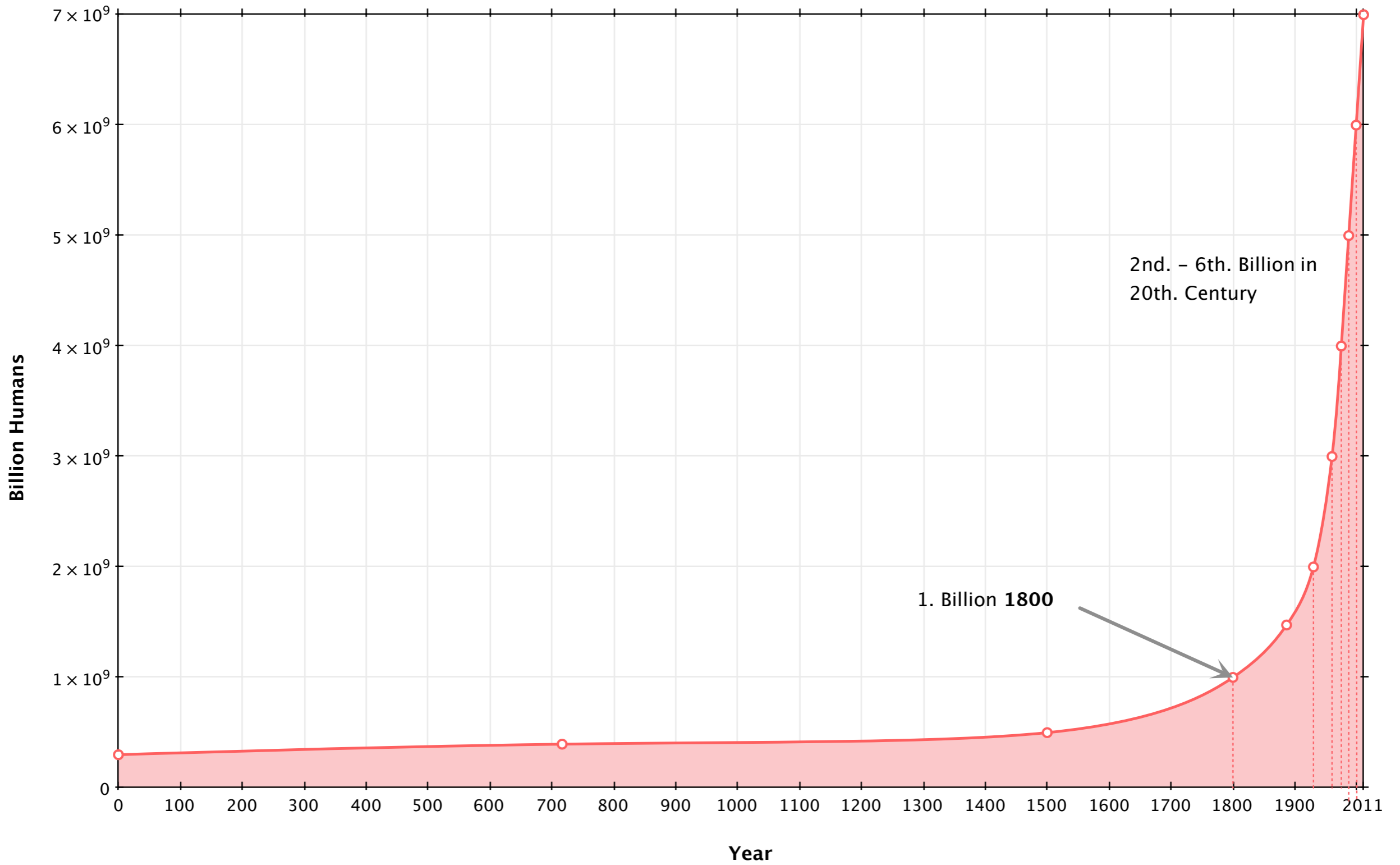


# Getting *Nothing* Done?

Dr. Alexander Schatten  
<https://podcast.zukunft-denken.eu>



**The First Billion?**



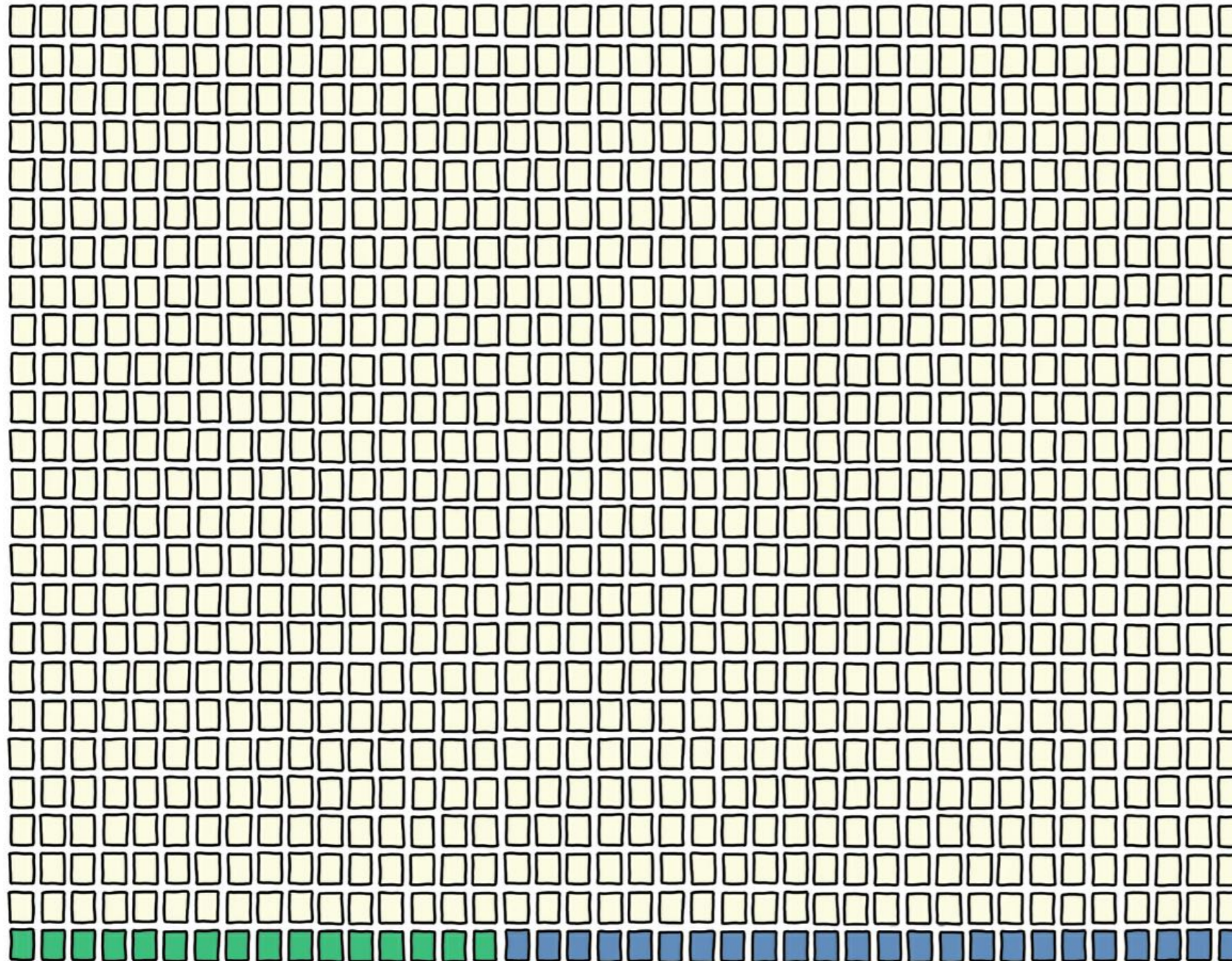
During my lifetime population **doubled**, during the lifetime of my father **tripled**.  
 A person who is 100 years old experienced a **quadrupling** of Earth's population.

# IF HUMAN HISTORY WERE A 1,000-PAGE BOOK

250,000  
YEARS AGO

EACH PAGE = 250 YEARS  
EACH ROW = 10,000 YEARS

HUNTER-GATHERERS

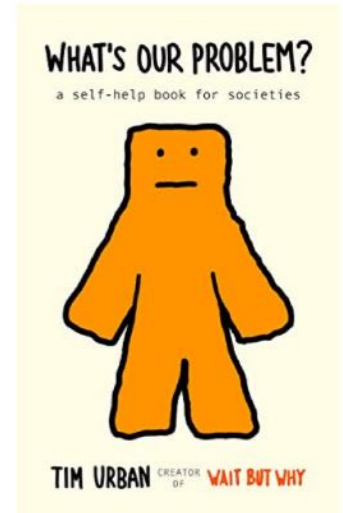


EARLY AGRICULTURE

↑  
RECORDED  
HISTORY BEGINS-ISH

super famous person  
who lived on that  
page, for reference →

- GANDHI
- SHAKESPEARE
- JOAN OF ARC
- GENGHIS KHAN
- CHARLEMAGNE
- MUHAMMAD
- CONSTANTINE
- JESUS
- CLEOPATRA
- ARISTOTLE
- BUDDHA



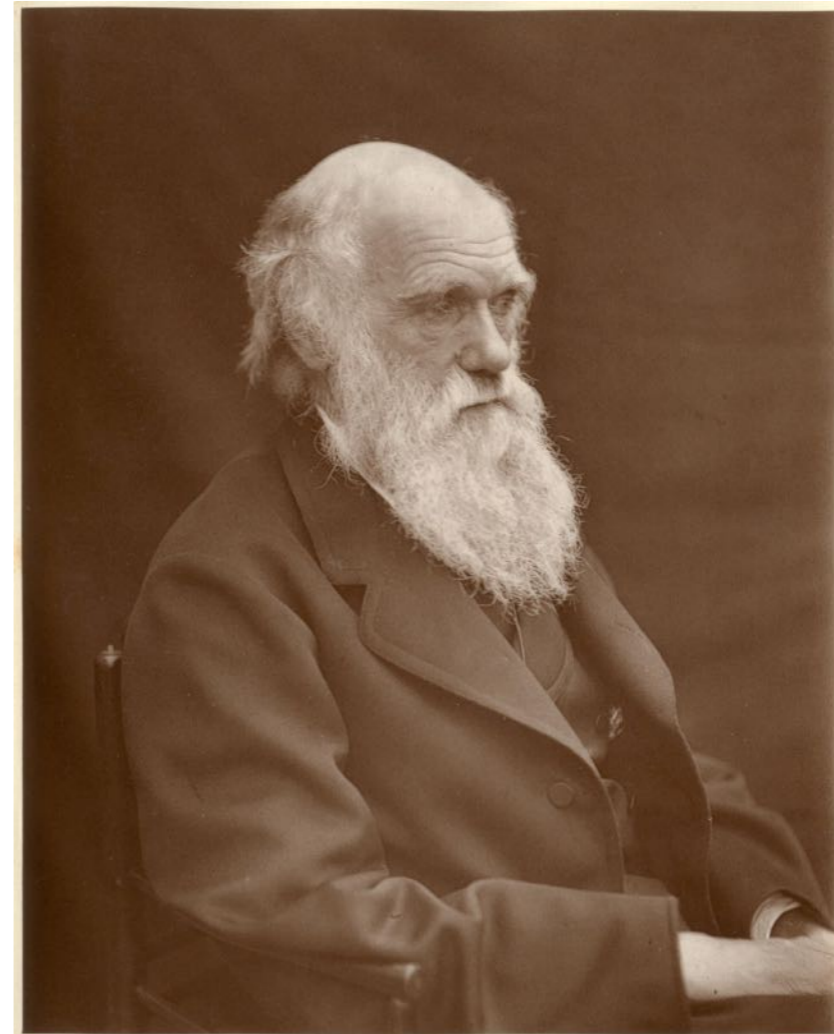
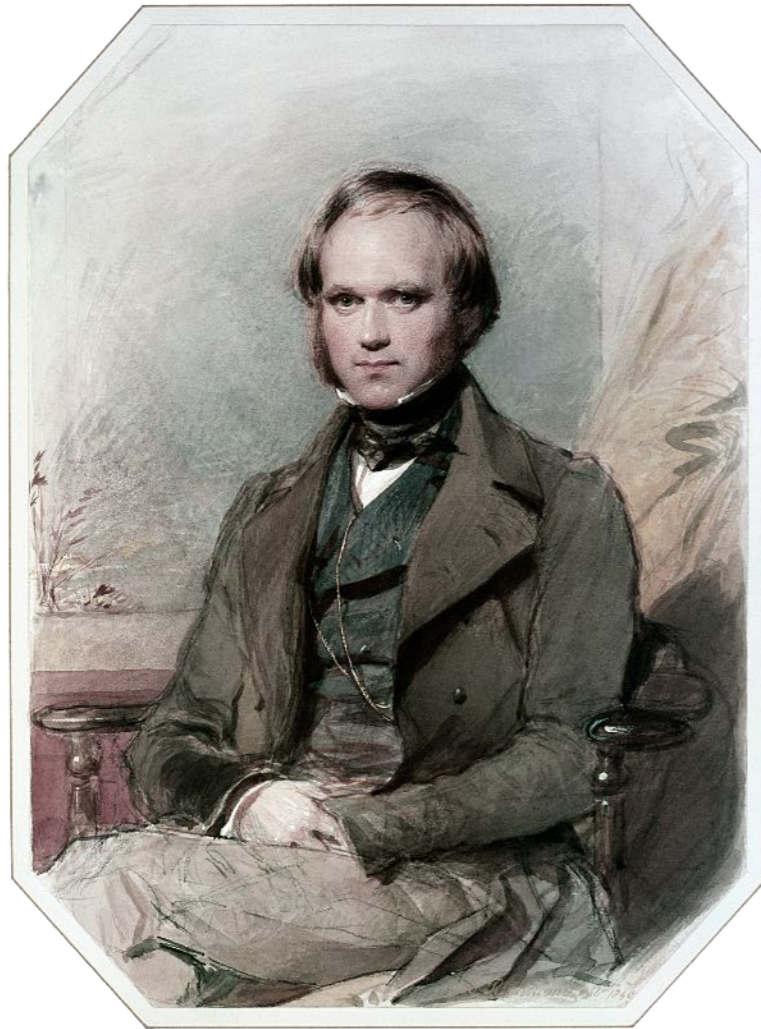
# Context

1. What happened between 1800 and 1960?
2. What happened in/since the 1970s?
3. What does this mean for our future?

# 19th Century

The Life from the Perspective of  
Charles Darwin — Science

# Charles Darwin



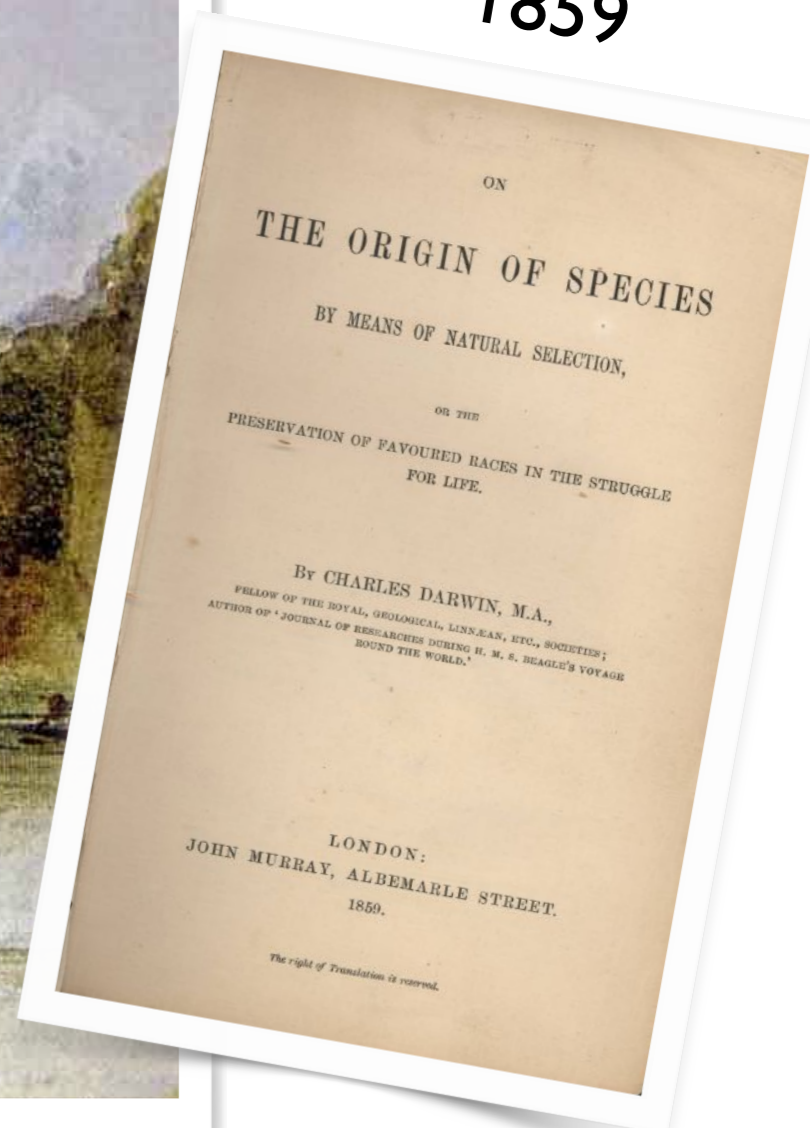
**1809 – 1882**

# Darwin, The Beagle & The Origin of Species

1831-1836



1859





# Life in 1800?

- Pre modern life
- Start of industrial revolution, esp. England
- Cities grow in importance
- But huge social problems (e.g. Seven Dials slum in London, child labour, Manchester capitalism/Friedrich Engels; epidemics...)

# Spectroscopy



5

Joseph von Fraunhofer demonstrating spectroscopy

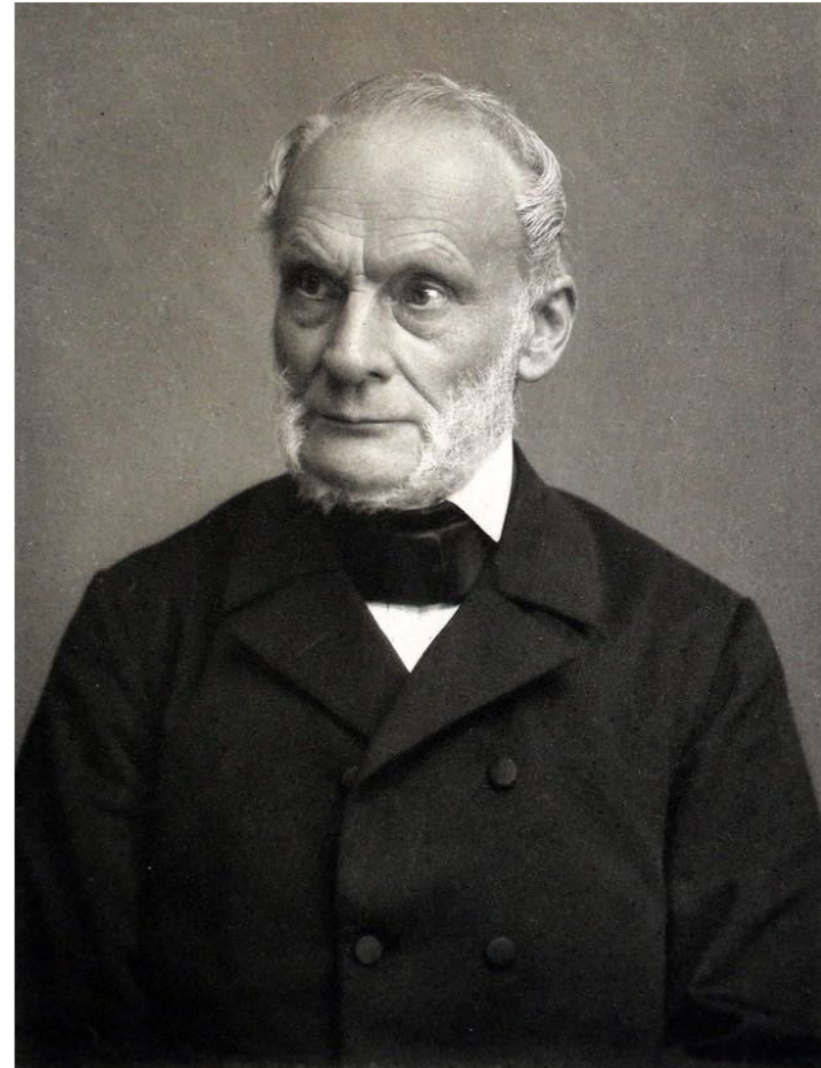
# Thermodynamics

15



Sadi Carnot  
How to design good steam engines  
(1824)

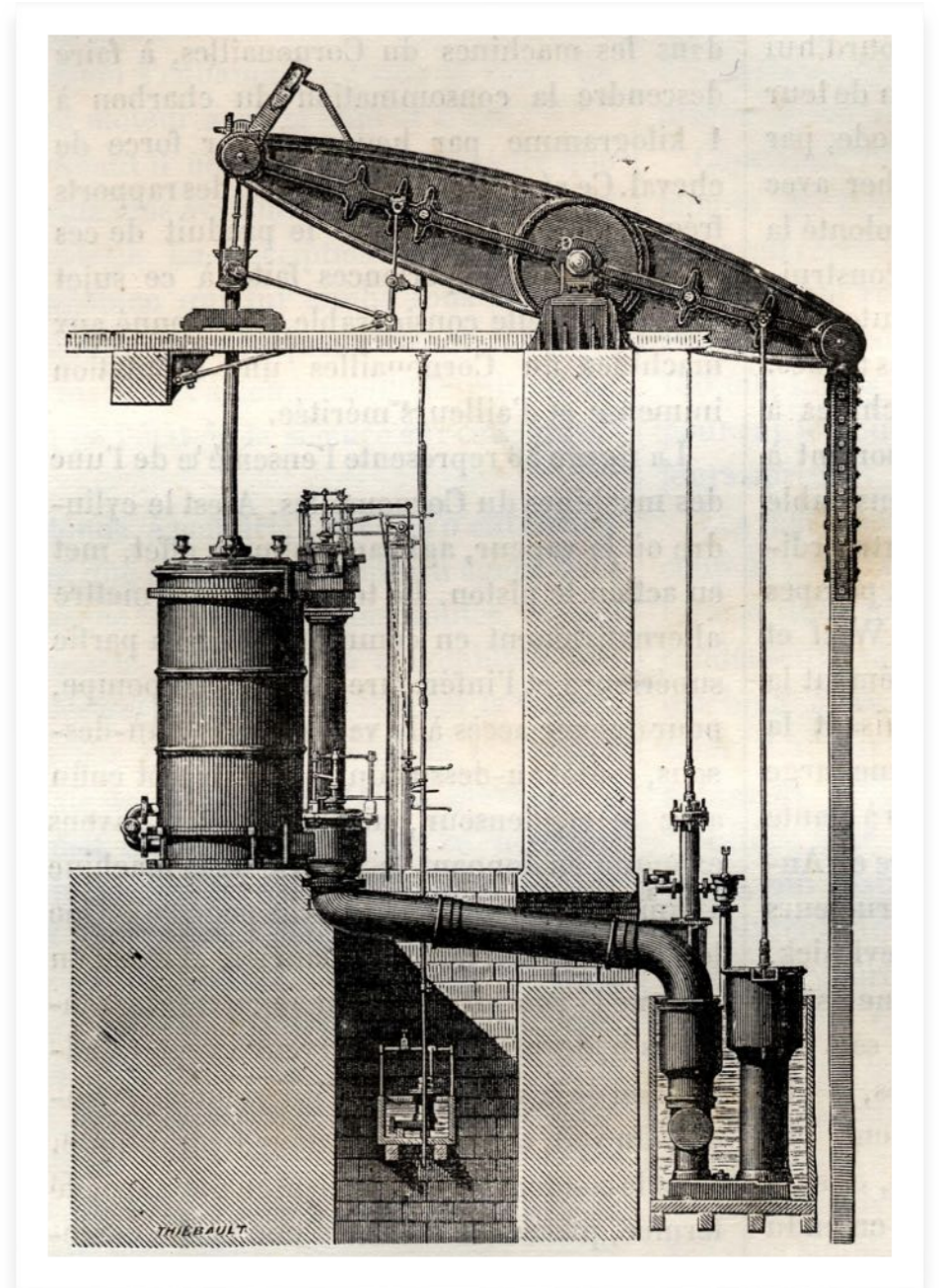
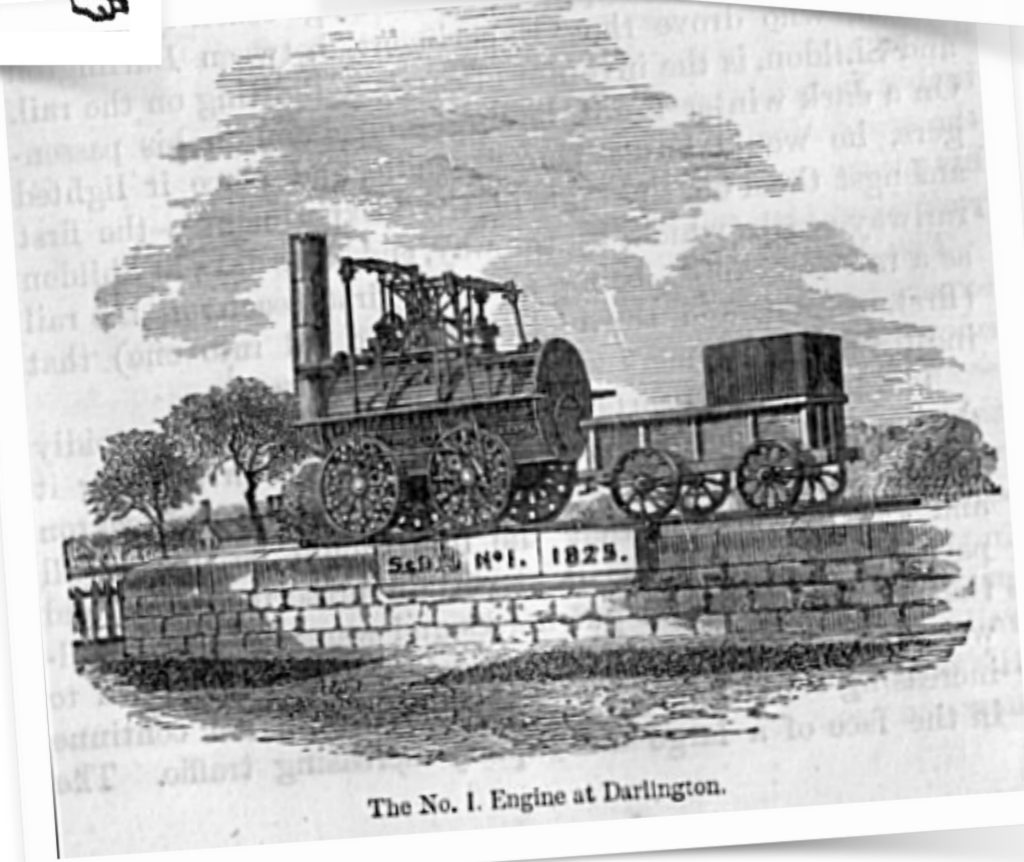
41



Rudolf Clausius  
Second Law of thermodynamics  
(1850)

Aeolipile  
ca. 100 n. Chr

# Steam Engine



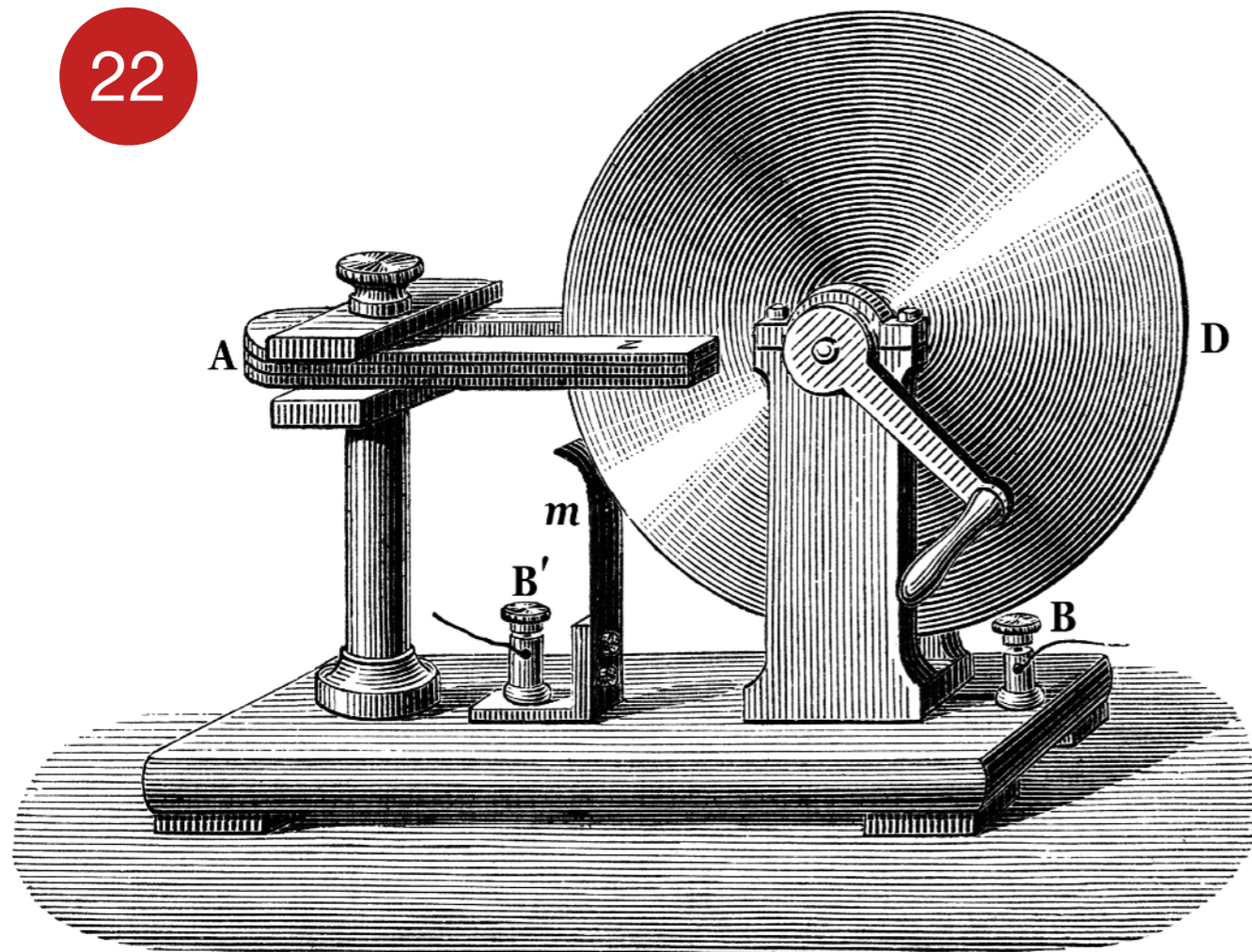
16

Stephenson No 1  
Stockton and Darlington Railway 1825

Cornish Engine

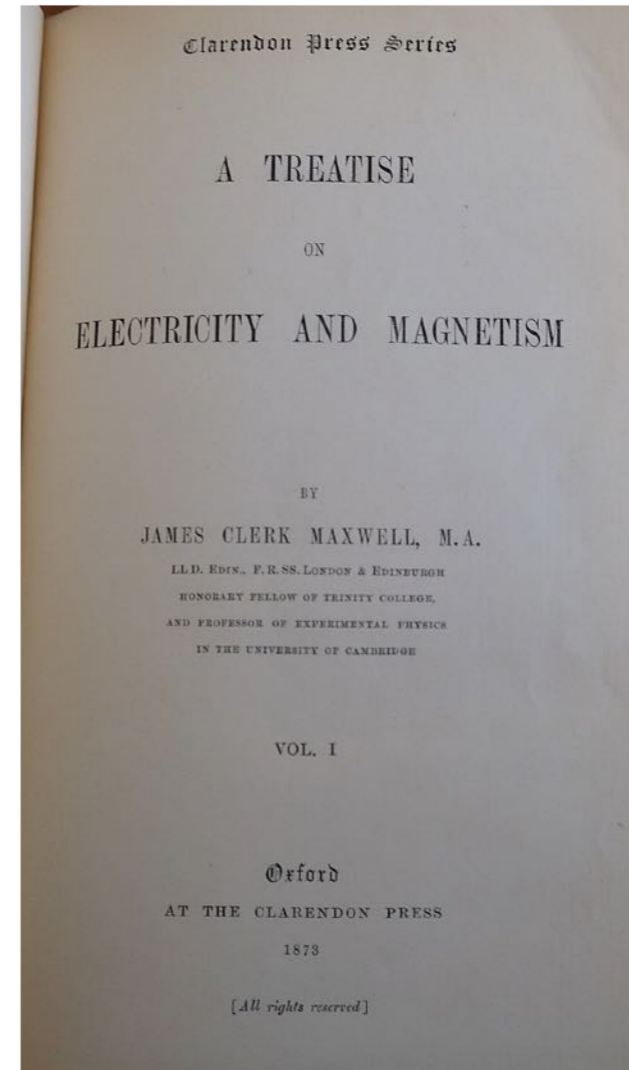
# Faraday & Maxwell

22



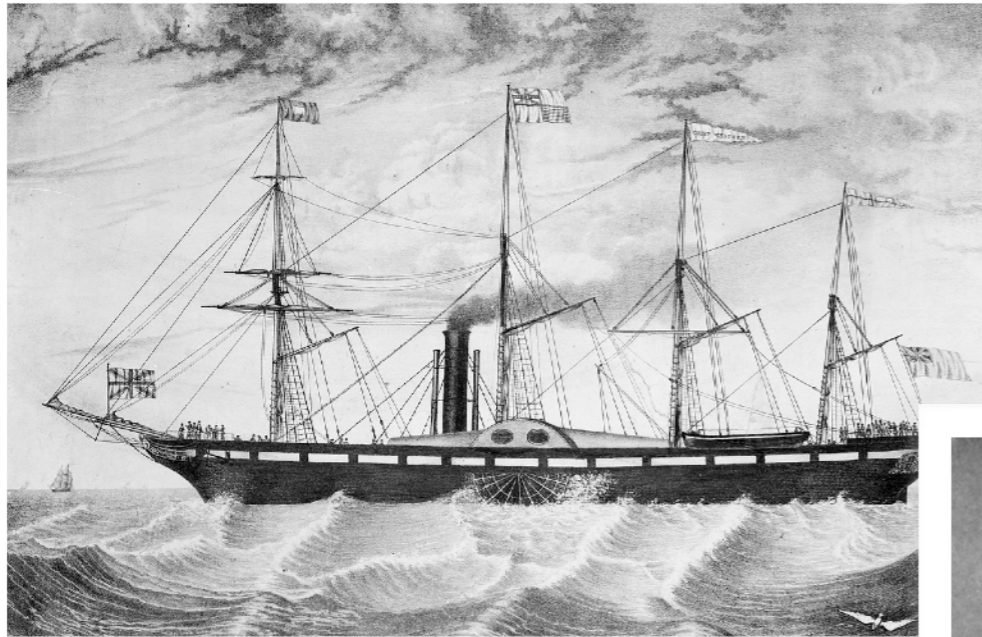
Faraday Disc — Electric Generator  
(1831)

64



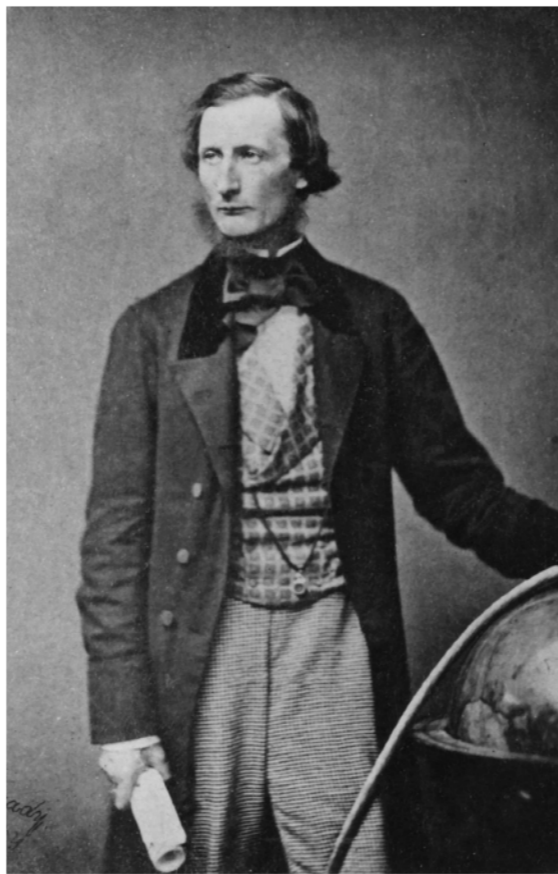
James Clerk Maxwell  
Treatise on Electricity  
and Magnetism  
(1873)

# Transatlantic Exchange

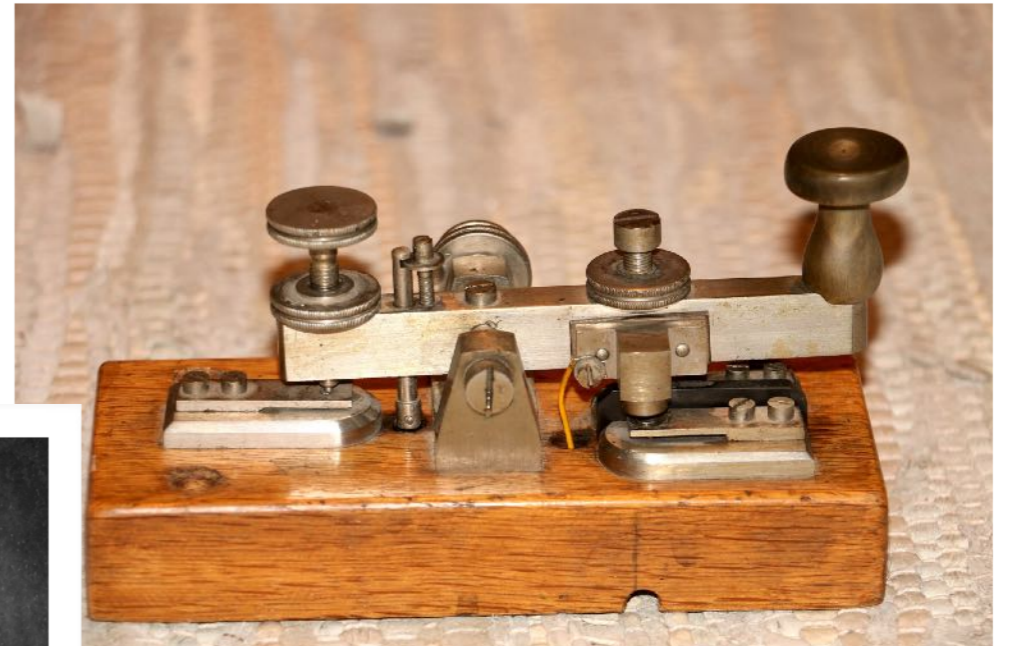


28

SS Great Western  
Isambard Kingdom Brunel  
(1837)



Cyrus Field, Transatlantic Cable  
(1858)



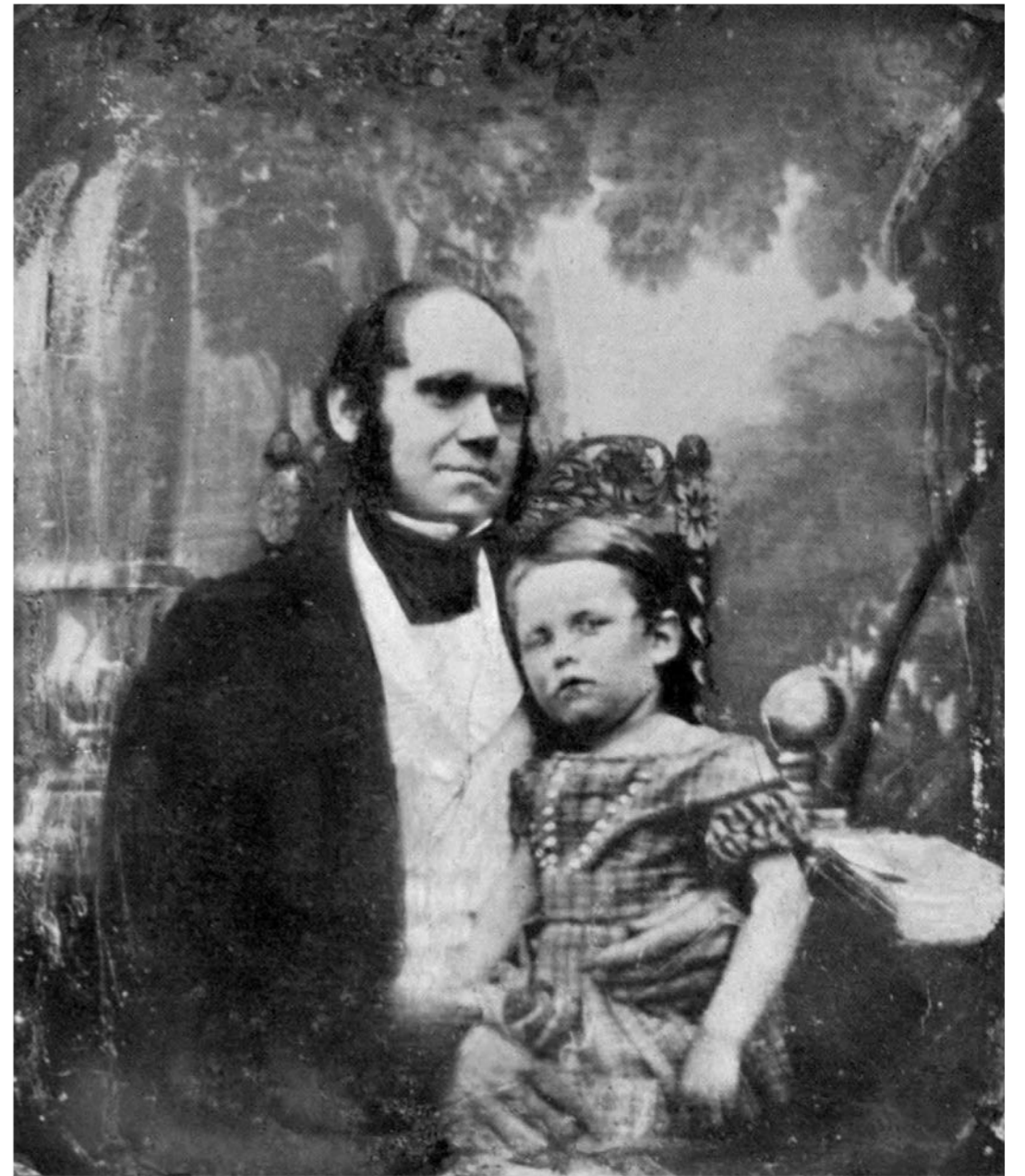
Morse Code & Telegraph  
(1844)

35

49

# Invention of Photography

30



Roundhay, 1888 original 20 frames  
Louis Le Prince

33

# Medicine

37



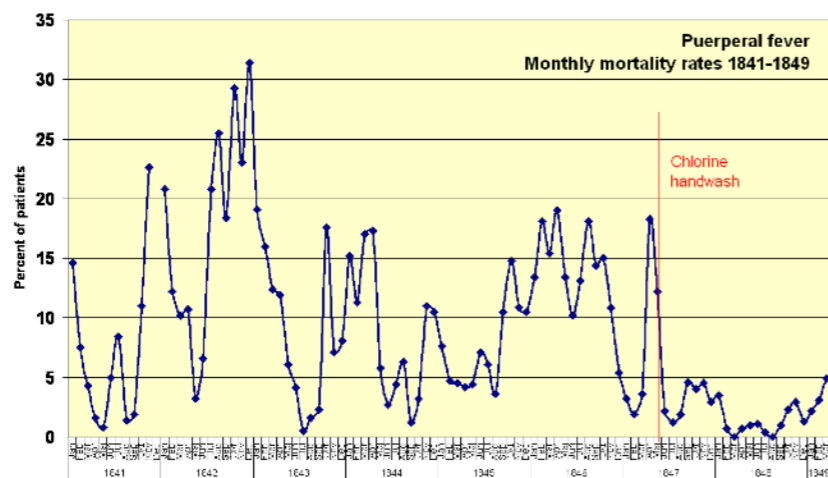
Anesthesia 1846



Pasteur / Anthrax 1881

72

38



Iganz Semmelweis 1847

75



Robert Koch / Cholera 1884



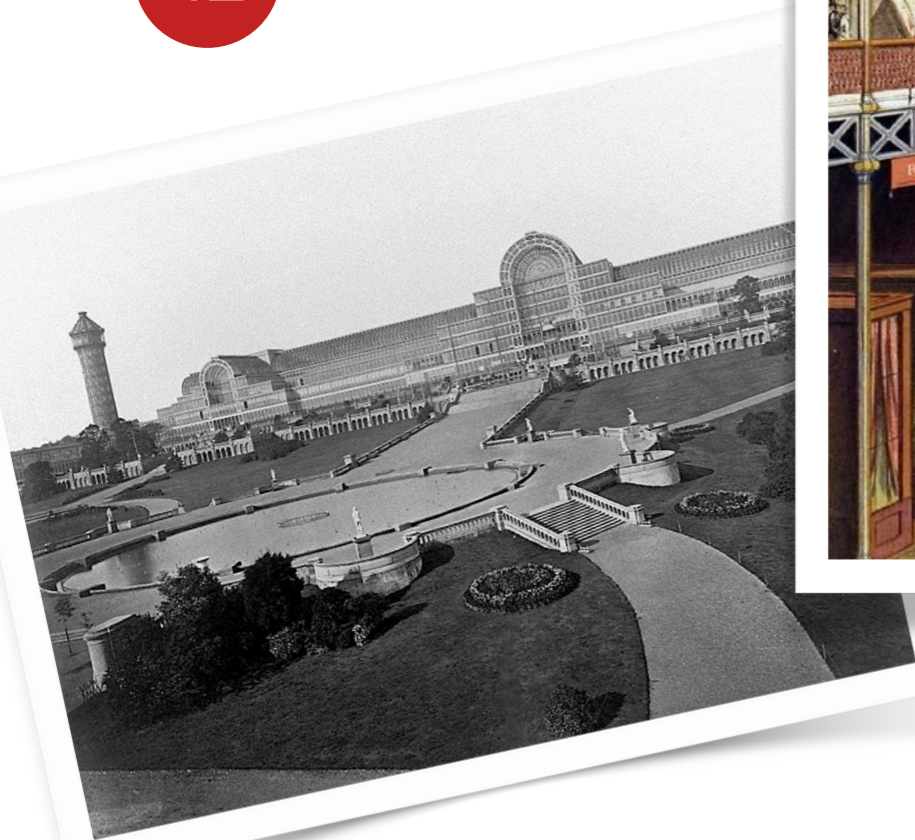
# Crystal Palace (World Expo 1851)

42



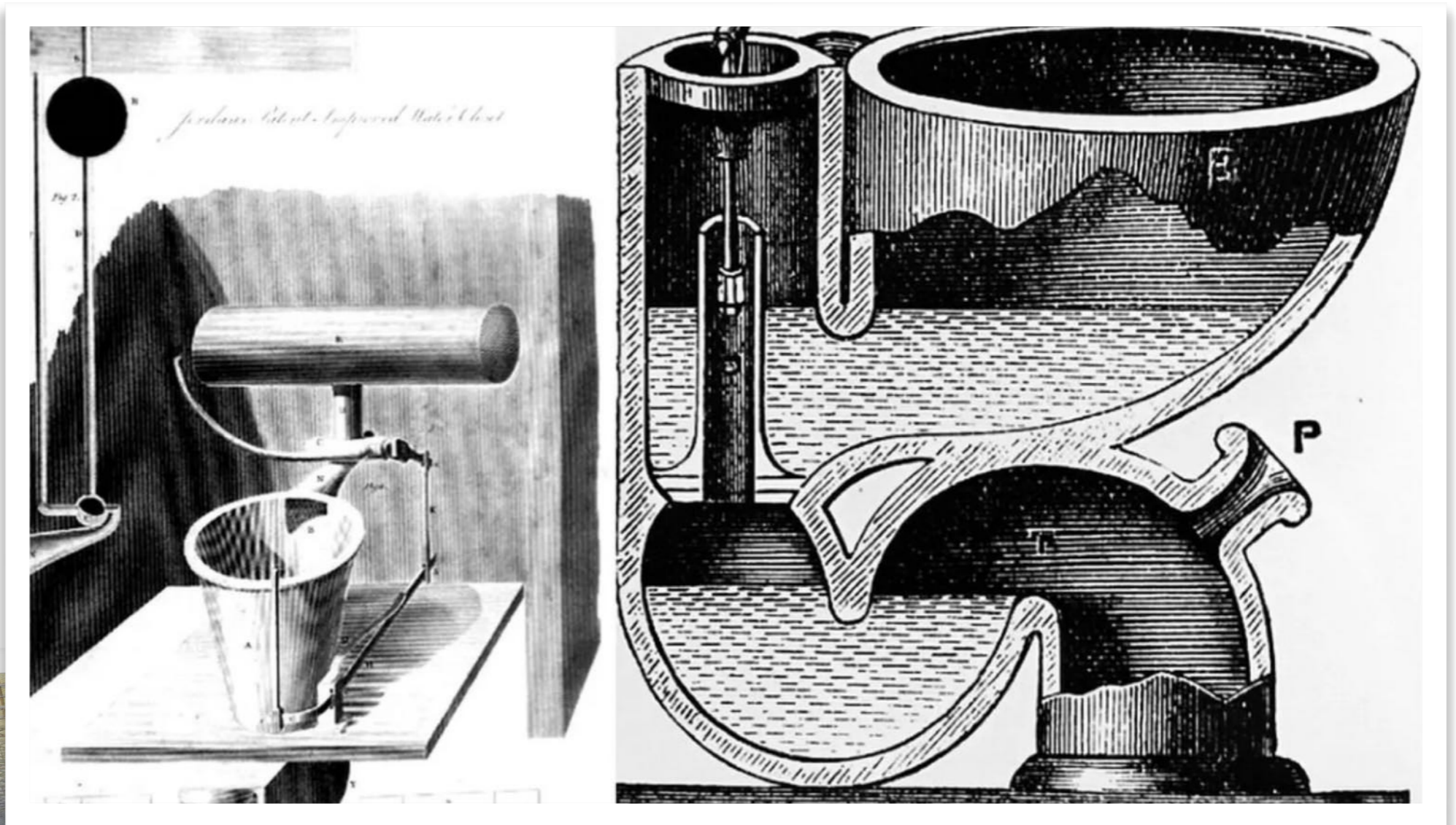
# Crystal Palace (World Expo 1851)

42



# Crystal Palace (World Expo 1851)

42



Monkey Closet by George Jennings

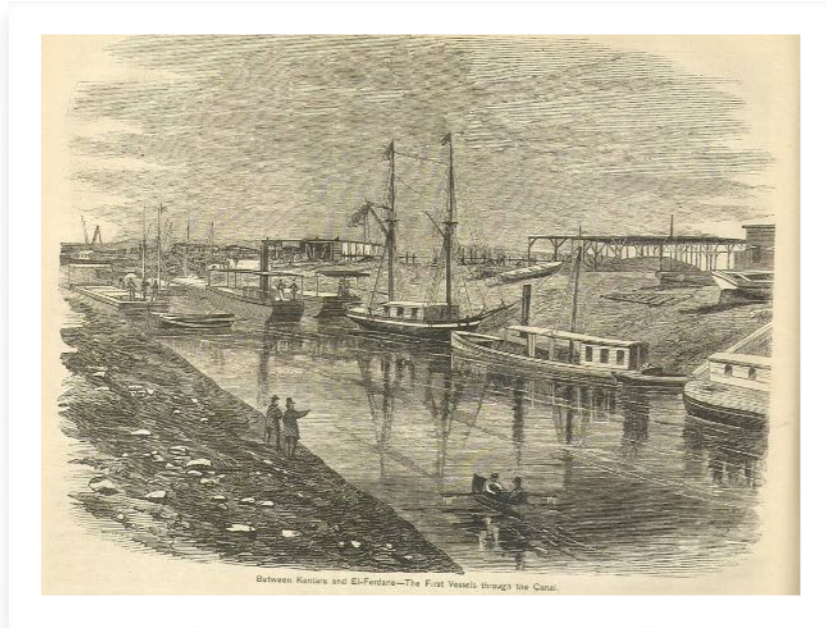


# Modern Chemistry: Dmitri Mendeleev

Reihen	Gruppe I. — R'O	Gruppe II. — RO	Gruppe III. — R'O'	Gruppe IV. RH <sup>4</sup> RO <sup>2</sup>	Gruppe V. RH <sup>3</sup> R'O <sup>3</sup>	Gruppe VI. RH <sup>2</sup> RO <sup>3</sup>	Gruppe VII. RH R'O'	Gruppe VIII. — RO <sup>4</sup>
1	II=1							
2	Li=7	Be=9,4	B=11	C=12	N=14	O=16	F=19	
3	Na=23	Mg=24	Al=27,3	Si=28	P=31	S=32	Cl=35,5	
4	K=39	Ca=40	—=44	Ti=48	V=51	Cr=52	Mn=55	Fe=56, Co=59, Ni=59, Cu=63.
5	(Cu=63)	Zn=65	—=68	—=72	As=75	Se=78	Br=80	
6	Rb=86	Sr=87	?Yt=88	Zr=90	Nb=94	Mo=96	—=100	Ru=104, Rh=104, Pd=106, Ag=108.
7	(Ag=108)	Cd=112	In=113	Sn=118	Sb=122	Te=125	J=127	
8	Cs=133	Ba=137	?Di=138	?Ce=140	—	—	—	— — — —
9	(—)	—	—	—	—	—	—	
10	—	—	?Er=178	?La=180	Ta=182	W=184	—	Os=195, Ir=197, Pt=198, Au=199.
11	(Au=199)	Hg=200	Tl=204	Pb=207	Bi=208	—	—	
12	—	—	—	Th=231	—	U=240	—	— — — —

Periodic table 1869

# Construction



60

Suez Canal Opening 1869



Wiener Hochquellwasserleitung 1873



71

First Central Power Generation New York 1880

64

- What a time to live! In terms of science, technological, economical advances!
- But: the actual life of Darwin (and most “ordinary” people) changed less over his lifetime than one might expect
- However
  - from 1/5 people in cities to nearly 3/4
  - wealth per person ~ doubled, before 1800 ~0%
  - Europes last famine: Ireland (1845–1852)
  - Foundations for modern life in cities
  - Arctic & Antarctic last terra incognita
- **Technology of modernity did not scale**
- **Yet!**

»Wir zogen in die Stadt zu einem alten Ehepaar in eine kleine Kammer, wo in einem Bett das Ehepaar, im andern meine Mutter und ich schliefen. Ich wurde in einer Werkstätte aufgenommen, wo ich Tücher häkeln lernte; bei zwölfstündiger fleißiger Arbeit verdiente ich 20 bis 25 Kreuzer im Tage. Wenn ich noch Arbeit für die Nacht nach Hause mitnahm, so wurden es einige Kreuzer mehr. Wenn ich frühmorgens um 6 Uhr in die Arbeit laufen mußte, dann schliefen andere Kinder meines Alters [ca. 11 Jahre] noch.«

# **The 20th Century**

Technology scales; Modernity  
(and Existential Risk)



Attila Hörbiger

**1896 – 1987**



Paul Hörbiger

**1894 – 1981**

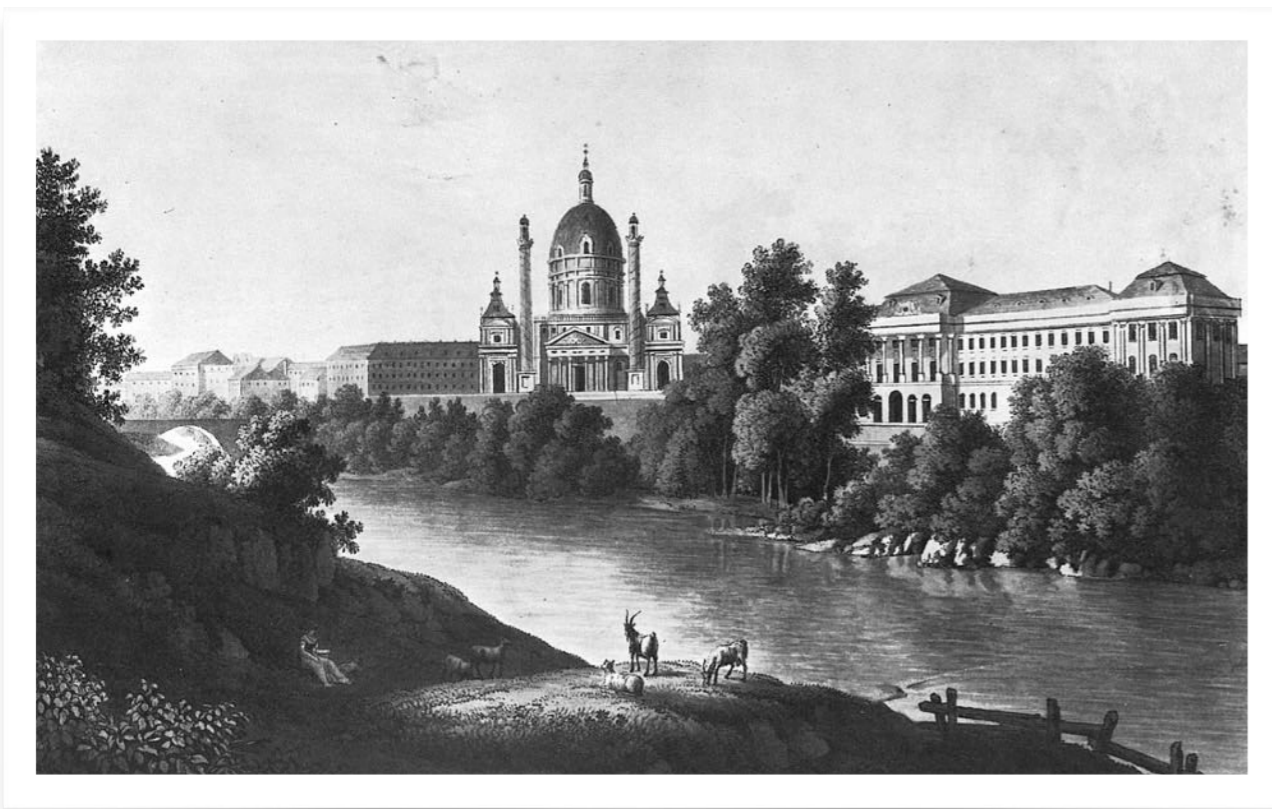
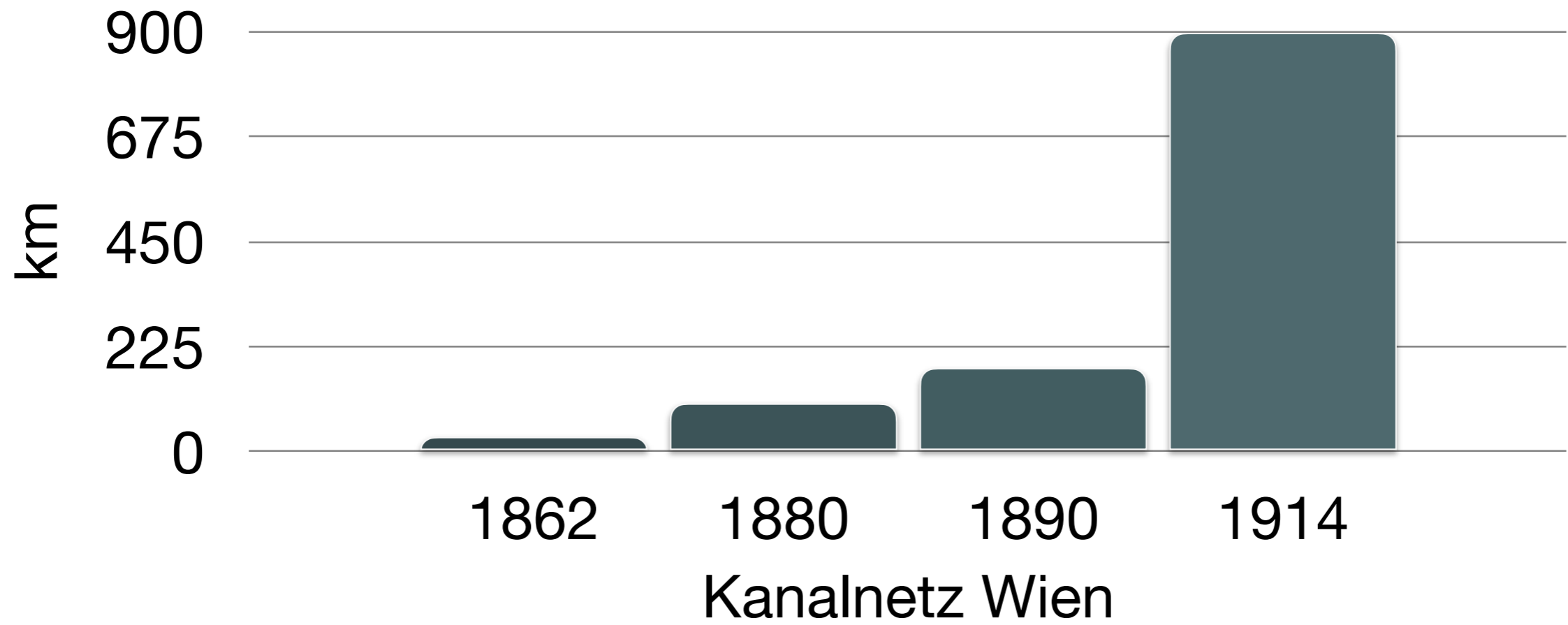


# Childhood (1890s) like Darwin!

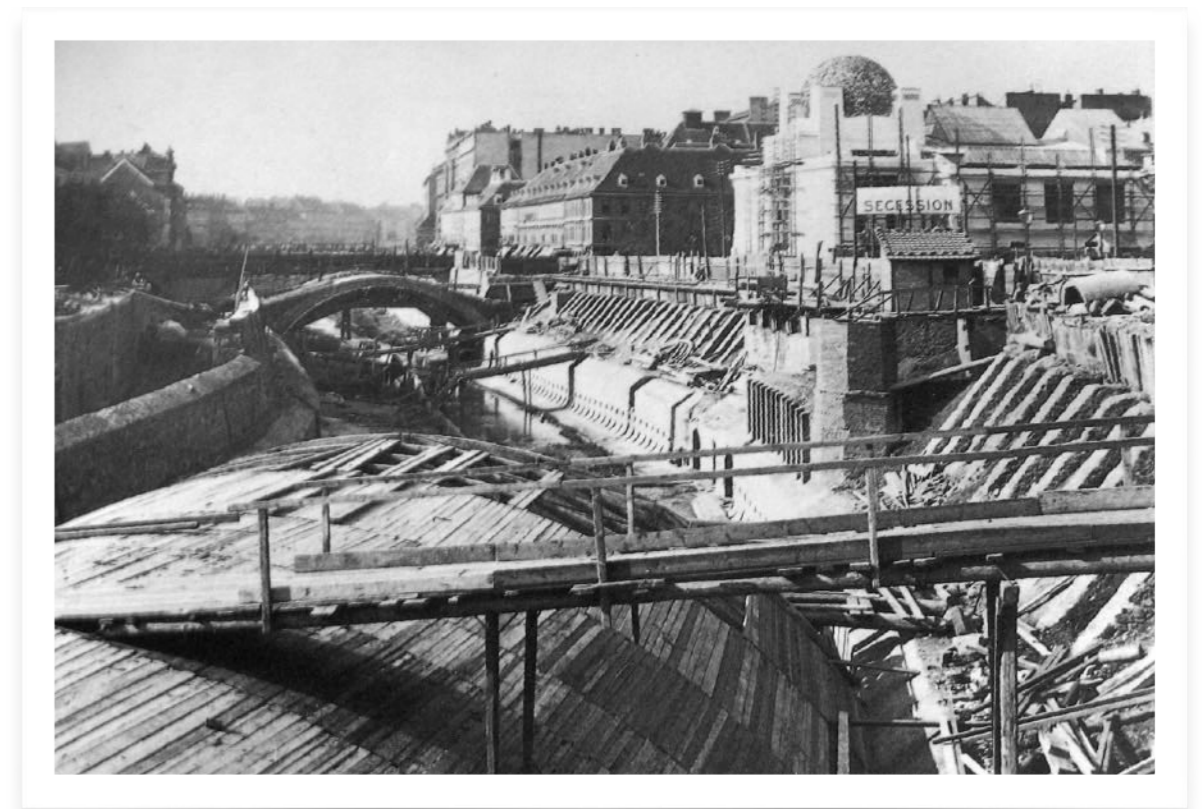
- no electricity
- no water in apartment
- no water toilet in apartment
- no phone
- no car, airplane, etc.
- no household appliances
- no movies
- ... hardly anything we would identify as modern living.



[Episode 71](#)  
[Episode 44](#)



Wien, 1822

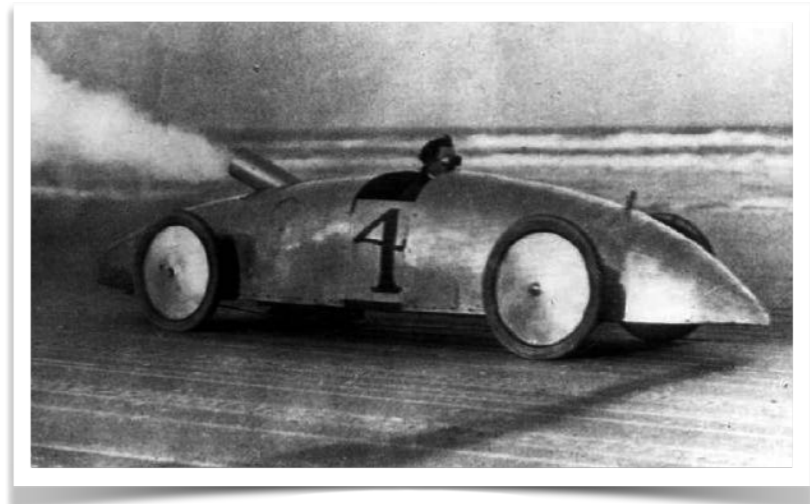


Wienflussregulierung, 1898

# Turn of the Century



Brothers Wright (1903)



Stanley Steamer (1903)



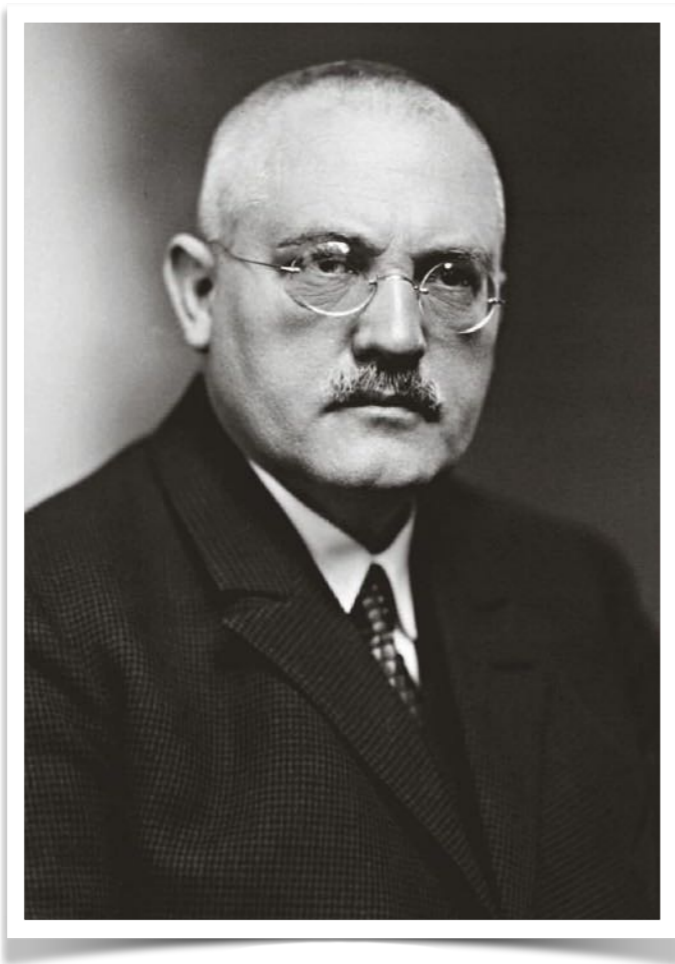
Steam Turbine (1910)



Panama Canal(1904)

# Haber-Bosch & Green Revolution

13



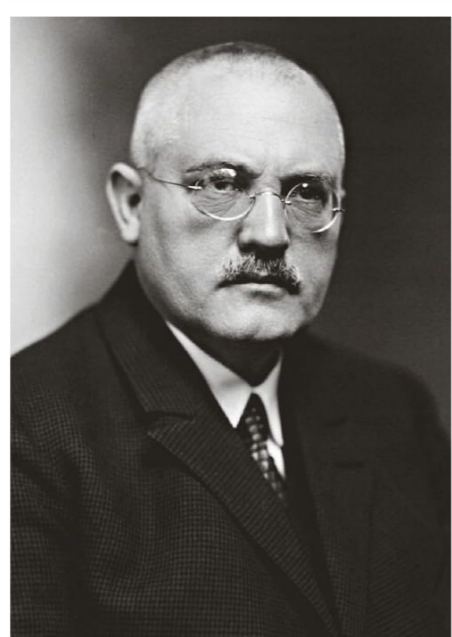
Carl Bosch



Fritz Haber

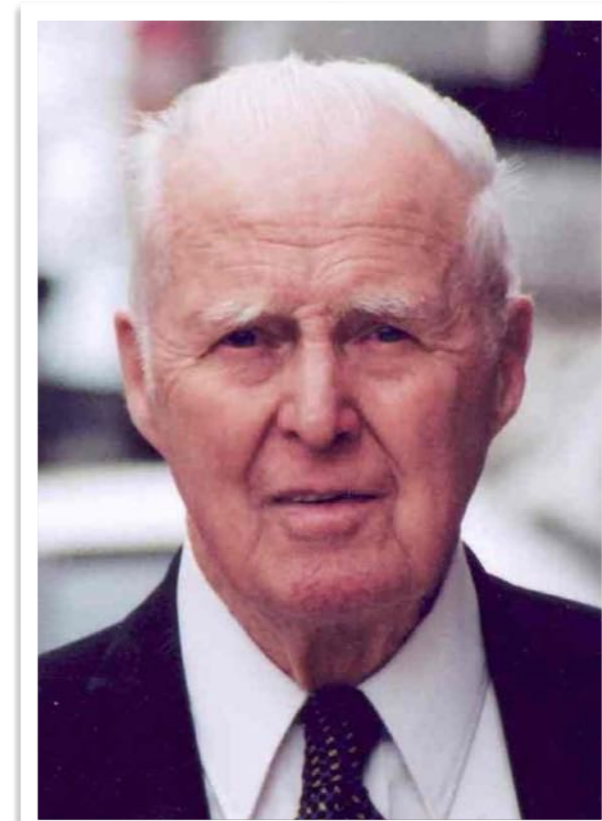
# Haber-Bosch & Green Revolution

13



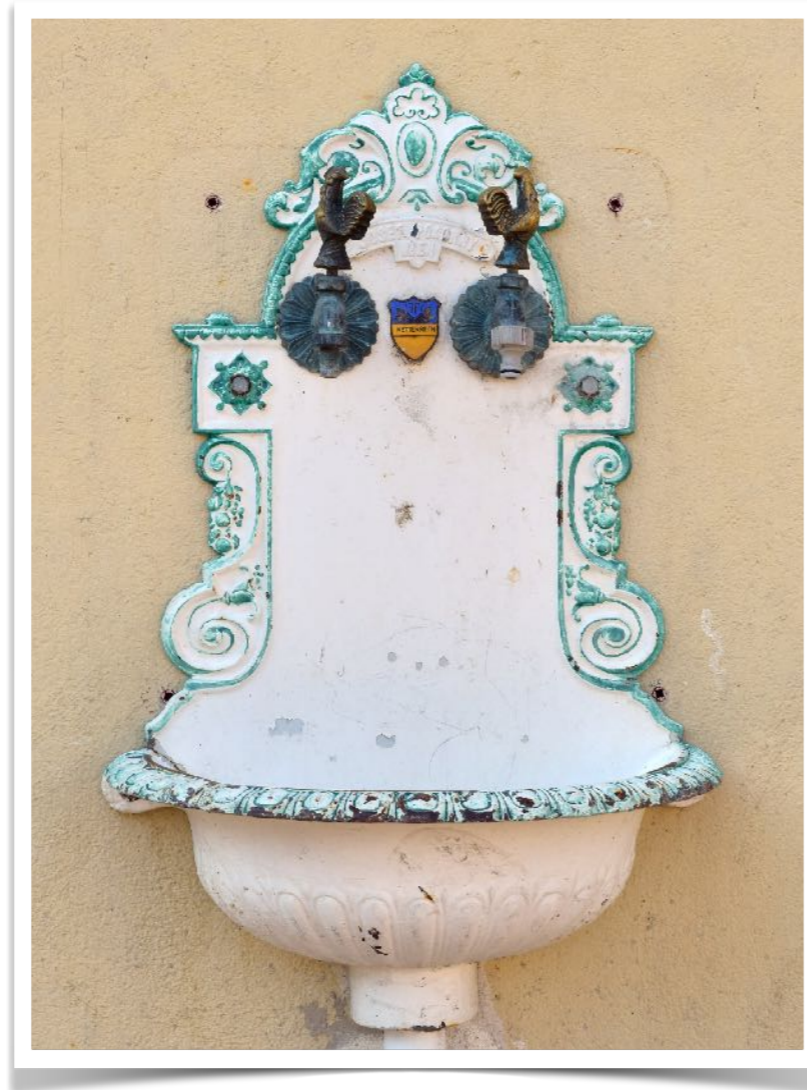
[https://commons.wikimedia.org/wiki/File:1908\\_Carl\\_Bosch\\_\(1874-1940\).jpg](https://commons.wikimedia.org/wiki/File:1908_Carl_Bosch_(1874-1940).jpg)

Norman Borlaug saves  
one Billion People from starvation



65

# Water & Water Toilets



**Hot Shower?**

# First World War

20



# 1924 Calvin Coolidge Jr.

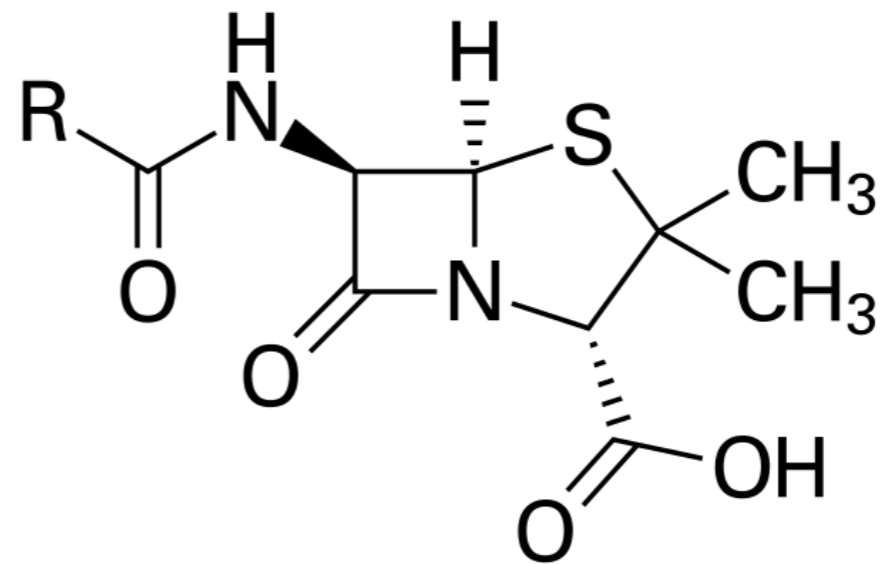
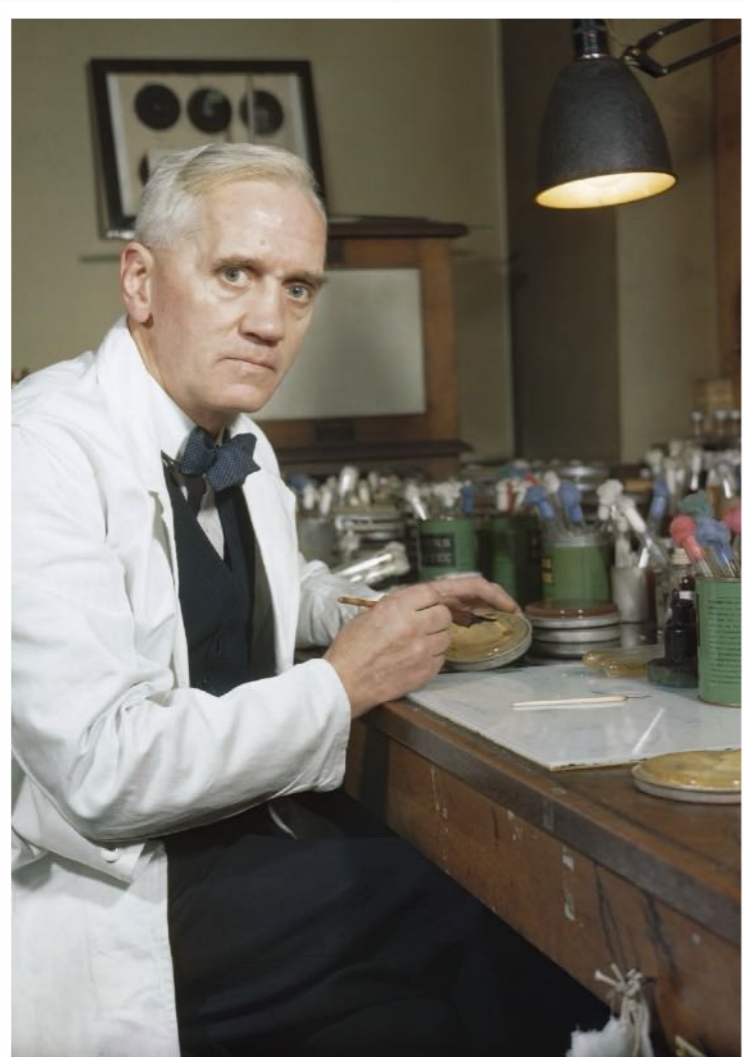


Son of US president dies age 16  
due to infection after tennis game





# 1928/1930s Alexander Fleming



# Empire State Building & Hoover Dam

35



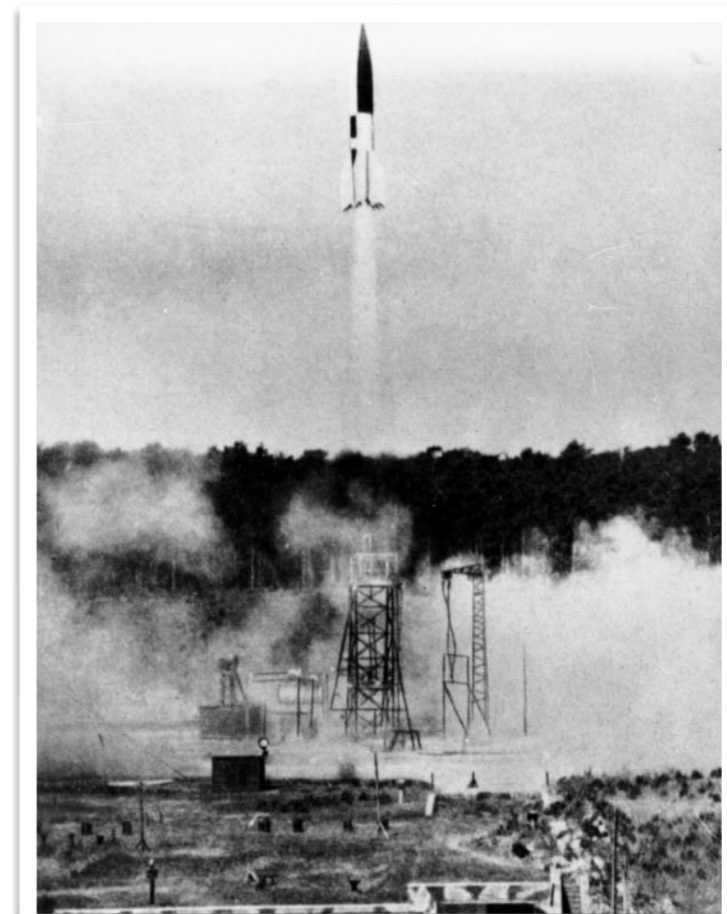
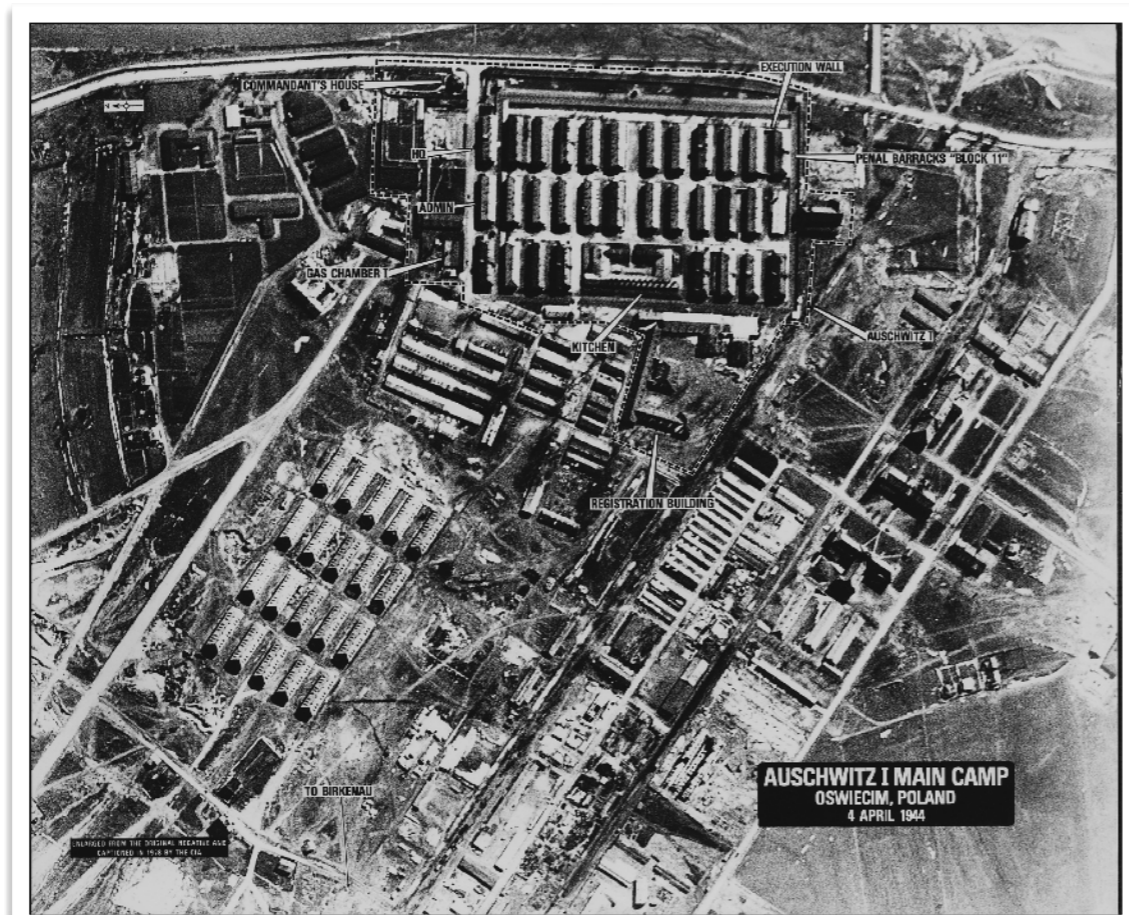
Empire State Building 1930

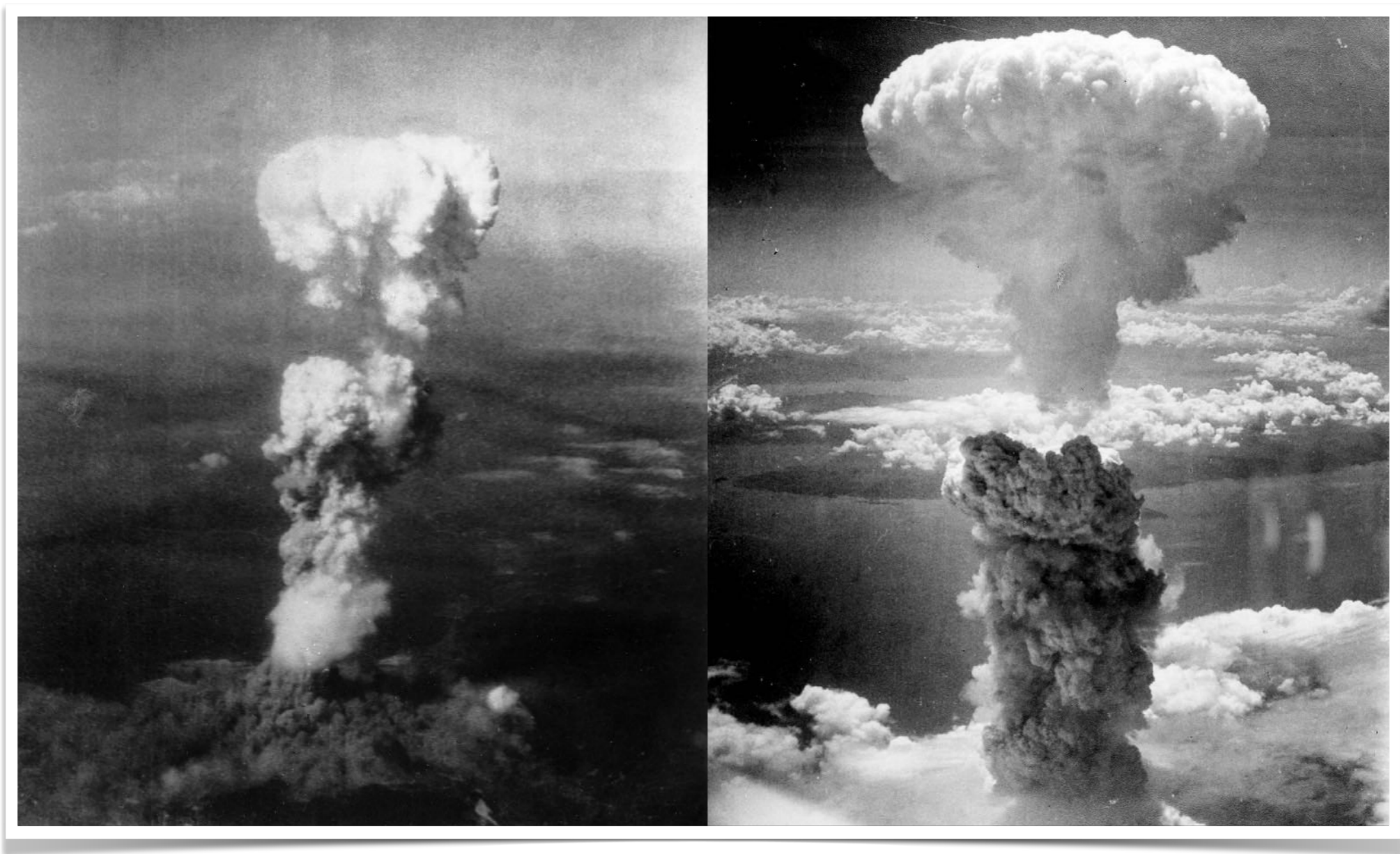


Hoover Dam 1936

41

# Second World War



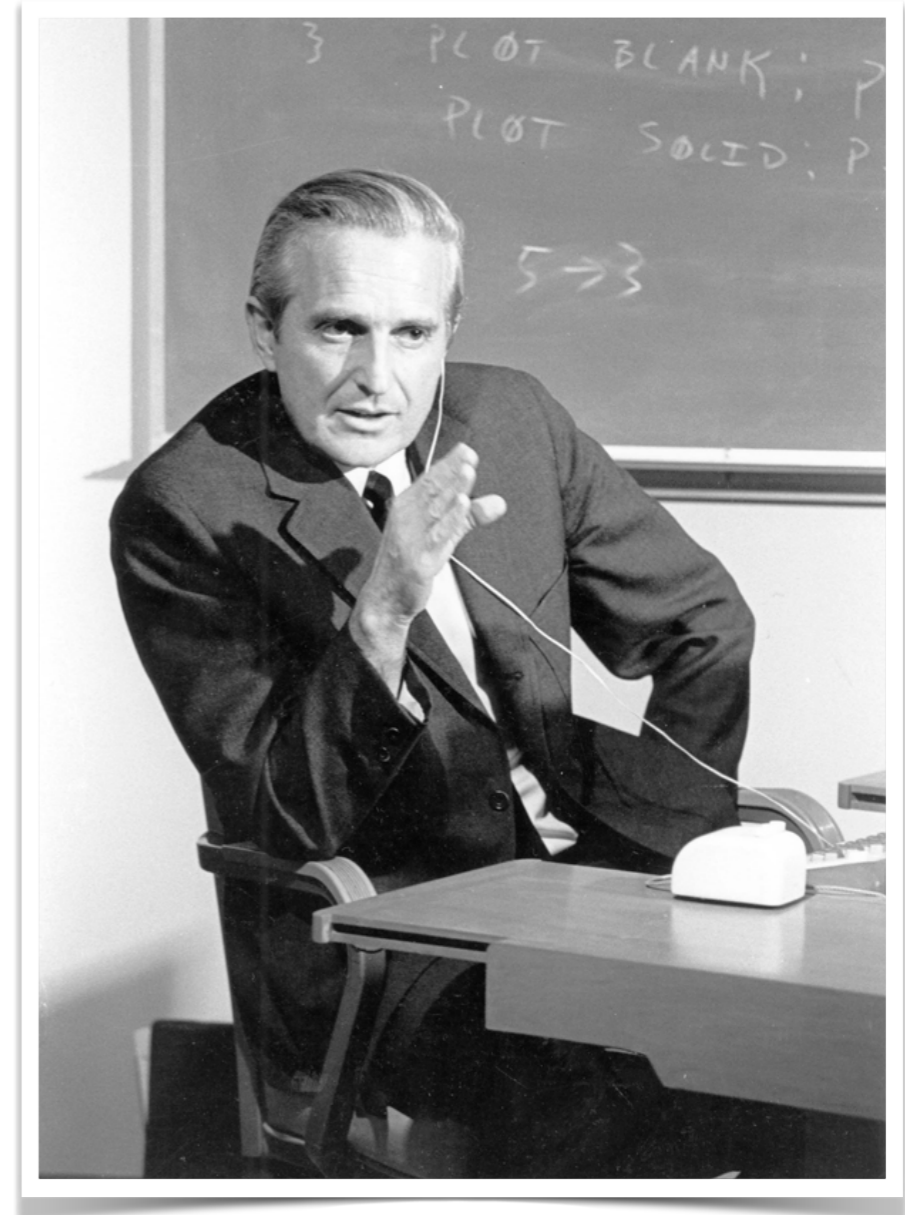


# Household Refrigerators



# “Mother of all Demos” Douglas Engelbart 1968

- windows & graphics
- hypertext
- command input
- video conferencing
- computer mouse
- word processing
- revision control
- a collaborative real-time editor



[https://en.wikipedia.org/wiki/The\\_Mother\\_of\\_All\\_Demos#/media/File:SRI\\_Douglas\\_Engelbart\\_1968.jpg](https://en.wikipedia.org/wiki/The_Mother_of_All_Demos#/media/File:SRI_Douglas_Engelbart_1968.jpg)

# Apollo Mission 1969



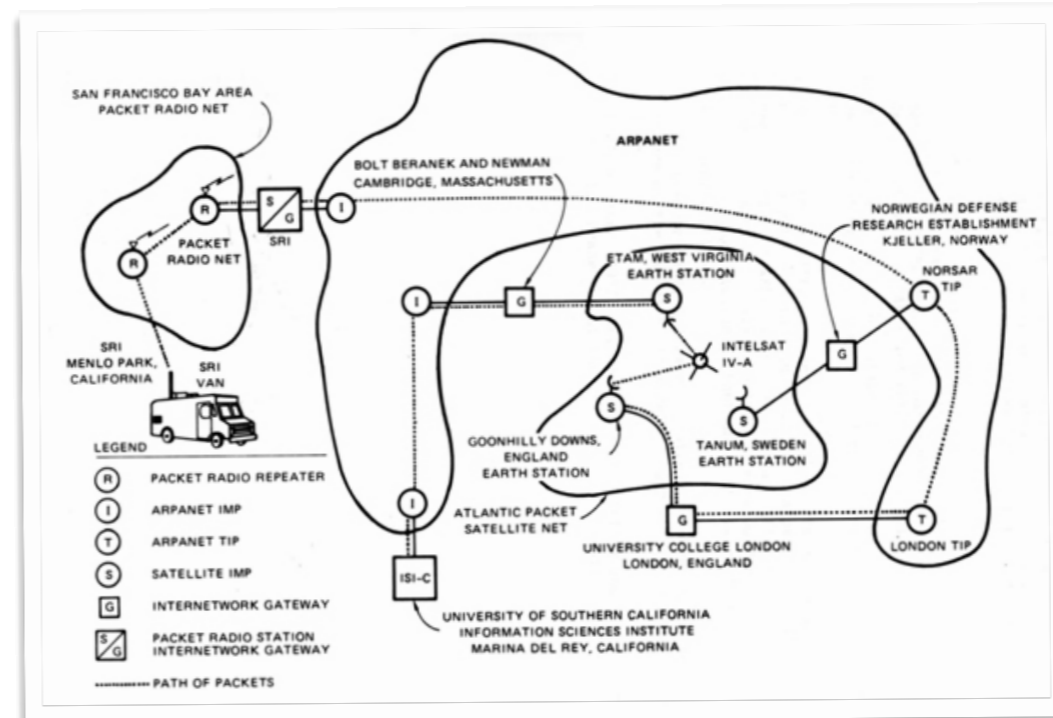
# Apollo Mission 1969

74

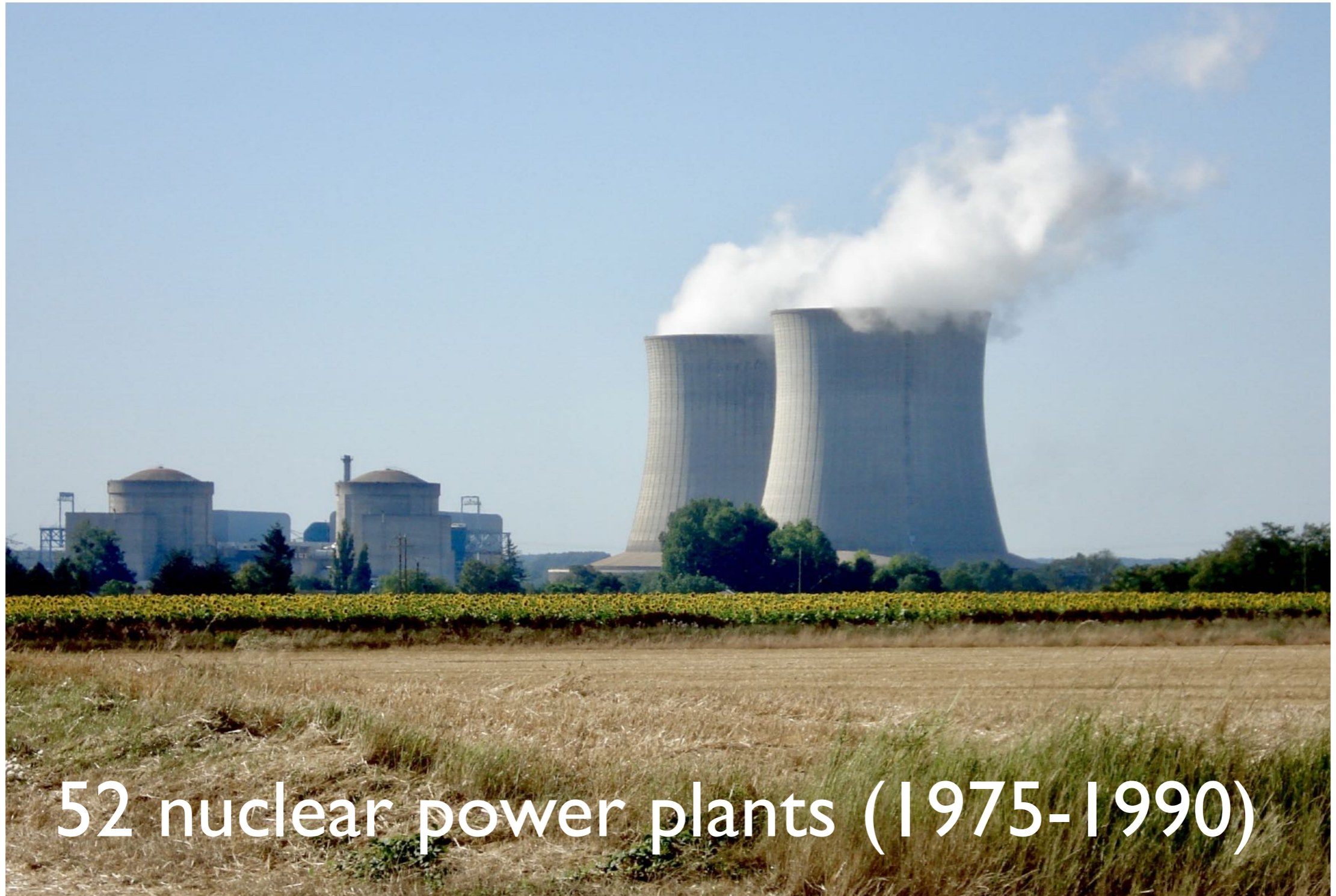




# Mainframe Computer & Internet



# Messmer Plan France

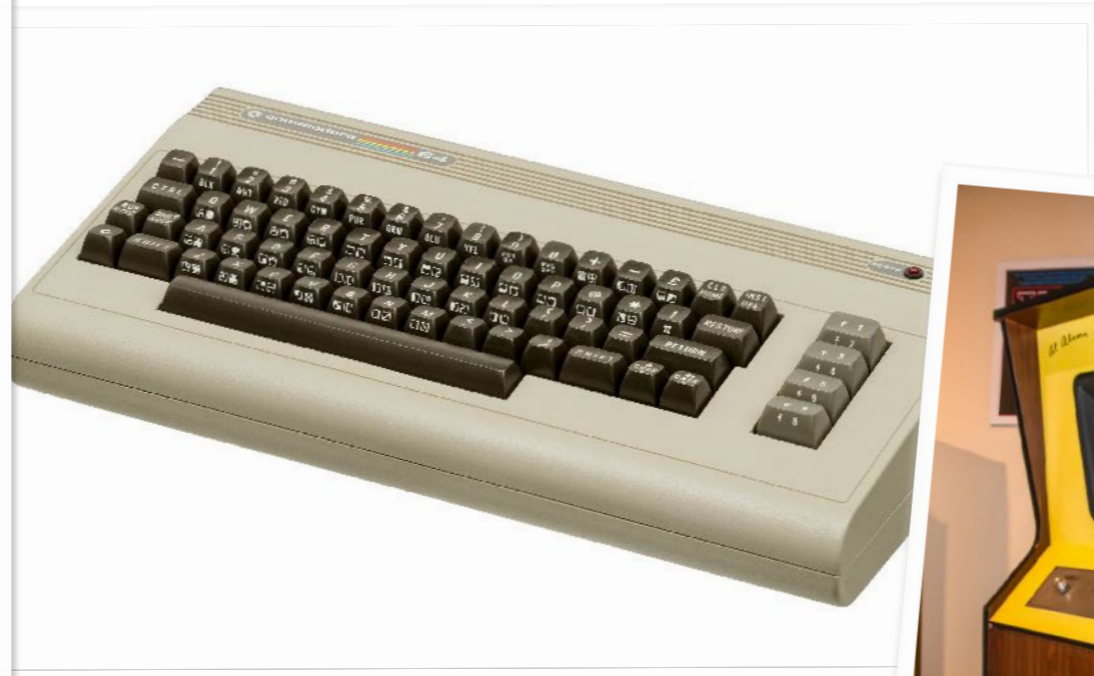


52 nuclear power plants (1975-1990)

# Home Computer and Video Games




[https://de.wikipedia.org/wiki/Arcade-Spiel#/media/Datei:Donkey\\_Kong\\_arcade.jpg](https://de.wikipedia.org/wiki/Arcade-Spiel#/media/Datei:Donkey_Kong_arcade.jpg)



[https://en.wikipedia.org/wiki/File:Signed\\_Pong\\_Cabinet.jpg](https://en.wikipedia.org/wiki/File:Signed_Pong_Cabinet.jpg)

- Darwins Life and especially the life of average people barely changed while science exploded and industry formed
- During Hörbigers lifetime **everything changed:** science and technology exploded and scaled
- **Nearly everything that makes modern life is introduced in this lifetime**

# The Last 50 Years?



**Me, as a 12-year-old  
sent to 2023?**



# Ergebnisse der RAND-Studie von Helmer (1965)

- 1975 provisorische Mondbasis,
- 1980 Wettersteuerung auf der Erde,
- 1985 Rohstoffgewinnung auf dem Mond,
- 1990 Forschungsstationen auf erdnahen Planeten,
- 1995 weltweiter Flugverkehr auf ballistischen Bahnen,
- 2000 Autobahnen für automatisches Fahren,
- 2005 ständige Marsbasis,
- 2010 Symbiose Mensch–Maschine,
- 2015 Medikamente zur Intelligenzsteigerung,
- 2020 Umfliegen des Pluto,
- 2025 intergalaktische Nachrichtenverbindung,
- 2025 lang anhaltendes Koma, das lang dauernde Weltraumreisen erlaubt.

**0 : 12**



# Getting Nothing Done?

Stagnation or Unimaginable Progress?

# Stagnation since the 1970s?

- Robert Gordon: *Productivity high until 1970s then significantly down*
- Tyler Cowen: *The great stagnation*
- Peter Thiel: “stagnation started in the late 1970s, with exception of digital technologies”
- David Graeber: “scientists [...] convince potential donors they already know what they are going to discover.”

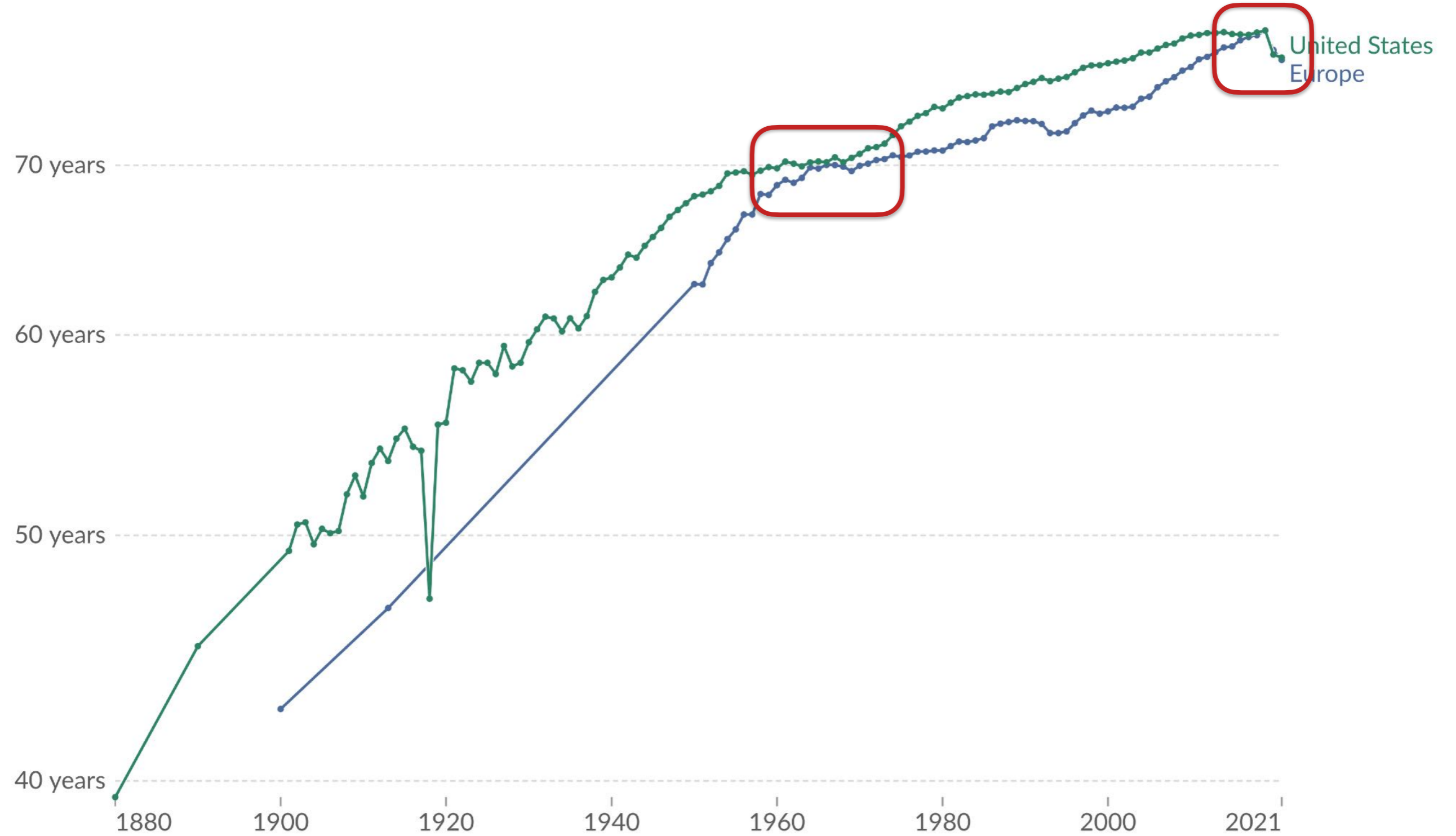


Hochquellwasserleitung: 100km, inkl.Vienna (1873)	4 y
Crystal Palace, 560mx120m (1851)	8 m
Empire State Building (1931)	18 m
Hoover Dam (1936)	5y
Golden Gate Bridge (1937)	4y
Manhattan Project (1945)	3y
Messmer Plan: 52 nuclear power plants	15y

Semmering Basistunnel 27km	18y (?)
Elbharmonie	9y (77Mio → 800Mio)
California High Speed Rail LA → SF	stopped? (33 → 100 Bio)
Honolulu rail transit 32km	20y(?) 125 Mio → 4 Bio
Airport Berlin	14y
New York East Side Extension 10km	17y (2.2 → 11 Bio)
Olkiluoto Block 3	18y

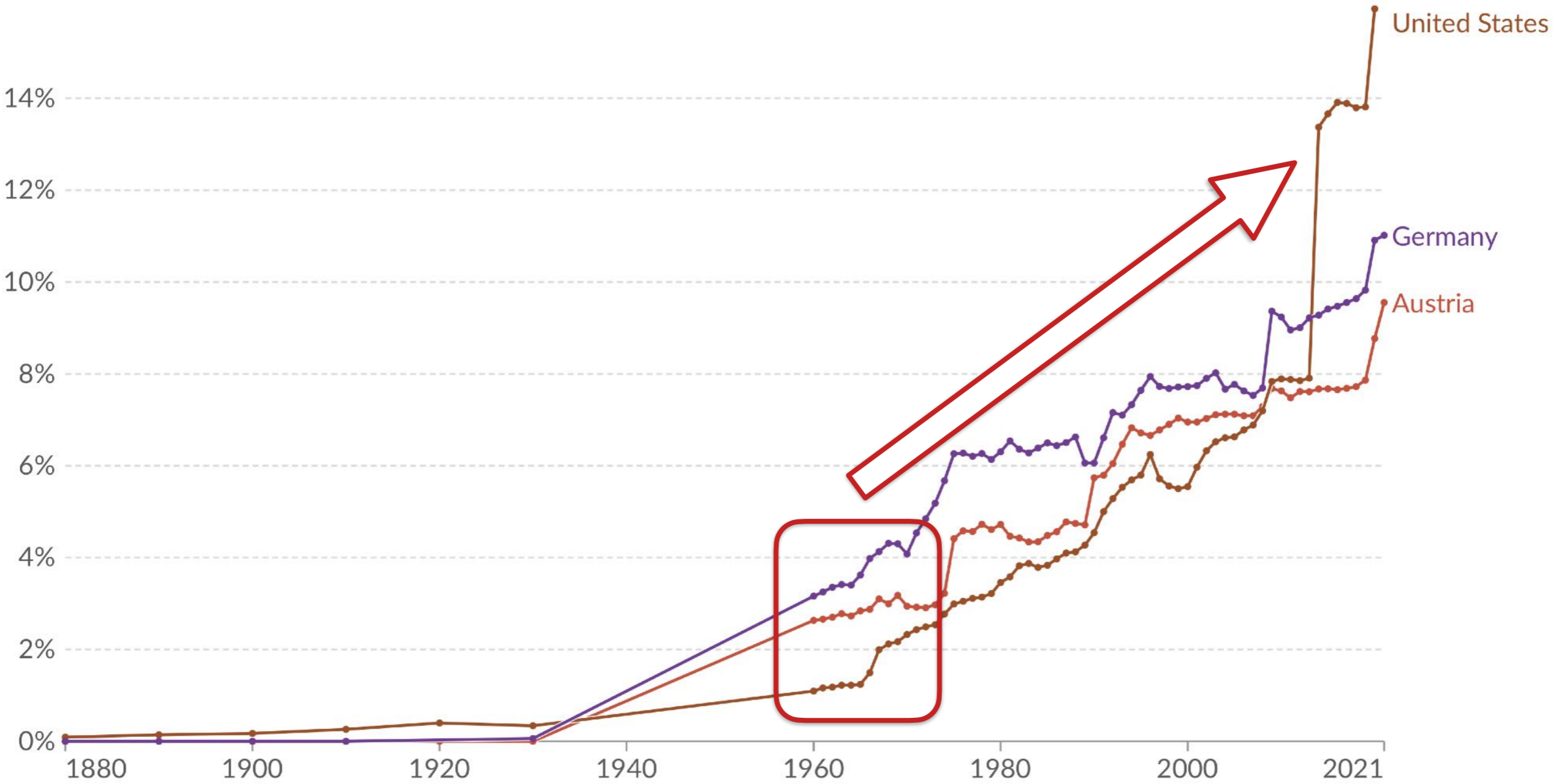
# Life expectancy

The period life expectancy<sup>1</sup> at birth, in a given year.



# Government health expenditure as a share of GDP, 1880 to 2021

This metric captures spending on government funded health care systems and social health insurance, as well as compulsory health insurance.



# But certainly, Software is Easy?

“McKinsey researchers had started investigating major information technology projects—the biggest of which cost more than \$10 billion—and their preliminary numbers were so dismal that they said it would take a

**big improvement for IT projects to rise to the level of awfulness of transportation projects.”**



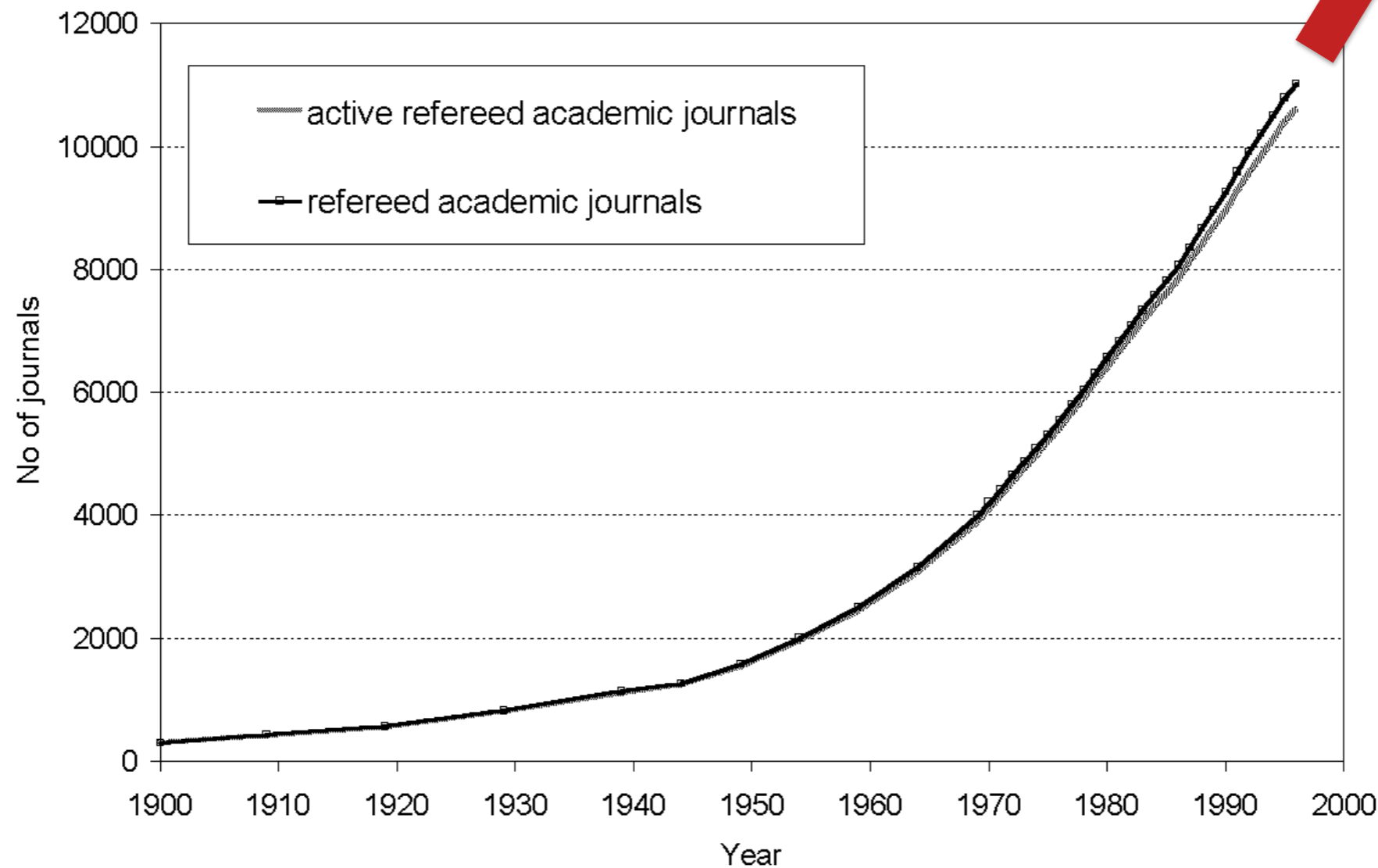
[Episode 19](#)  
[Episode 20](#)  
[Episode 31](#)  
[Episode 40](#)

# Strategic Misrepresentation

“In the world of civic projects, **the first budget is really just a down payment.** If people knew the real cost from the start, nothing would ever be approved.”

Bent Flyvbjerg

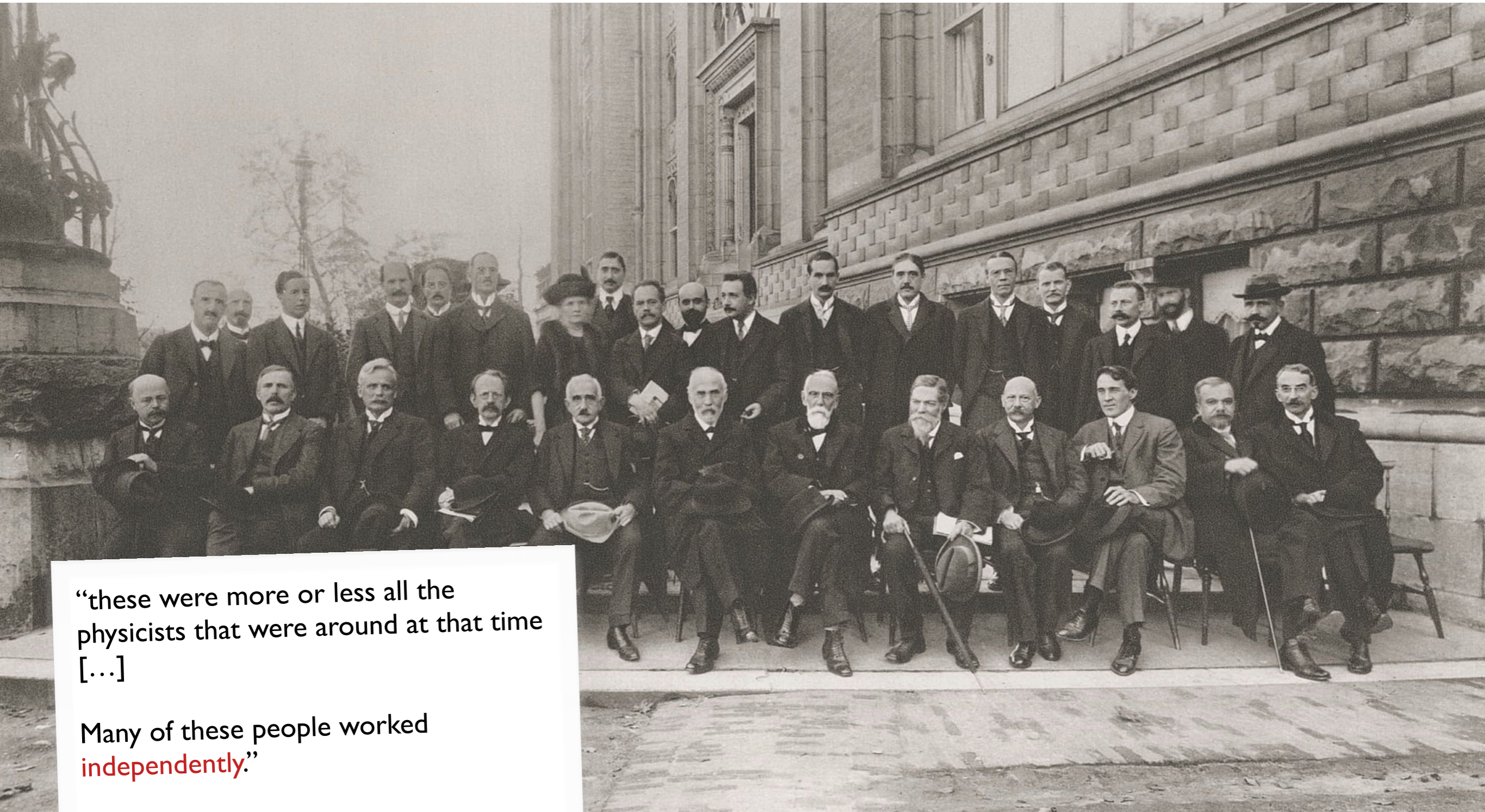
# Ludwig Fahrbach — Growth of Science (2009)



»80 to 90 percent of all the scientists that have ever lived are **alive now**.«



# Are Ideas Getting Harder to Find?



“these were more or less all the physicists that were around at that time [...]”

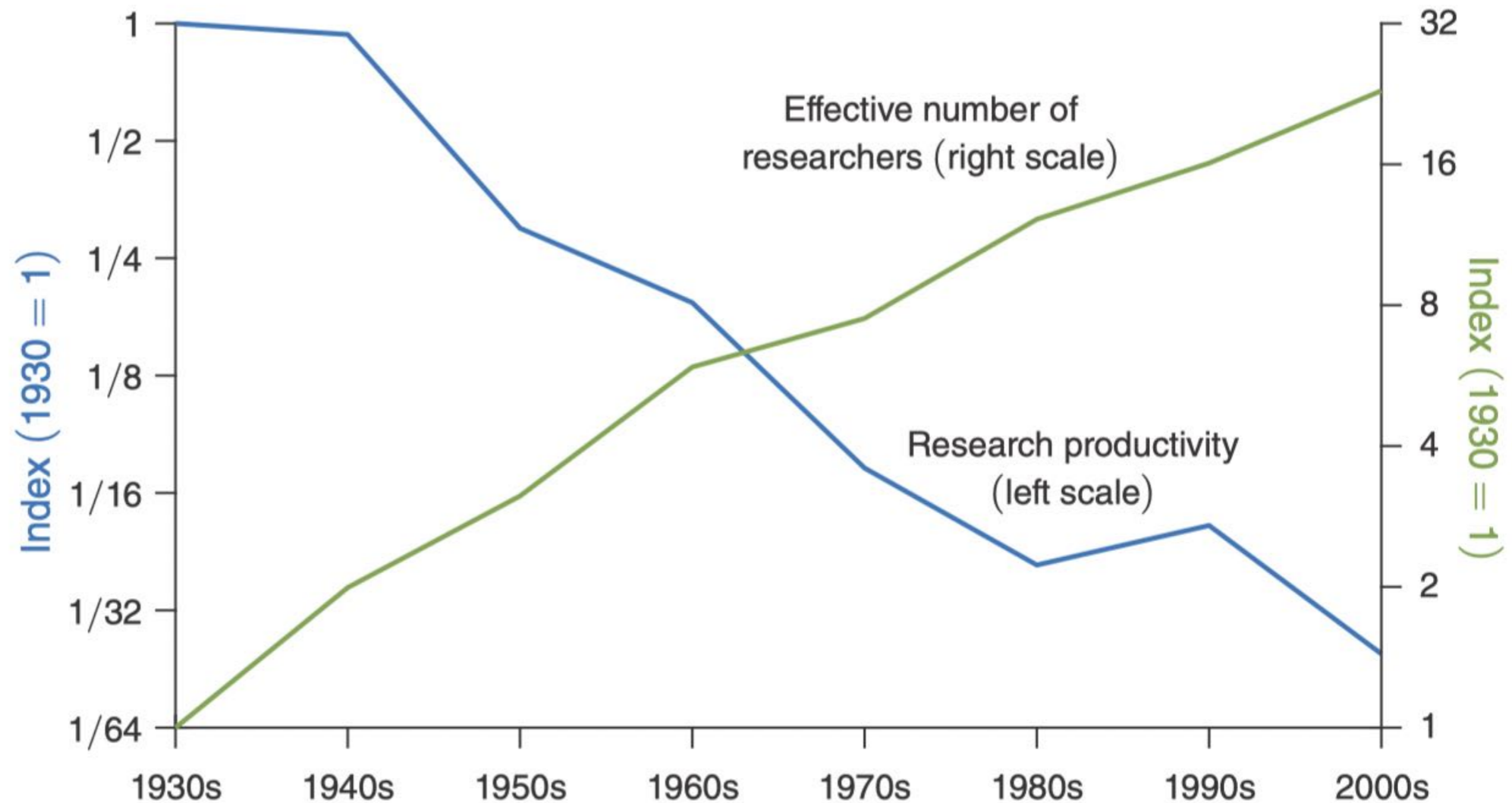
Many of these people worked **independently.**”

[David Deutsch](#)

Solvay Conf. 1913

# Are Ideas Getting Harder to Find?

 [Episode 72](#)  
[Episode 91](#)



**“it takes around 13 years for research productivity to fall by half.**

Or put another way, the economy has to double its research efforts every 13 years just to maintain the same overall rate of economic growth.”



“Progress has definitely **slowed down**, not just in fundamental physics.

[David Deutsch \(2023\)](#)

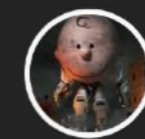
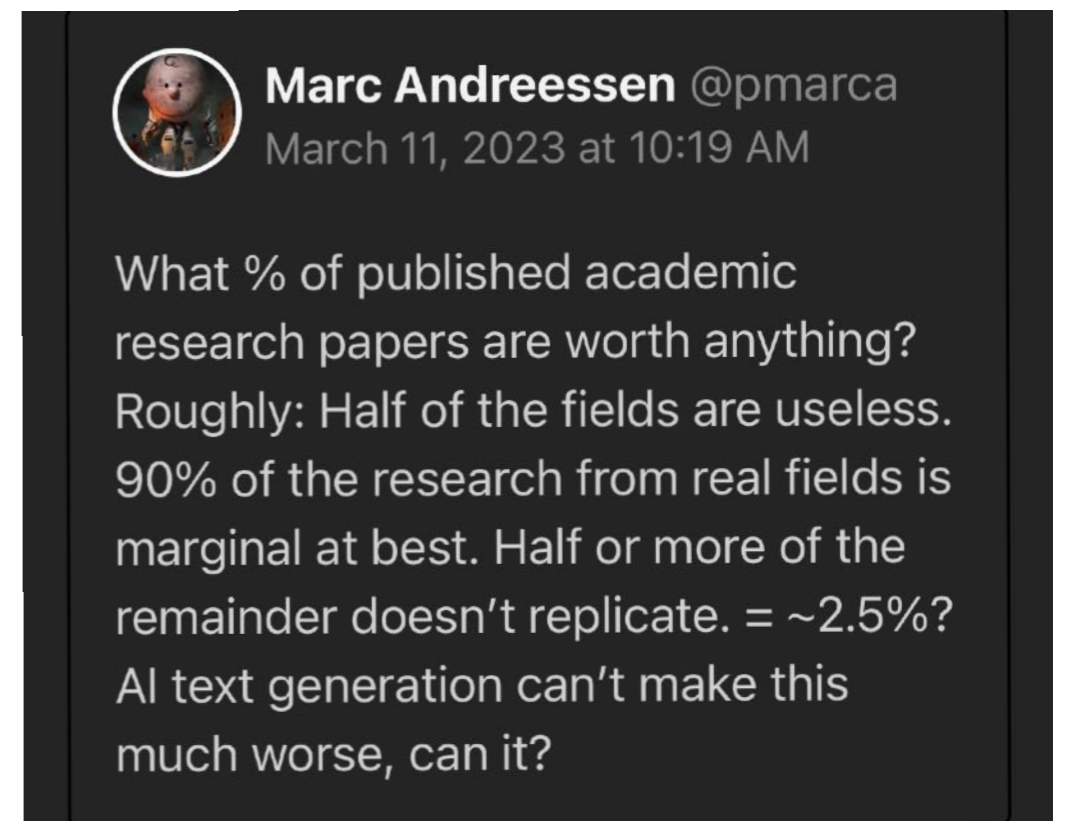


“I contrast the now common belief in an ever-faster pace of innovation with the many unmistakable signs of technical **stagnation** and slowing advances: there are limits to everything, and invention and innovation cannot be exceptions.”

Vaclav Smil, Invention and Innovation (2023)

"my generation has been **stunningly unsuccessful** [...] for more than thirty years now we have not been able to improve the foundations of physics.",

Sabine Hossenfelder, Lost in Math (2020)



**Marc Andreessen** @pmarca

March 11, 2023 at 10:19 AM

What % of published academic research papers are worth anything? Roughly: Half of the fields are useless. 90% of the research from real fields is marginal at best. Half or more of the remainder doesn't replicate. = ~2.5%? AI text generation can't make this much worse, can it?

# Digitisation Disappointment

- Digitisation as productivity improvement, enablement
- Digitisation as distraction, complexity and box ticking amplification

“If we turn away from technology for a moment, and look instead at culture, we absolutely do *not* find rapid change. We see the exact opposite.”, Ted Gioia



# What's Next?

Will stagnation continue?

What could we discuss?

How can we improve?

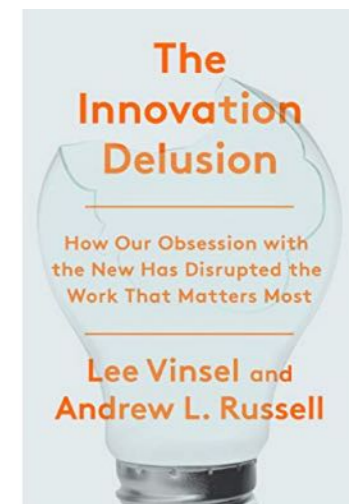
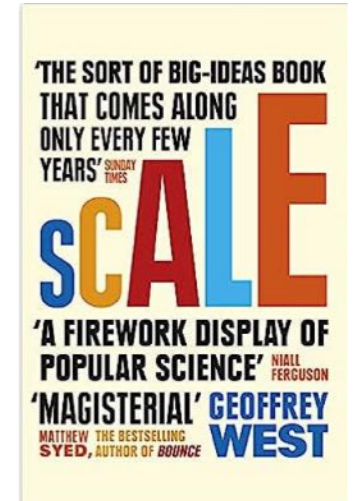
# Steampunk Future

- Things move much slower than expected by most (in the real, material world)
- Large consequences for those who believe we will innovate ourselves out of problems (e.g. energy, 4 pillars)
- **Steampunk Future?**
  - Struggling with tech we knew how to do 100 years ago
  - But in some fields extreme progress (AI, biotech?)
  - Very uneven globally



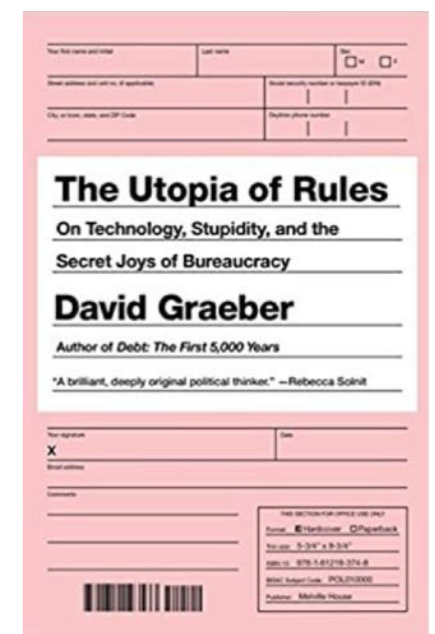
# Complexity, Scaling & Wicked Problems

- Two sides of scaling and interconnection
- → Complexity & Wicked Problems
- Innovation → Infrastructure → Maintenance → ...
- Systemic archetypes



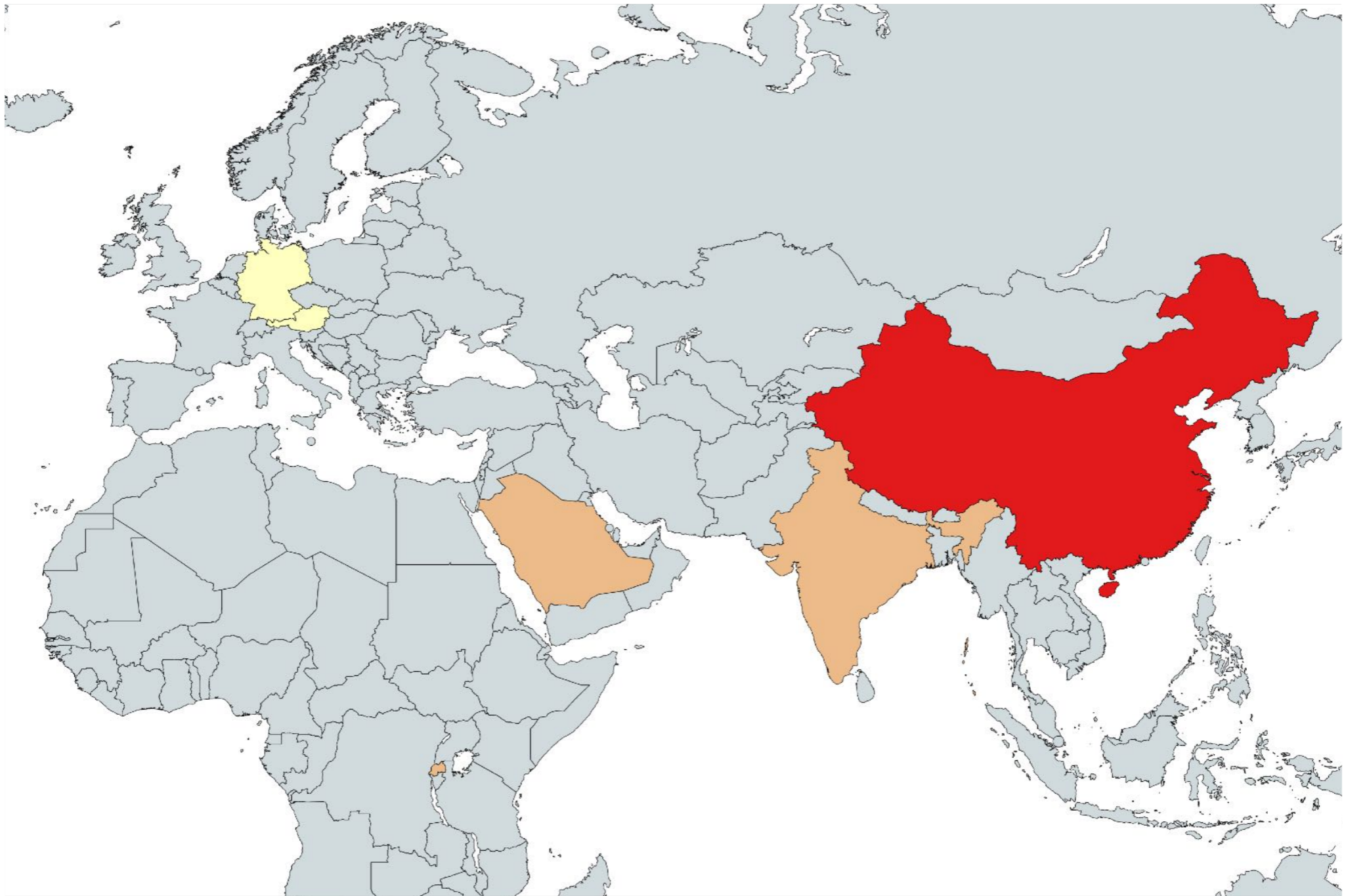
# Regulation, Bureaucracy

- “Regulation is the disease of which it pretends to be the cure.”, Niall Ferguson
- Stuck in red tape
  - Box ticking (David Graeber)
- Computer as bureaucracy amplifier
- *festina lente*

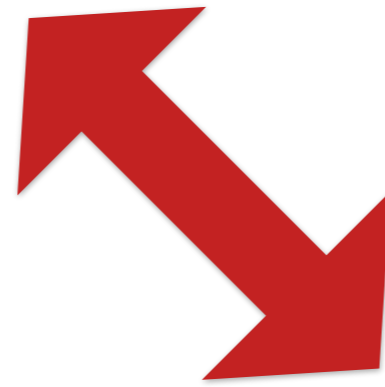




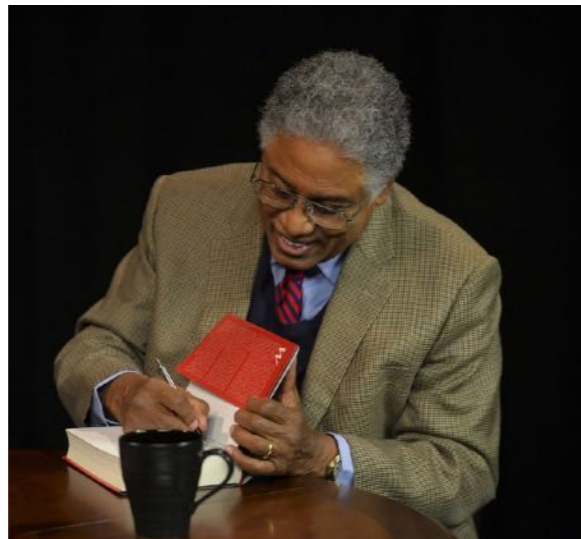
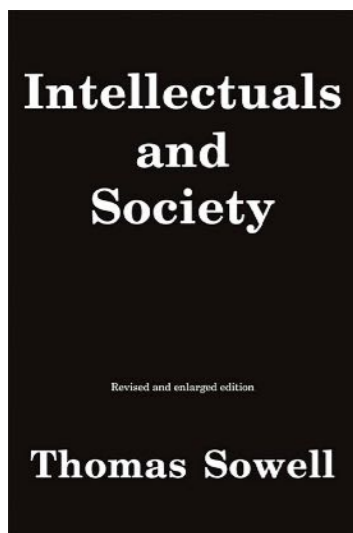
# Who is in the Driving Seat in the New Cold War?



# Expertise



# Knowledge



“Why the transfer of decisions from those with personal experience and a stake in the outcome to those with neither can be expected to lead to better decisions is a question seldom asked, much less answered.”, Thomas Sowell



# Conclusion

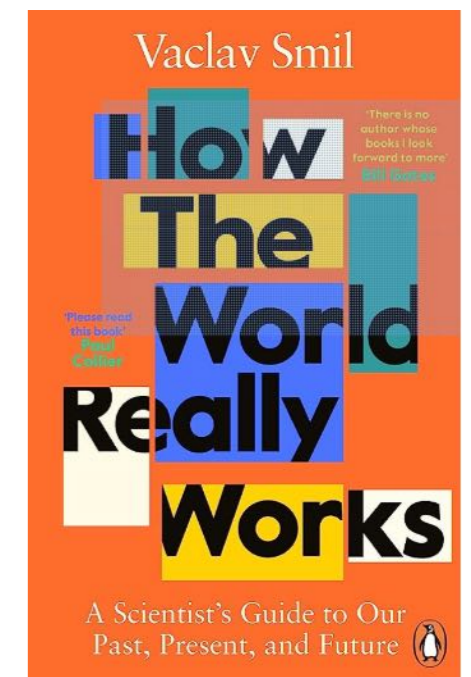
1. **Science** is in Significant Troubles

2. Innovation is not **Progress**

3. **Knowledge** is not **Expertise**

4. Hardly anything follows **Moore's Law**

5. **Humility and Hard Work**, not Hype and Wishful Thinking



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»Mit dem Erfolg wuchsen die Ansprüche–und der Mensch hatte alles Recht dazu, anspruchsvoll zu sein. Was ihm als ein begeisterndes Versprechen gegolten hatte, erschien ihm jetzt als unzureichend, das Tempo des Fortschritts als viel zu langsam, und in den Prinzipien, die diesen Fortschritt in der Vergangenheit ermöglicht hatten, sah man schließlich mehr ein Hindernis für seine Beschleunigung, das auf dem raschesten Wege beseitigt werden müsse, statt einer Vorbedingung für die Erhaltung und Weiterentwicklung des bereits Errungenen.«

*Friedrich von Hayek, Der Weg in die Knechtschaft*