
https://www.gnu.org/licenses/gpl.htm
https://en.wikipedia.org/wiki/Free_software_movement
https://en.wikipedia.org/wiki/Emacs
https://en.wikipedia.org/wiki/GNU_Compiler_Collection
https://en.wikipedia.org/wiki/Free_Software_Foundation

# Linus Torvalds (1969)

- avaldas operatsioonisüsteemi tuuma aastal 1991, mis hiljem sai nime Linux
- Git'i looja



https://en.wikipedia.org/wiki/Linux
https://en.wikipedia.org/wiki/Git
https://en.wikipedia.org/wiki/Linus_Torvalds

# sir Tim Berners-Lee (1955)

- ehitas esimese HTTP-serveri 1989 Euroopa Tuumauuringute Keskuses (CERN)
- asutas WWW konsortsiumi 1994

https://en.wikipedia.org/wiki/Tim_Berners-Lee

# WHO RUNS THE INTERNET?

## NO ONE PERSON, COMPANY, ORGANIZATION OR GOVERNMENT RUNS THE INTERNET.

The Internet itself is a globally distributed computer network comprised of many voluntarily interconnected autonomous networks. Similarly, its governance is conducted by a decentralized and international multi-stakeholder network of interconnected autonomous groups drawing from civil society, the private sector, governments, the academic and research communities, and national and international organizations. They work cooperatively from their respective roles to create shared policies and standards that maintain the Internet's global interoperability for the public good.

## WHO IS INVOLVED:

**IAB** A C P S R
INTERNET ARCHITECTURE BOARD
Oversees the technical and engineering development of the IETF and IRTF.
www.iab.org

**ICANN** C O P V
INTERNET CORPORATION FOR ASSIGNED NAMES AND NUMBERS
Coordinates the Internet's systems of unique identifiers: IP addresses, protocol parameter registries, top-level domain space (DNS root zone).
www.icann.org

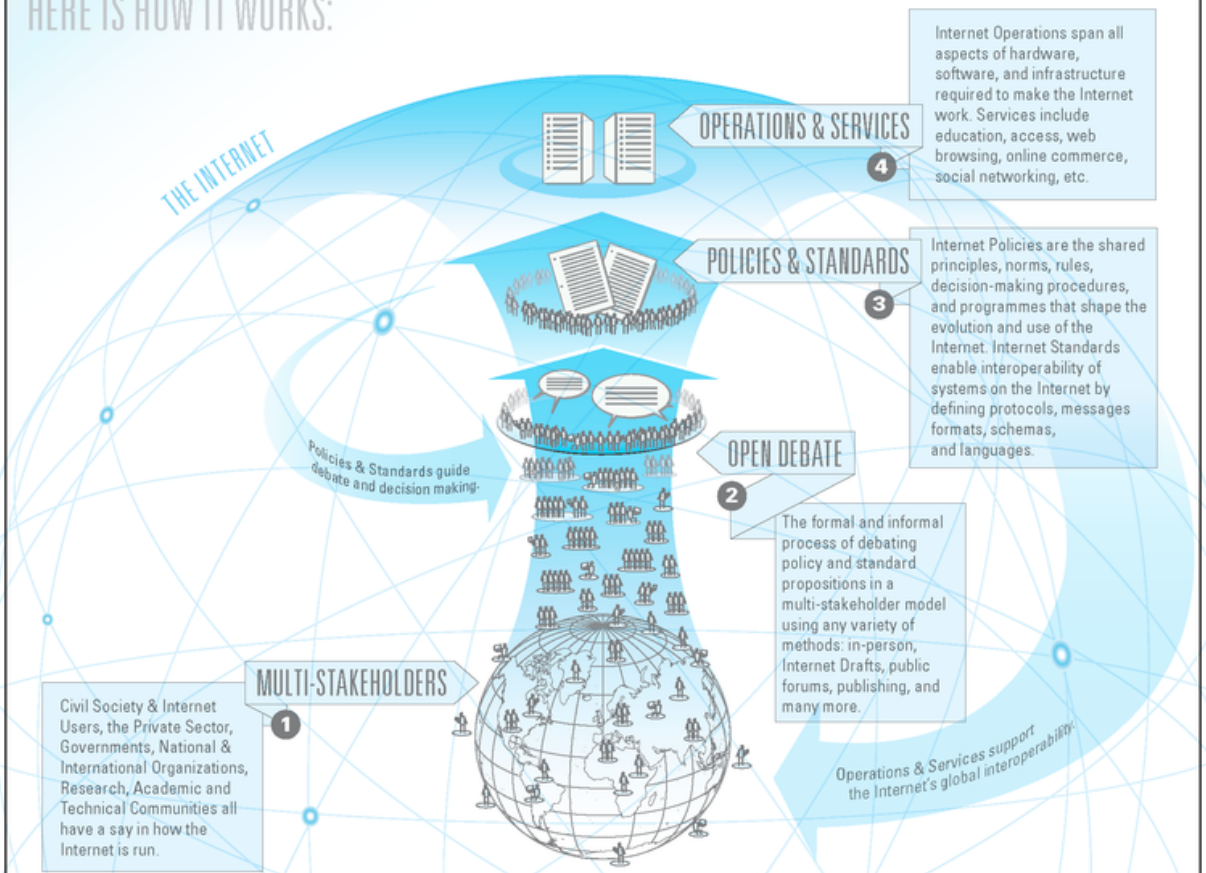
**IETF** C P S
INTERNET ENGINEERING TASK FORCE
Develops and promotes a wide range of Internet standards dealing in particular with standards of the Internet protocol suite. Their technical documents influence the way people design, use, and manage the Internet.
www.ietf.org

**IGF** A C P
INTERNET GOVERNANCE FORUM
A multi-stakeholder open forum for debate on issues related to Internet governance.
www.intgovforum.org

**IRTF** R
INTERNET RESEARCH TASK FORCE
Promotes research of the evolution of the Internet by creating focused, long-term research groups working on topics related to Internet protocols, applications, architecture and technology.
www.irtf.org

**GOVERNMENTS AND INTER-GOVERNMENTAL ORGANIZATIONS** C P
Develop laws, regulations and policies applicable to the Internet within their jurisdictions; participants in multilateral and multi-stakeholder regional and international fora on Internet governance.

## HERE IS HOW IT WORKS:




## WHO IS INVOLVED:

**ISO 3166 MA** S
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION, MAINTENANCE AGENCY
Defines names and postal codes of countries, dependent territories, special areas of geographic significance.
www.iso.org/iso/country_codes.htm

**ISOC** C E P V
INTERNET SOCIETY
Assure the open development, evolution and use of the Internet for the benefit of all people throughout the world. Currently ISOC has over 90 chapters in around 80 countries.
www.internetsociety.org

**RIRs** O P V
5 REGIONAL INTERNET REGISTRIES
Manage the allocation and registration of Internet number resources, such as IP addresses, within geographic regions of the world.

| | |
|---|---|
| www.afrinic.net | Africa |
| www.apnic.net | Asia Pacific |
| www.arin.net | Canada & United States |
| www.lacnic.net | Latin America & Caribbean |
| www.ripe.net | Europe, the Middle East & parts of Central Asia |

**W3C** S
WORLD WIDE WEB CONSORTIUM
Create standards for the world wide web that enable an Open Web Platform, for example, by focusing on issues of accessibility, internationalization, and mobile web solutions.
www.w3.org

**INTERNET NETWORK OPERATORS' GROUPS** A O V
Discuss and influence matters related to Internet operations and regulation within informal fora made up of Internet Service Providers (ISPs), Internet Exchange Points (IXPs), and others.

*This graphic is a living document, designed to provide a high level view of how the Internet is run. It is not intended to be a definitive guide. Please provide feedback at www.xplanations.com/whorunstheinternet*



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

# Amazon (1994)

- 1994 aastal asutas Jeff Bezoz ettevõtte Amazon
- 2015.a. kasum 107 mrd USD
- algselt e-äri platvorm
- tänaseks IaaS – Infrastucture as a Service

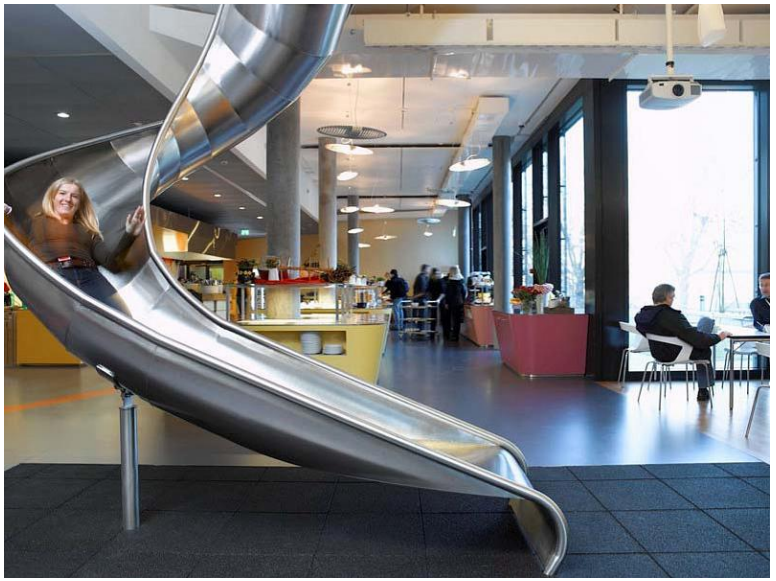
https://en.wikipedia.org/wiki/Cloud_computing

https://en.wikipedia.org/wiki/Amazon.com

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

# Google (1998)

- asutajad Sergei Brin, Larry Page
- kasutavad odavamat riistvara ja vaba tarkvara



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

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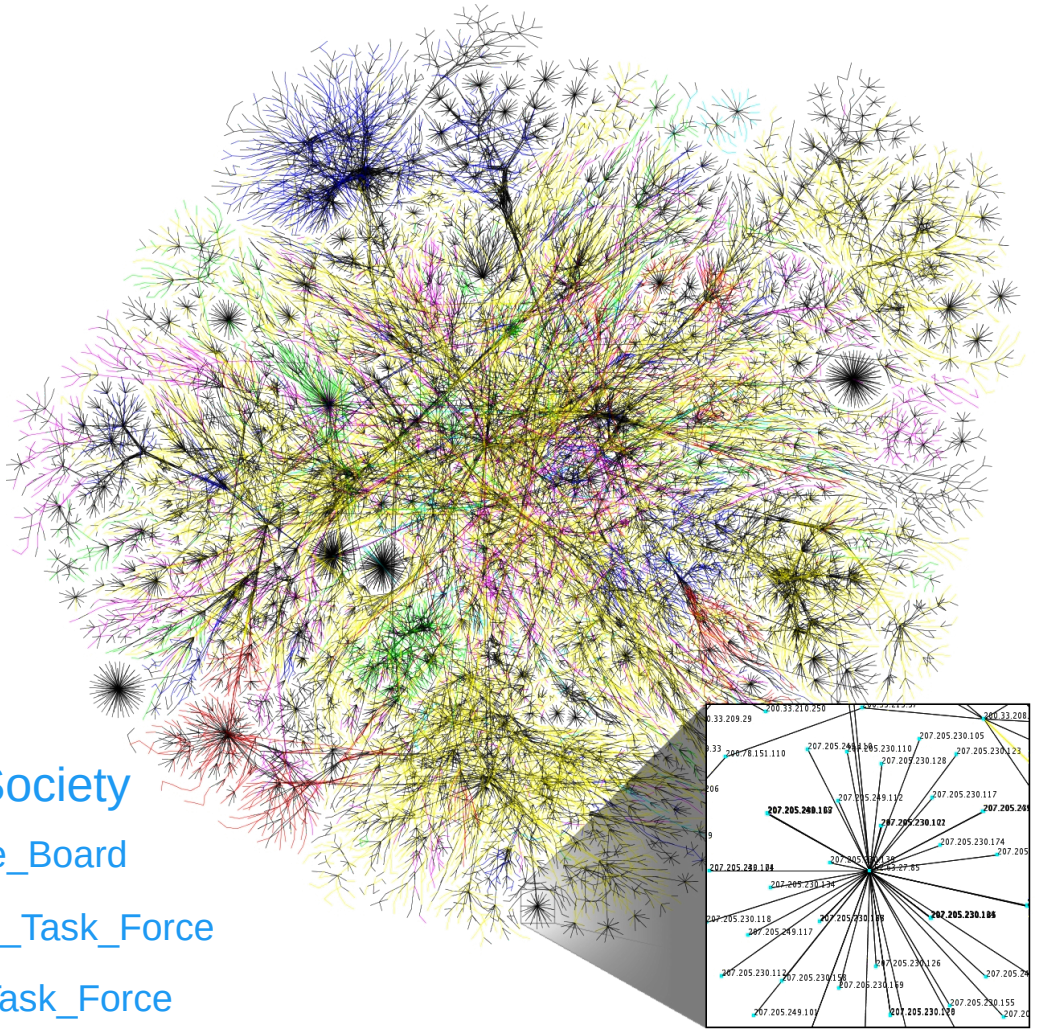
http://www.internetlivestats.com/google-search-statistics/

http://www.businessinsider.in/Heres-How-Much-Money-Big-Tech-Companies-Make-In-Just-One-Second/articleshow/34161370.cms

# Interneti standardid – ISOC (1992)

Internet Society (ISOC)

- standardid
- haridus
- ligipääs
- poliitika



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

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

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

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

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

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

# Tehnoloogia areng (*Gartner Hype Cycle*) lingid

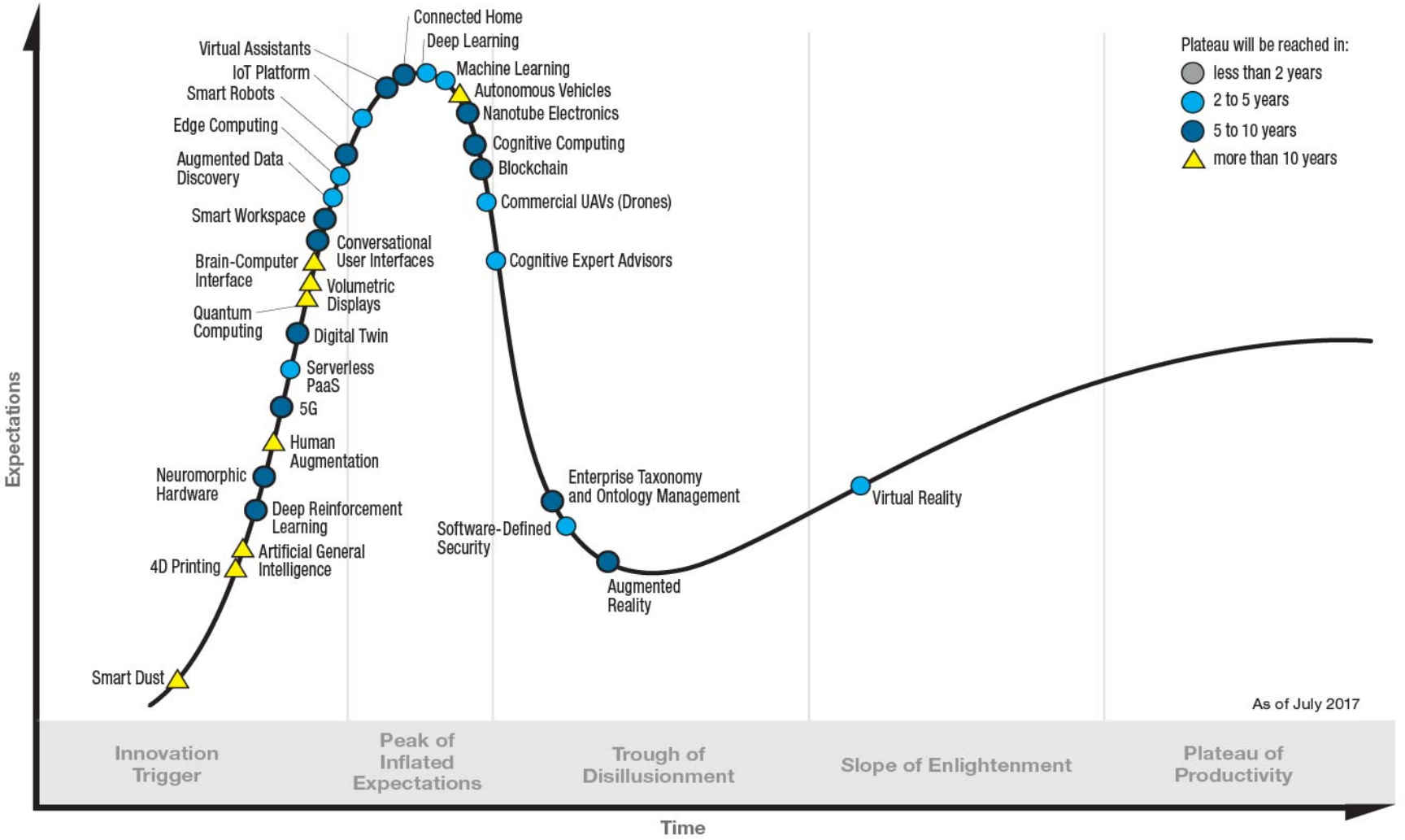
https://en.wikipedia.org/wiki/Gartner_hype_cycle
https://www.gartner.com/smarterwithgartner
https://www.gartner.com/en/research/methodologies/gartner-hype-cycle
https://www.gartner.com/smarterwithgartner/
https://www.gartner.com/en/information-technology/insights/top-technology-trends

Otsing internetist:
gartner hype cycle for emerging technologies

2021-2023 Emerging Technology Roadmap for Large Enterprises
https://emtemp.gcom.cloud/ngw/globalassets/en/publications/documents/le-emerging-tech-roadmap-2021-2023.pdf

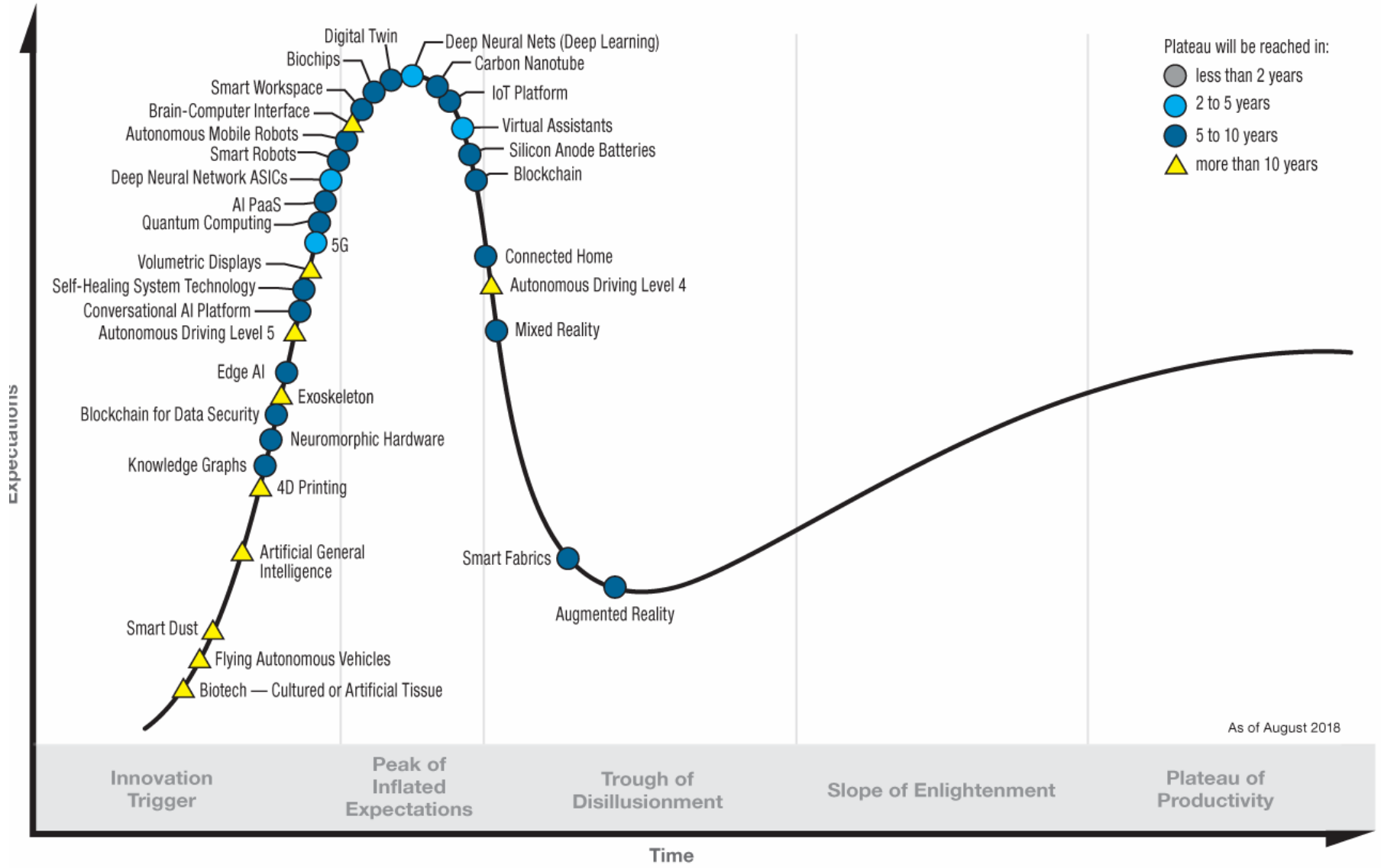
2021-2023 Emerging Technology Roadmap for Midsize Enterprises
https://emtemp.gcom.cloud/ngw/globalassets/en/publications/documents/mse-emerging-tech-roadmap-2021-2023.pdf

# Tehnoloogia areng (*Gartner Hype Cycle*) 2017

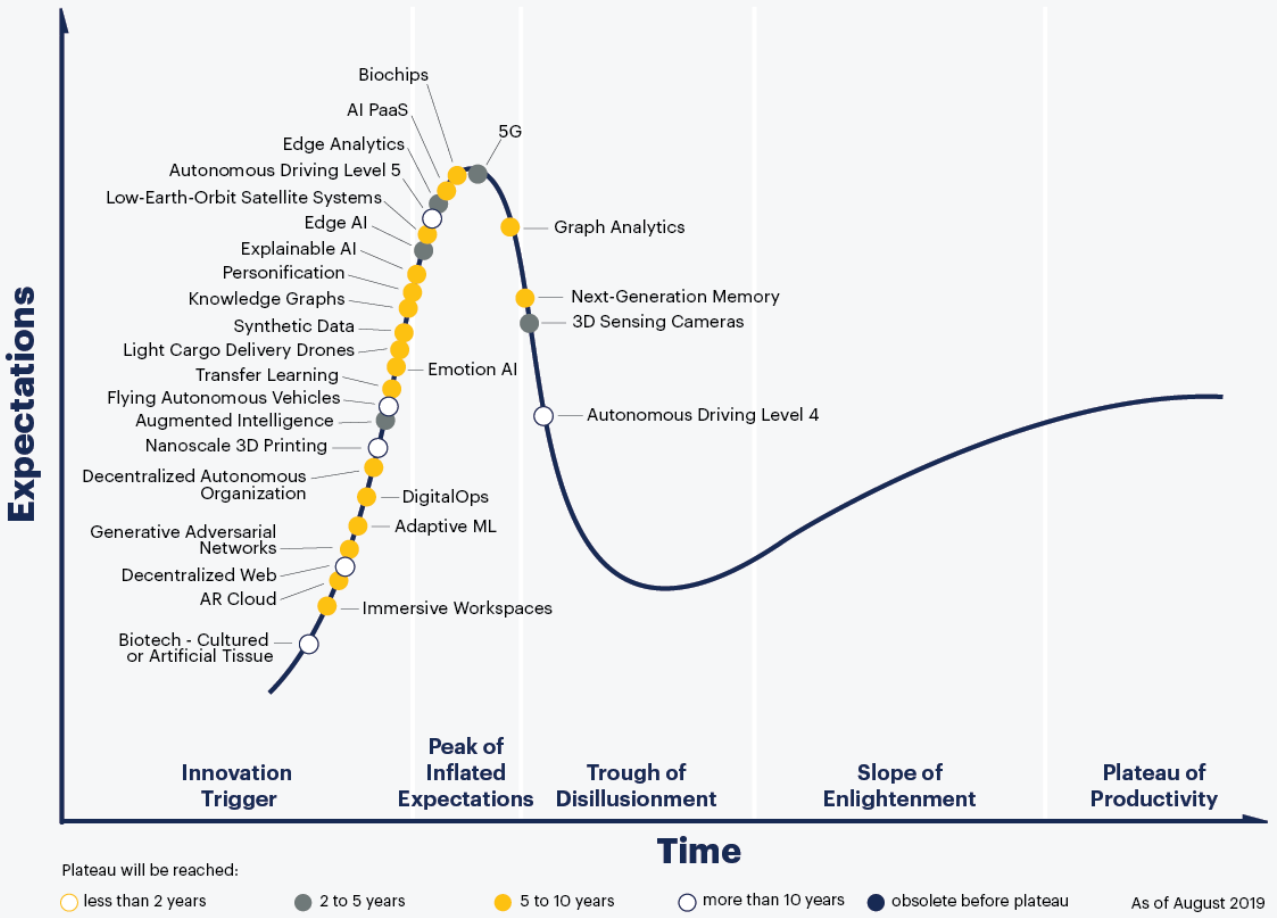



https://www.gartner.com/smarterwithgartner/top-trends-in-the-gartner-hype-cycle-for-emerging-technologies-2017/

# Tehnoloogia areng (*Gartner Hype Cycle*) 2018

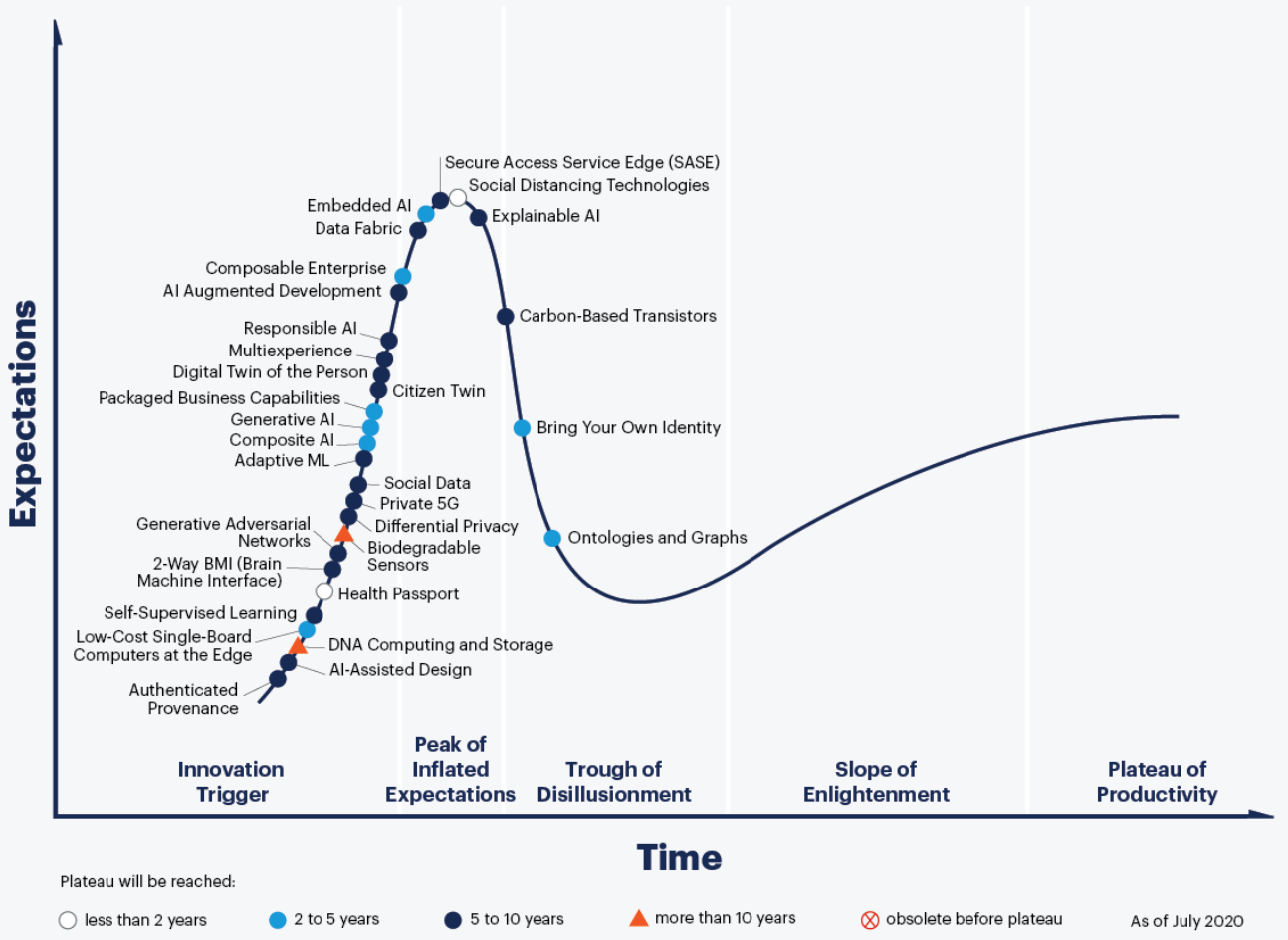


# Tehnoloogia areng (*Gartner Hype Cycle*) 2019



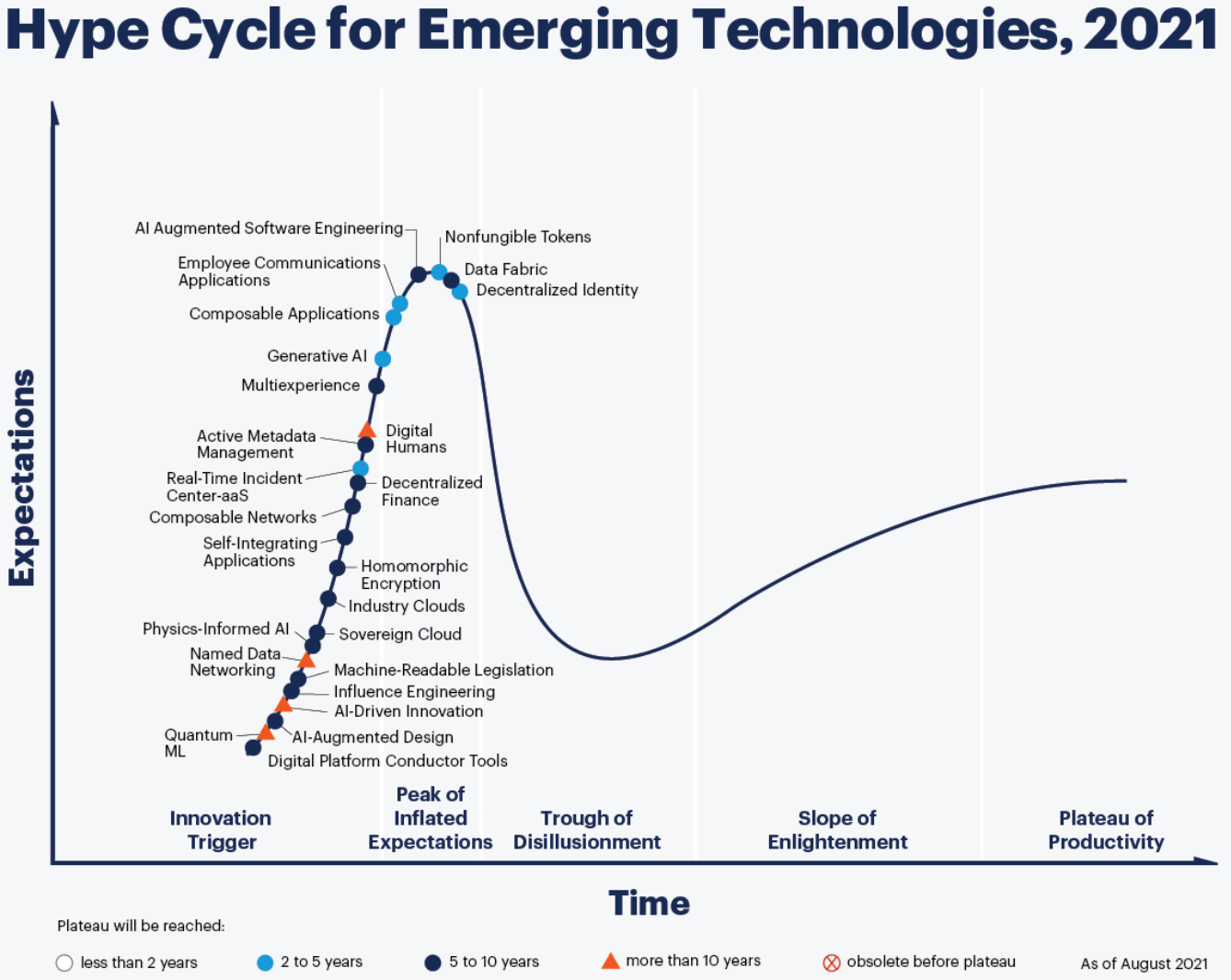

https://www.gartner.com/smarterwithgartner/5-trends-appear-on-the-gartner-hype-cycle-for-emerging-technologies-2019

# Tehnoloogia areng (*Gartner Hype Cycle*) 2020



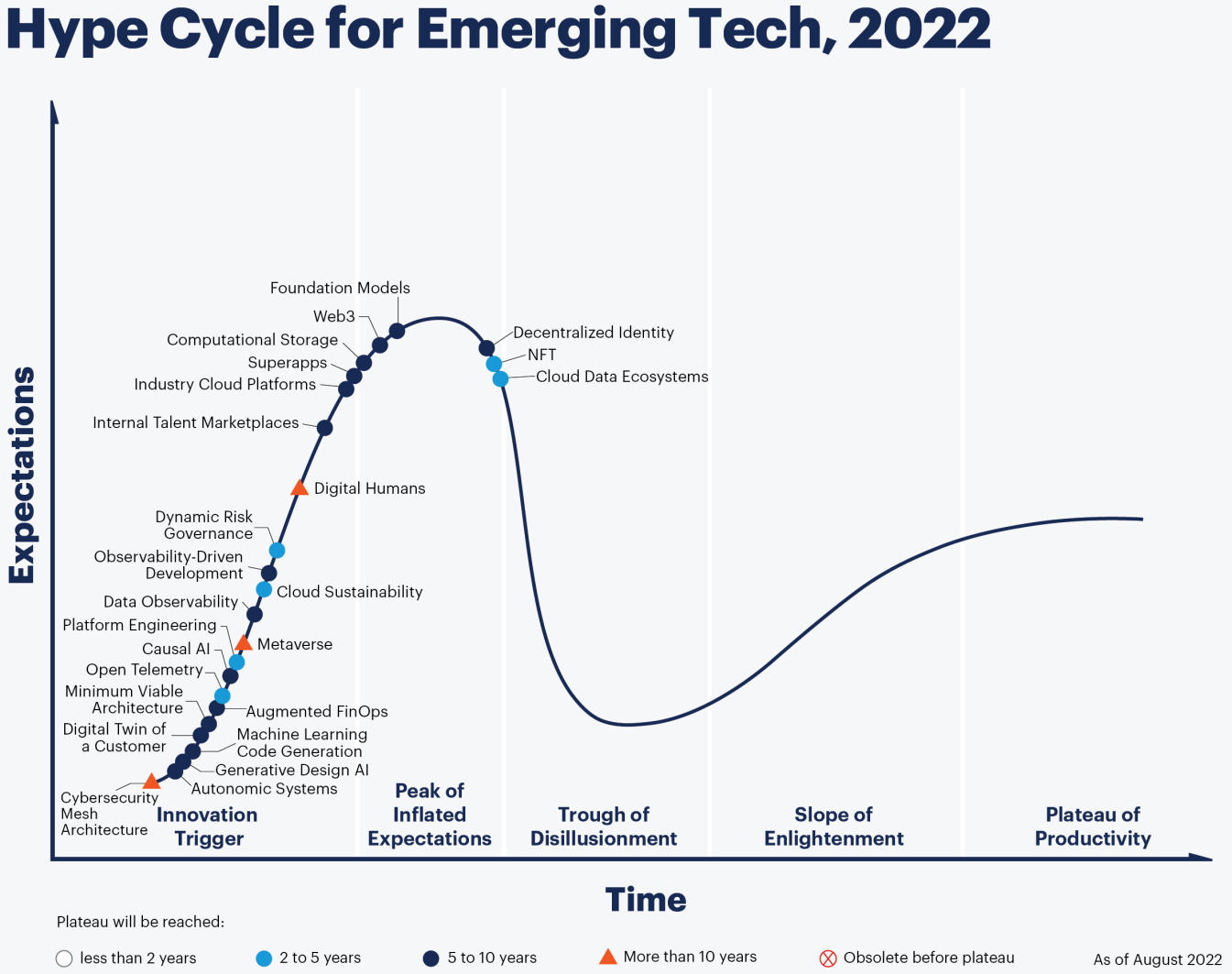

https://www.gartner.com/smarterwithgartner/5-trends-drive-the-gartner-hype-cycle-for-emerging-technologies-2020

# Tehnoloogia areng (*Gartner Hype Cycle*) 2021



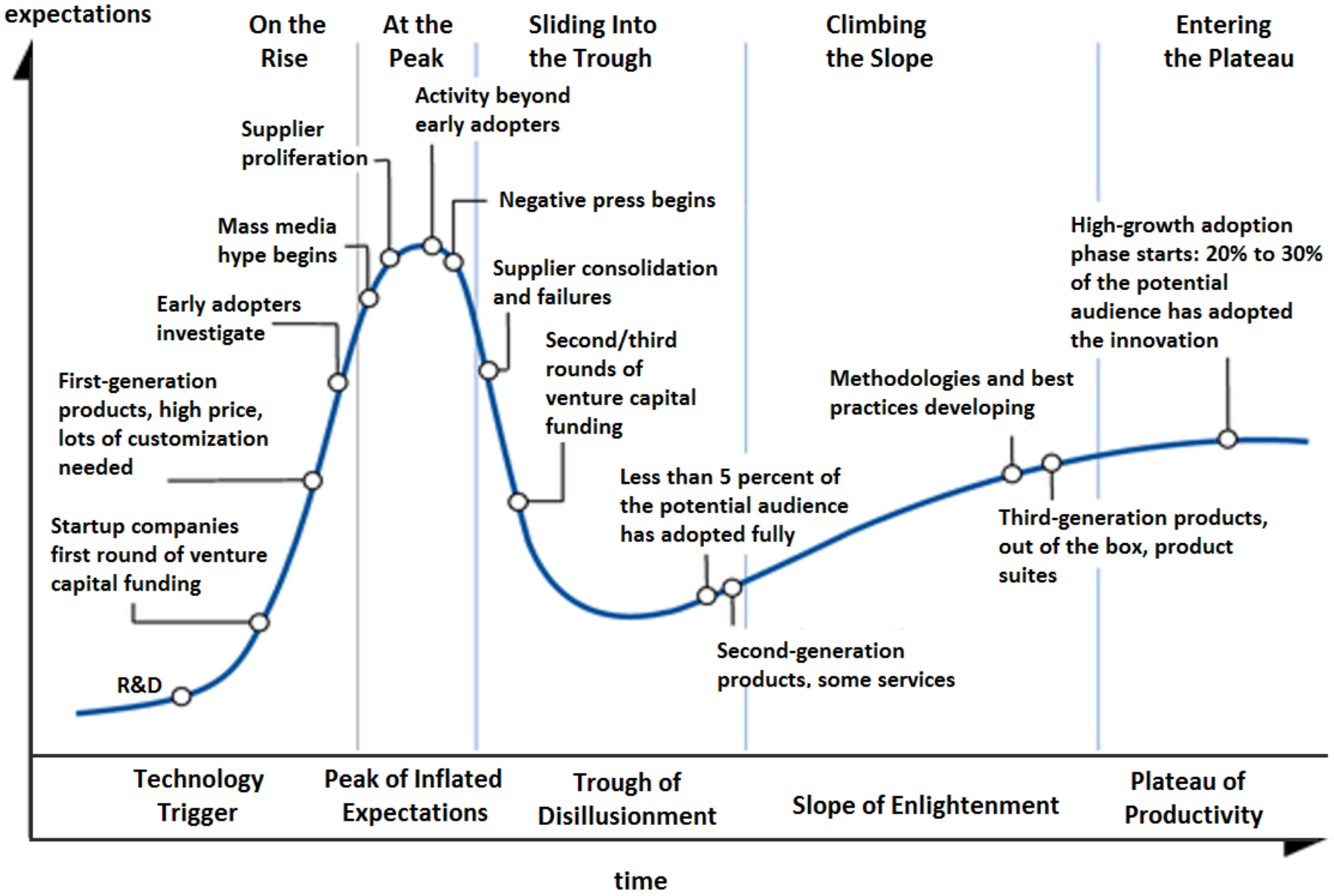

https://www.gartner.com/smarterwithgartner/3-themes-surface-in-the-2021-hype-cycle-for-emerging-technologies

# Tehnoloogia areng (*Gartner Hype Cycle*) 2022




https://www.gartner.com/en/articles/what-s-new-in-the-2022-gartner-hype-cycle-for-emerging-technologies

# Tehnoloogia areng Gartneri järgi, üldine



# Kvantarvuti

- töötab superpositsiooni meetodil (samaaegselt 0 ja 1 olekus)
- *QPU – quantum processing unit*
- *qubit* – kvantbitt – tutvustatud 1983 Stephen Wiesner'i poolt
- qubait (*qubyte*) – kvantbait – sisaldab 8 kvantbitti (qubit)
- 30 qubit → ~30 TFLOPS
  (triljonit ujukomaarvutust sekundis)

tänapäeva arvutid: GFLOPS


2020 valminud 5076 qubit kvantarvuti D-Wave Advantage firma D-Wave Systemsi poolt (energiavajadus: ~16kW).

https://www.dwavesys.com/resources/white-paper/the-d-wave-advantage-system-an-overview/

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

http://oxfordquantum.org/

https://en.wikipedia.org/wiki/D-Wave_Systems

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

http://computer.howstuffworks.com/quantum-computer1.htm

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

# Viited

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- https://en.wikipedia.org/wiki/Portal:Information_technology
- https://en.wikipedia.org/wiki/Portal:Cryptography
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- https://en.wikipedia.org/wiki/Category:Technology_portals
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- https://en.wikipedia.org/wiki/List_of_pioneers_in_computer_science
- https://en.wikipedia.org/wiki/List_of_computer_scientists

# Viited 2

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- https://en.wikipedia.org/wiki/List_of_important_publications_in_computer_science
- https://en.wikipedia.org/wiki/List_of_programmers
- https://en.wikipedia.org/wiki/List_of_programming_language_researchers
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- https://en.wikipedia.org/wiki/Information_Age
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- http://arvutimuuseum.ut.ee/
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- http://www.internetlivestats.com/
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- https://en.wikipedia.org/wiki/Category:Electro-mechanical_computers
- https://en.wikipedia.org/wiki/Category:1940s_computers
- https://en.wikipedia.org/wiki/Chemical_computer
- https://en.wikipedia.org/wiki/Category:Quantum_computing
- https://en.wikipedia.org/wiki/Category:Quantum_information_science
- https://www.top500.org

# Küsimused?
# Tänan tähelepanu eest!

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**TTÜ IT KOLLEDŽ**

**Raja 4C, 12616 Tallinn**

**tel +372 628 5800**

**info@itcollege.ee**

**http://www.itcollege.ee/**

IT KOLLEDŽ
TALLINNA TEHNIKAÜLIKOOL

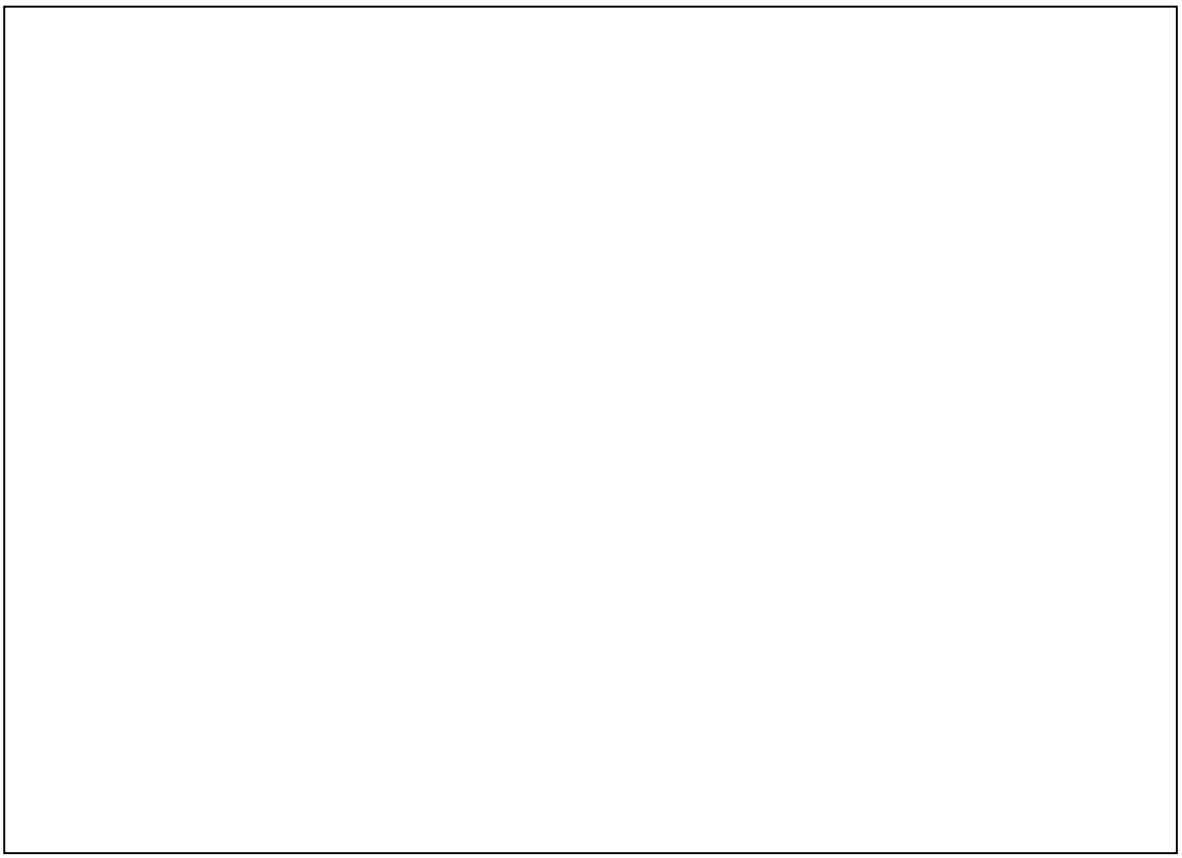
# Infotehnoloogia ajalugu

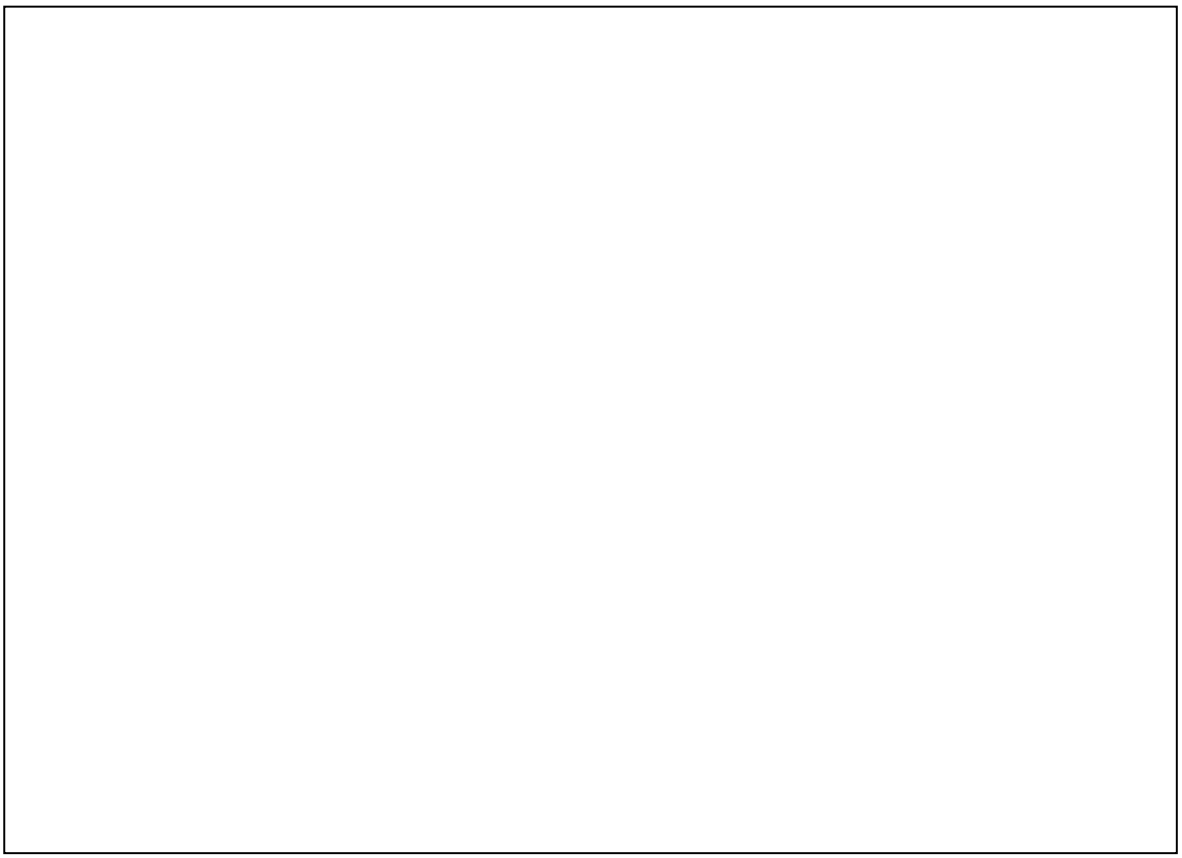
## Sissejuhatus infotehnoloogiasse ja riistvarasse ICA0012

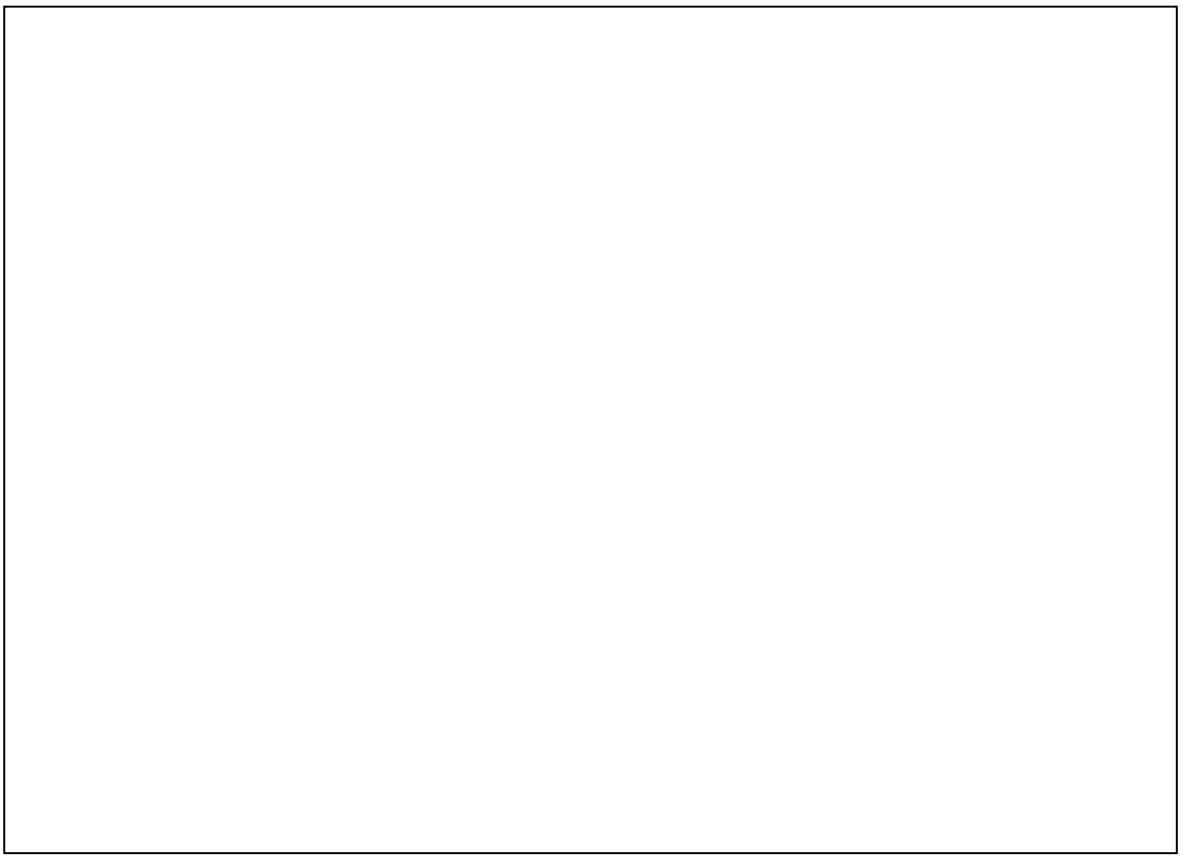
Edmund Laugasson

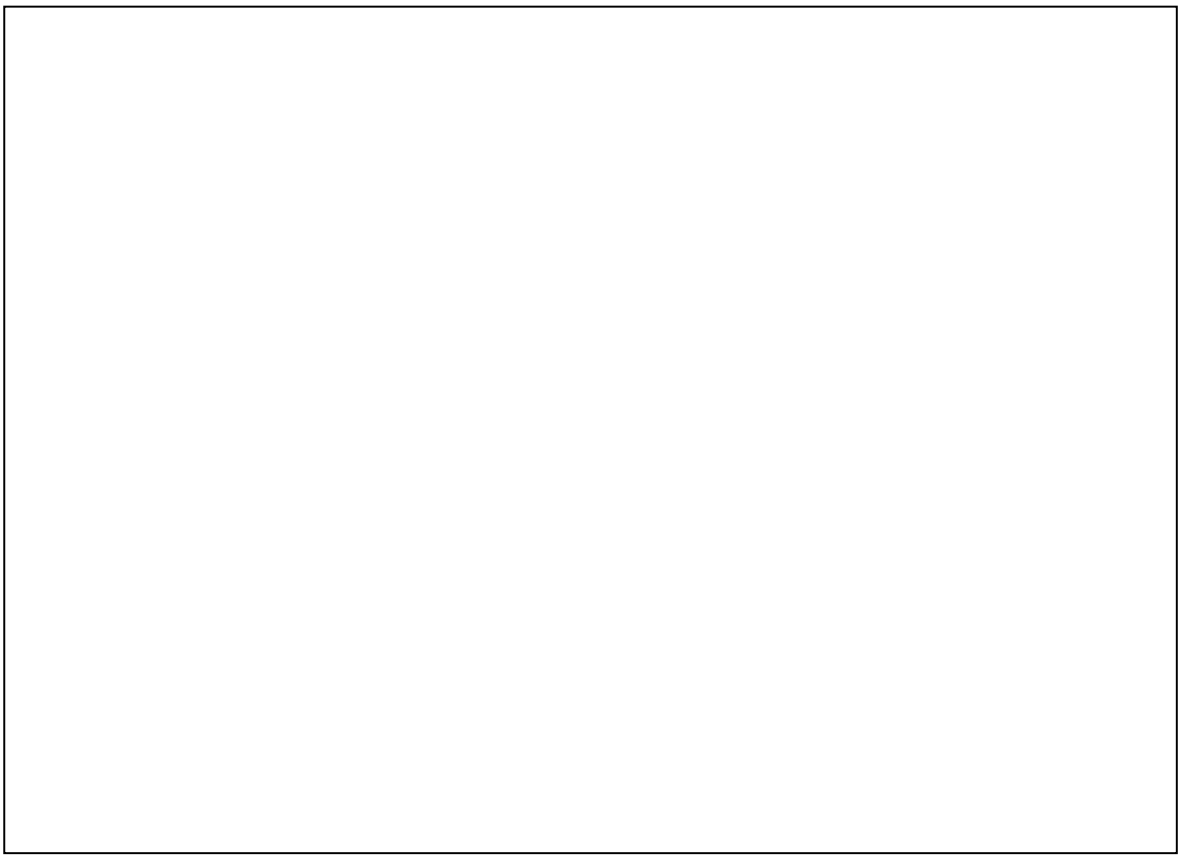
edmund.laugasson@taltech.ee

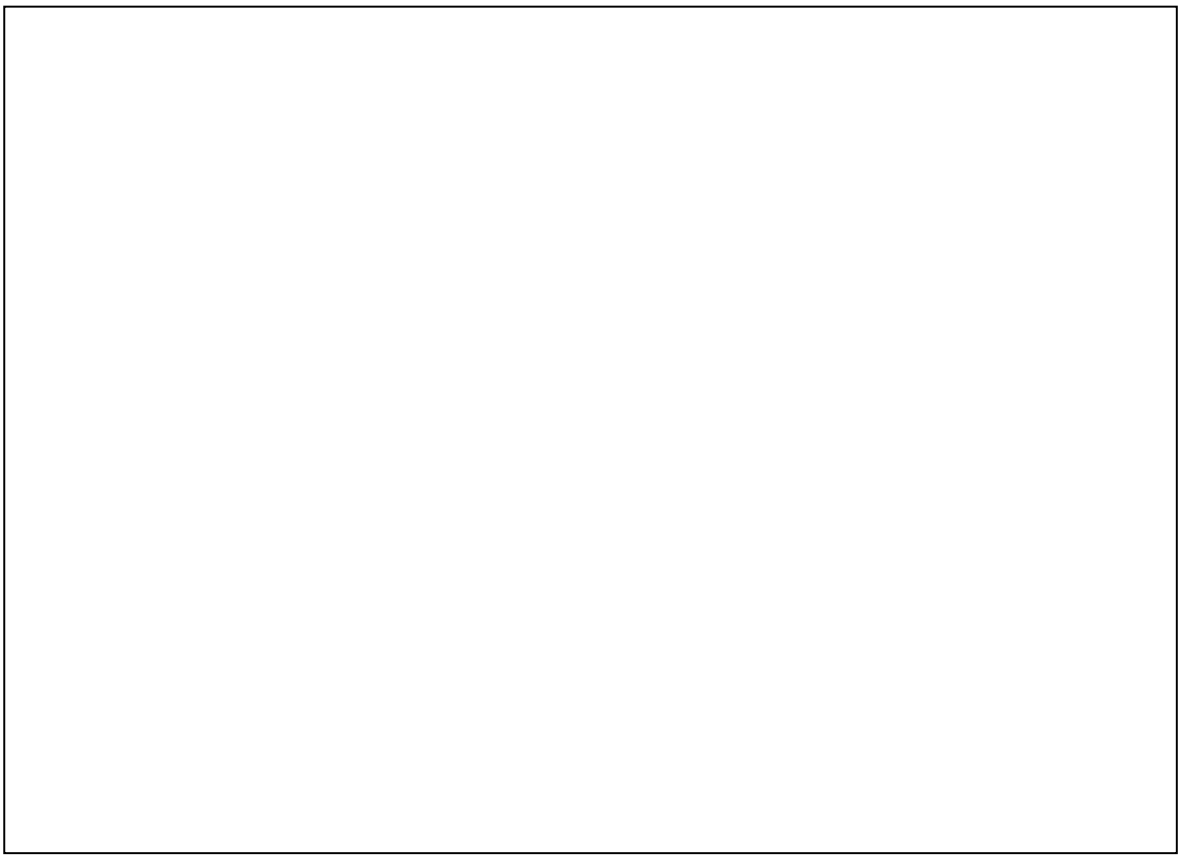
https://wiki.itcollege.ee/index.php/User:Edmund#eesti_keeles

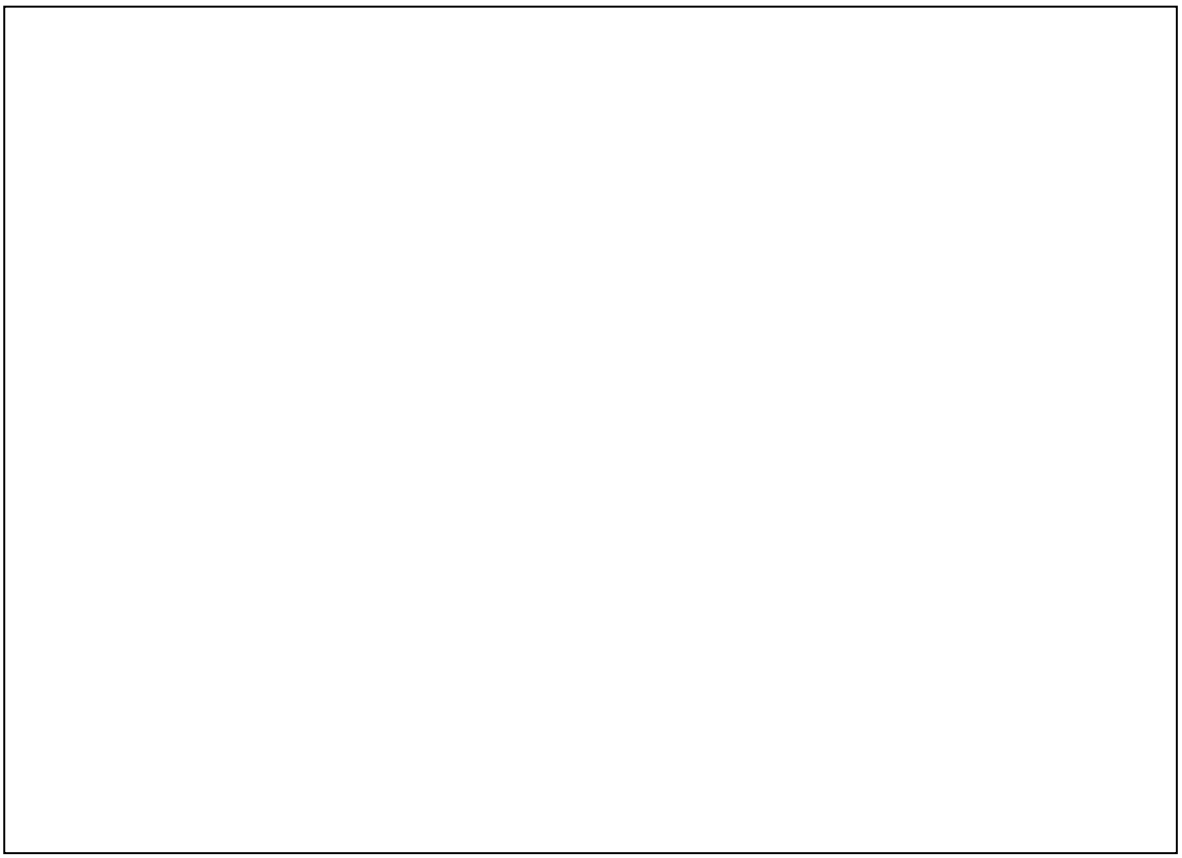


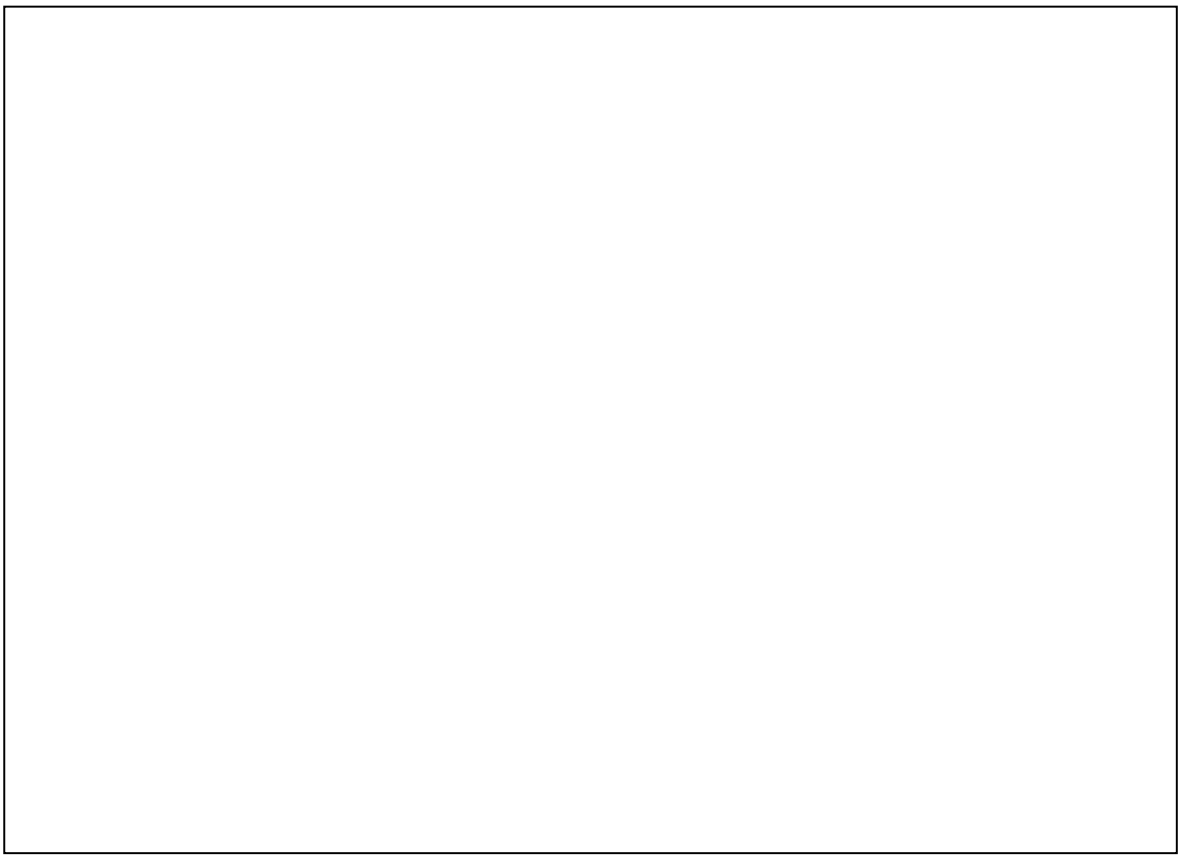


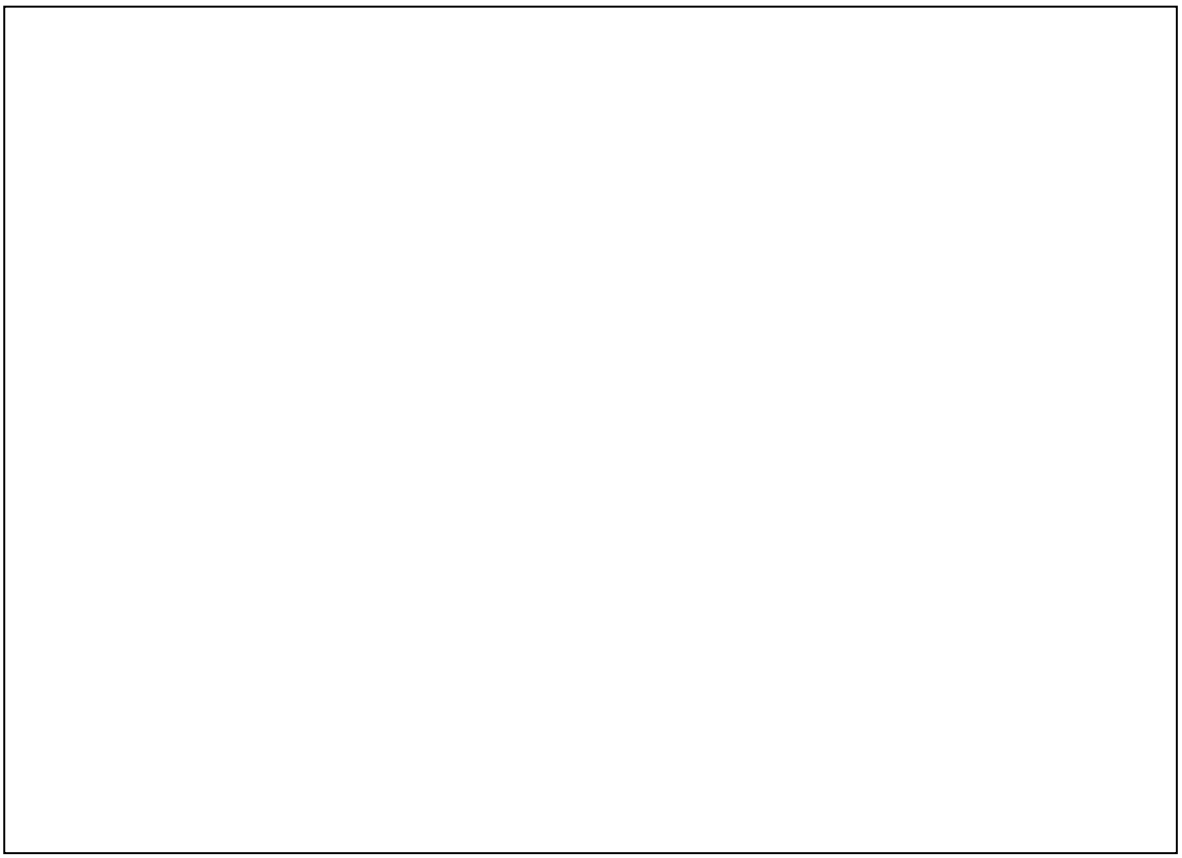


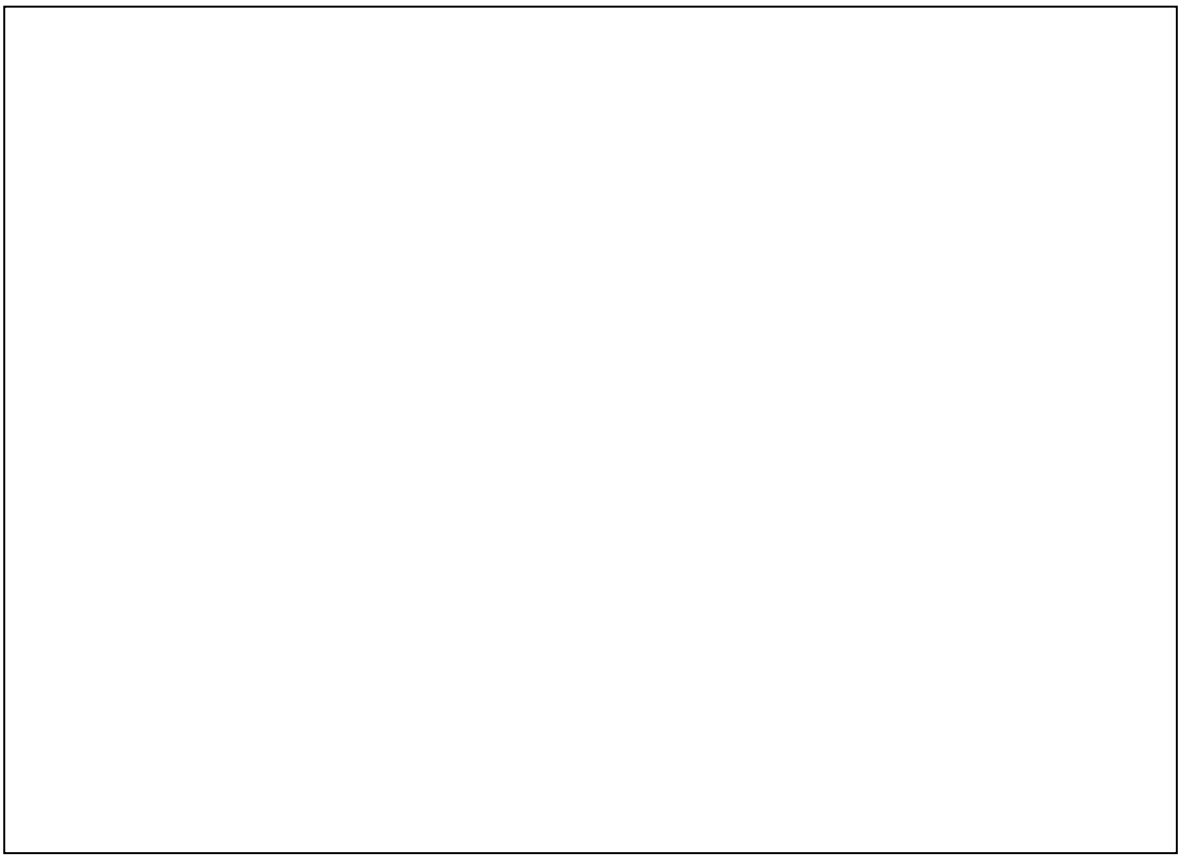


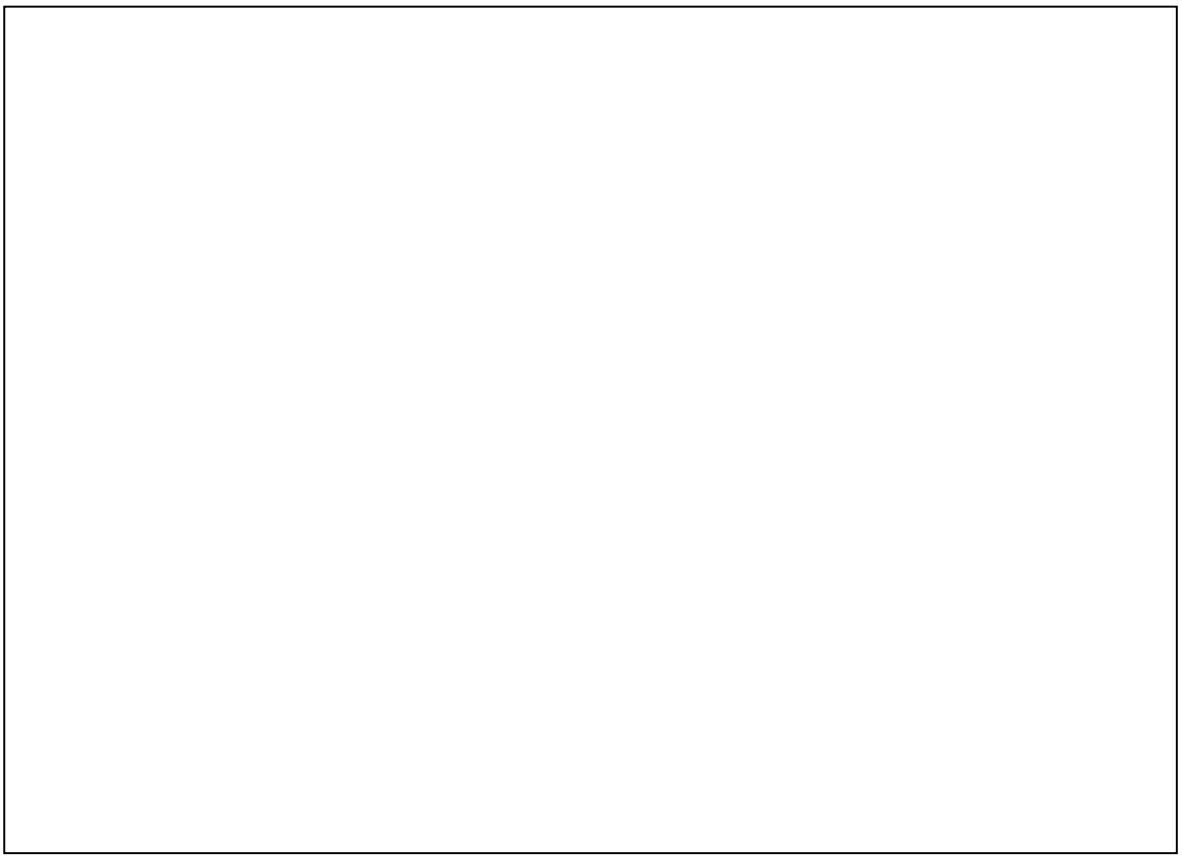


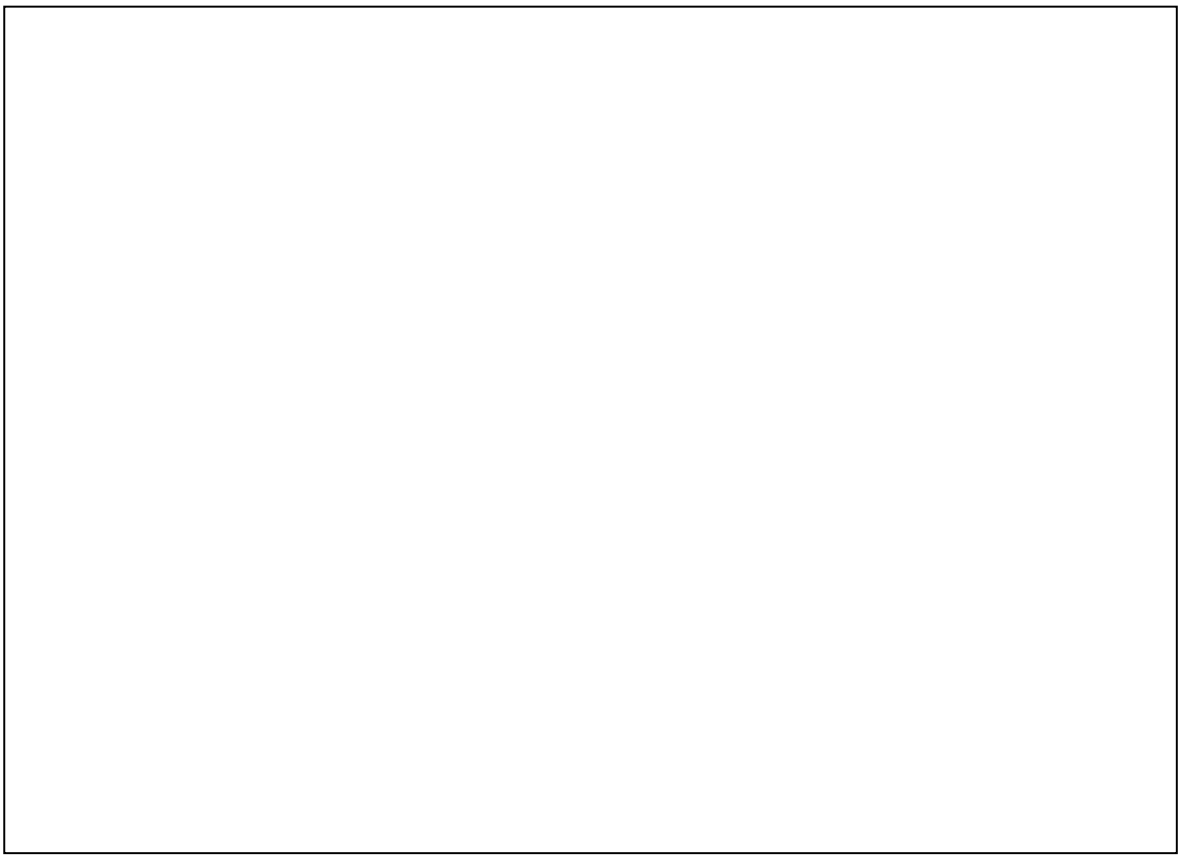


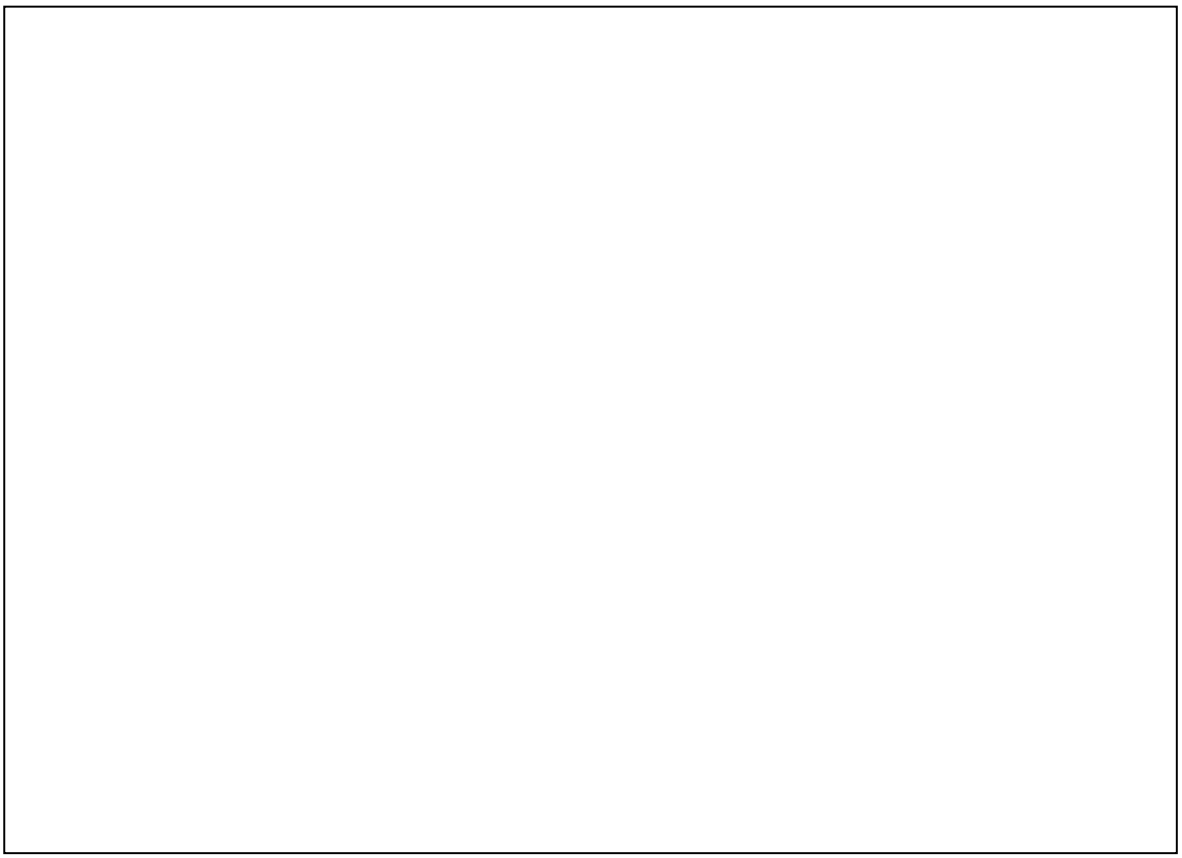


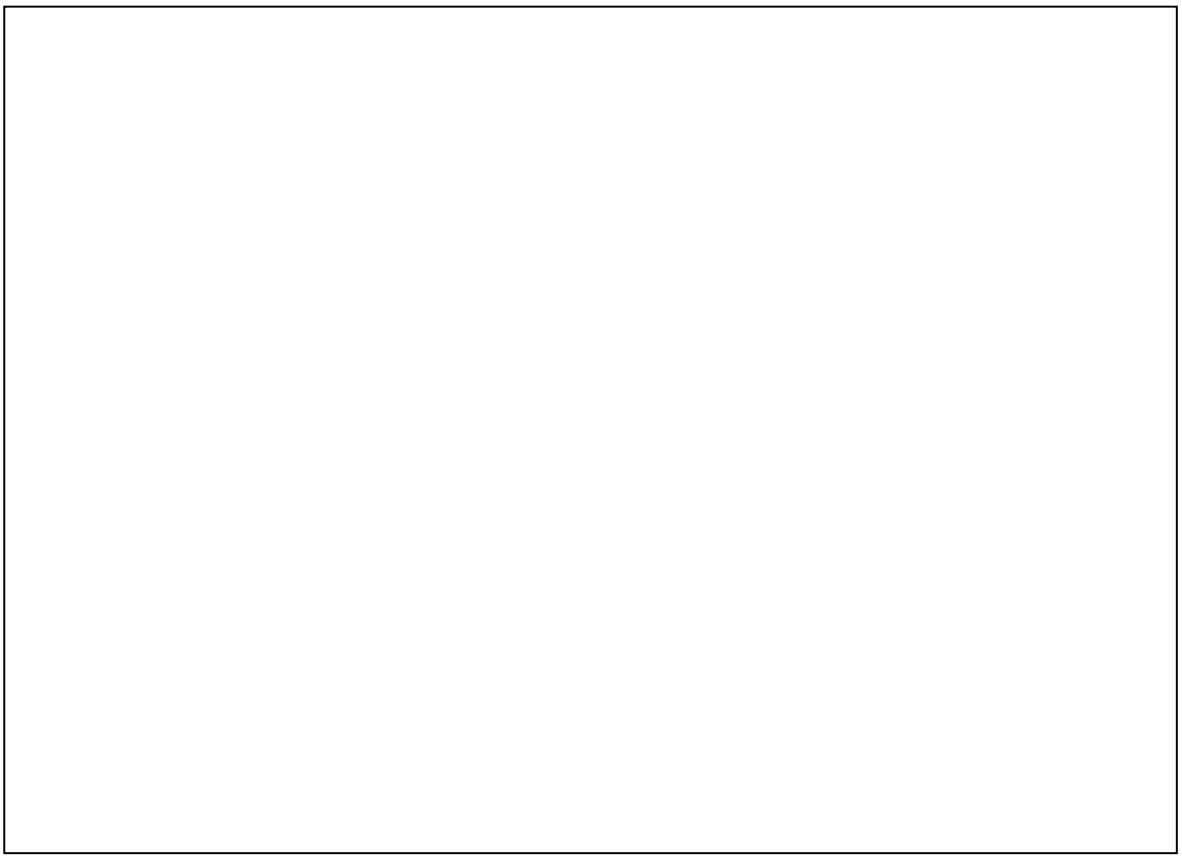


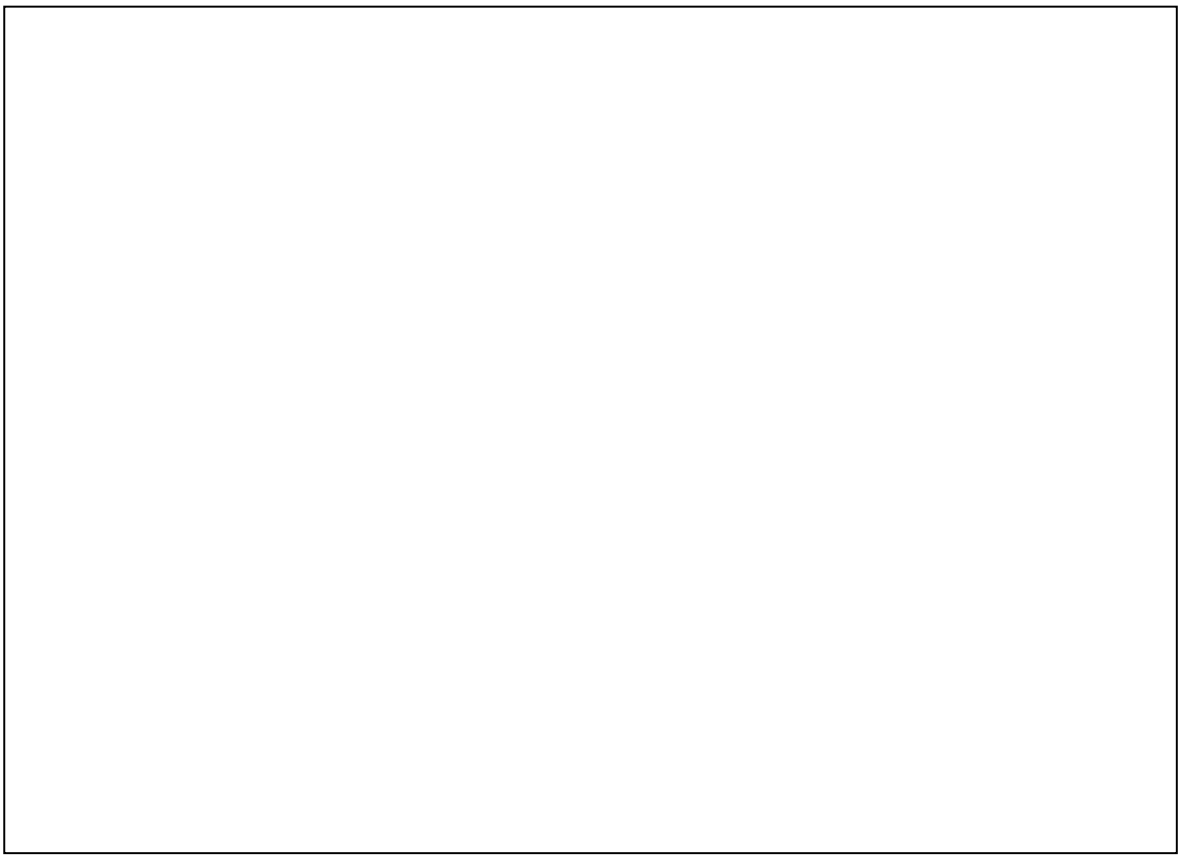


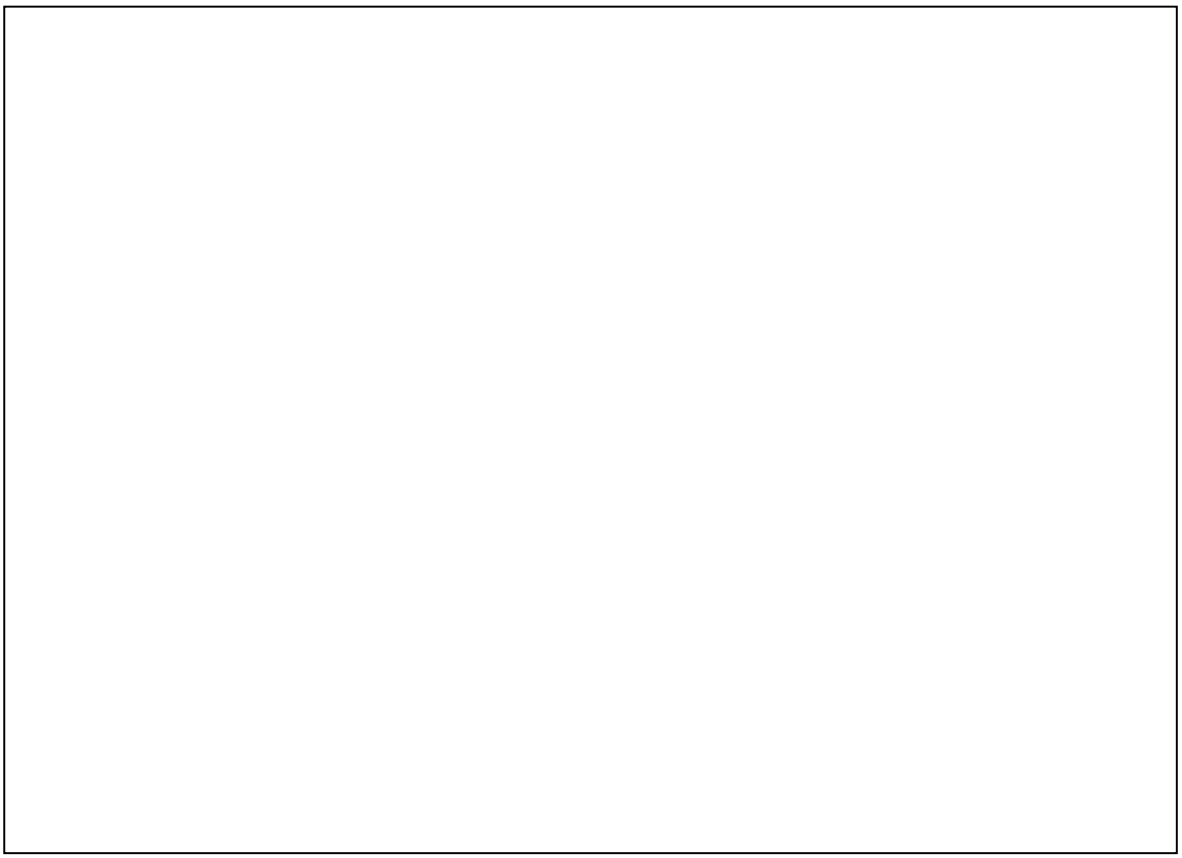


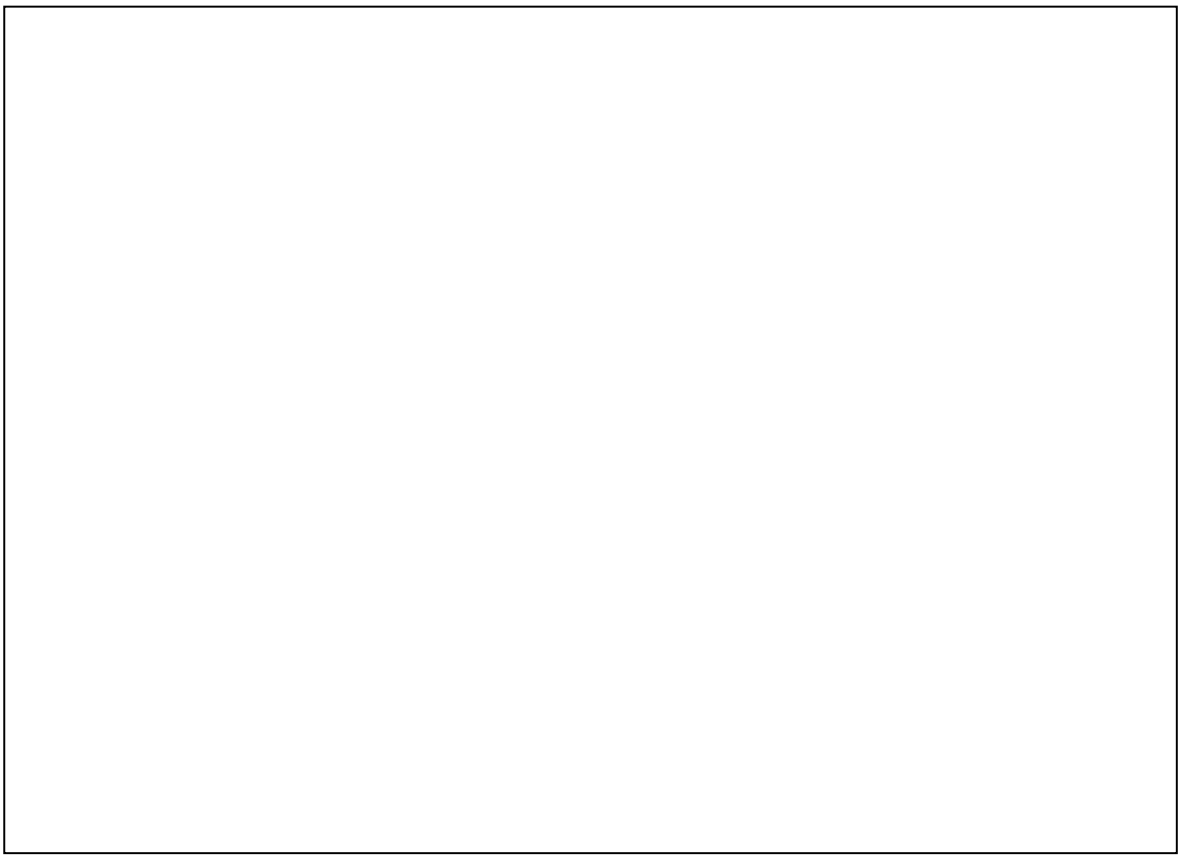


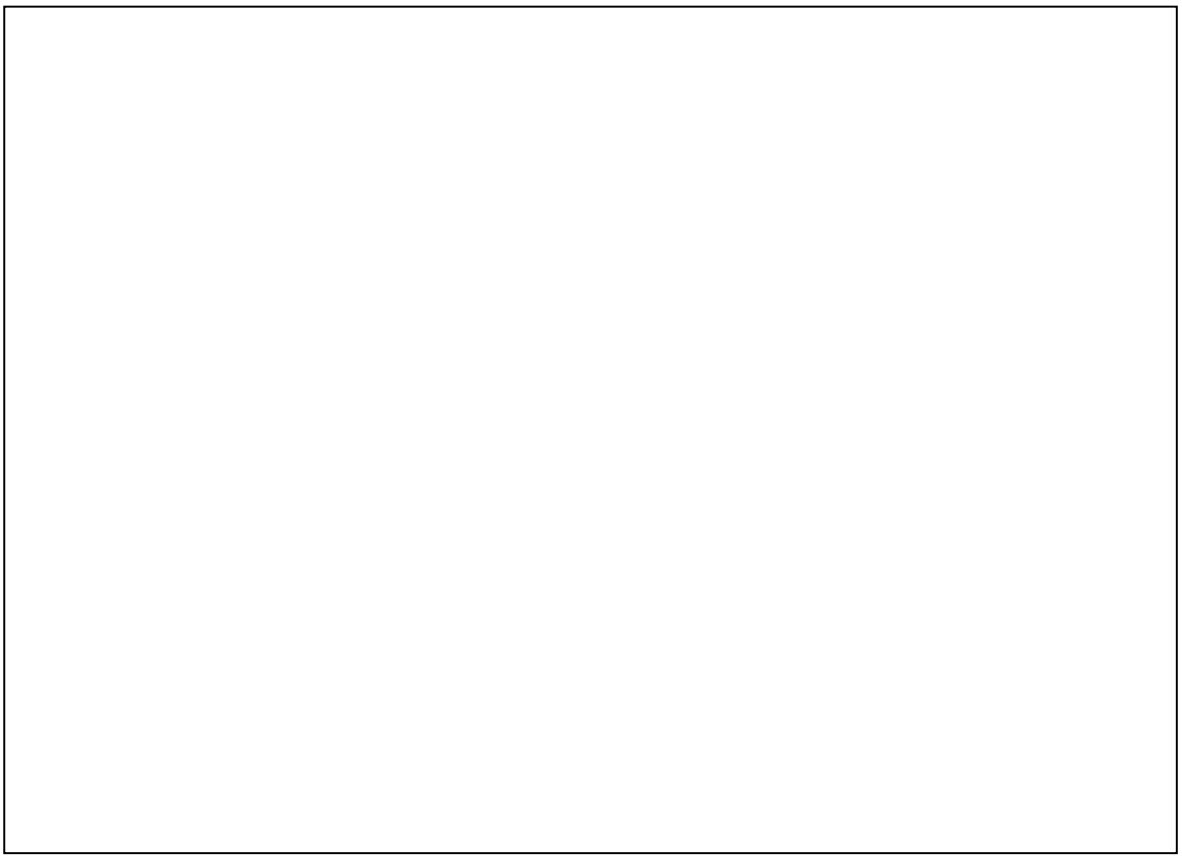


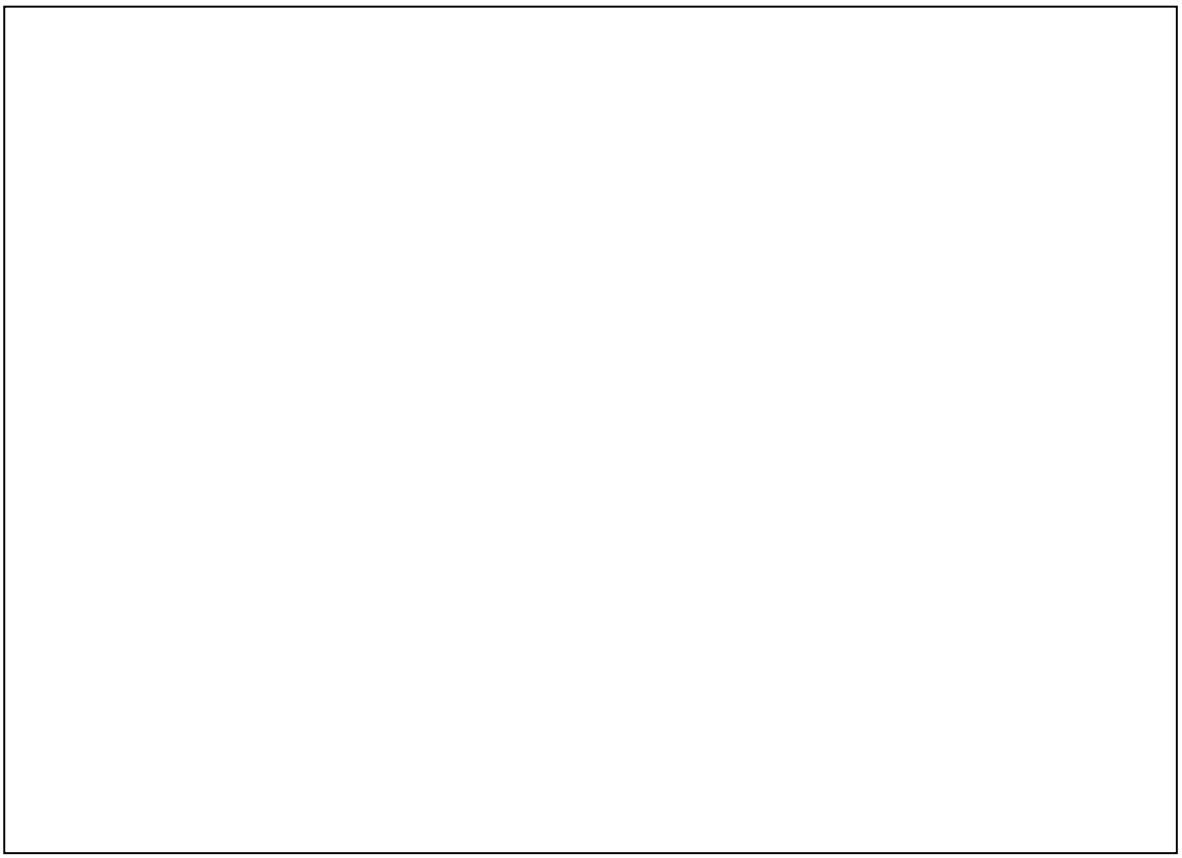












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