



# Innovation after the pandemic

# The global Covid-19 death toll is finally easing

Daily deaths of patients diagnosed with coronavirus (7-day rolling average)

Twitter  
Facebook  
LinkedIn  
Save

The US accounts for **one-third** of average global daily deaths

May 2-8  
Average daily deaths  
**5,132**

Mar 2-8  
Total daily deaths  
**128**

May 2-8  
**1,726**  
US

The UK has the highest number of average daily deaths outside of the US

Rest of LatAm and Caribbean

Asia

Africa

Mideast

Brazil

Rest of N America

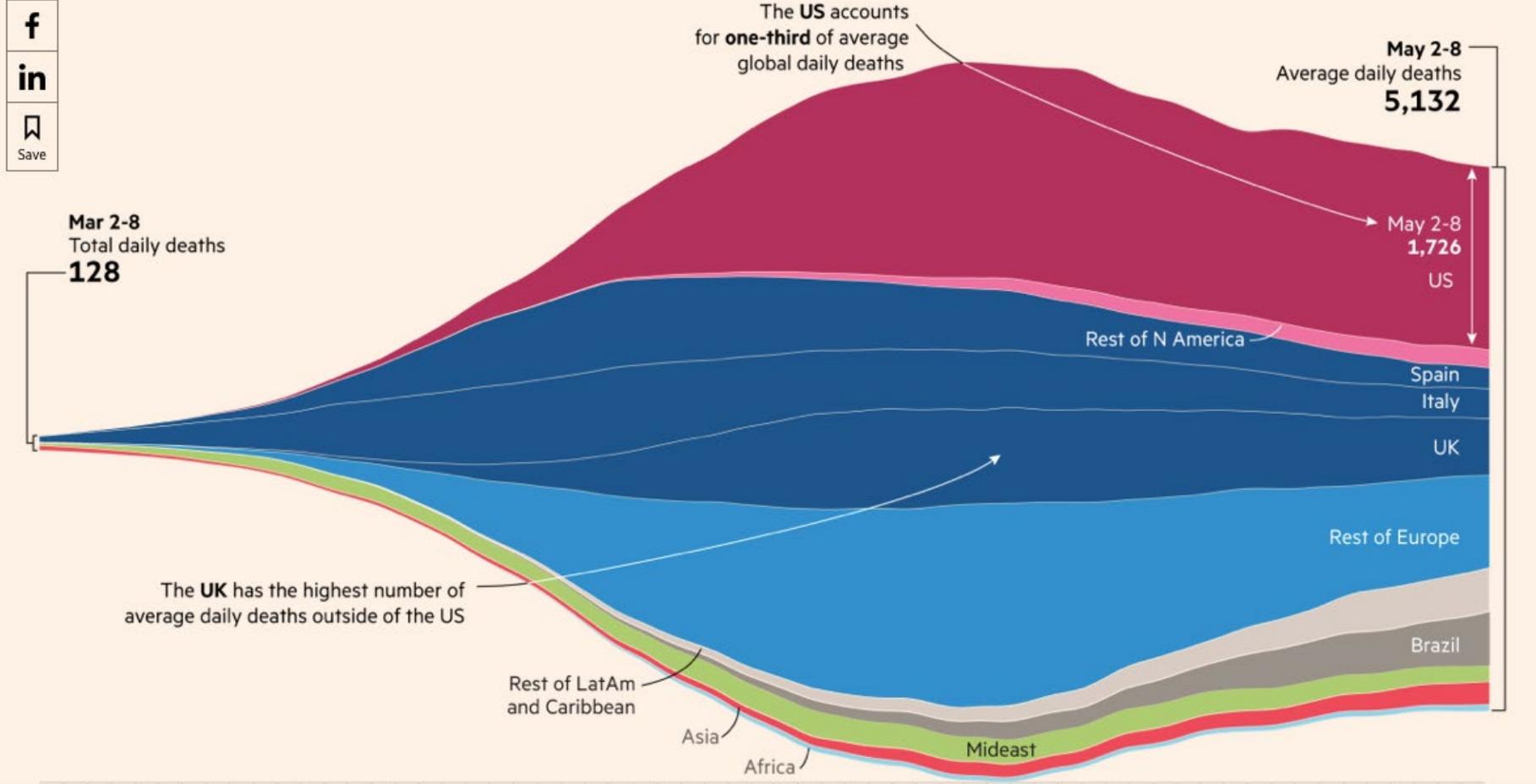
Spain

Italy

UK

Rest of Europe

Mar 8    Mar 15    Mar 22    Mar 29    Apr 5    Apr 12    Apr 19    Apr 26    May 3    May 8



# Issues thrown up by Covid-19

Zoonoses and  
wildlife  
markets

Globalisation  
and trade  
with China

Pandemic  
preparedness

Health and  
medical  
innovation

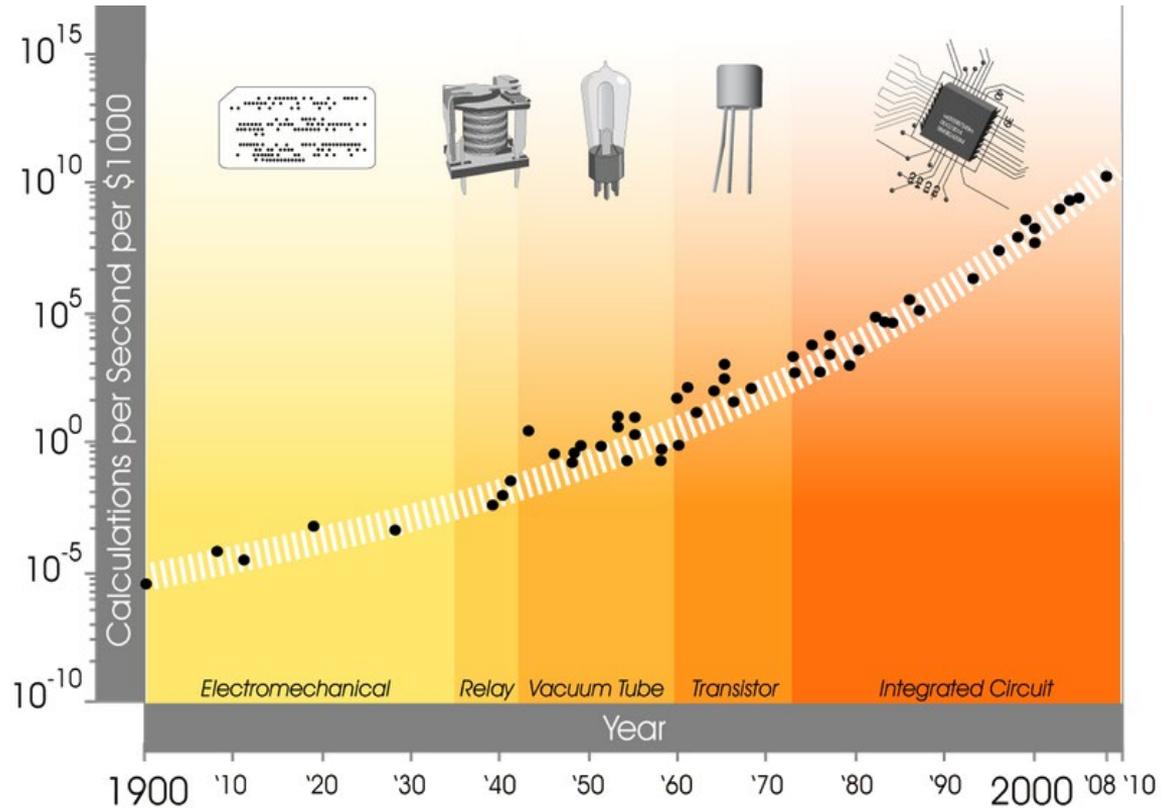
Economic  
Recovery

Rational  
Optimism

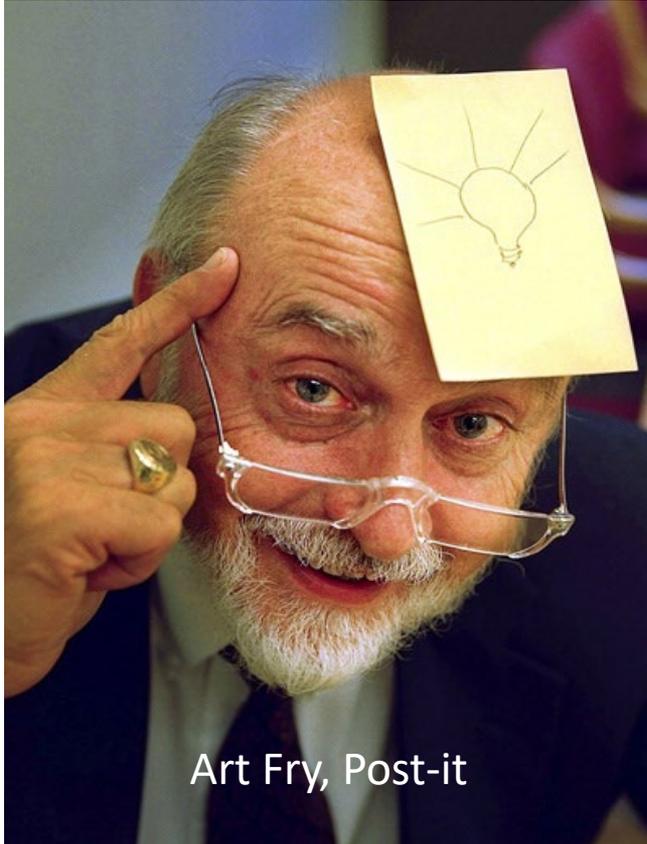
# Innovation's essentials

- Gradual
- Serendipitous
- Recombinant
- Different from invention
- Trial and error
- Team sport
- Inexorable
- Hype cycle
- Fragmented governance
- Evolutionary
- Seed of science
- Creates jobs
- More from less
- Flourishes in freedom

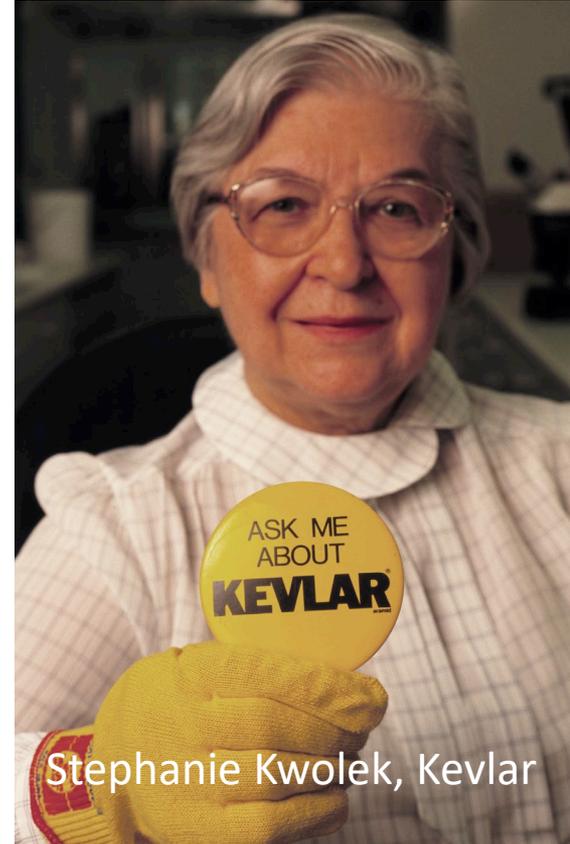
# Innovation is gradual



# Innovation is serendipitous



Art Fry, Post-it



Stephanie Kwolek, Kevlar

# Innovation is recombinant

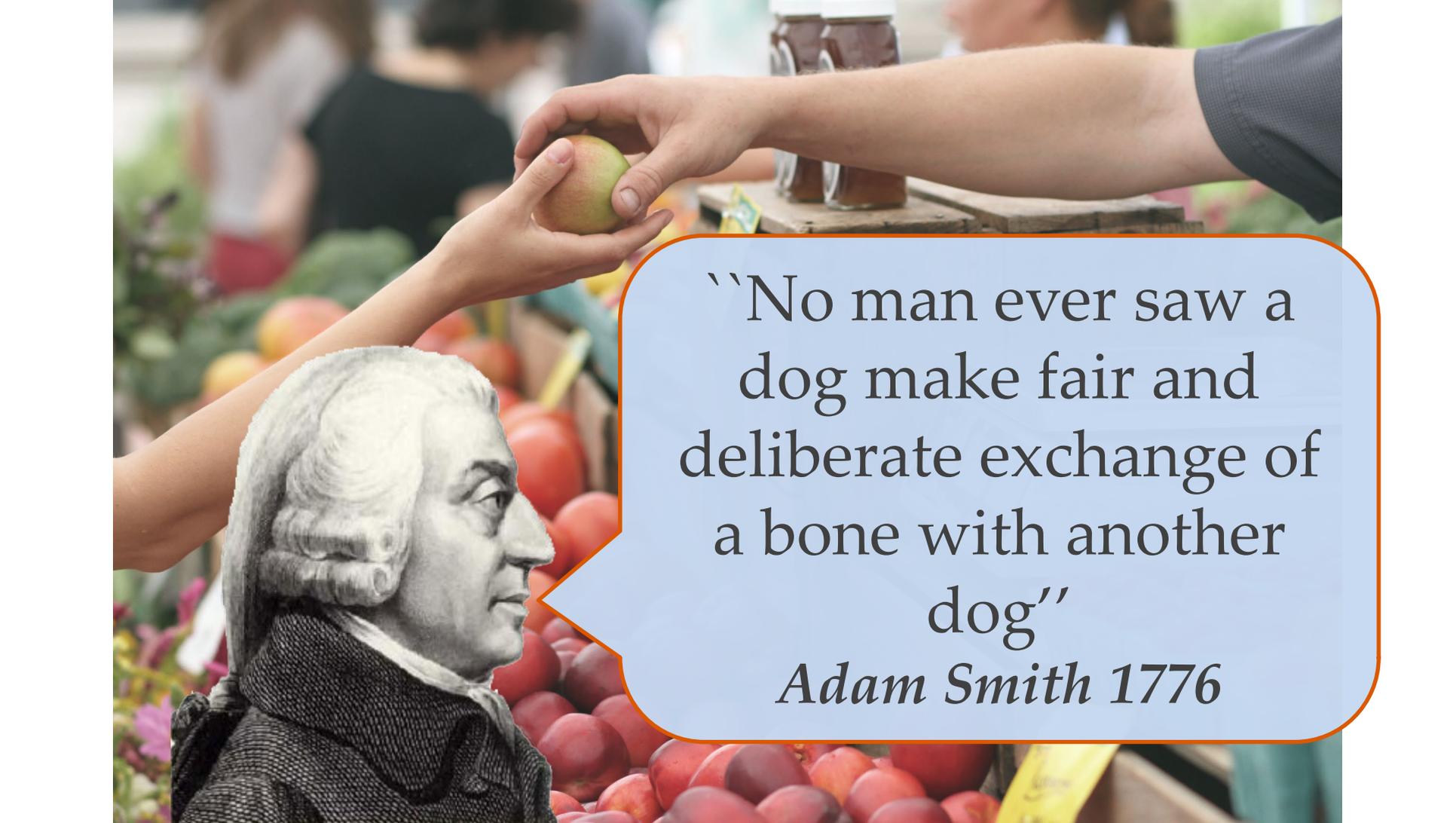




“I, Pencil”

By  
Leonard  
Reed





“No man ever saw a  
dog make fair and  
deliberate exchange of  
a bone with another  
dog”

*Adam Smith 1776*

# Innovation is different from invention



**The beaver said to the rabbit, as they looked at the Hoover Dam: “No, I didn’t build it, but it’s based on an idea of mine”**



“The capitalist achievement does not typically consist in providing more silk stockings for queens but in bringing them within reach of factory girls.”

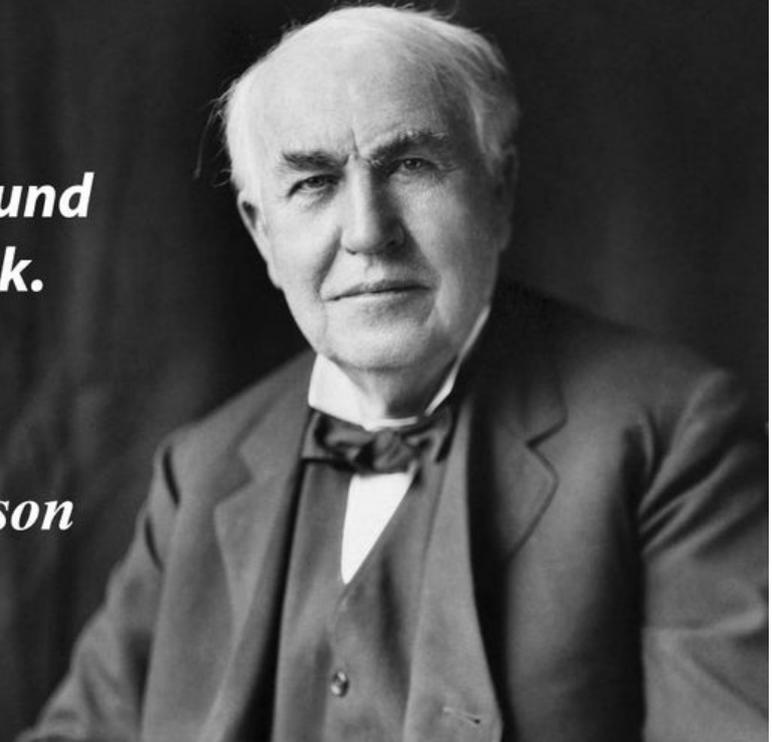
Joseph Schumpeter



# Innovation requires trial and error

***I have not failed. I've just found  
10,000 ways that won't work.***

*~ Thomas Edison*



# Innovation is a team sport



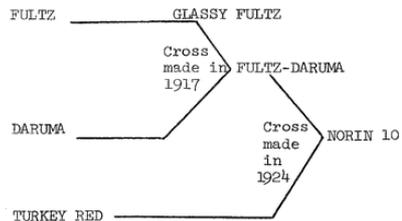
## VARIETIES OF CLUB WHEAT

By J. ALLEN CLARK, senior agronomist, and B. B. BAYLES, associate agronomist,  
Division of Cereal Crops and Diseases, Bureau of Plant Industry

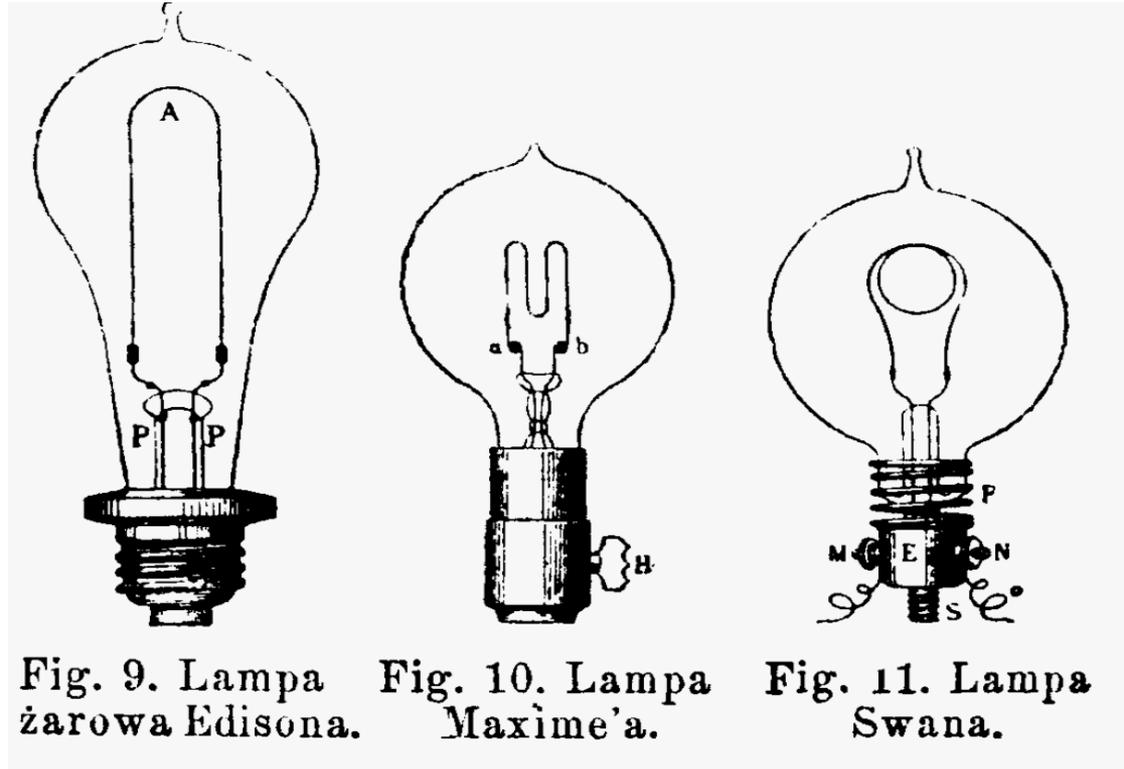
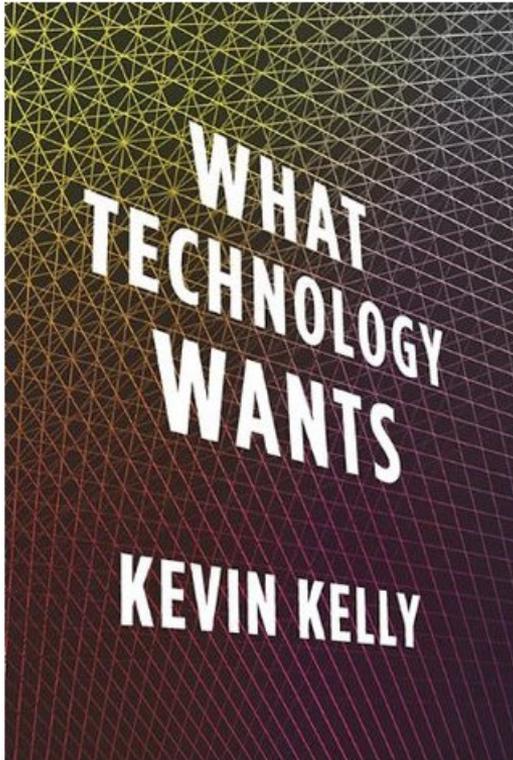
CONTENTS	
Description.....	Page
Where grown.....	2
Varieties.....	3
Group 1.—Heads beardless; chaff smooth, white or yellow; kernels white.....	4
Group 2.—Heads beardless; chaff smooth, white or yellow; kernels red.....	8
Varieties—Continued.....	Page
Group 3.—Heads beardless; chaff smooth, brown or red; kernels white.....	8
Group 4.—Heads beardless; chaff veiny, white or yellow; kernels red.....	11
Group 5.—Heads bearded; chaff smooth, brown or red; kernels red.....	11

**DESCRIPTION**

**T**HE CLUB WHEATS have short, thick, and very compact heads and small kernels. Because of these distinctive characters, they usually are placed in a different division or so-called sub-



# Innovation is inexorable



Google™  
YAHOO!®

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.com

msn.™

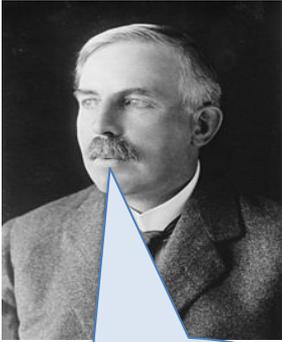
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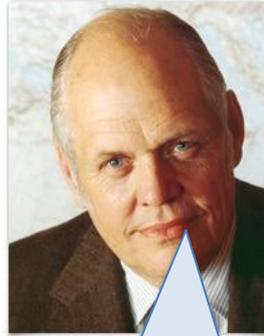


**Ernest Rutherford,  
Nobel Prize Winner,  
1933**



**"Anyone who expects a source of power from the transformation of the atom is talking moonshine."**

**Ken Olsen, chairman,  
Digital Equipment  
Corporation, 1977**



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

**Paul Krugman,  
Nobel-winning  
economist, 1998.**



**"By 2005 or so, it will become clear that the Internet's impact on the economy will have been no greater than the fax machine's."**

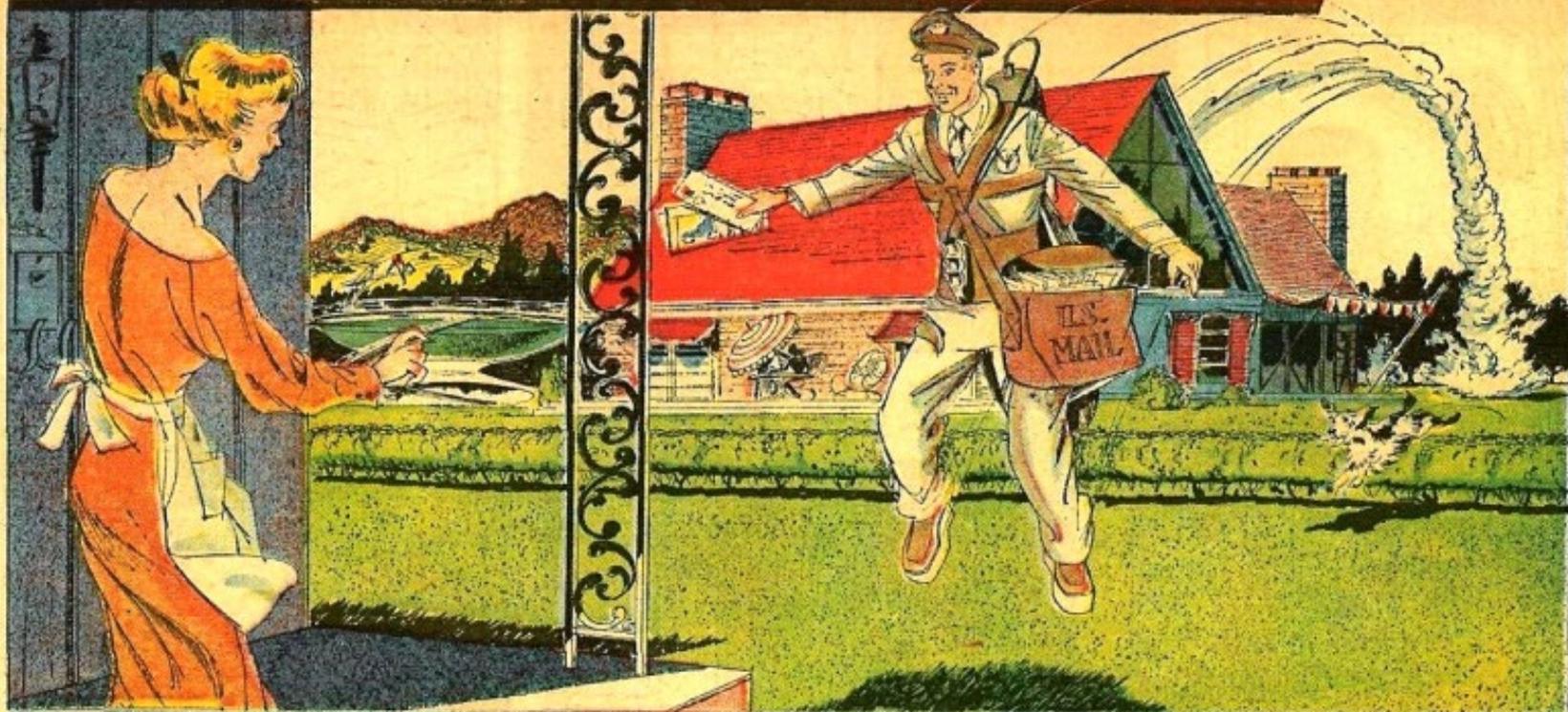
**Steve Ballmer, CEO,  
Microsoft,  
2007**



**"There's no chance the i-phone is going to get significant market share. No chance."**

--- **CLOSER THAN WE THINK!**

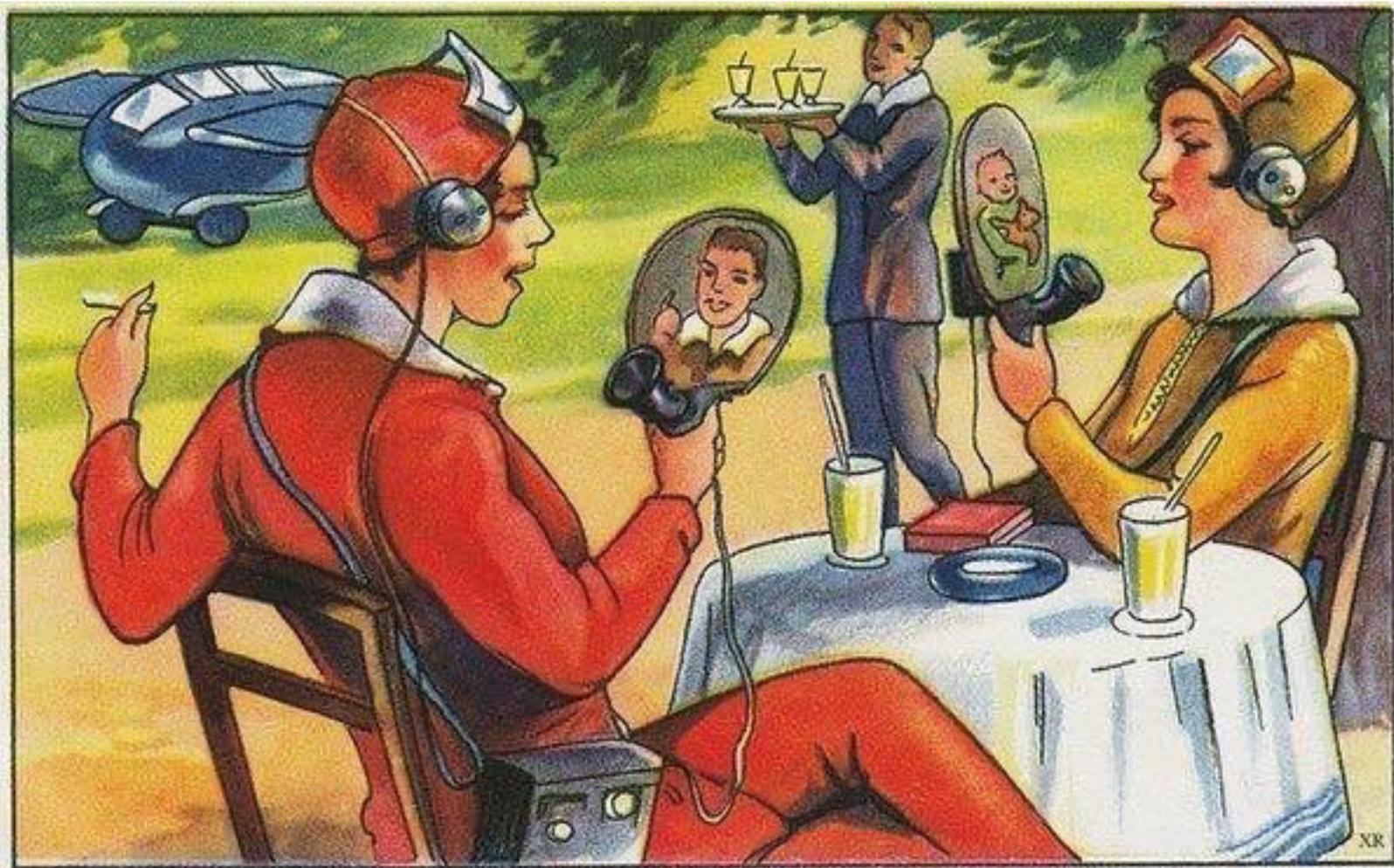
by *Ridgway*



**ROCKET MAILMEN** Uncle Sam's mailmen can look forward to going faster, getting farther, and doing so with less effort than ever before. All it will take will be a device like the recently perfected "rocket assista" which were originally developed to help infantrymen leap like grasshoppers.

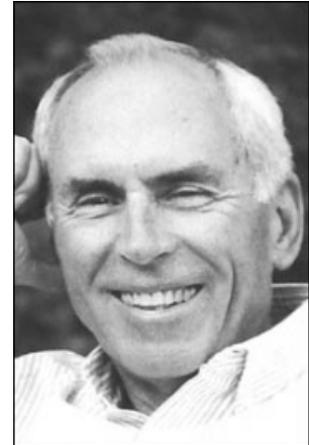
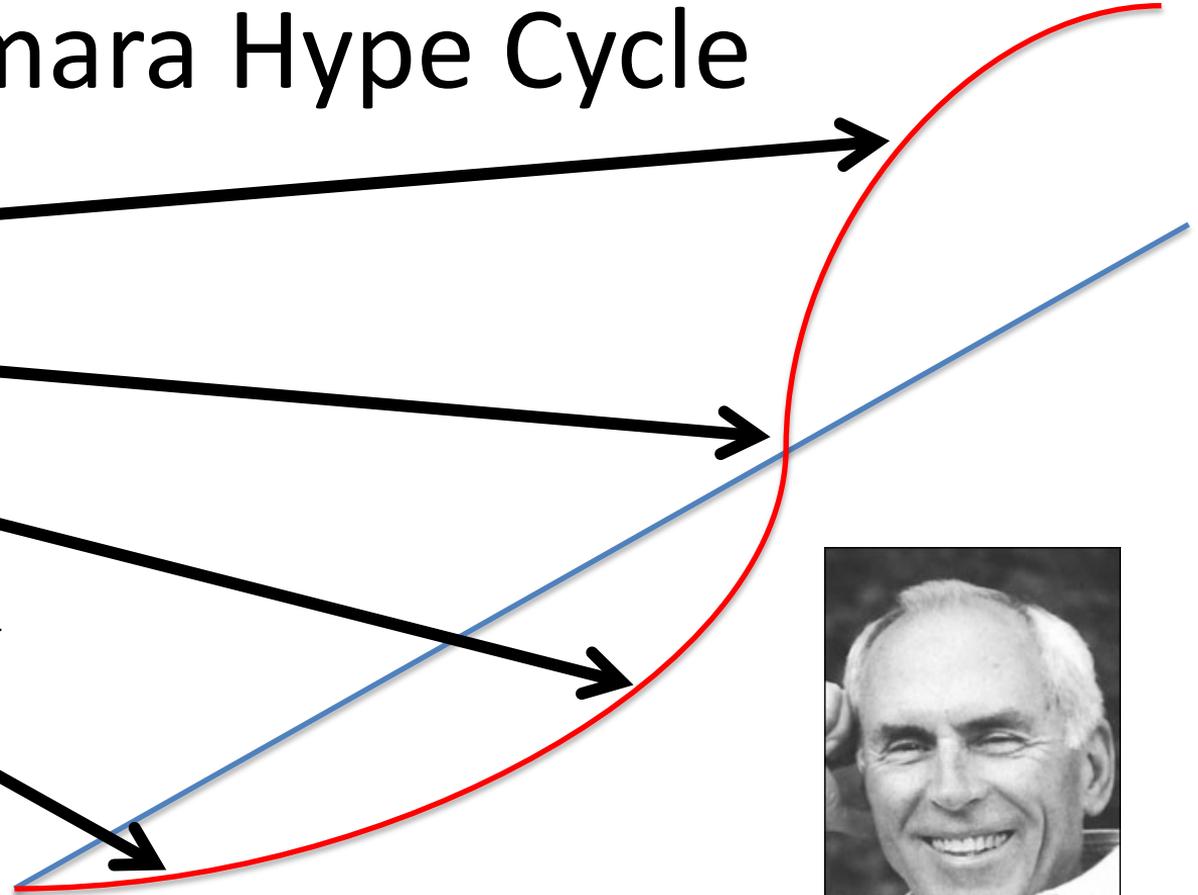
Just how such equipment works is still a military secret. The designer,

Reaction Motors, Inc., is not permitted to say how large the device is, or how long it fires, or what kind of fuel it uses. But best guess is that the rocket fires intermittently, so that the wearer can bound from spot to spot as he wishes, with no more energy than it takes to walk. Also the mechanism is believed to be of small size, simply constructed and low-priced. What a boon for mailmen and others whose work takes them from door to door!



# Amara Hype Cycle

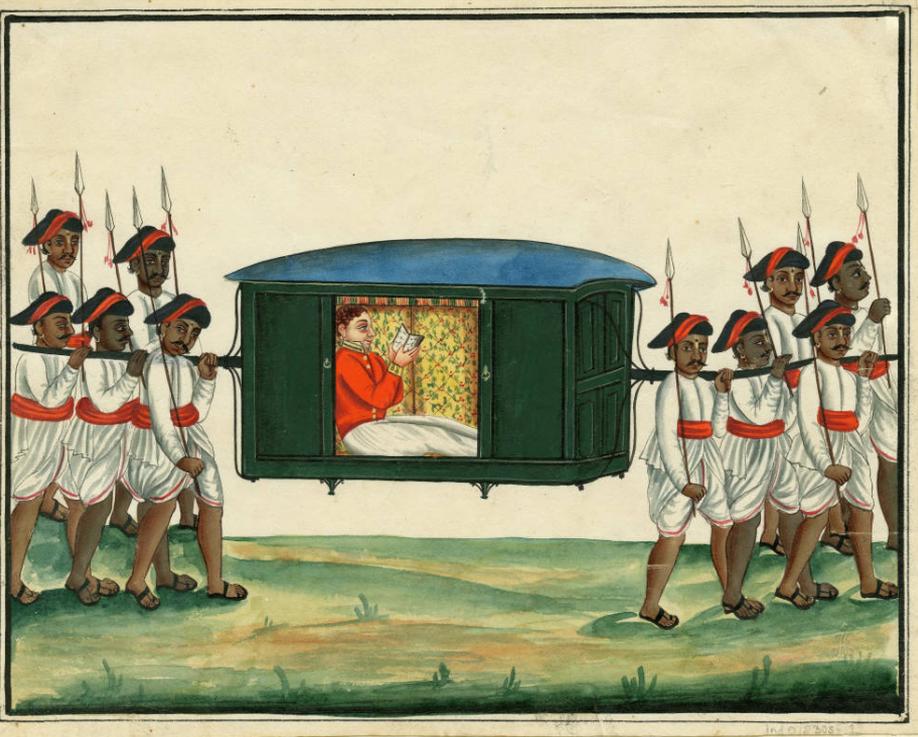
- Internet
- Genomics
- AI
- Block Chain



# Empires are bad at innovation

The EU is an empire in decay

It is Brussels – not Salvini or Orban – that is a threat to peace in Europe.



So are big companies



# Innovation is an evolutionary process



“Alain” (Emile Chartier), 1908



“Every boat is copied from another boat... Let’s reason as follows in the manner of Darwin. It is clear that a very badly made boat will end up at the bottom after one or two voyages and thus never be copied... One could then say, with complete rigor, that **it is the sea herself who fashions the boats**, choosing those which function and destroying the others.”

# Evolution of the Mobile Phone



**Motorola 8900X-2    Nokia 2146    Nokia 3210    Nokia 6210    Ericsson T39    Alcatel OT511    Samsung E250    Apple iPhone    BlackBerry Curve 8900    Samsung Galaxy S2    Samsung Galaxy S4    Sony Xperia Z Ultra**

<https://busy.org/@akbarbadsha/the-evolution-of-technology>

“The result of human  
action, but not the  
execution of any human  
design”

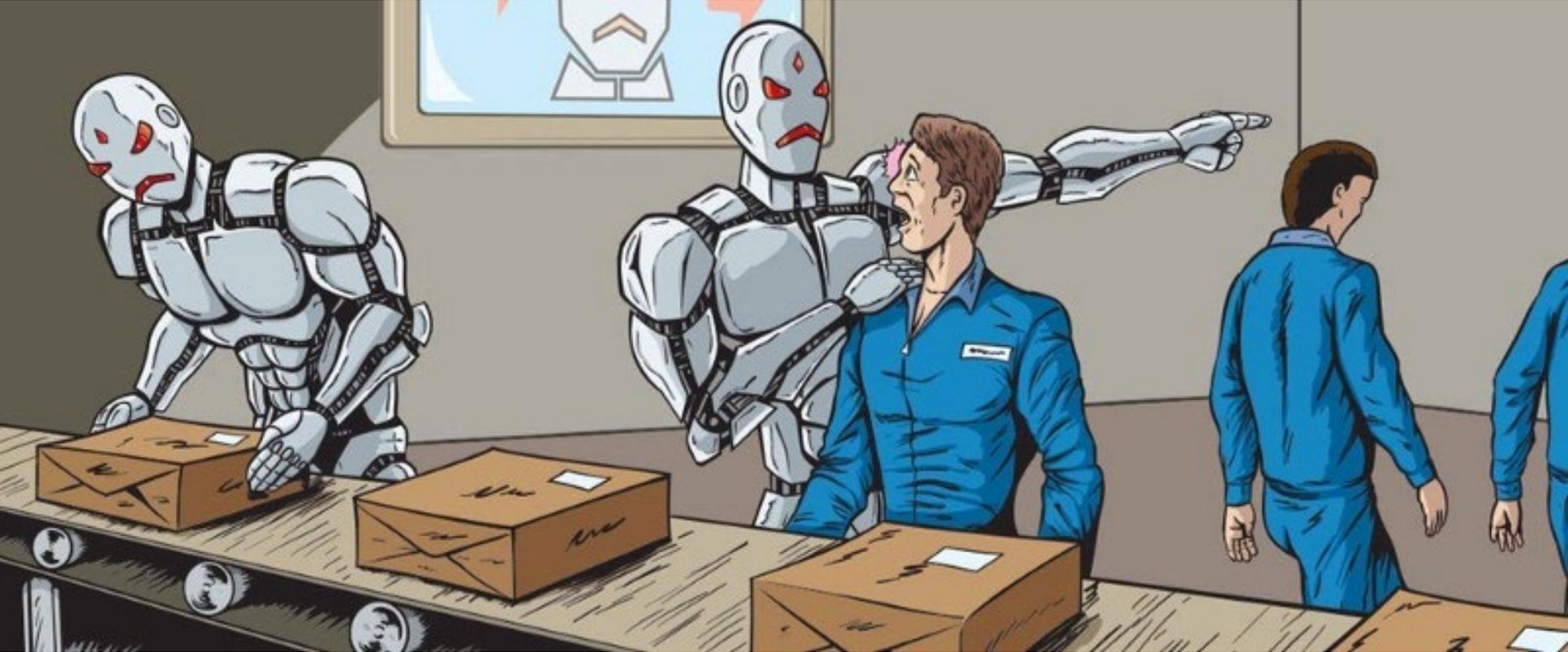
Adam Ferguson, 1767



Technology is the seed of science as  
well as the fruit



# Innovation does not destroy jobs

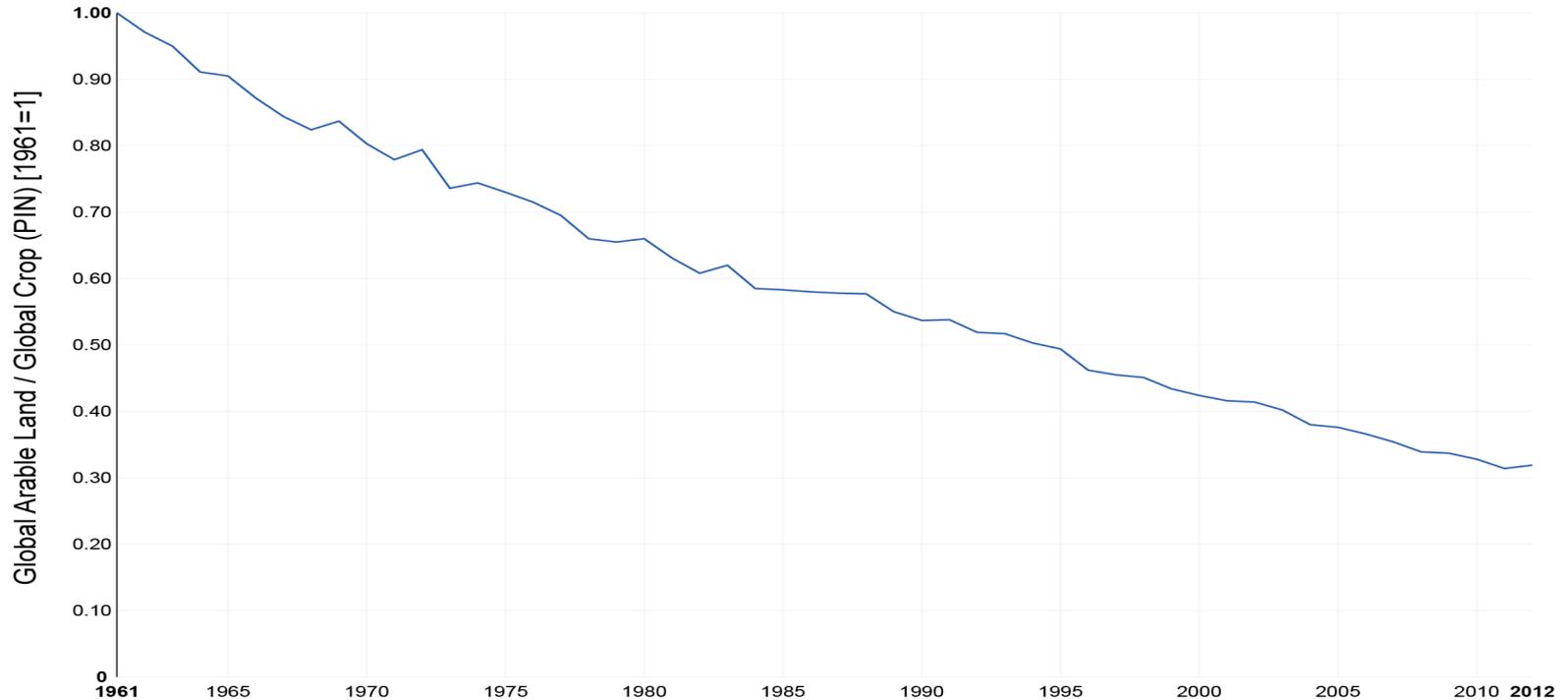


# More from less

Our World  
in Data

Global Arable Land / Global Crop (PIN) [1961=1]

After 50 years the world uses 68% less land to produce the same amount of food



Data Source: FAO

Data Visualisation: [www.OurWorldinData.org](http://www.OurWorldinData.org)

# Innovation flourishes in freedom

120

*R. 4th. Brit. 1. 1795  
Charles R. King*

By the King.

## A PROCLAMATION FOR THE Suppression of Coffee-Houses.

CHARLES R.



Whereas it is most apparent, that the Spirit of Coffee-houses of late years has run and here within this Kingdom, the Dominion of Wales, and the Town of Berwick upon Tweed, and the great cities of York and Oxford, persons to them, have produced very evil and dangerous effects; as that for this many Traders and others, do therein and spend much of their time, which might and probably should otherwise be employed in and about their lawful Callings and Affairs; but also, for that in such houses, and by occasion of the meeting of such persons therein, many false, malicious and scandalous Reports are spread and given abroad, to the Disreputation of his Majesty's Government, and to the Disturbance of the Peace and Quiet of the Kingdom: His Majesty hath thought it fit and necessary, That the said Coffee-houses be (for the future) shut down and discontinued, and that (with the Advice of His Majesty's Council) by this his Majesty's Proclamation, strictly Charge and Command all manner of persons, That they or any of them do not presume from and after the tenth day of January next ensuing, to keep any publick Coffee-house, or to sit or wait as sell by retail, or his, her or their house or houses (to be kept as usual) within the same; any Statute, Statute or Act, in that behalf made to the contrary in that behalf made.

And for the better accomplishment of this his Majesty's Royal Pleasure, His Majesty doth hereby that and require the Justices of Peace within their several Counties, and the Chief Magistrates in all Cities and Corporations, that they do at their next respective General Sessions of the peace (to be holden within their several and respective Counties, Cities and Corporations) recall and make both all Warrants at any time heretofore granted, for the shutting or detaining of any Coffee-house, Statute or Act, and that they or any of them do use (for the future) make or grant any such Warrant as aforesaid, to any person or persons whatsoever. And his Majesty doth further hereby declare, that if any person or persons shall take upon them, from or here, after his, her or their Warrant as aforesaid created, as aforesaid without Warrant, to sell by retail (as aforesaid) any of the King's subjects, other than the person or persons so appointed, shall not only be proceeded against, upon the Statute made in the fifth year of His Majesty's reign (which gives the Justices of the peace for every county) in that behalf made, but also that they shall (in case they persist to do so) receive the severest punishments that may by Law be inflicted.

Given at Our Court at Whitehall, this Nine and twentieth day of December 1795, in the Seventh and twentieth year of Our said Majesty's Majesty.

God save the King.

LONDON,

Printed by the Assigns of John Bell, and Christopher Barker,  
Printers to the King's most Excellent Majesty, 1795.

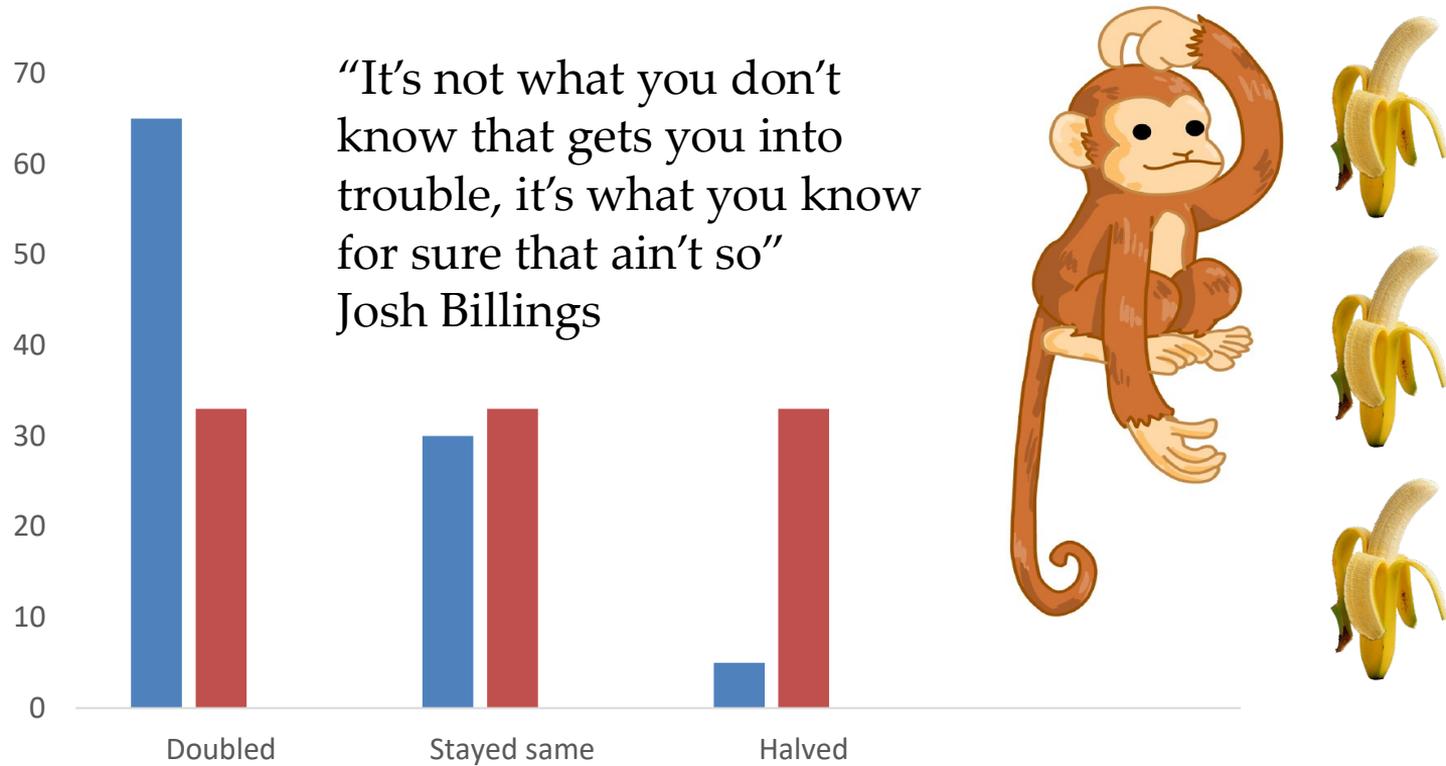
# The Digital Millennium Copyright Act



# Rational optimism



In the last 20 years the proportion of the world living in extreme poverty has....

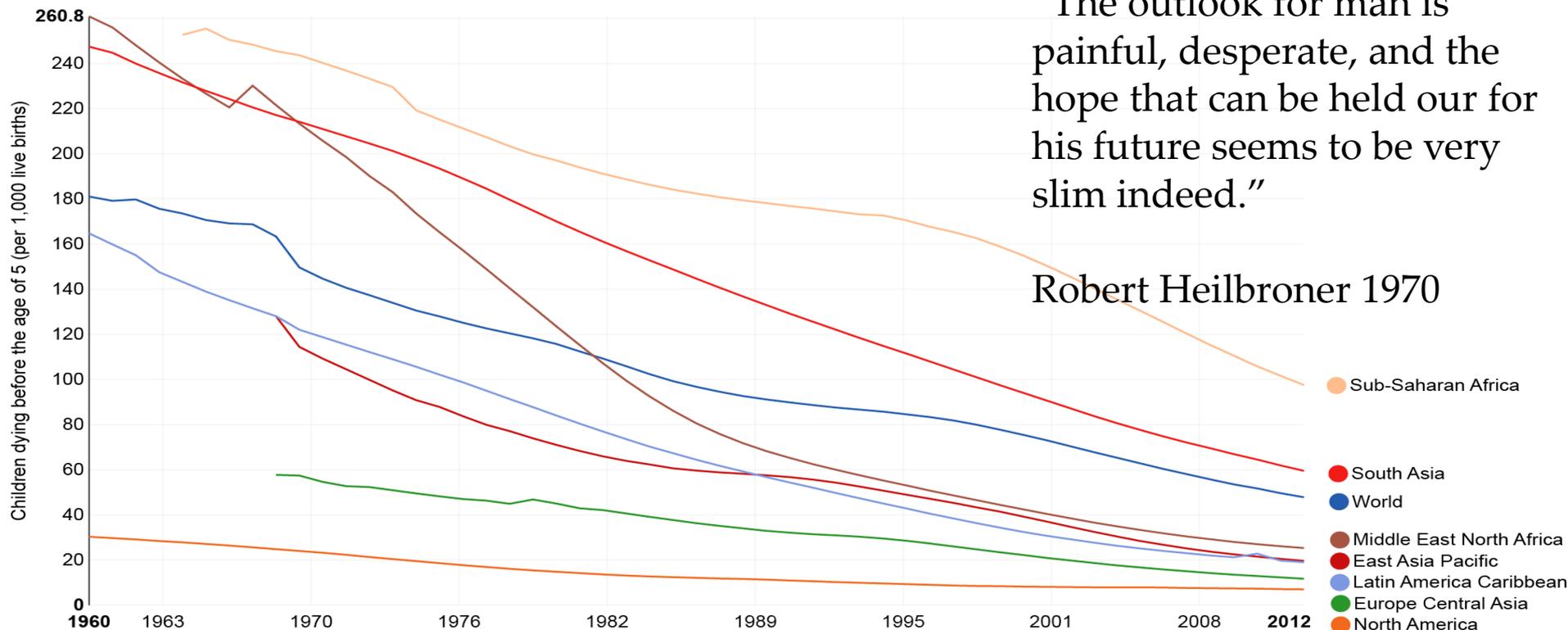


Source: Gapminder and Novus, n=1005

# Child Mortality by World Region Since 1960

“The outlook for man is painful, desperate, and the hope that can be held out for his future seems to be very slim indeed.”

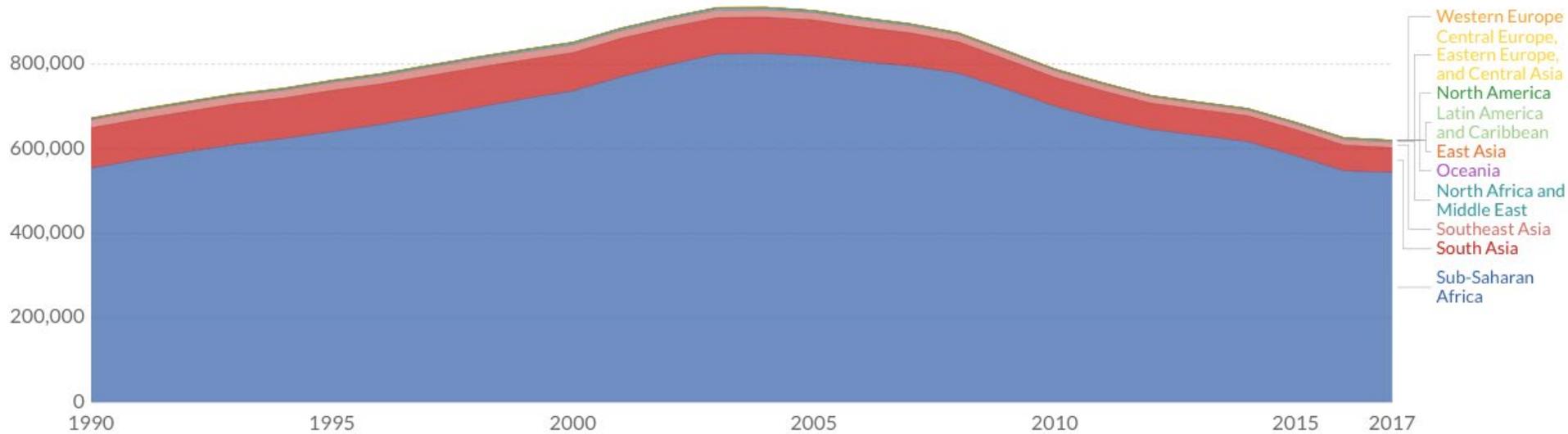
Robert Heilbroner 1970



# Malaria

## Malaria deaths by region

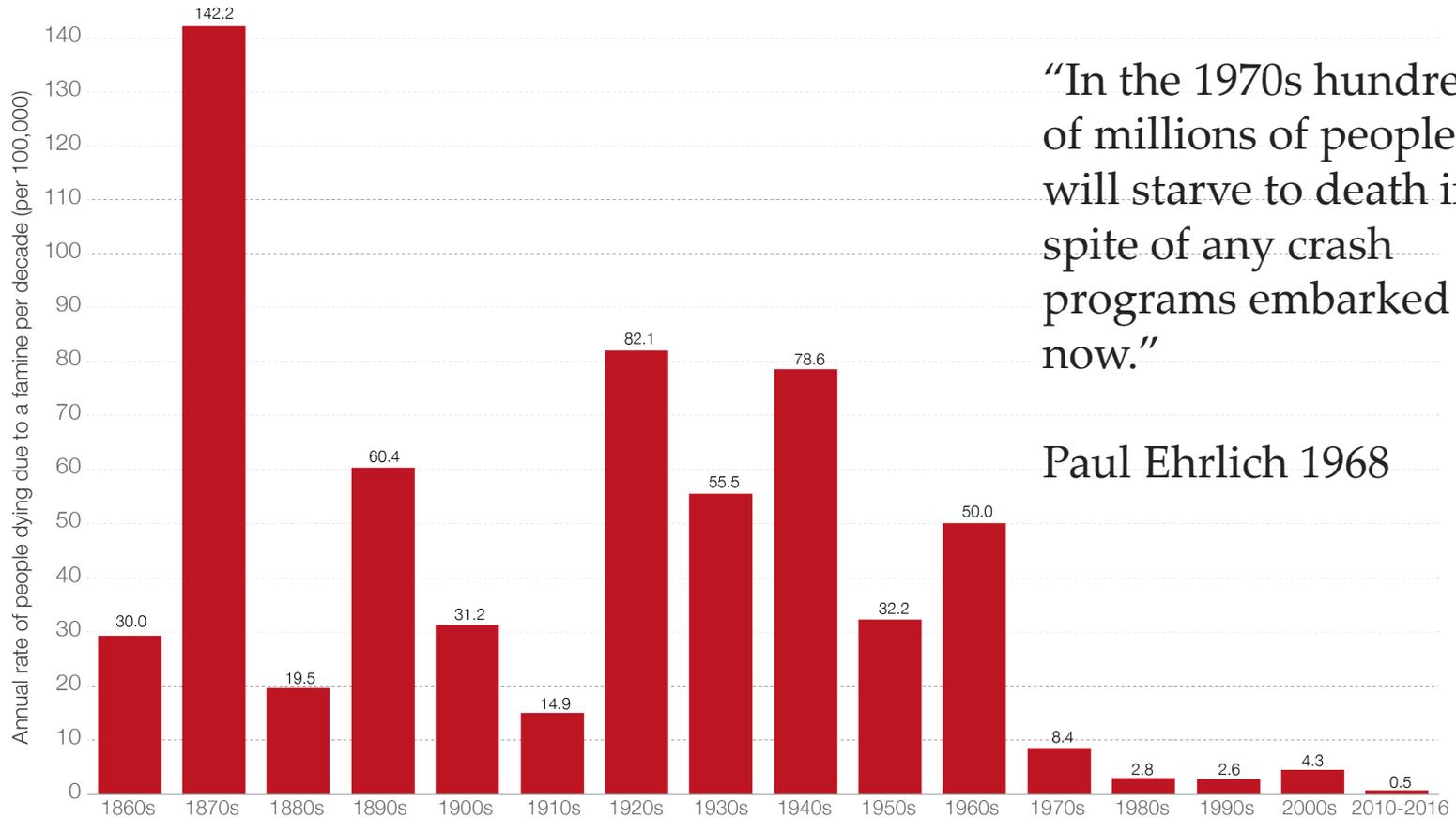
Annual number of deaths from malaria across all ages and both sexes, differentiated by region. Europe and North America are not shown since IHME report zero deaths from malaria over this period.



Source: IHME, Global Burden of Disease (GBD)

OurWorldInData.org/malaria/ • CC BY

# Annual rate of people dying due to a famine globally, per decade



“In the 1970s hundreds of millions of people will starve to death in spite of any crash programs embarked upon now.”

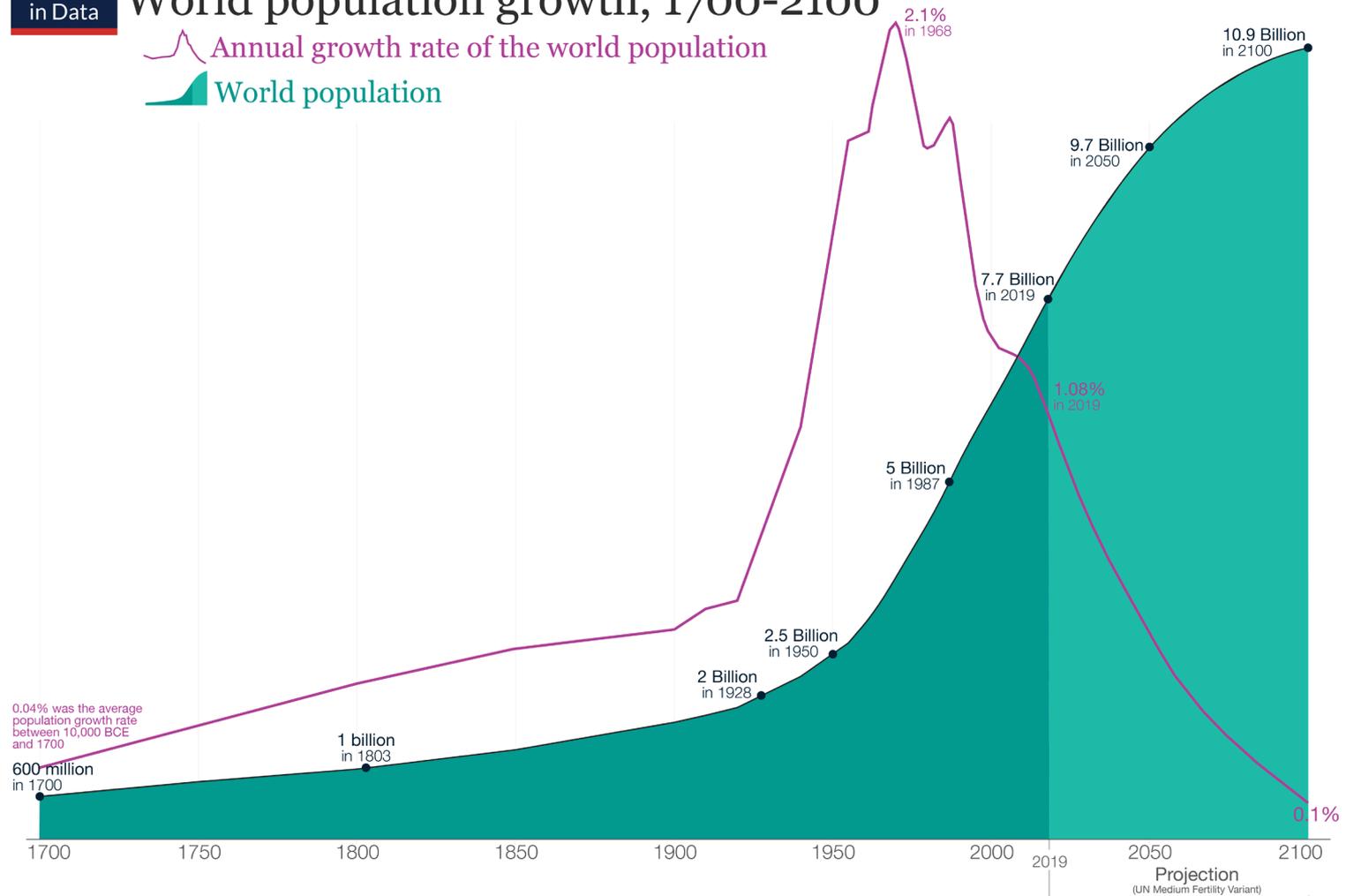
Paul Ehrlich 1968

Data source: The rate of the excess mortality due to famines shown here is presented in detail on [OurWorldinData.org/famines](https://OurWorldinData.org/famines) [The dataset was constructed by Joe Hasell and Max Roser].  
How the rate is calculated: The annual rate is calculated for each decade by dividing the total number of famine victims in each decade by the average size of the world population in that decade and dividing the resulting ratio by 10 (and for the data from 2010 to 2016 it is divided by 7) to arrive at a yearly rate. To express it as the rate per 100,000 people, this annual rate is then multiplied by 100,000.  
For famines that happened at the end of a decade and the beginning of the next decade the famine victims are split by decade on a year by year basis.  
For famines for which different excess mortality estimates are published the midpoint between these estimates was chosen here.  
This visualization is available at [OurWorldinData.org](https://OurWorldinData.org). There you find the full dataset and more research and visualizations on famines and global development.

# World population growth, 1700-2100

Annual growth rate of the world population

World population



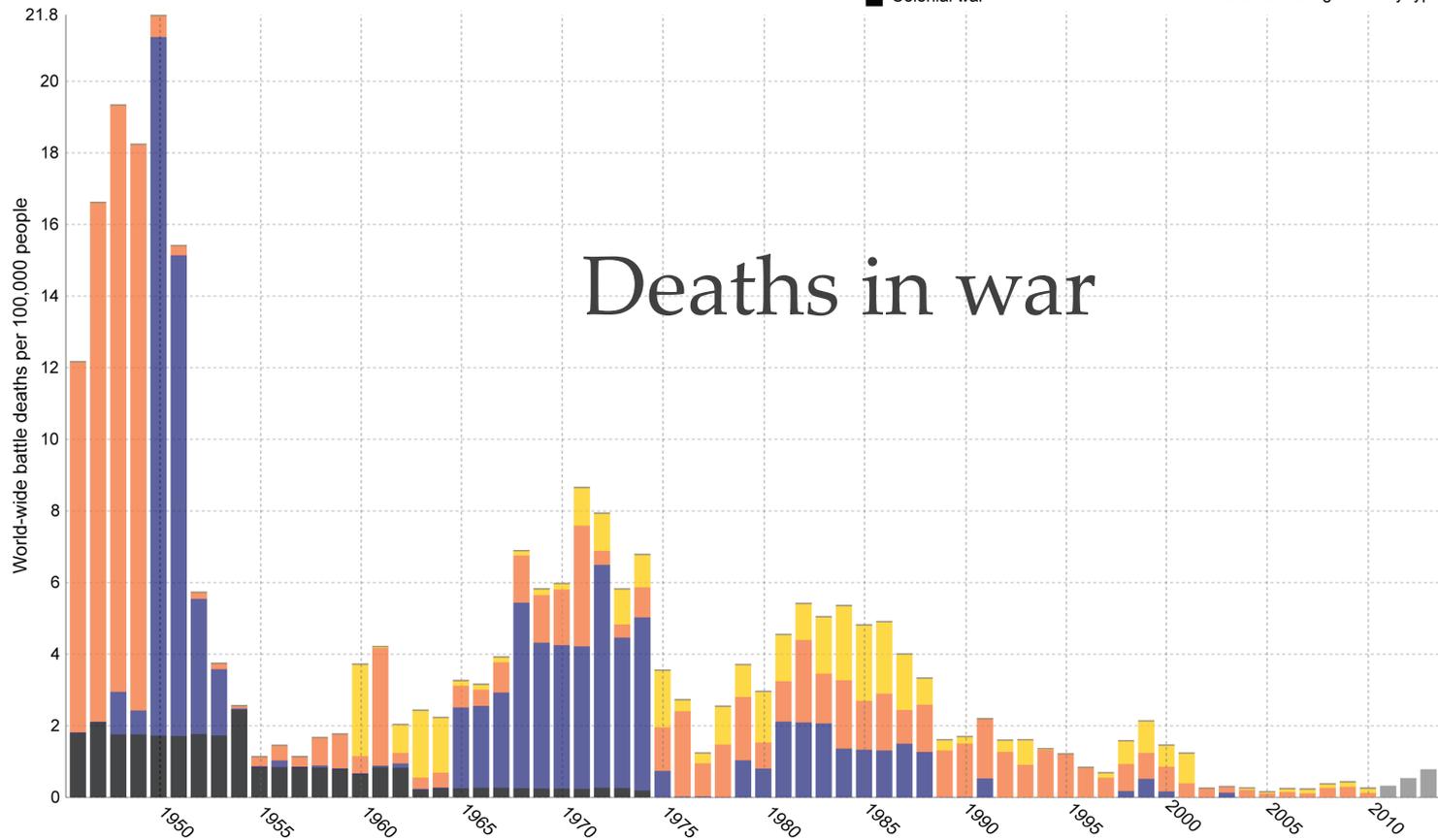
Data sources: Our World in Data based on HYDE, UN, and UN Population Division [2019 Revision]  
This is a visualization from [OurWorldinData.org](https://ourworldindata.org), where you find data and research on how the world is changing.

Licensed under CC-BY by the author Max Roser.

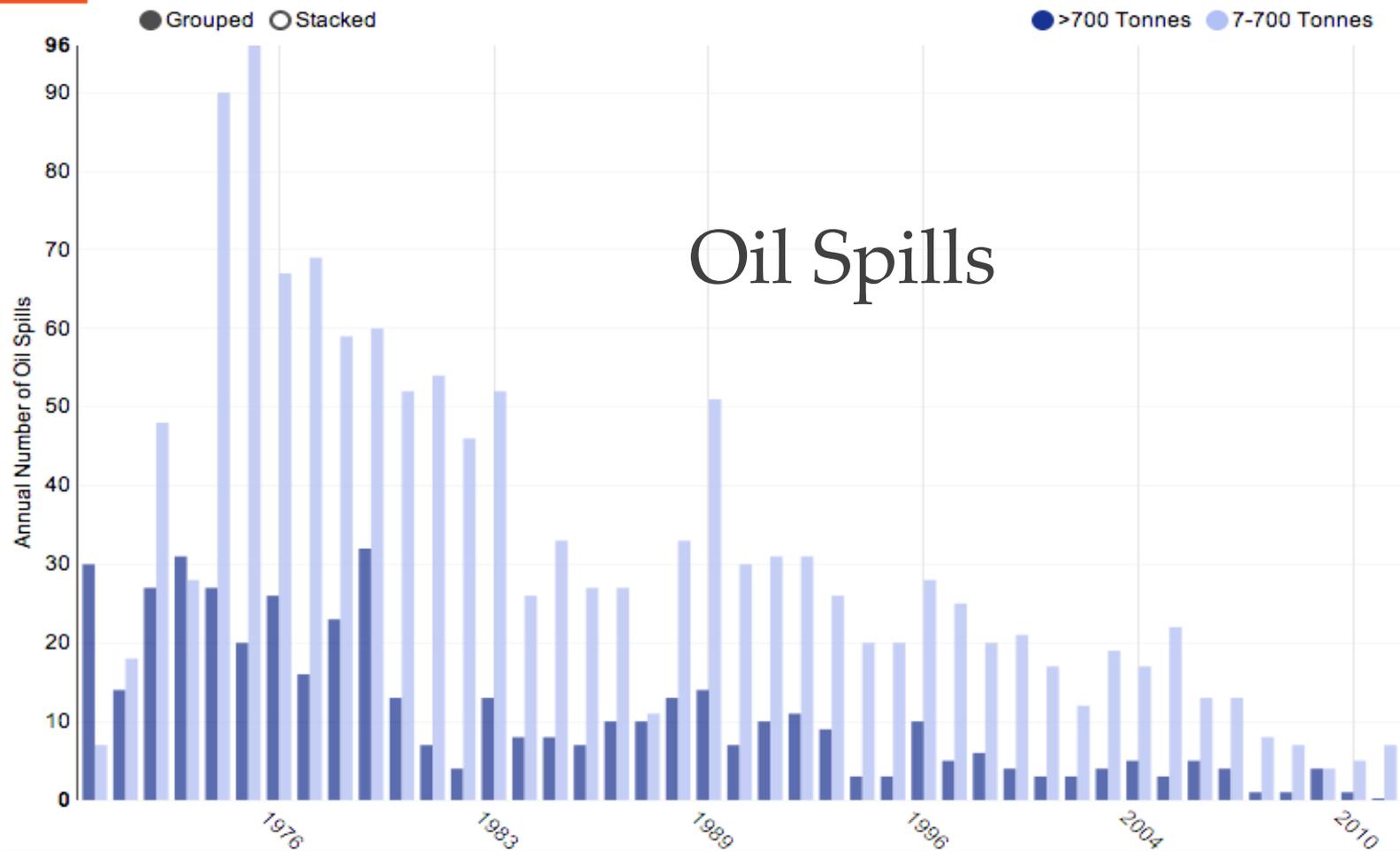
# Battle death rate in state based conflicts by type (1946-2013) – by Max Roser

Annual world-wide battle deaths per 100,000 people

- Civil war with foreign intervention
- Civil war
- Wars between states
- Colonial war
- All wars (for period 2011-13 wars are not distinguished by type)



## Deaths in war

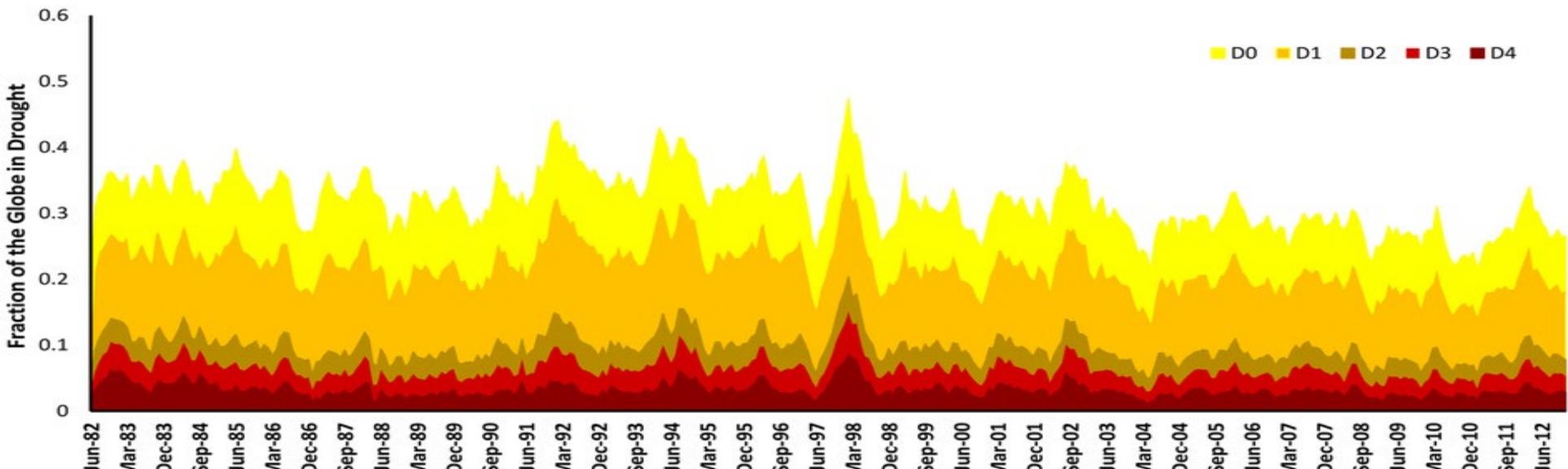


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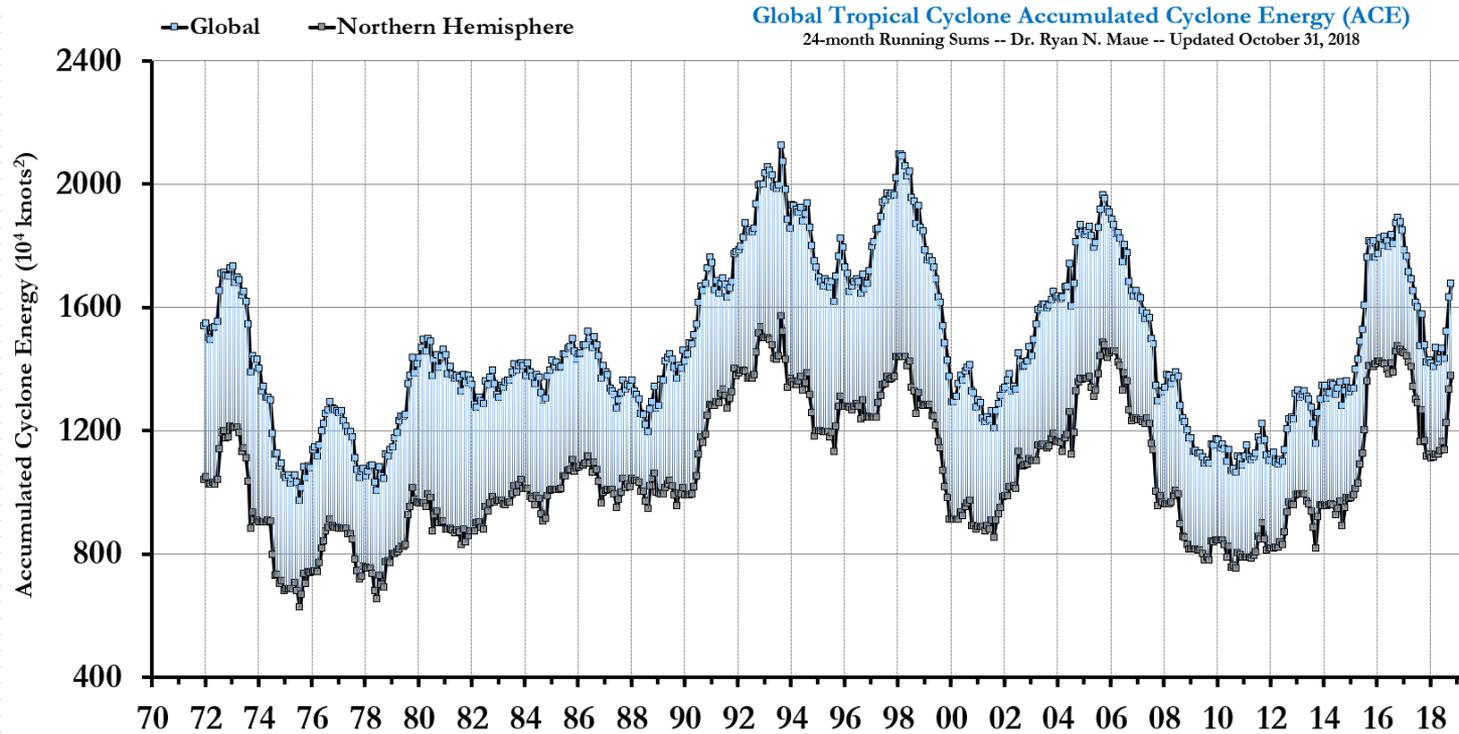
Data sources: ITOFF



# Drought



# Tropical cyclones



# Sea level rise

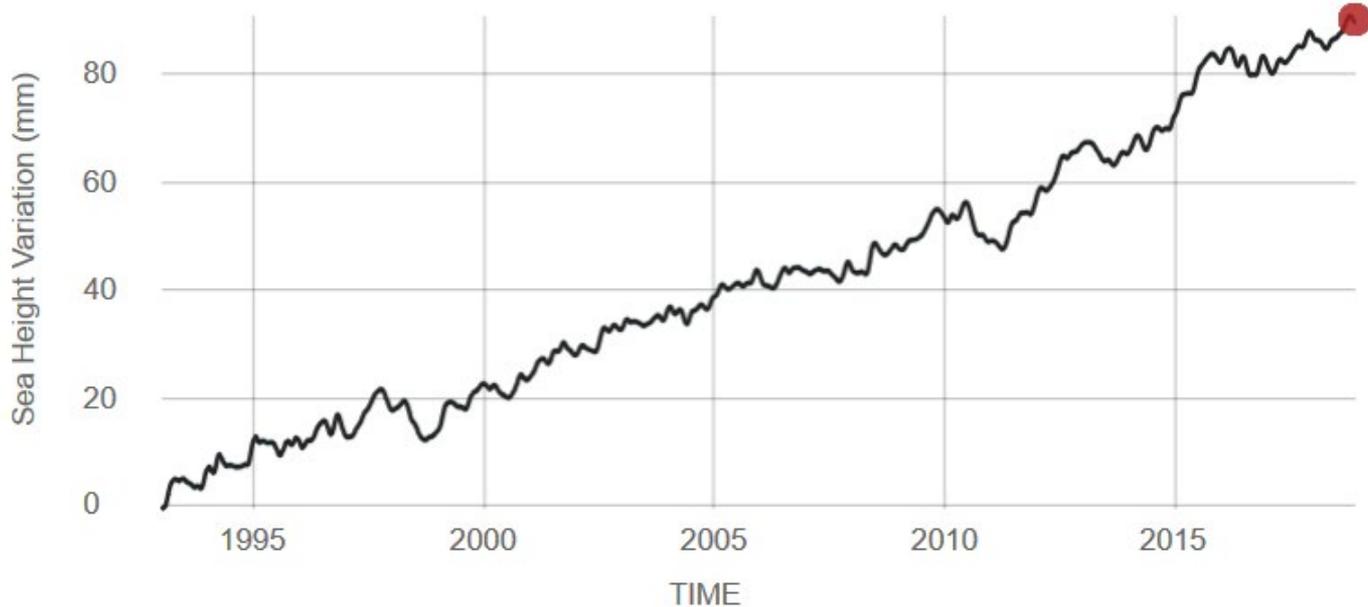
## SATELLITE DATA: 1993-PRESENT

Data source: Satellite sea level observations.  
Credit: NASA Goddard Space Flight Center

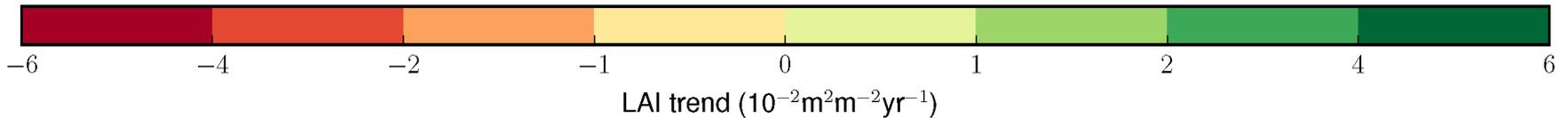
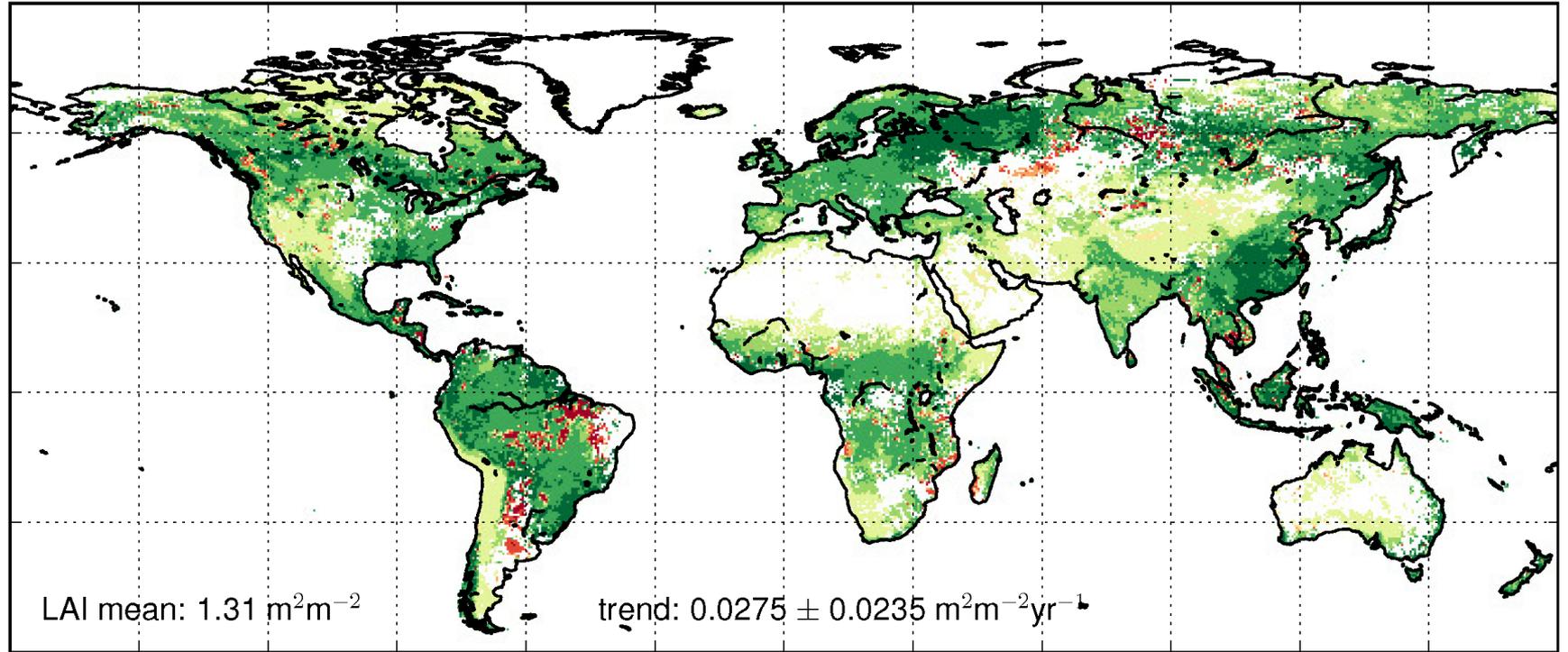
## RATE OF CHANGE

↑ 3.3

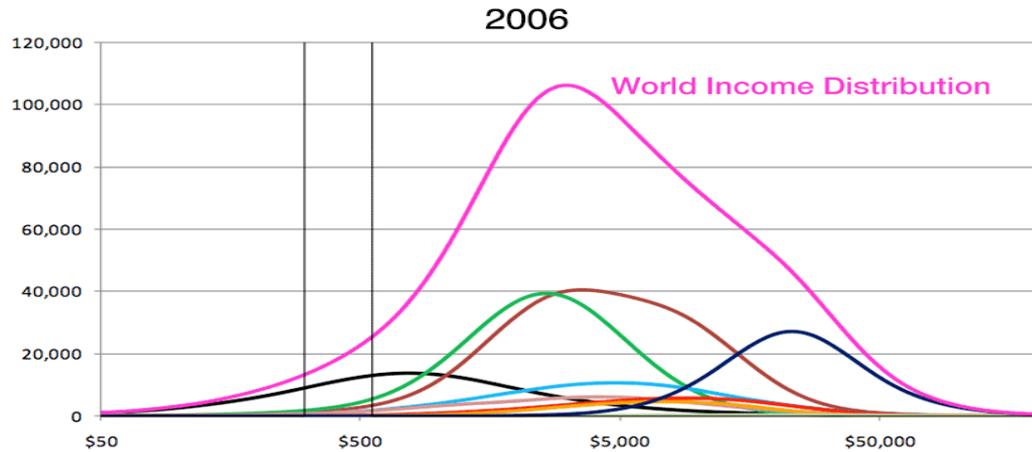
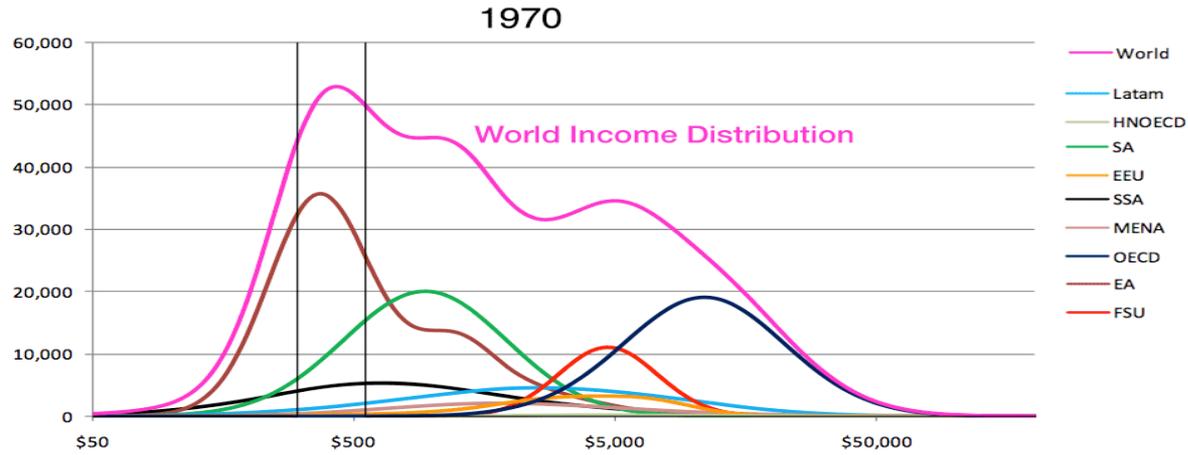
millimeters per year



# Global greening

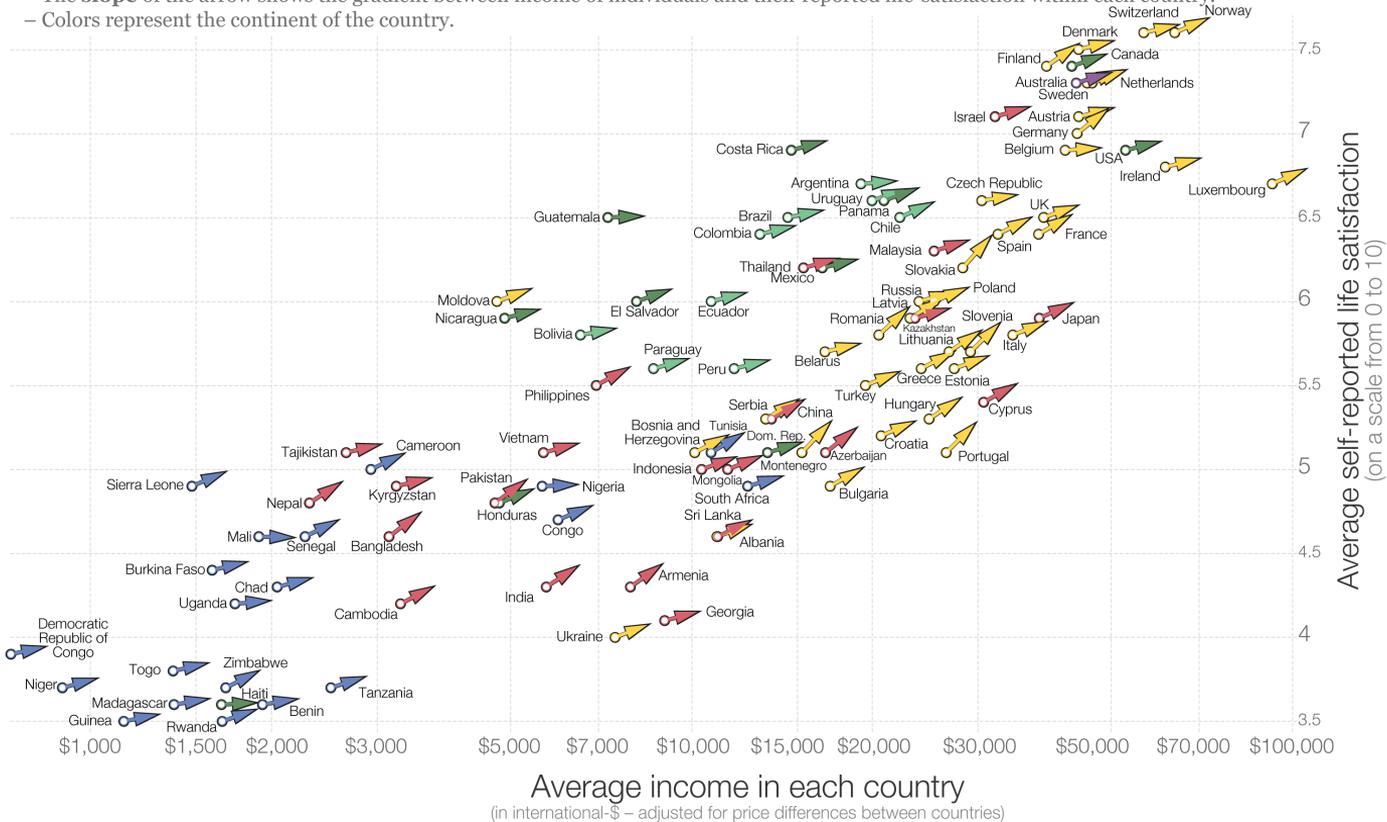


# Inequality



# People in richer countries tend to be happier and within all countries richer people tend to be happier

- The **position** of the arrow shows the average life satisfaction reported by the population of a country (vertical axis) and the average income of that country (horizontal axis).
- The **slope** of the arrow shows the gradient between income of individuals and their reported life-satisfaction within each country.\*
- Colors represent the continent of the country.



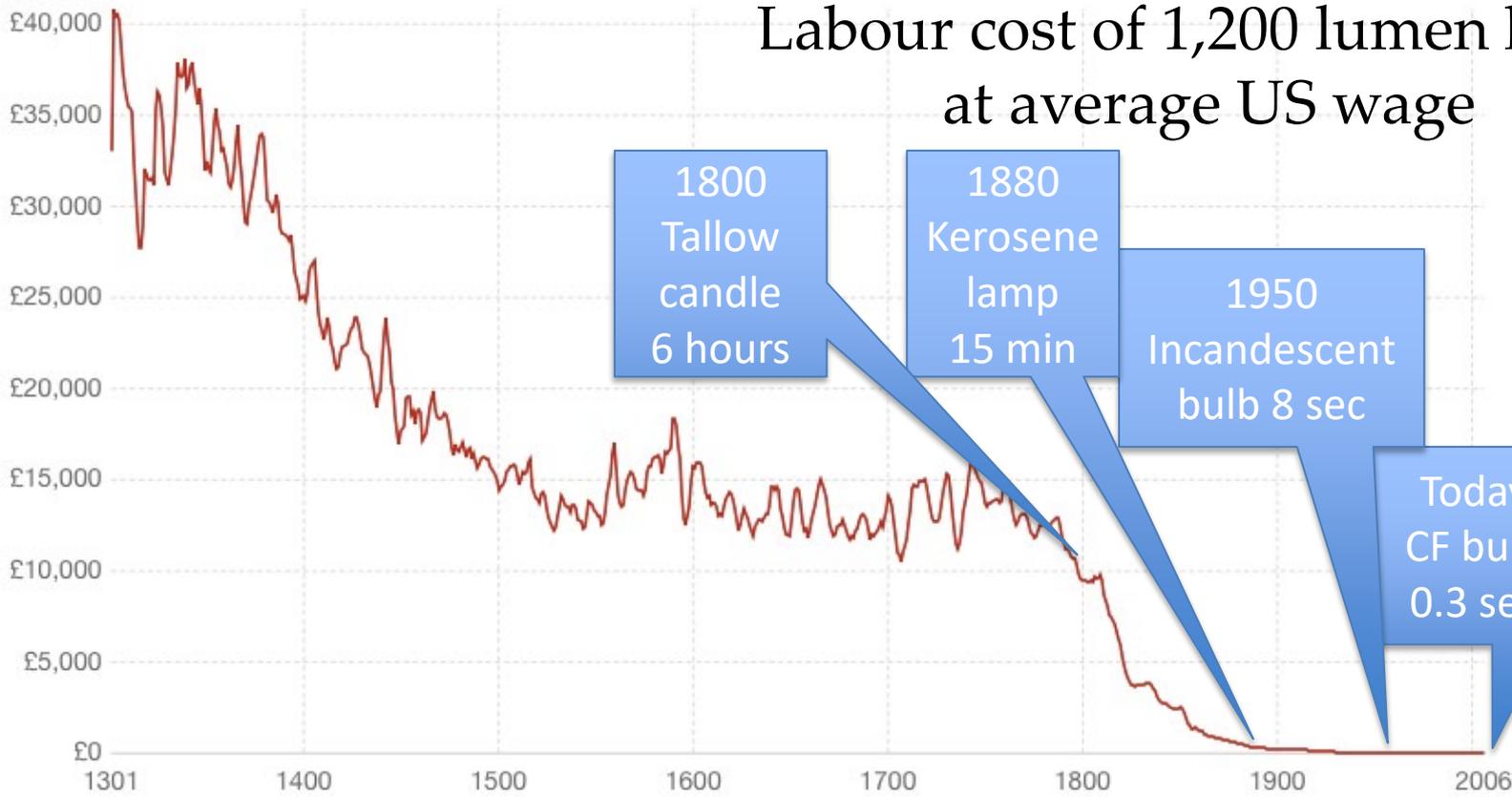
\* The gradients correspond, country by country, to the regression coefficients between income quintiles and the related average life satisfaction reported by people within each income quintile.  
**Data sources:** *World Bank* for data on incomes by quintile (based on income shares by quintile and GDP per capita as the mean income); *Gallup World Poll* for life satisfaction by income quintile. The visualization is available at [OurWorldinData.org](https://ourworldindata.org). There you find the research and more visualizations on life satisfaction. Licensed under [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) by the author Max Roser.

# The Price for Lighting (per million lumen-hours) in the UK in British Pound



1 lumen hour is equal to the luminous energy emitted in 1 hour by a light source emitting a luminous flux of 1 lumen. For comparison: a standard 100W incandescent light bulb emits ±1700 lumen.

⚙ LINEAR

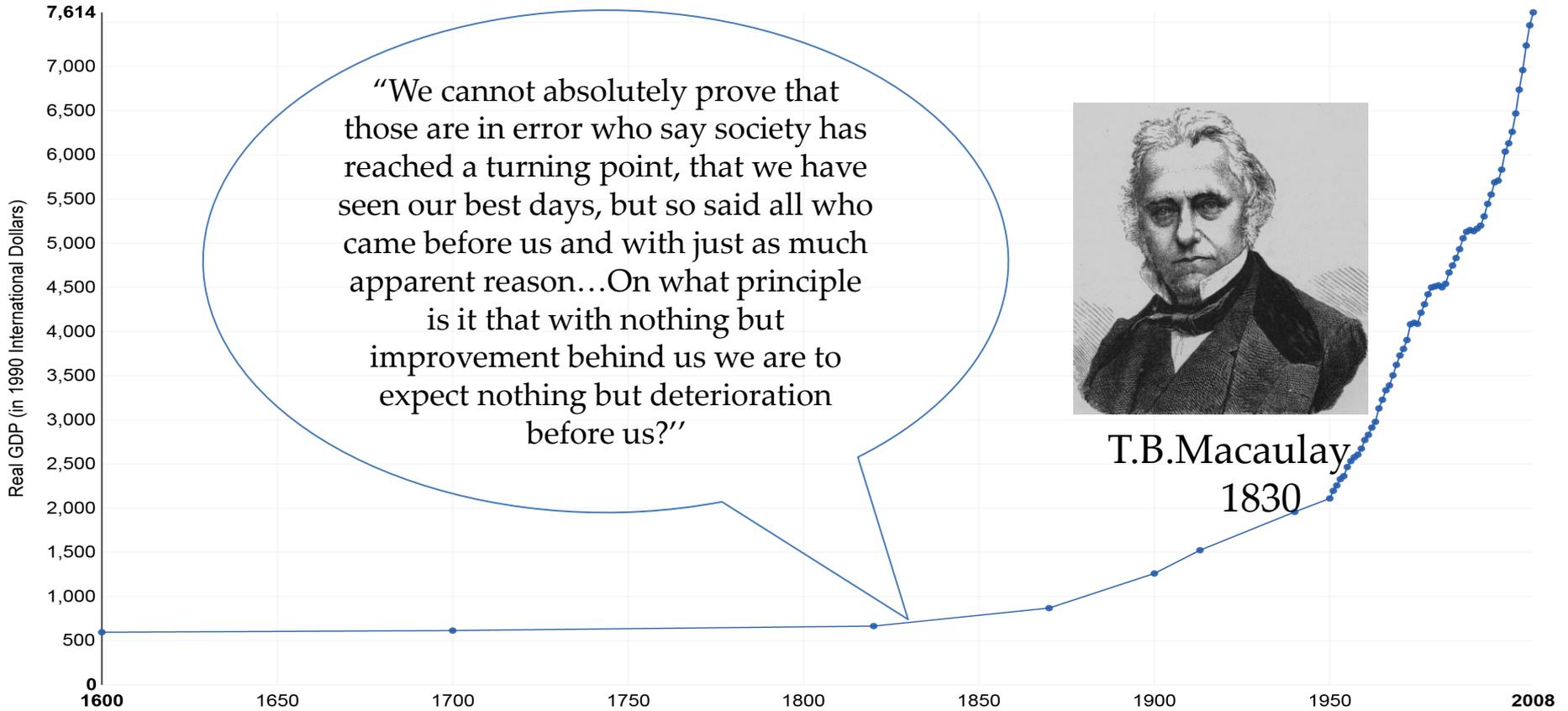


Labour cost of 1,200 lumen hours at average US wage

Source: Fouquet and Pearson (2012)

Notes: The price is adjusted for inflation and expressed in prices for the year 2000. Shown is a 5-year moving average.

# Real World Average GDP per Capita Since 1600





The End

