

Role of “Unnatural Evolution” in Cancer & Beyond

Steve Gullans, PhD

October 16, 2020

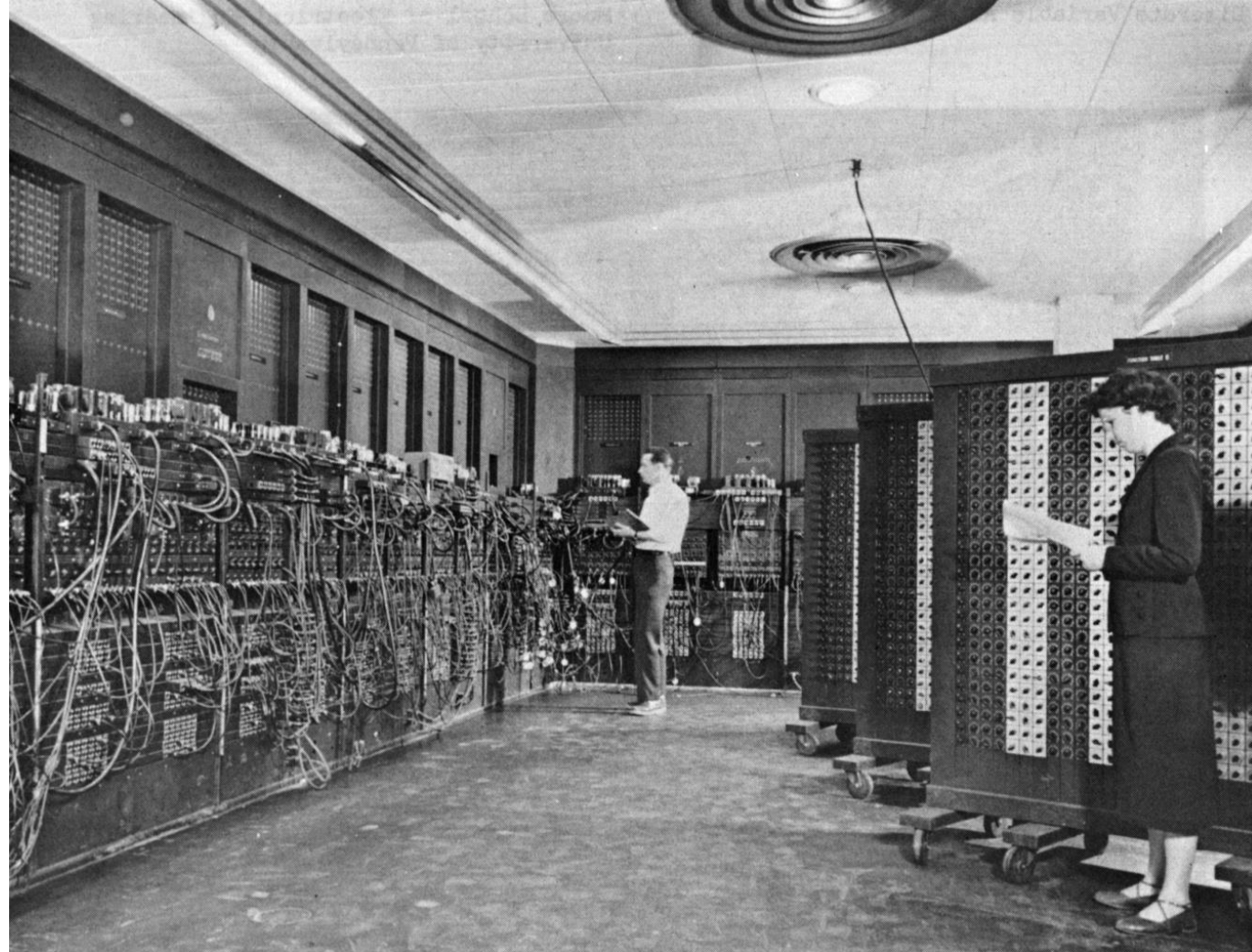
The IT Revolution

A Very Brief History

How fast has it occurred?

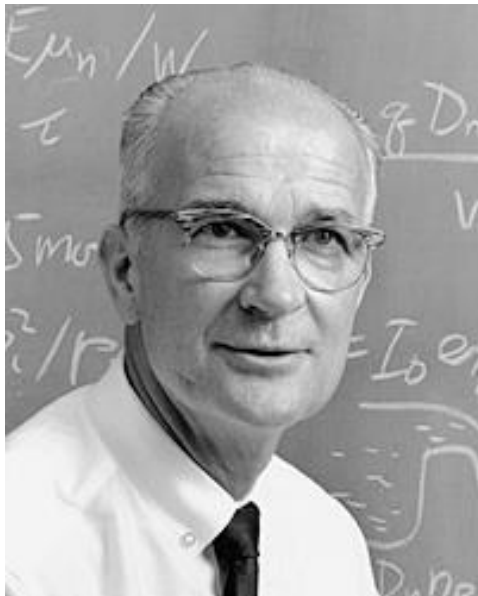
ENIAC - 1945

- University of Pennsylvania
- General purpose calculating computer – ballistics & nuclear bomb simulations
- 27 Tons
- \$500,000 (~\$6,300,000 today).
- By 1956, ENIAC contained
 - 20,000 vacuum tubes
 - 7,200 crystal diodes
 - 1,500 relays
 - 70,000 resistors
 - 10,000 capacitors
 - 5,000,000 hand-soldered joints



First Transistor - 1947

Invented by William Shockley *et al* at Bell Labs in NJ



1956 - Moves to Silicon Valley to found Shockley Semiconductor



Fairchild Semiconductor – 1957

The “Traitorous Eight” leave Shockley Semiconductor to found Fairchild Semiconductor



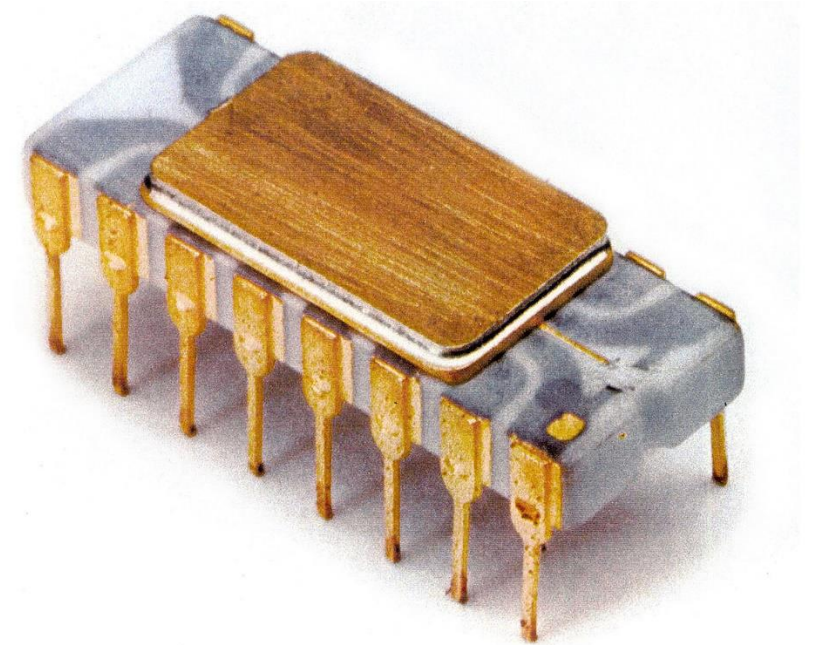
Eight Fairchild founders pose under the “Flying F” logo in the company’s Mountain View lobby.

From left: Gordon Moore, Sheldon Roberts, Eugene Kleiner, Robert Noyce, Victor Grinich, Julius Blank, Jean Hoerni and Jay Last

Intel Founded - 1968

Gordon Moore and Robert Noyce leave Fairchild Semiconductor to found Intel

1971 - Created the world's first microprocessor - Intel 4004



Eureka – The Transistor Radio!



Microsoft – 1975



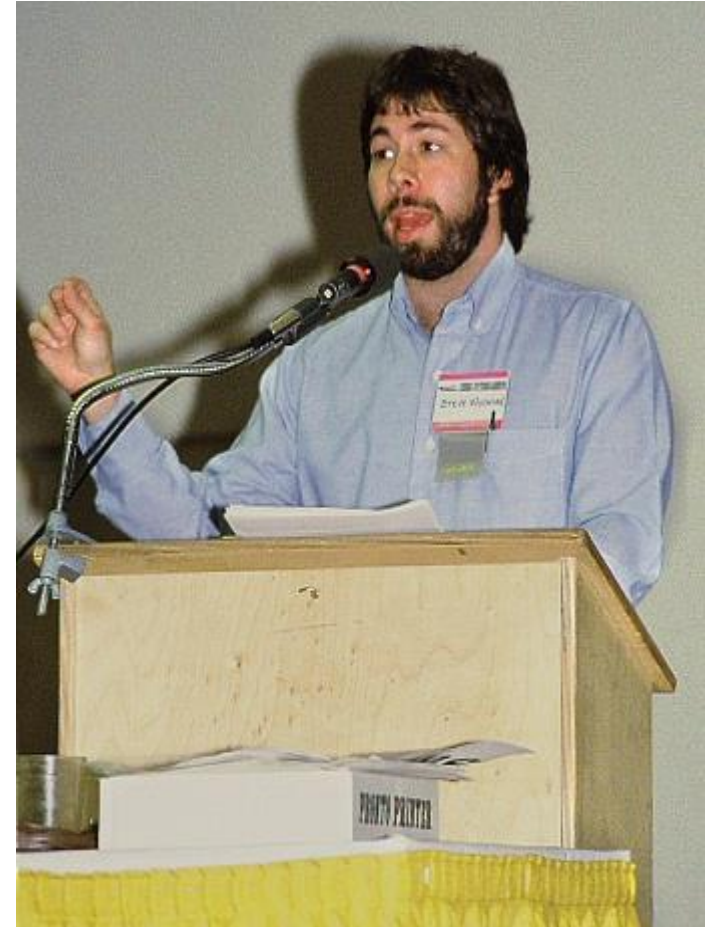
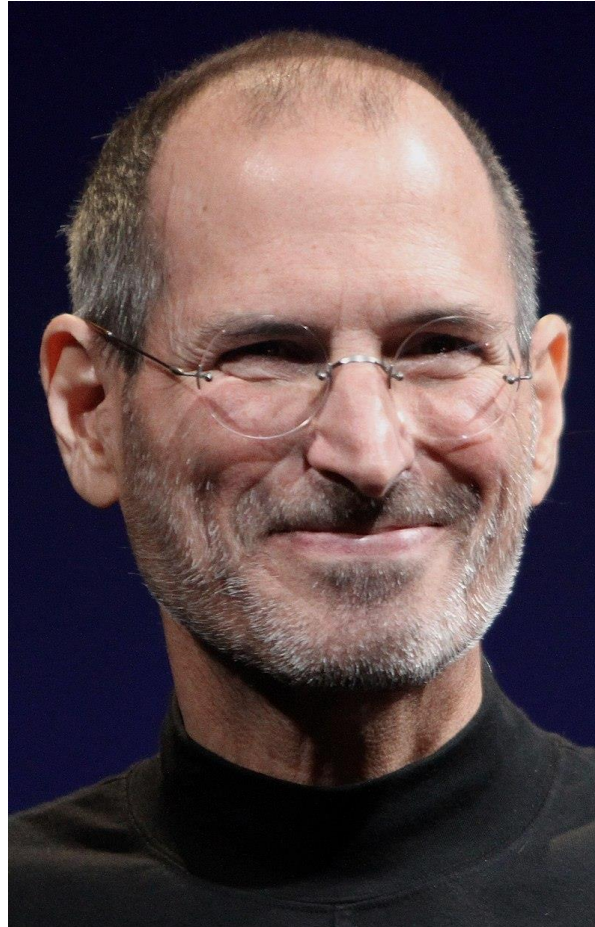
Altair 8K BASIC on paper tape



Altair 8800



Apple Founded - 1976

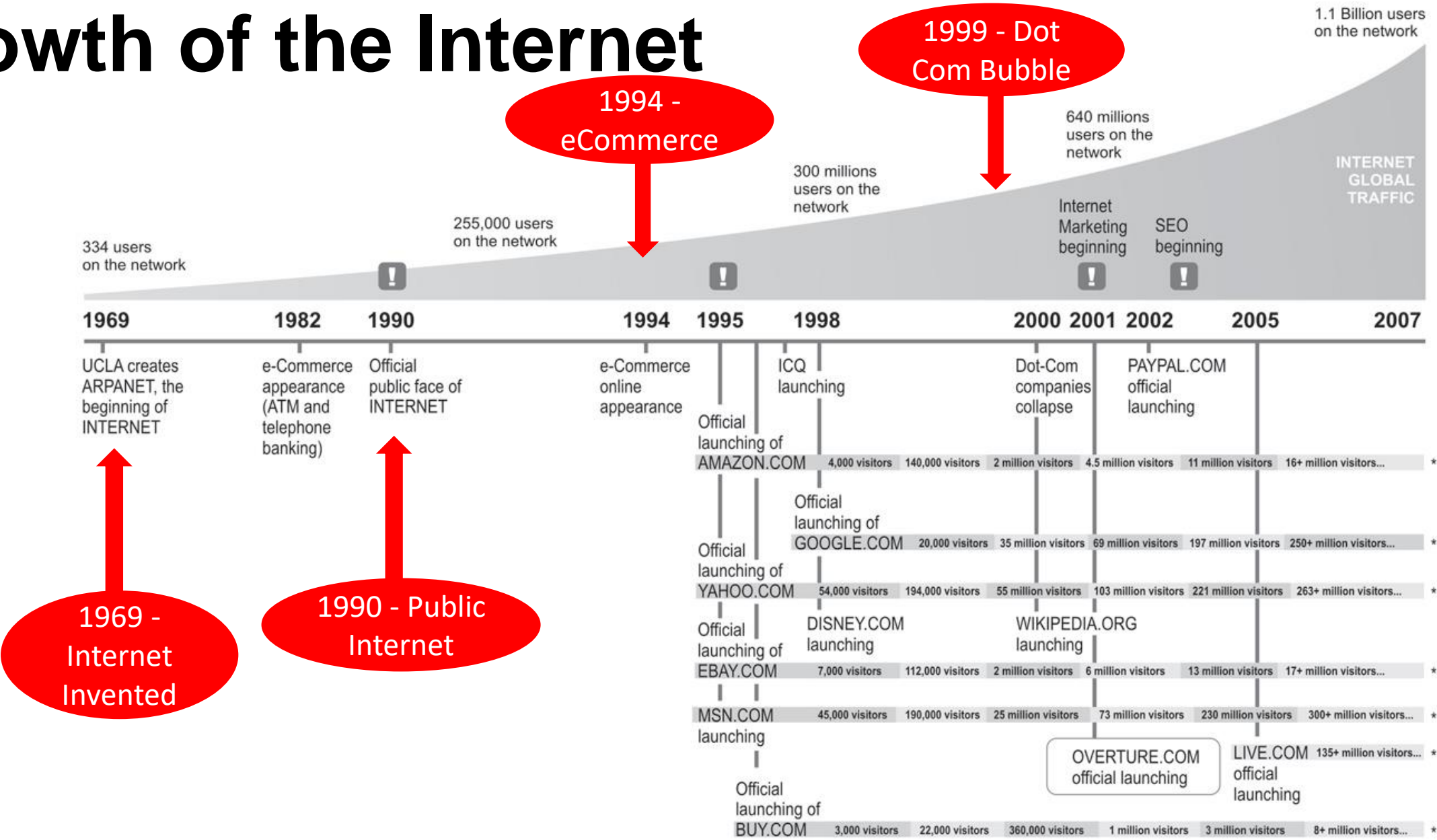


**"There is no reason
anyone would want a
computer in their home."**

Ken Olson, 1977

Founded Digital Equipment in 1957

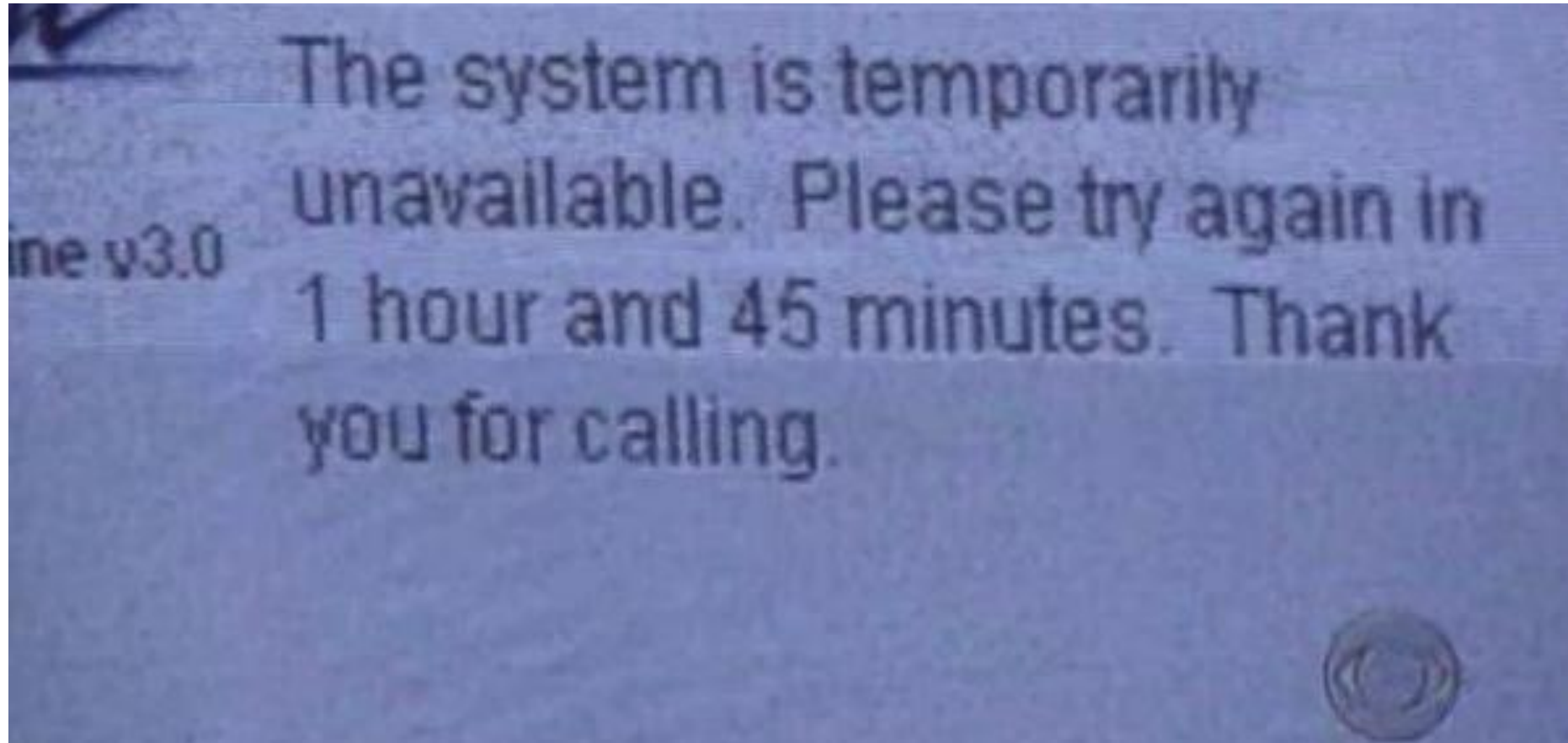
Growth of the Internet



* User traffic calculation per day

“AOL Blackout” – The Lead News Story


- CBS Evening News, Aug 7, 1996



10 Largest Companies in 1999

Company	Market Cap
Microsoft	\$583 B
General Electric	\$504 B
54 Years	
Lucent	\$252 B
Nokia	\$197 B
BP	\$196 B

10 Largest Companies Today

Company	Market Cap (Q3 2020)
Apple	\$1,981 B
Microsoft	\$1,592 B
	
Berkshire Hathaway	\$509 B
Visa	\$426 B
Taiwan Semiconductor	\$420 B

10 Largest Companies Today

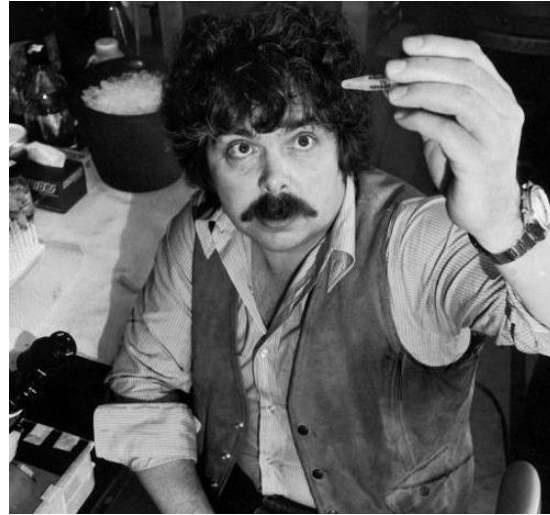
Company	Market Cap (Q3 2020)
Apple	\$1,981 B
Microsoft	\$859 B
Amazon	\$857 B
Alphabet	\$700 B
Alibaba	\$495 B
Facebook	\$46 B
Tencent	\$47 B
Berkshire Hathaway	\$309 B
Visa	\$226 B
Taiwan Semiconductor	\$420 B



The Biotech Revolution

Where are we today?

Berg, Boyer & Cohen - 1973



Start of Biotech Industry - 1976

- Genentech – 1976 – Boyer & Swanson; Insulin, 1982
- Biogen – 1978 – Gilbert & Sharp; Factor IX, 1993
- Amgen – 1980; Epo, 1989; Neupogen, 1991
- Genetics Institute – 1980; Maniatis & Ptashne; Neumega, 1997
- Genzyme – 1981; Snyder & Whitesides; Ceredase, 1991



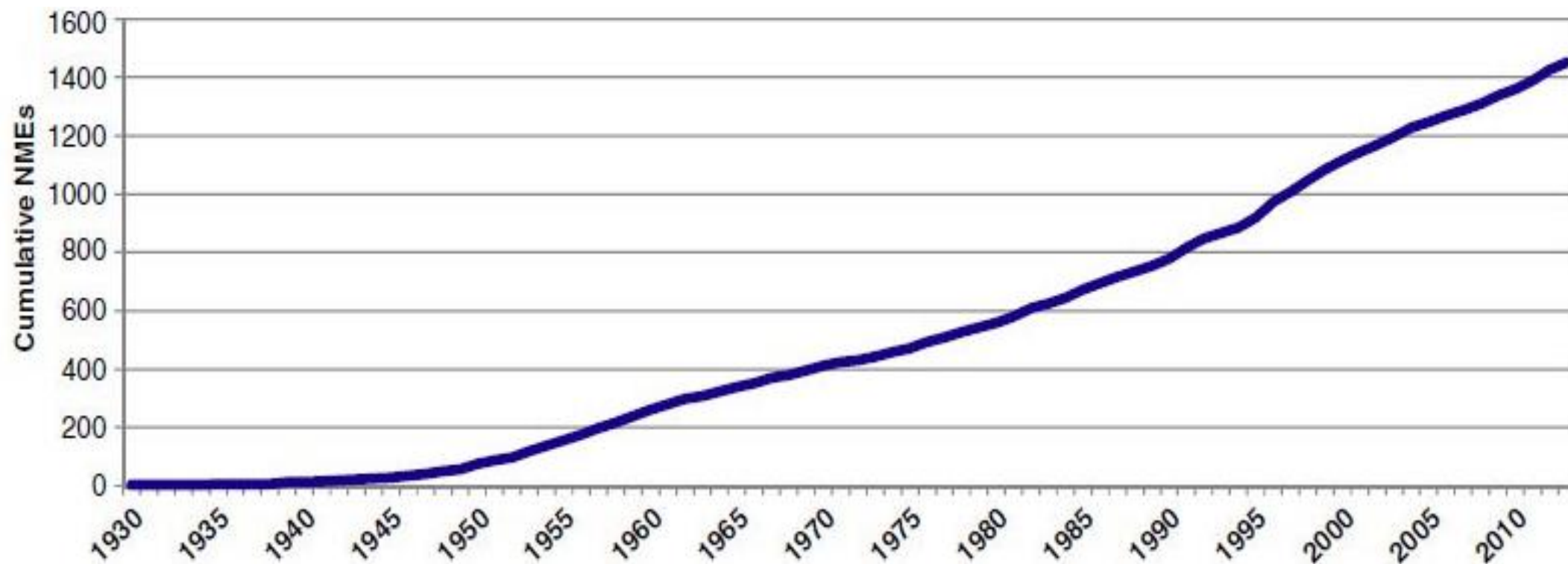
Biogen

AMGEN

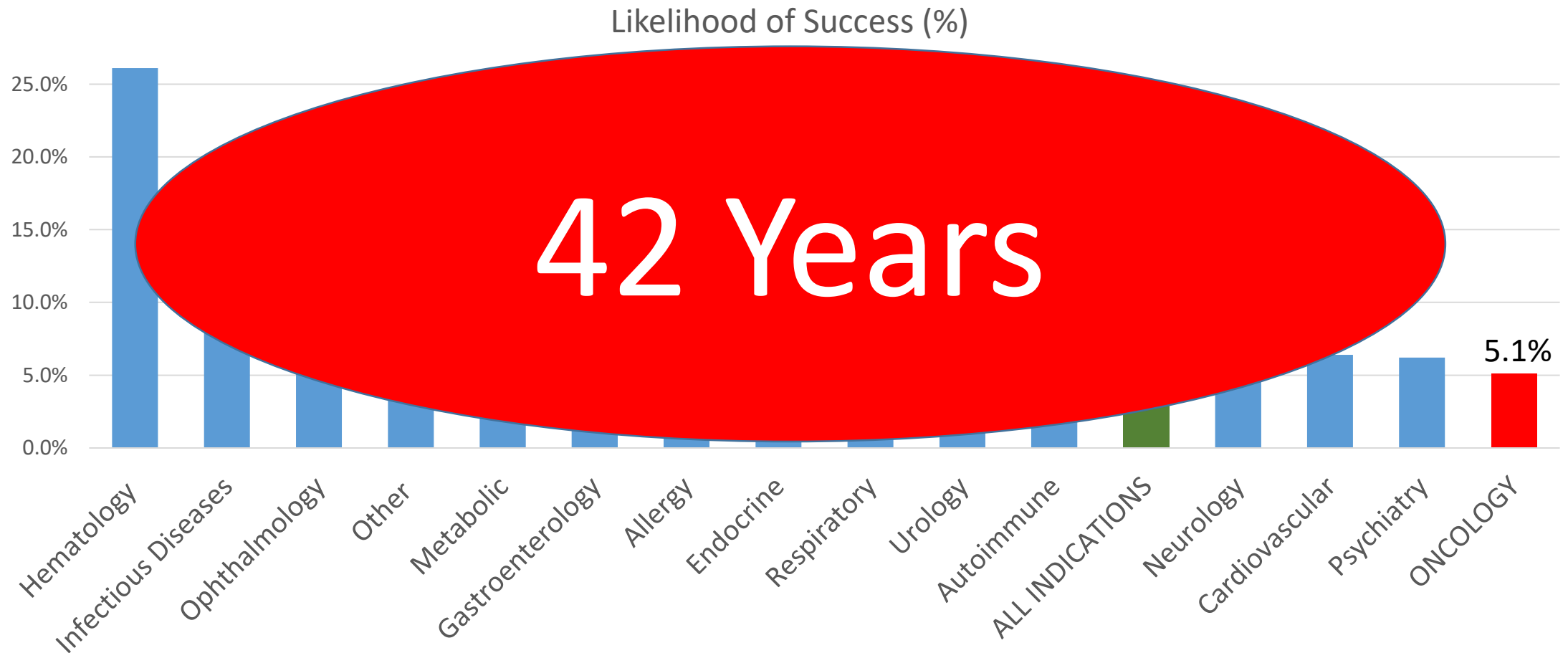
genzyme



Cumulative Number of FDA Approved Drugs 1930-2014

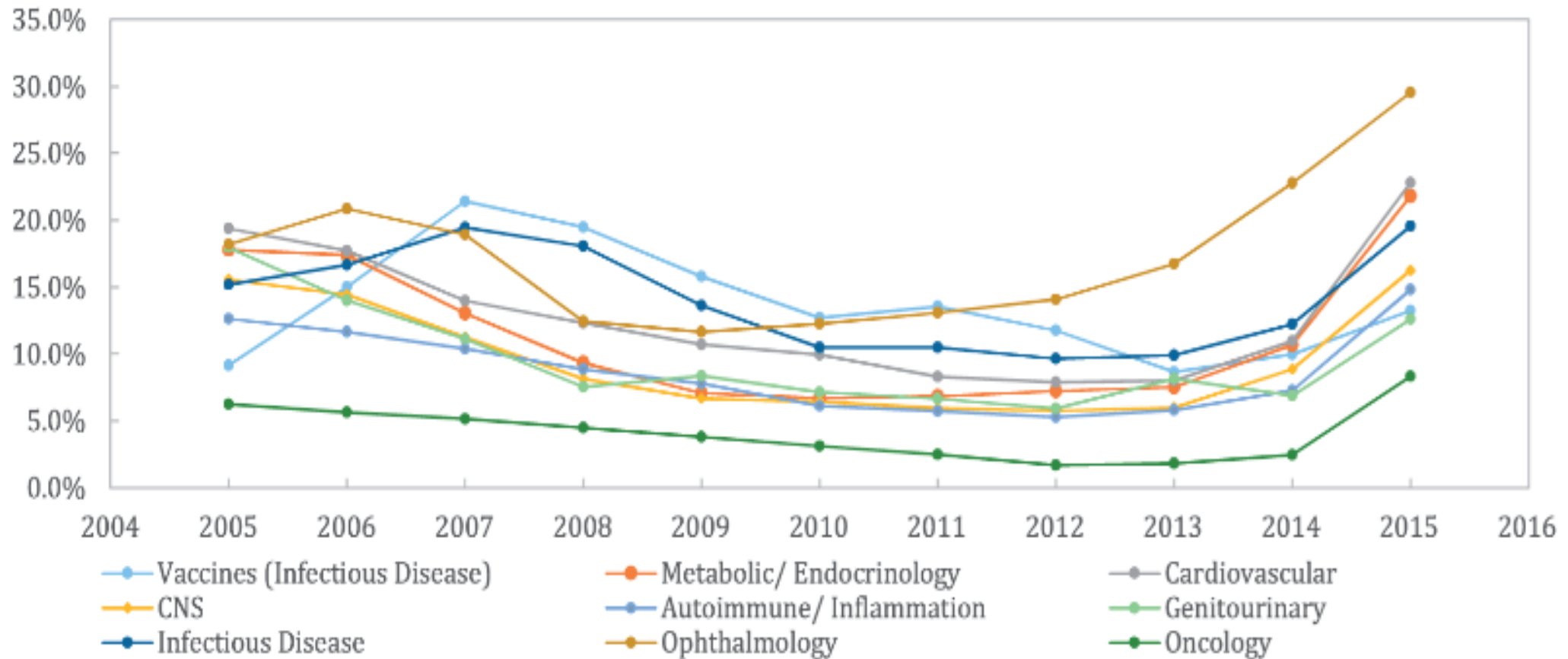


Phase 1 to FDA Drug Approval Success Rates 2006-2015



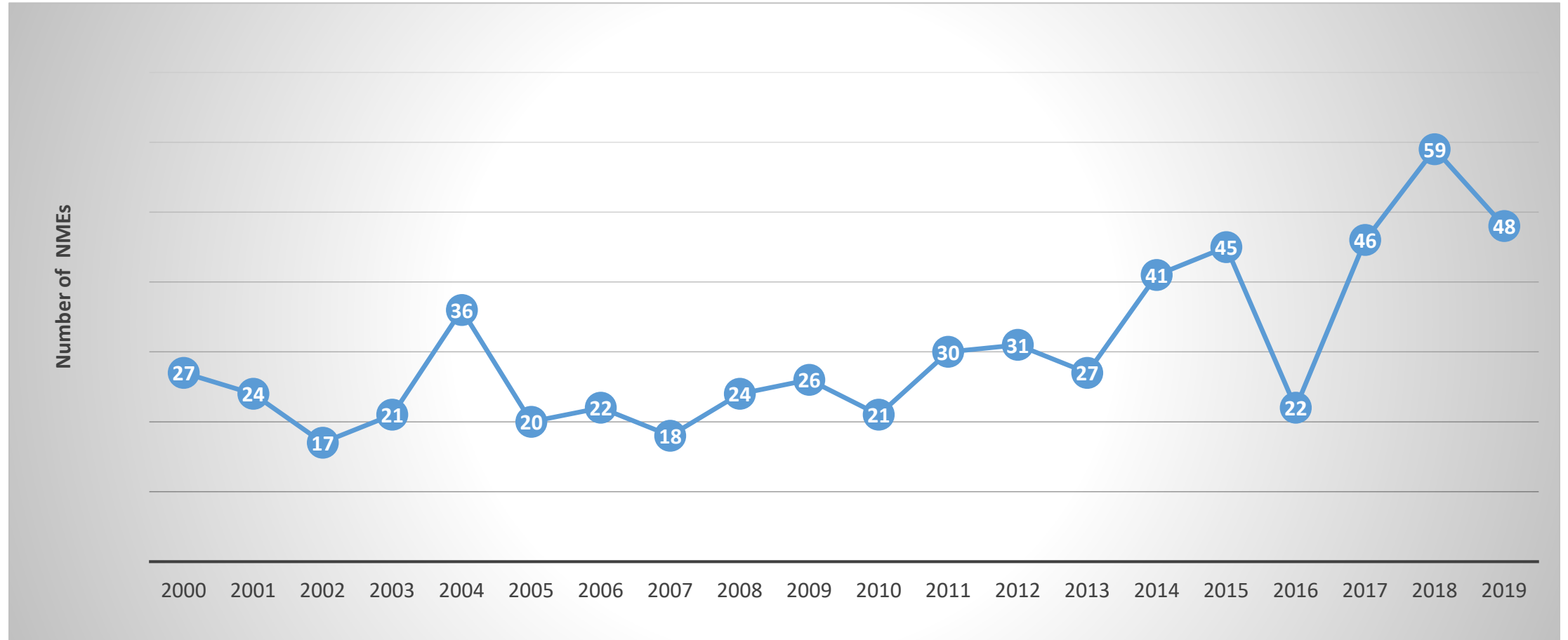
Increasing Clinical Trial Success Rates

Phase 1 to FDA Approval, 2006-2015



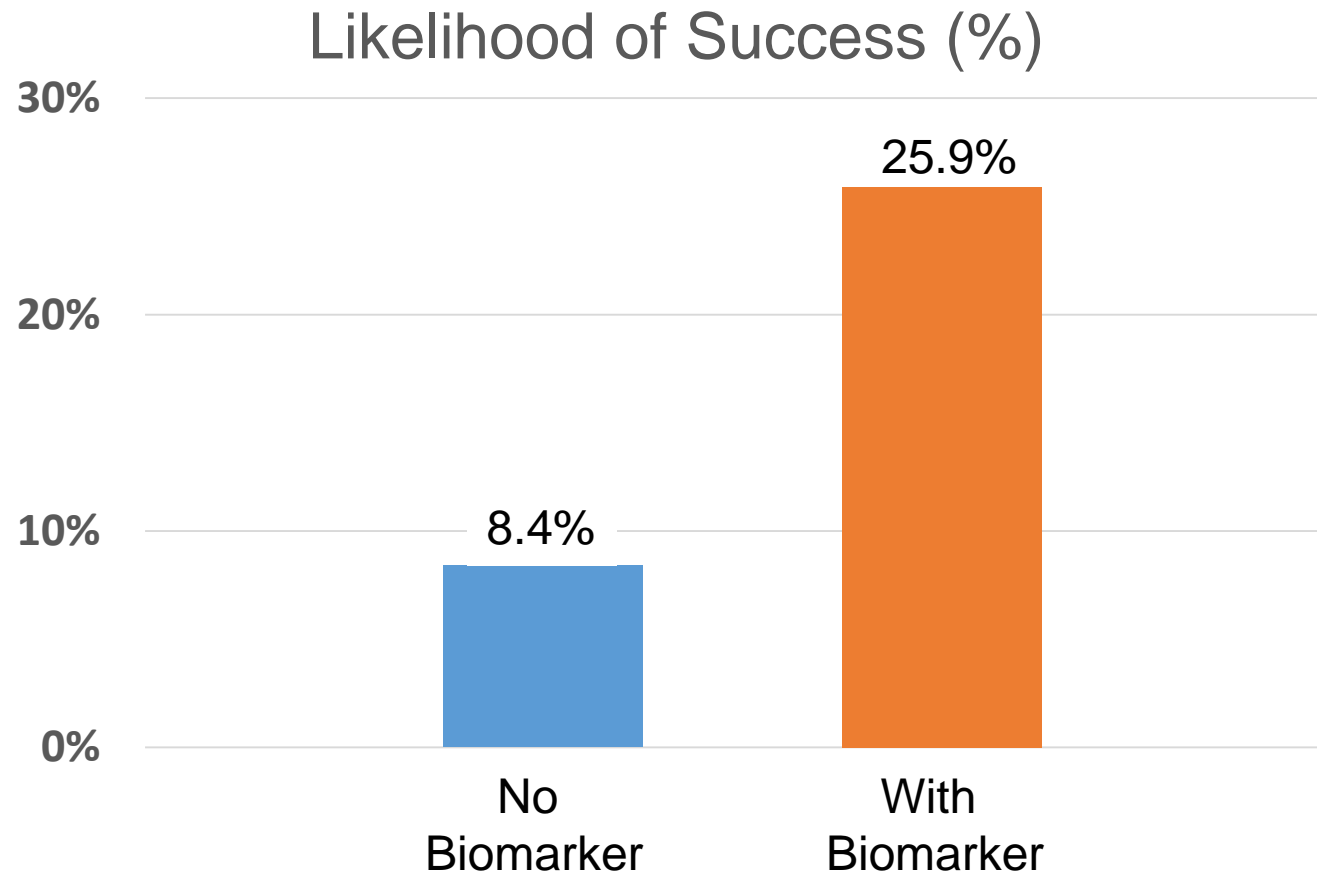
Recent Number of FDA Drug Approvals

2000-2019

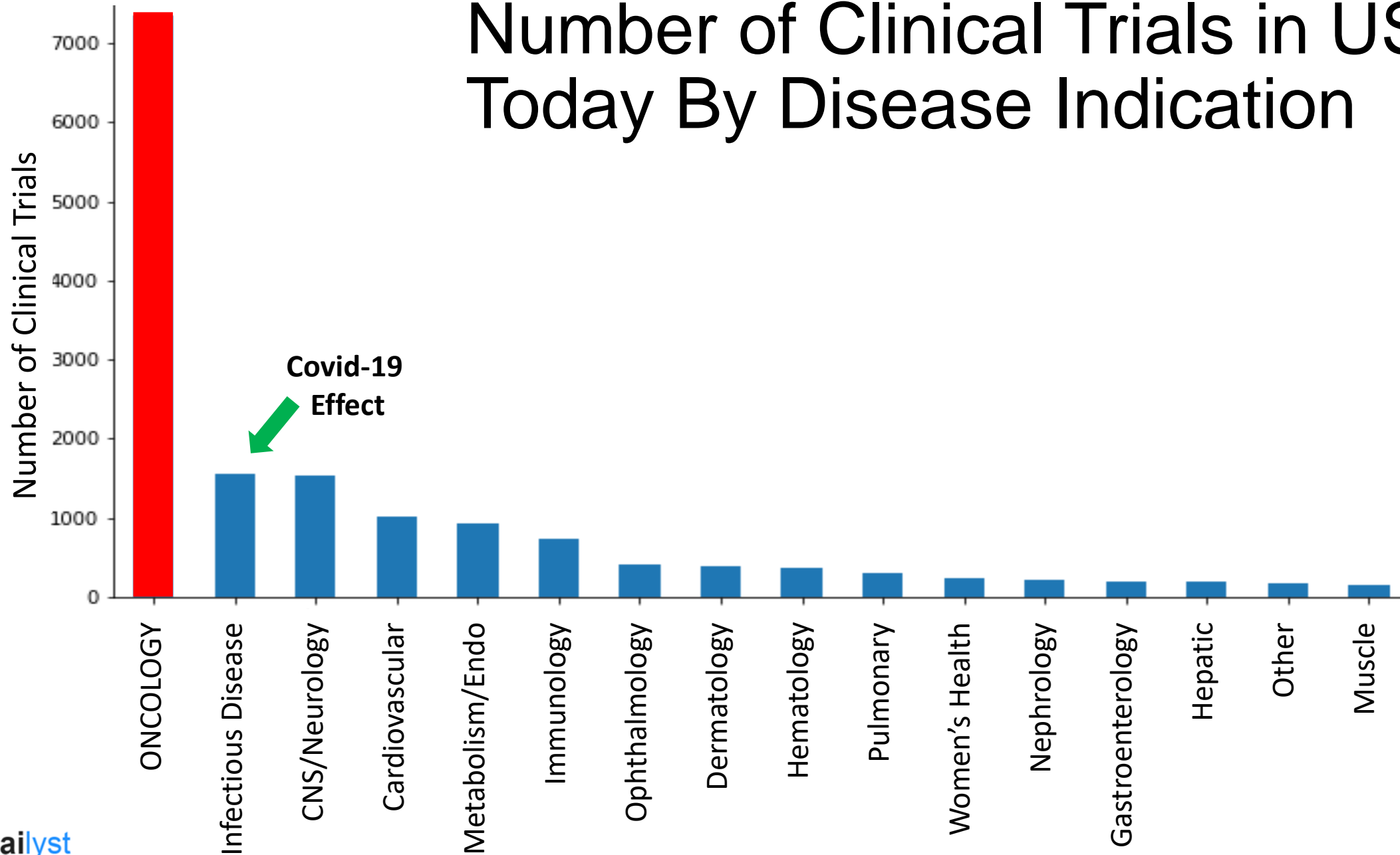


Biomarker Guided Trials Are More Successful

Phase 1 to FDA Approval, 2006-2015



Number of Clinical Trials in US Today By Disease Indication



The New York Times

January 20, 2020

W.H.O. Declares Global Emergency as Wuhan Coronavirus Spreads

The announcement came as nearly 10,000 cases have been reported worldwide.

The New Language of Life Science

Gene Therapy

Gene Editing

RNAi

Bispecifics

Transgenics

ADCs

Genetically
Modified
Organisms

CRISPR

Stem Cells

Genomics

Designer
Probiotics

Synthetic Biology

Gene Transfer

Microbiome

CAR-T Cells

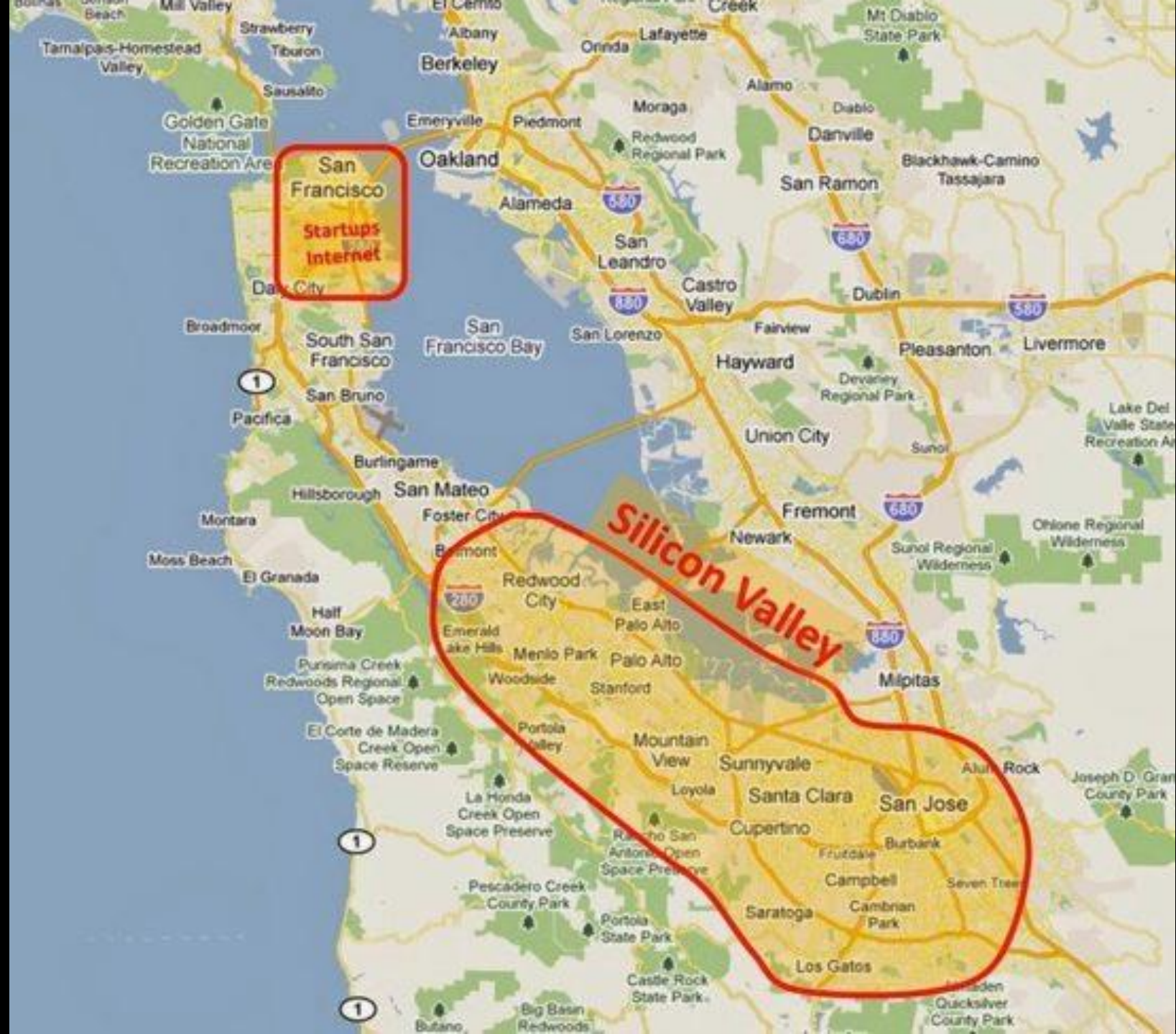
Health Span

Gene Drive

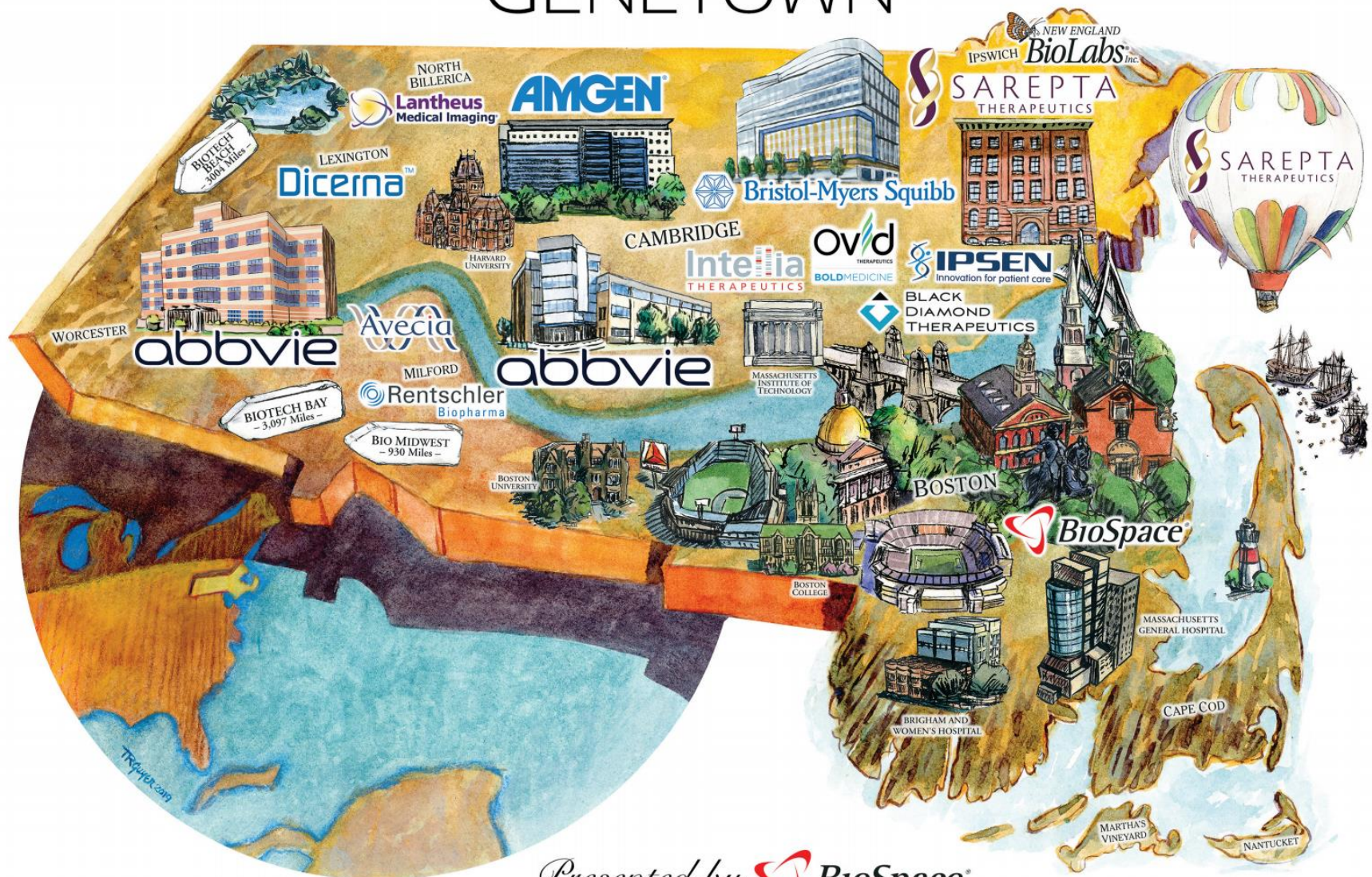
Largest Healthcare/Life Science Companies Today

Company	Rank
Johnson & Johnson	# 12
United Health	# 17
Danaher	# 45
AbbVie	# 46

47 Years



GENETOWN



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“The future ain't what it
used to be.”

Yogi Berra