

Cancer and AI

there is nothing new under the sun

2600 BCE

Egypt — Edwin Smith papyrus

“One having a wound in his throat,
piercing through to his gullet... an
ailment with which I will contend.”

“An ailment which I will treat” —
curable

“An ailment with which I will
contend” — potentially curable

“An ailment which will not be
treated” — incurable



400 BCE

Greece — Hippocrates names things — *Karkinos*



~0 CE

China — First known epidemiological observation — hot alcohol and throat cancer



Mawangdui silk fragment, Western Han, 2nd century B CE — public domain

1200 CE

“Medicine” enters the English language



Excusado (Toilet) by Edward Weston. 1925.

1538

Paracelsus - Sola dosis facit venenum.

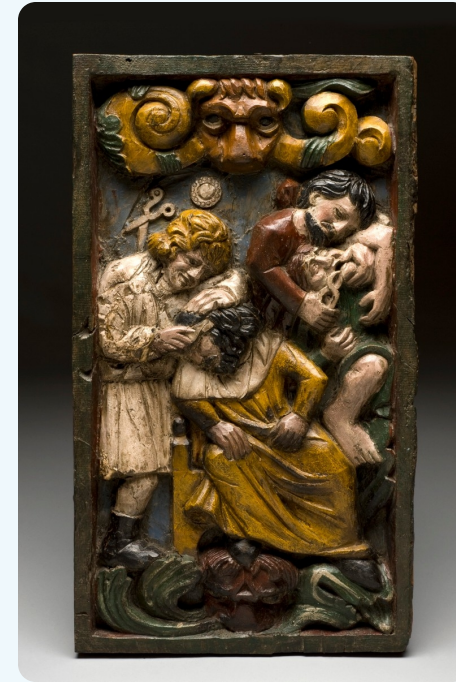


Paracelsus, *Septem Defensiones* (1538). Latin tag is a later paraphrase of the original German.

1690

John Casaubon's diary

“At dinner I was almost choaked by swallowing a bit of a roasted Sd of mutton which as I thought stuck in the passage about the mouth of the stomach. But it suffered noething to goe downe and the stomach threw all up... on a sudden I grew lean as a skeleton and at some tymes very faint and feeble... my meate doeth noe gt. good and I am in a kind of atrophie... It is a sine of gt weakenes certainly and of insoaed decay.”



1842

Ada Lovelace writes the first computer program



Margaret Sarah Carpenter, 1836 — public domain

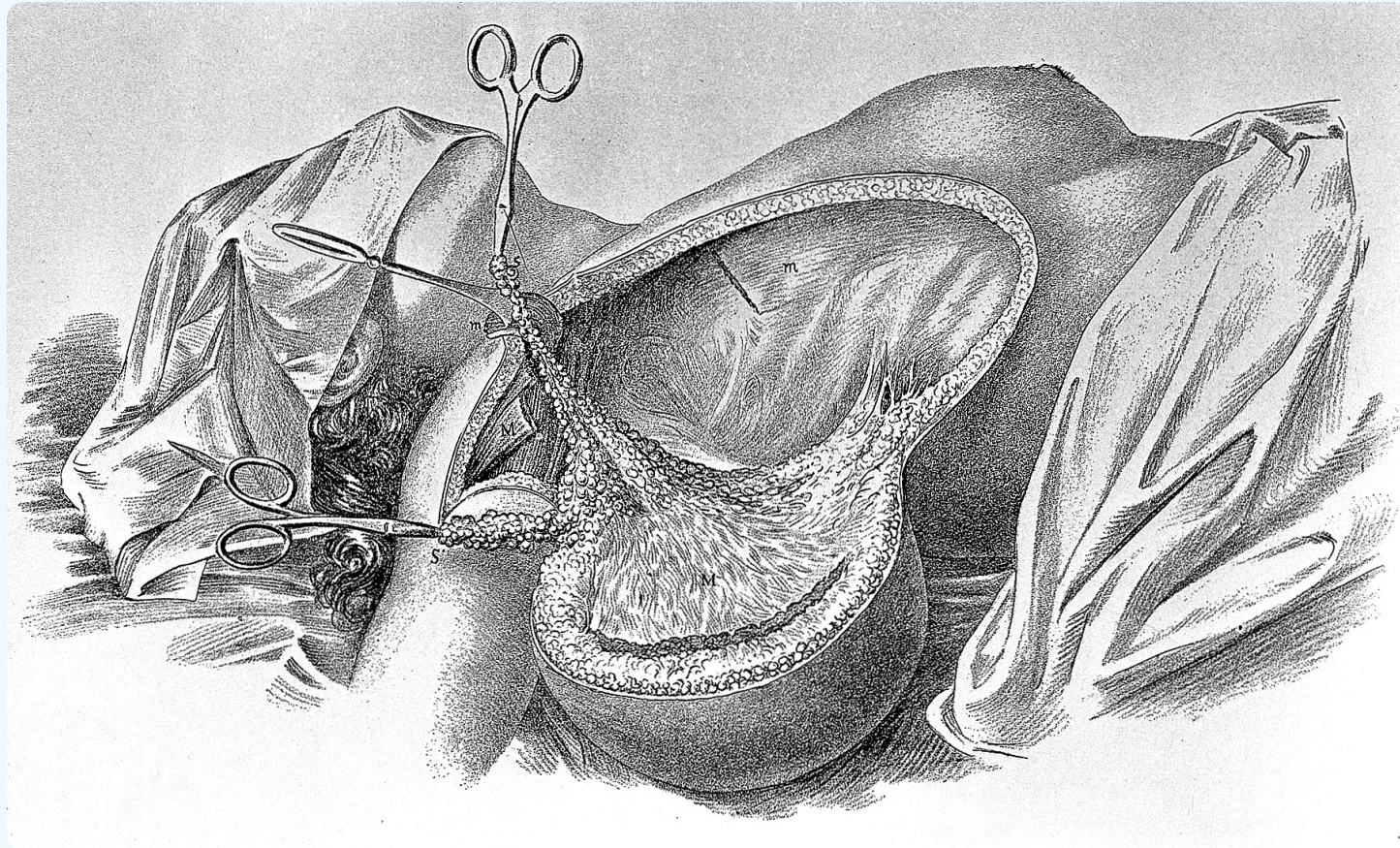
1882

Halsted — the radical mastectomy

Trigger warning.

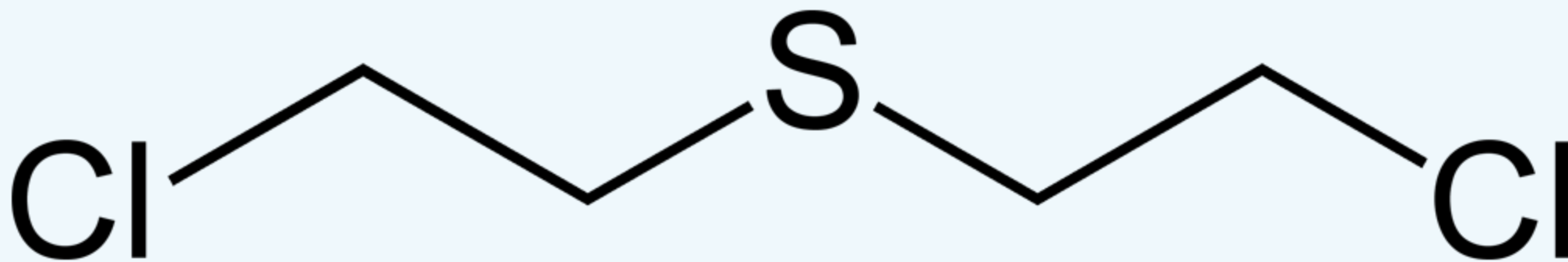
1882

Halsted — the radical mastectomy



1886

Synthesis of mustard gas



1895

Discovery of X-rays

1896: X-rays used to treat cancers.

1899: Sweden reports the first successful cures of skin carcinomas with X-rays.



Röntgen, 22 Dec 1895 — public domain

1907

Synthesis of arsphenamine (Salvarsan)

The first drug called a **chemotherapy**: chemicals that specifically target disease-causing organisms.

Salvarsan was the standard of care for treating syphilis until penicillin was invented.



Wellcome Collection — CC BY 4.0

1917

Use of mustard gas in warfare

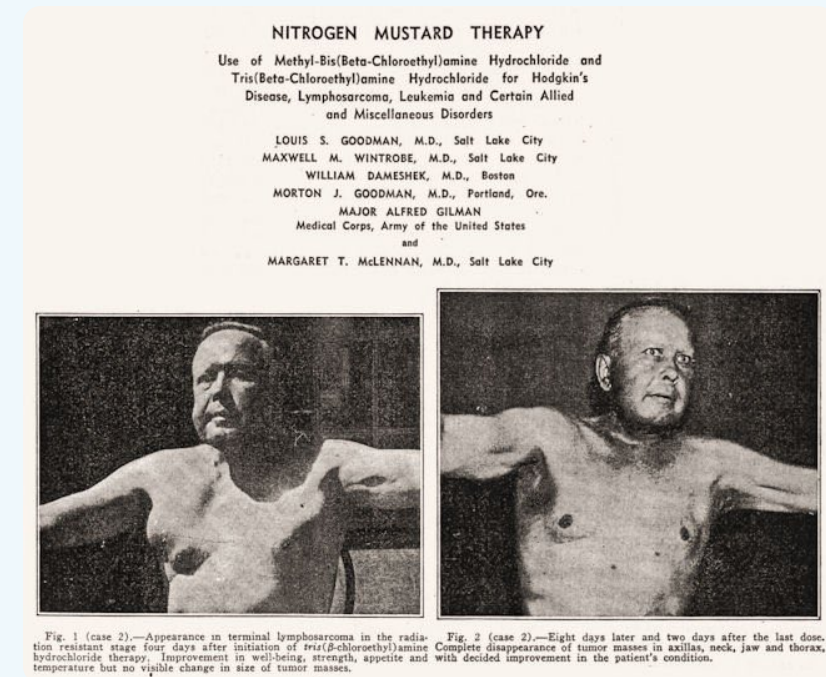


T. K. Aitken / IWM Q 11586 — public domain

1942

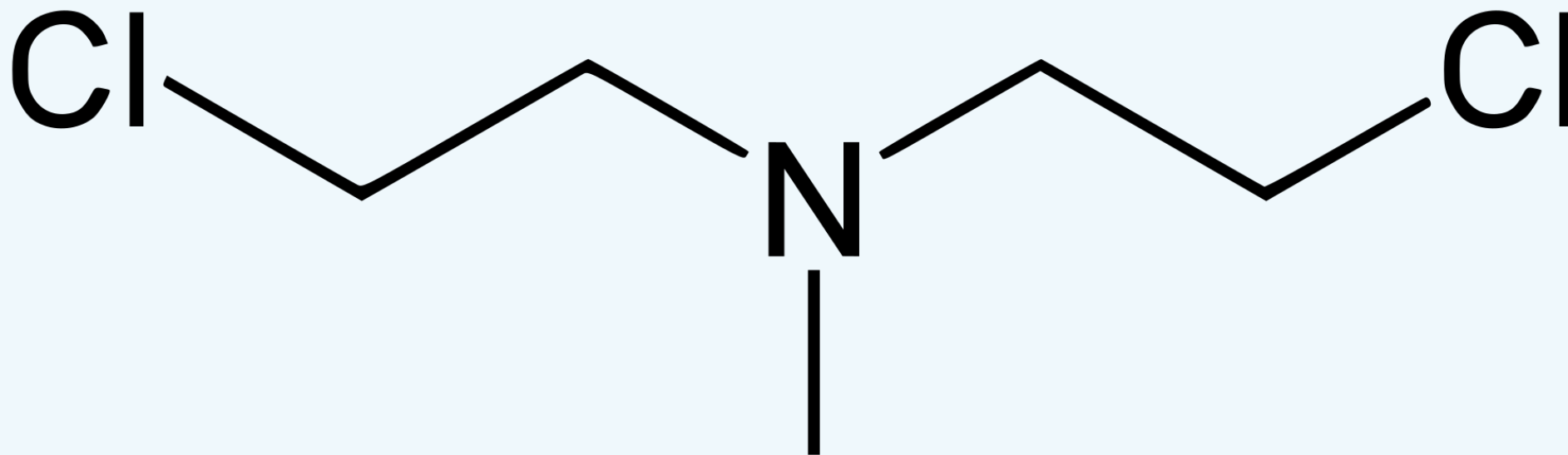
Patient JD

Goodman, Gilman, and Lindskog secretly treat a patient with non-Hodgkin lymphoma using nitrogen mustard at Yale — the first modern chemotherapy.



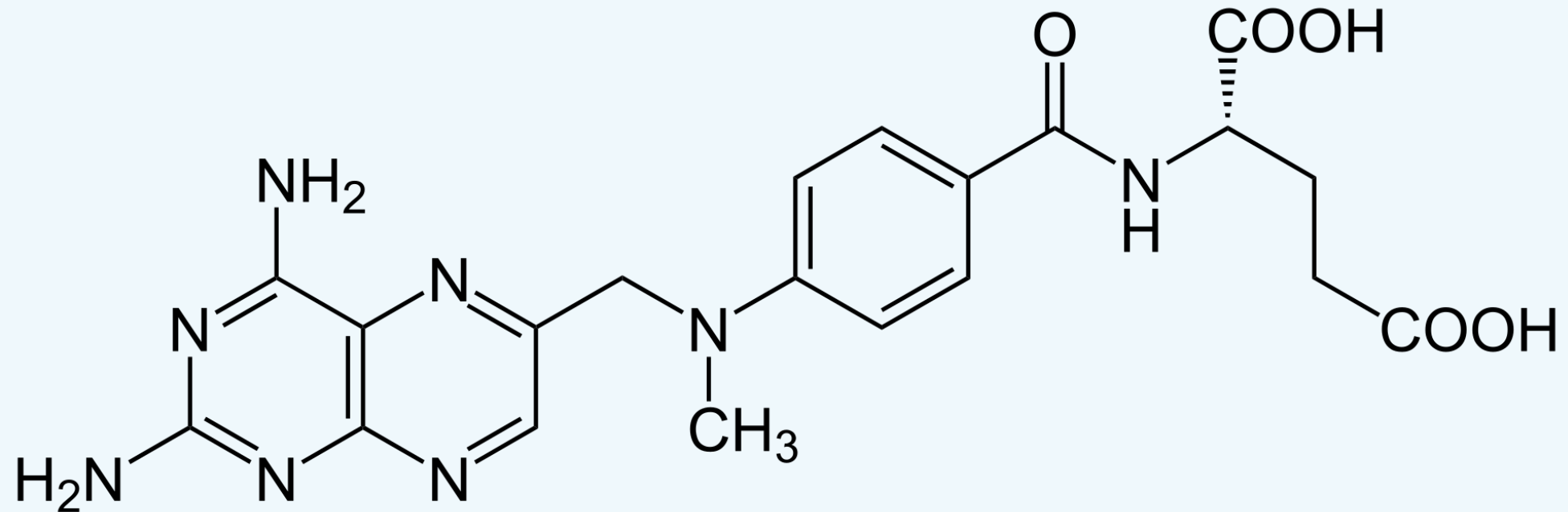
1949

First FDA-approved cancer drug — HN2 (Mustargen)



1956

Methotrexate cures choriocarcinoma without surgery or radiation



1956

"AI" first defined

How to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves.

— *John McCarthy. 1956.*

AI is a collective name for problems which we do not yet know how to solve properly by computer.

— *Bertram Raphael, via Donald Michie. 1971.*

AI is whatever hasn't been done yet.

— *Larry Tesler, via Douglas Hofstadter. 1979.*

1966

ELIZA — the first "chatterbot"

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Welcome to
      EEEEE LL      IIII ZZZZZZ AAAAA
      EE    LL      II   ZZ   AA  AA
      EEEEE LL      II   ZZ   AAAAAA
      EE    LL      II   ZZ   AA  AA
      EEEEE LLLLLL IIII ZZZZZZ AA  AA

Eliza is a mock Rogerian psychotherapist.
The original program was described by Joseph Weizenbaum in 1966.
This implementation by Norbert Landsteiner 2005.

ELIZA: Is something troubling you ?
YOU:   Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU:   They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU:   Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU:   He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU:   It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:
```

Wikimedia Commons — public domain

1973

Invention of the PET scanner - high dimensional data

XR (2D) → CT (3D) → PET (4D)



Ter-Pogossian et al., *Radiology* 114, 89 (1975) — PETT prototype operational 1973–74

1977

Apple II launch

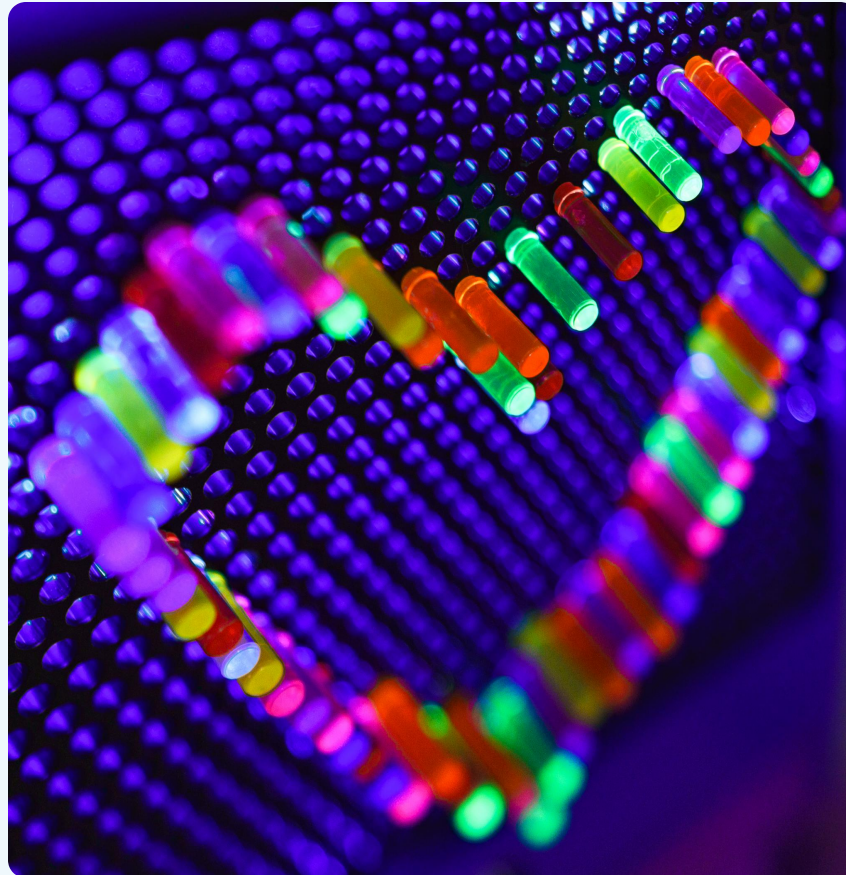


1988

Me!

1990

The Human Genome Project starts



1996

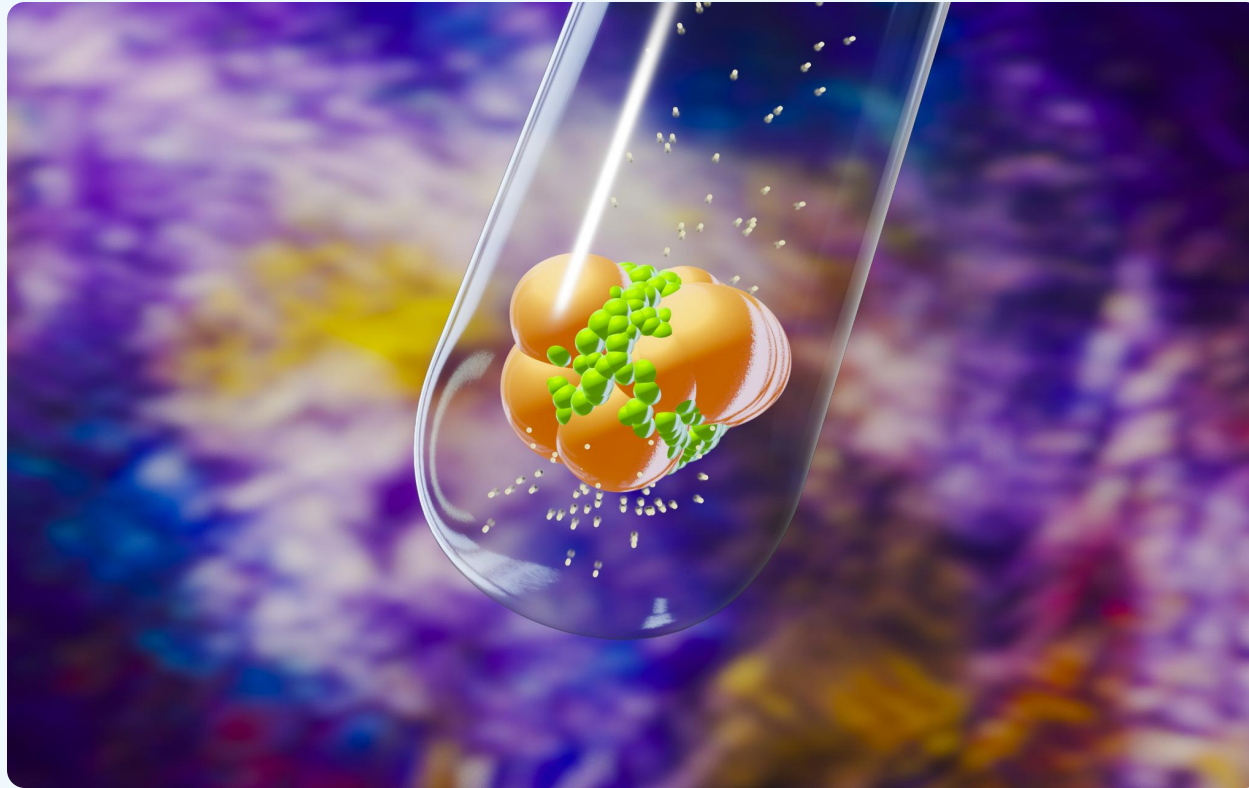
Deep Blue beats Kasparov in game 1
Kasparov takes the match 4-2; Deep Blue wins the
1997 rematch.



Hsu, *Behind Deep Blue* (Princeton UP, 2002)

1997

First monoclonal antibody for cancer — rituximab (anti-CD20)



Maloney et al., *Blood* 90, 2188 (1997)

2001

Imatinib approved — BCR-ABL targeted therapy — CML becomes a chronic disease.



Druker et al., *NEJM* 344, 1031 (2001)

2003

Human Genome completed



Int'l Human Genome Sequencing Consortium, *Nature* 431, 931 (2004)

2009

Fei-Fei Lee publishes ImageNet - 14 million annotated images

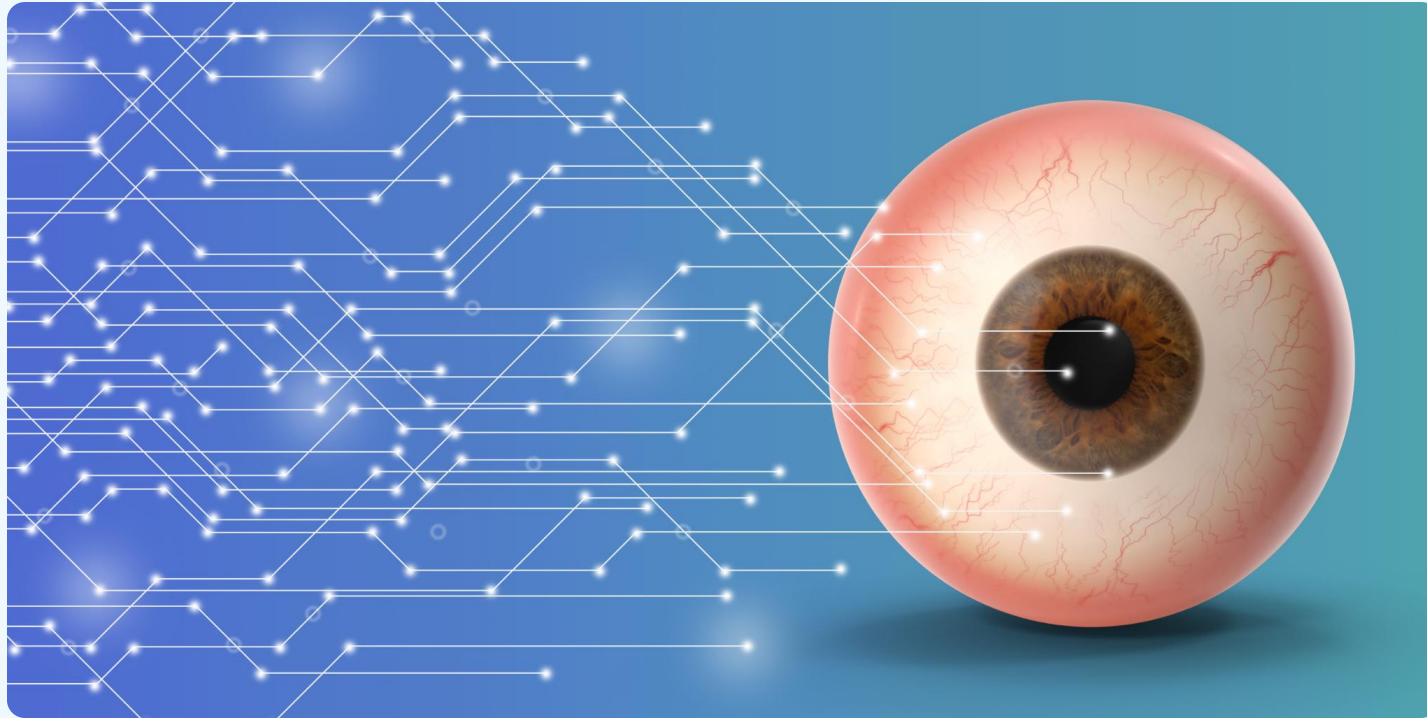


ITU Pictures, 2017 — CC BY 2.0

Deng et al., *CVPR* 248 (2009); Russakovsky et al., *IJCV* 115, 211 (2015)

2018

First FDA-approved autonomous AI system — IDx-DR — diabetic retinopathy detection



Abràmoff et al., *npj Digital Medicine* 1:39 (2018)

2022

Release of ChatGPT



OpenAI, "Introducing ChatGPT" (Nov 30, 2022)

How do LLMs work?

Mary	had	a	little	lamb	88.59%
				Lamb	0.74%
				lamp	0.65%
				\n	0.40%
				skirt	0.21%

How do LLMs work?

Mozart	had	a	little	sister	45.63%
				bit	4.78%
				star	4.78%
				pet	3.32%
				red	1.58%

Current projects — a sampling

NeoplasmNews

Mehtatron

AON Community

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Thank you