# From science as a public good to the new oligopoly: a paradox?

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Perspectives on big science and the question of justice 22-23 April 2021



#### THE NEW OLIGOPOLY

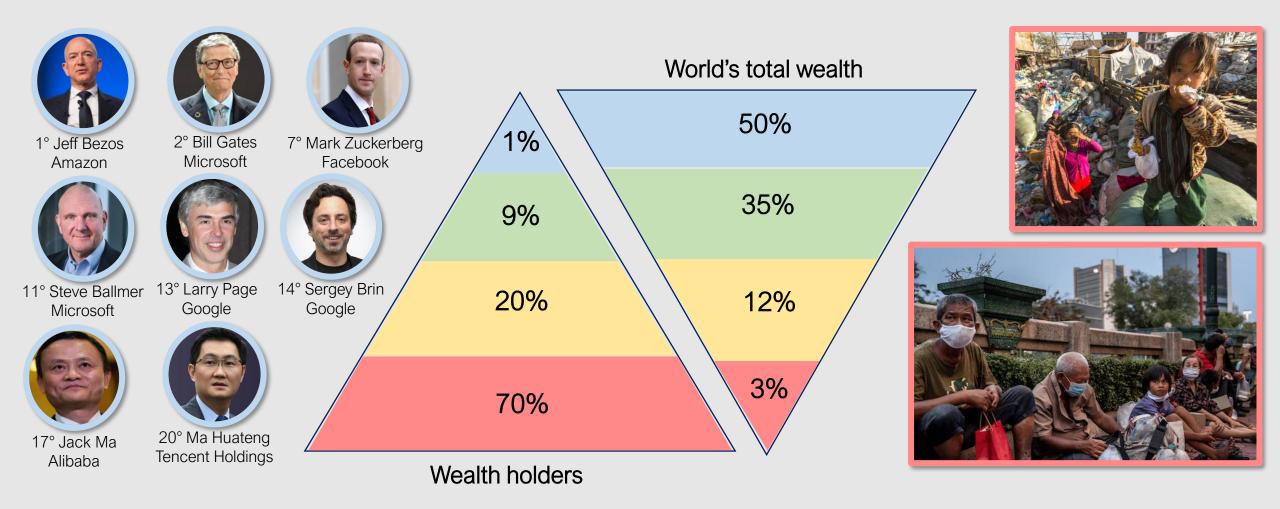
- How it happened that CERN and Tim Berners-Lee co-created the wealth of Amazon and Jeff Bezos?
- Eight out of the top ten companies in the world are knowledge-based: Tech Giants & Big Pharma

	Microsoft	Ranking	Market value*
<image/> <image/>	<b>É</b>	2. Microsoft	1,359
	amazon	3. Apple	1,258
	Alphabet	4. Amazon	1,233
	facebook.	5. Alphabet	919
		6. Facebook	584
	E Alibaba Group	7. Alibaba	545
	Tencent 腾讯	8. Tencent Holdings	510
	Johnson-Johnson	10. Johnson & Johnson	395

https://www.statista.com/statistics/263264/top-companies-in-the-world-by-market-capitalization/

\*billion \$, year 2020

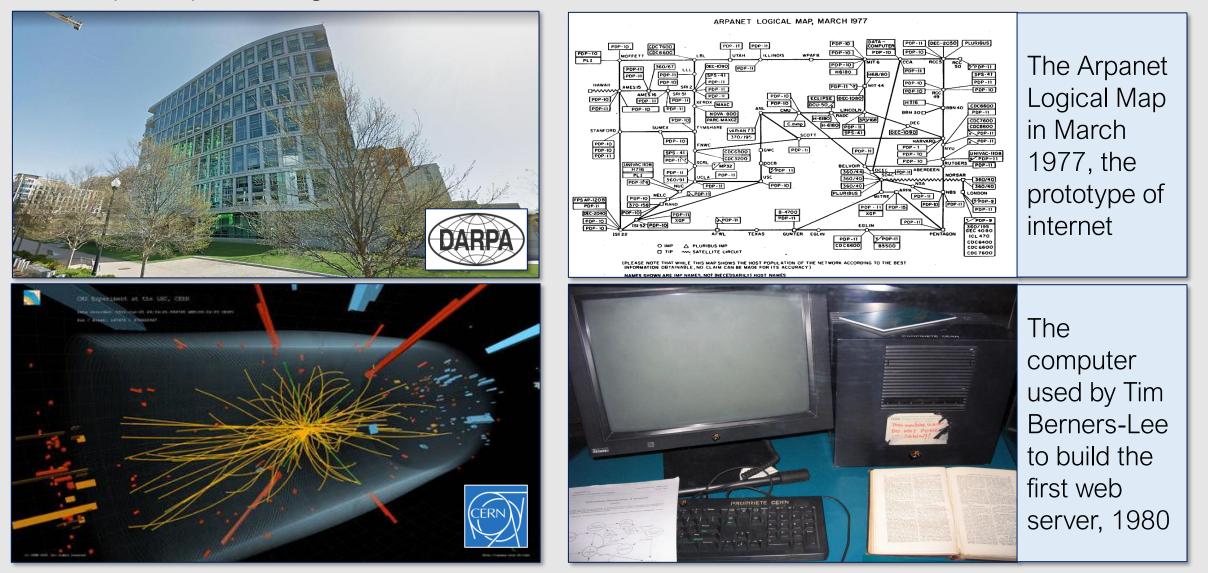
### THE NEW OLIGOPOLY AND SOCIAL INEQUALITY



"Nine of the 20 wealthiest people in the world are *tech tycoons* - one more than on the 2019 list. [...] The 20 richest people in technology are worth a combined \$740 billion [...]. In all, there are 241 technology billionaires on Forbes' 2020 billionaires list, up from 215 last year. Combined, they are worth a whopping \$1.4 trillion - 16% of the total net worth for all 2,095 billionaires on the list this year." <a href="https://www.forbes.com/billionaires/">https://www.forbes.com/billionaires/</a>

#### FROM SCIENCE TO PROFITS

The tech giants profits are based on innovation created and donated by scientists and not-for-profit public organizations



- Five main mechanisms:
- 1. Intellectual property rights as new enclosures
- 2. Public procurement, innovation, and the industrial complex
- 3. Human capital formation from science to business
- 4. Data science and data expropriation
- 5. The capture of open data

# 1. INTELLECTUAL PROPERTY RIGHTS AS NEW ENCLOSURES



ALBA Synchrotron, Cerdanyola del Vallès (ES)

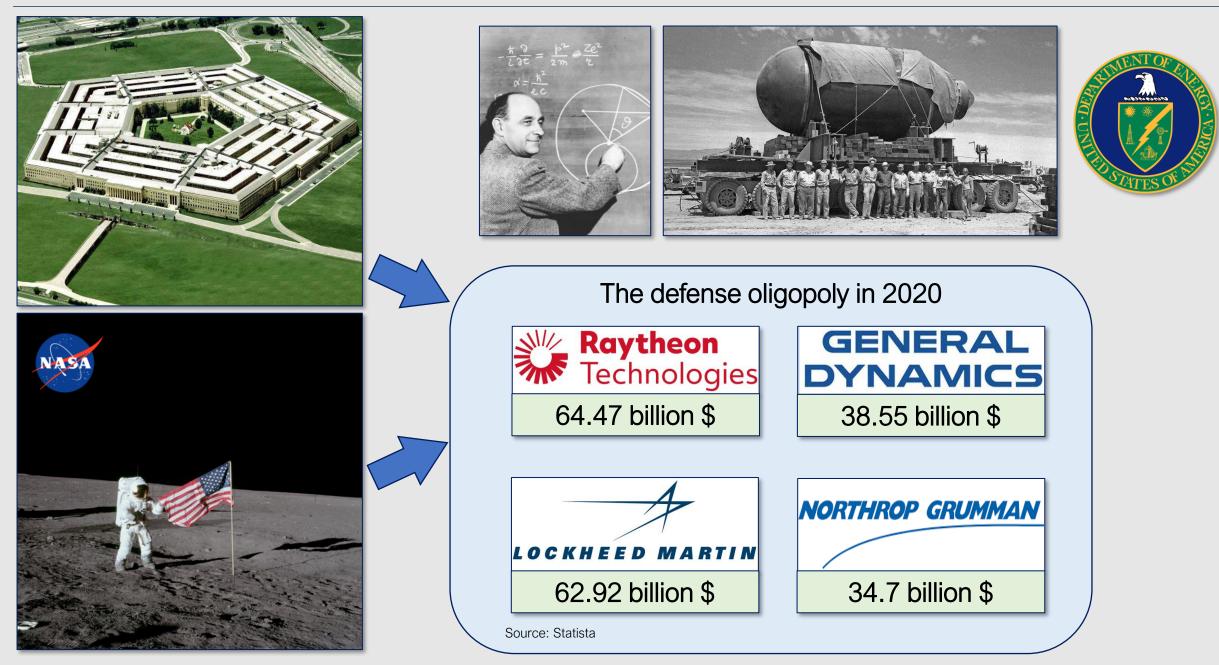


European Synchrotron Radiation Facility (ESRF), Grenoble (FR)

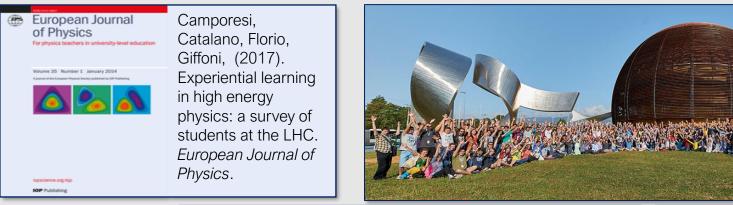
Beamline	Publication	Patent key
	DOI	
	201	WO_2020_018433_A1 =
		WO_2019_017937_A1 =
		WO_2017_060391_A1 =
		US_10500191_B2 =
		WO_2017_191323_A1
	DOI:10.1371/journal.pone.0129891	WO_2017_025657_A1
	DOI:10.1073/pnas.1414545111	WO_2019_238995_A1 .
	DOI:10.1021/ja5030657 =	WO_2019_145409_A1 .
	DOI:10.1039/c5ce00850f =	WO_2019_016391_A1 =
	DOI:10.1039/c4cc09024a =	CN_107413362_A =
(XALOC (BL13)	DOI:10.1016/j.chom.2014.04.006 =	CN_106311237_A .
	DOI:10:1038/nchem.1721	WO_2017_100727_A1
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50 BOD	DOI:10.1038/ncomms7451	WO_2017_064189_A1 =
	DOI:10.1038/nmat4462	WO_2016_202874_A1
	DOI:10.1021/acs.chemmater.5b00381	WO_2016_202871_A1
	DOI:10.1021/acs.chemmater.6b02659 =	WO_2016_202868_A1
		FR_3042313_A1
	DOI:10.1021/cm5016449	WO_2019_207043_A1
No beamtime	DOI:10.1016/j.apsusc.2015.11.117	CN_107146877_A
	DOI:10.1117/12.617650 =	WO_2019_053310_A1
-	DOI:10.1016/j.cemconcomp.2014.08.003	WO_2008_110779_A1
NCD-SWEET (BL11	DDI:10.1016/jinancrysol.2019.04.001 =	WO_2016_088083_A1
	DOI:10.1021/cm304007d	US_10450232_B2 •
CIRCE (BL24)		US_10350330_B2
	DOI:10.1016/j.ijbiomac.2018.08.052	US_10112162_B2
	DOI:10.1016/j.polymer.2016.02.003	WO_2020_002737_A1
		ES_2730729_A1
	DOI:10.1016/j.colsurfb.2015.05.025	WO_2018_192743_A1
	DOI:10.1088/1381-8528/aa8e5c =	WO_2018_060241_A1
		US_9725558_B2 •
		EP_3301091_A1 •
		IT_201700034725_A1
		EP_3381517_A1
		CN_110104675_A =

Source: Catalano, Florio, Pancotti, Vignetti, Sánchez Grueso, García López, The pathways from experiments to innovation impacts: evidence from ALBA Synchrotron Light Facility, <u>https://ri-paths.eu/wp-content/uploads/2020/06/T5.2\_Pilot-IA-project-with-ALBA.pdf</u>

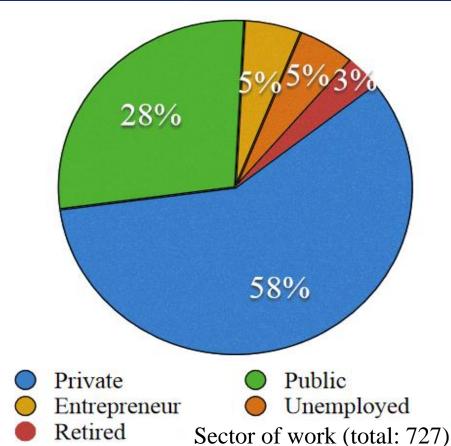
#### 2. PROCUREMENT FOR INNOVATION AND THE MILITARY INDUSTRIAL COMPLEX

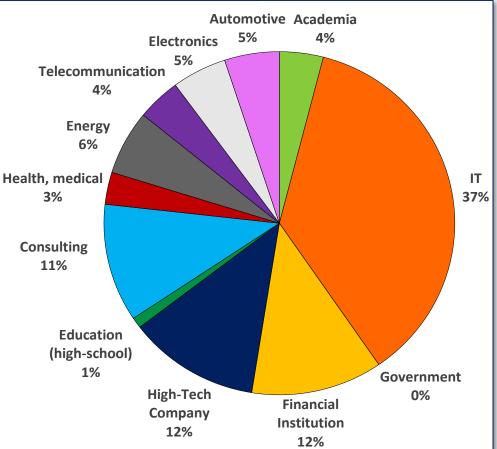


#### 3. HUMAN CAPITAL FORMATION FROM SCIENCE TO BUSINESS



Source: Bianchin, Giacomelli et al., Study on the career trajectories of people with a working experience at CERN, https://arxiv.org/pdf/1910.05116.pdf





# 4. DATA SCIENCE AND DATA EXPROPRIATION

• Broad Institute (Harvard and MIT) 70 Petabytes genomic data

• CERN

- 1 Petabyte per day of data
- Square Kilometre Array SKA
  4.9 Zettabytes per year in Australia

YouTube
 24 Terabytes

- Facebook (10 billion photos)
  1,5 Petabyte
- Google
  15 Exabytes
- 23andMe

10 million genome data





# 5. THE CAPTURE OF OPEN DATA

• Impact of European Molecular Biology Laboratory EMBL-EBI:

81 million **Petabytes** of raw data storage web requests made to our websites on an average day

545,000 unique IPs accessed our Train online platform in 2020



said they could neither have created/collected the last

Source: https://www.ebi.ac.uk/about/our-impact

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"We find citations in more than 8,000 patents from 2014, demonstrating substantial use and an important role for data resources in defining biological concepts in granted patents to both academic and industrial innovators."



Source: Bousfield et al., Patterns of database citation in articles and patents indicate long-term scientific and industry value of biological data resources, https://f1000research.com/articles/5-160/v1

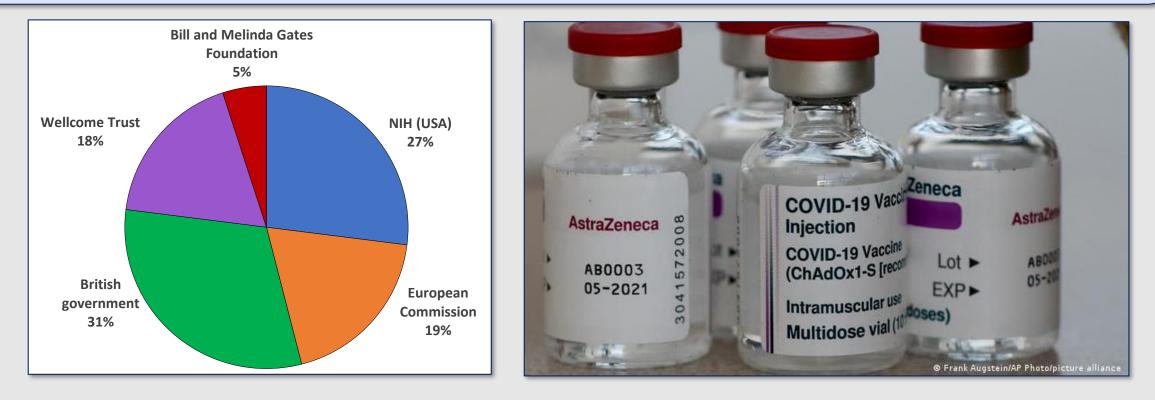
Why traditional public policies do not work?

- Tax elusion by multinationals
- Inadequate market regulation
- Externalities: the case of Big Pharma

## PUBLIC FUNDING OF COVID-19 R&D OF VACCINES

# 97-99% of the funding towards the R&D of Chimpanzee Adenovirus Oxford and the Oxford-AstraZeneca vaccine was from public funding

Cross et al., Who funded the research behind the Oxford-AstraZeneca COVID-19 vaccine? https://www.medrxiv.org/content/10.1101/2021.04.08.21255103v1



Public funding of approximately \$ 11 billion to accelerate the development and preparation for production of the vaccine candidates (2020)

# A NEW PUBLIC MODEL OF SCIENCE AND INNOVATION

- A new generation of research infrastructures
- A "CERN" for biomedical R&D (beyond the EMBL)
- New pharma manifacturing and distribution capacity
- Transfers from the budget of Member States
- Public and private contributions for specific missions
- A good example: European Space Agency, 22 Member States, over 80 satellites, 2020 budget: 6.68 billion = 12€ per European
- A "CERN" for climate change, science and technology
- A "CERN" for information technology in the public interest



Università degli Studi di Milano Jean Monnet Centre of Excellence "The impact of European Union Research and Innovation Policy upon Services of General Interest"

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# Thank you <u>massimo.florio@unimi.it</u> www.massimoflorio.com



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