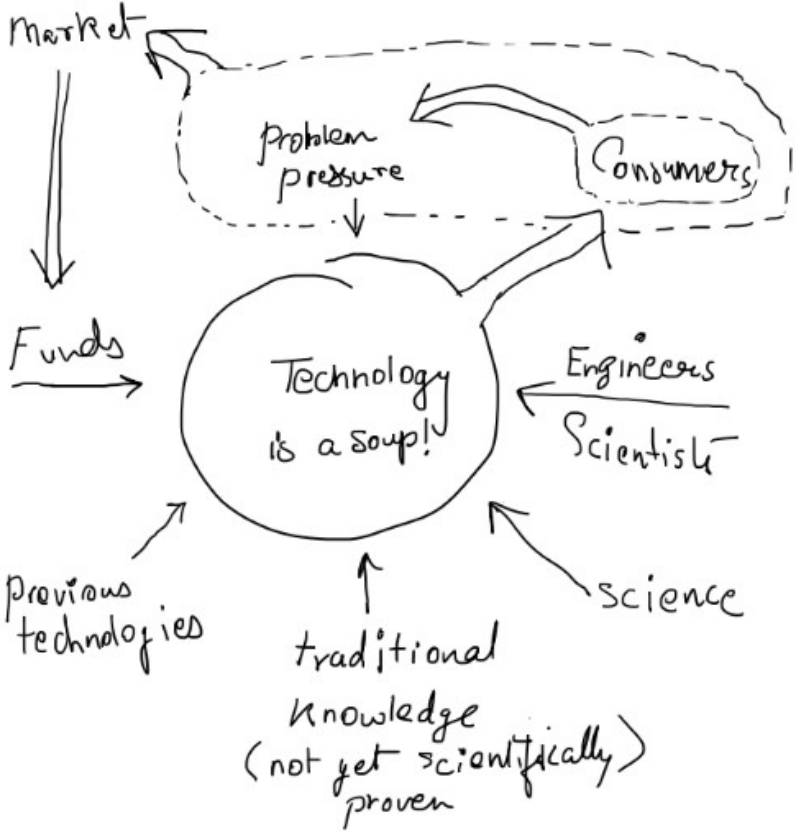
Social context of scientific research

Science Vs. Technology



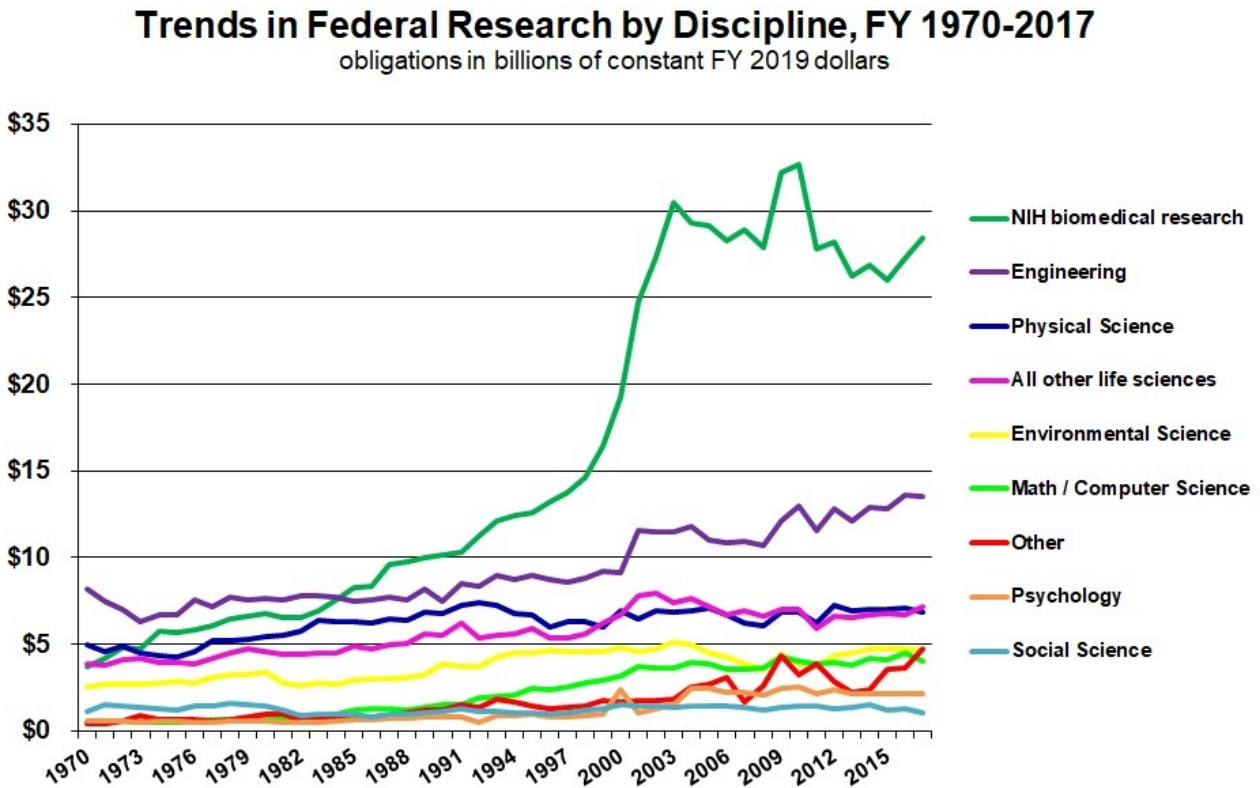
Why science today? & Who funds?

Development of better technology	Private companies,universities, government, NGOs, individuals
Understanding of the world	Government and universities
Enhancement of human knowledge	Government and universities
Spiritual needs	?

Why patronage for science?

- Need of good training
- Building up/maintenance of scholarly community
- Money for long term experiments
- Freedom from market and social pressures

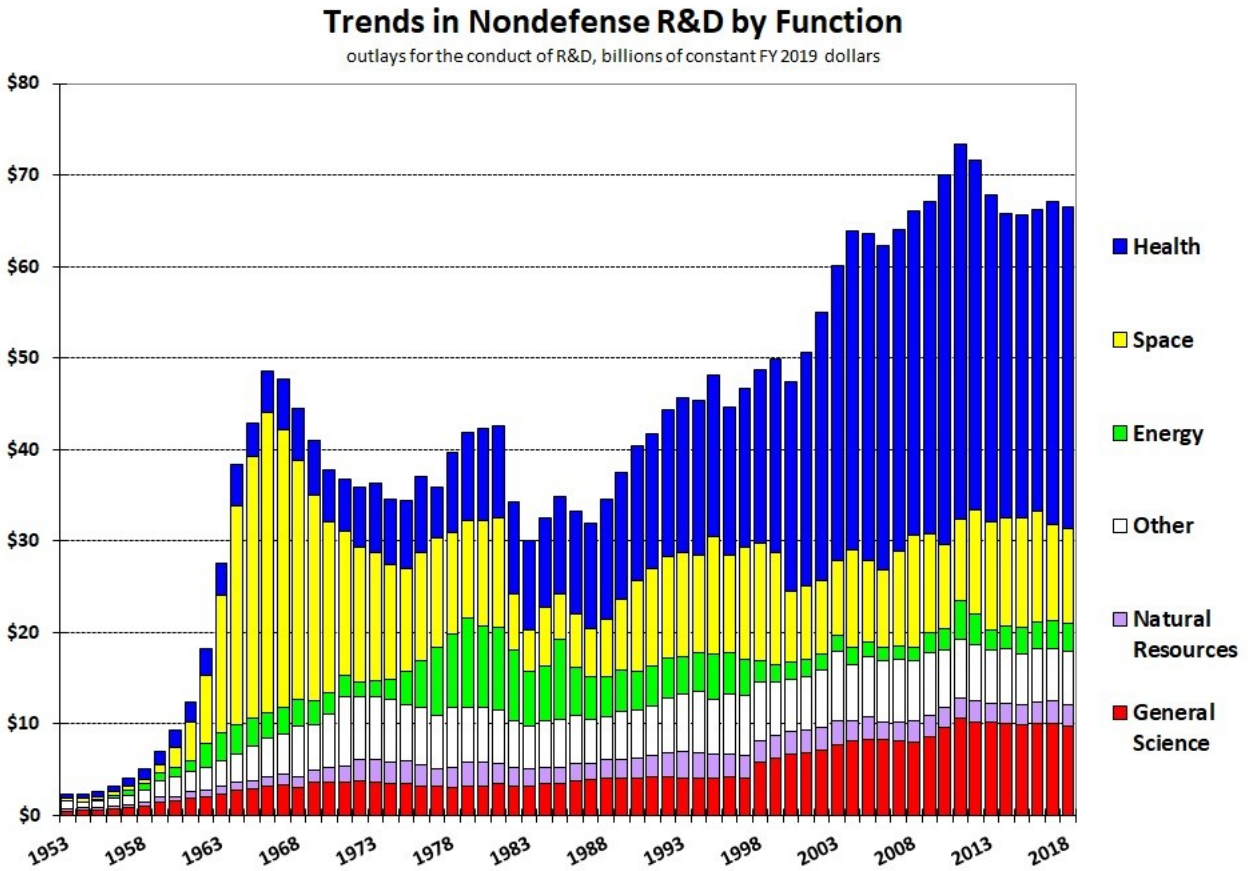
Funding pattern - USA



"Other" includes research not classified (includes basic research and applied research; excludes development and R&D facilities). Life sciences are split into NIH support for biomedical research and all other agencies' support for life sciences.

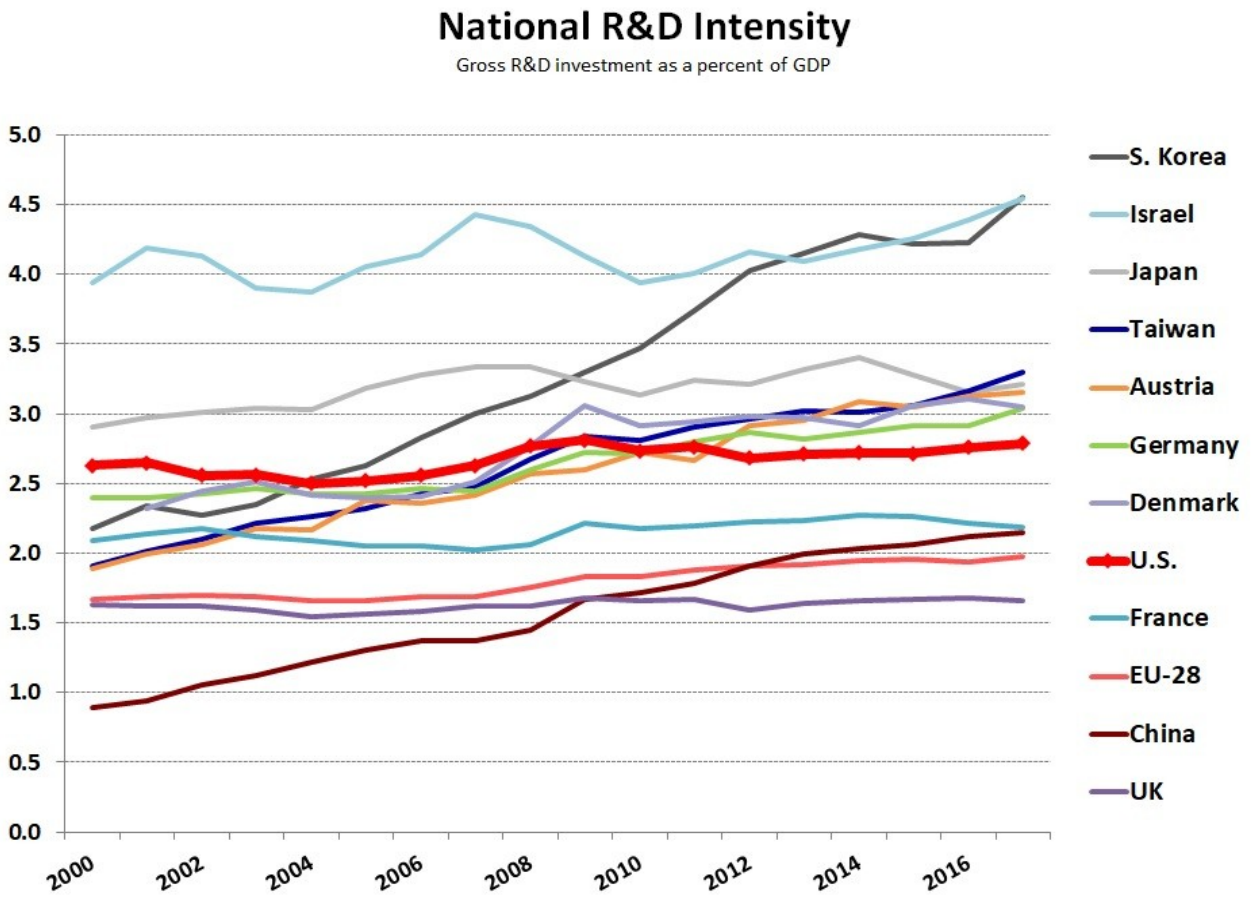
Source: NSF, *Federal Funds for Research and Development* series. Constant-dollar conversions based on OMB's GDP deflators. © 2019 AAAS

Funding pattern - USA

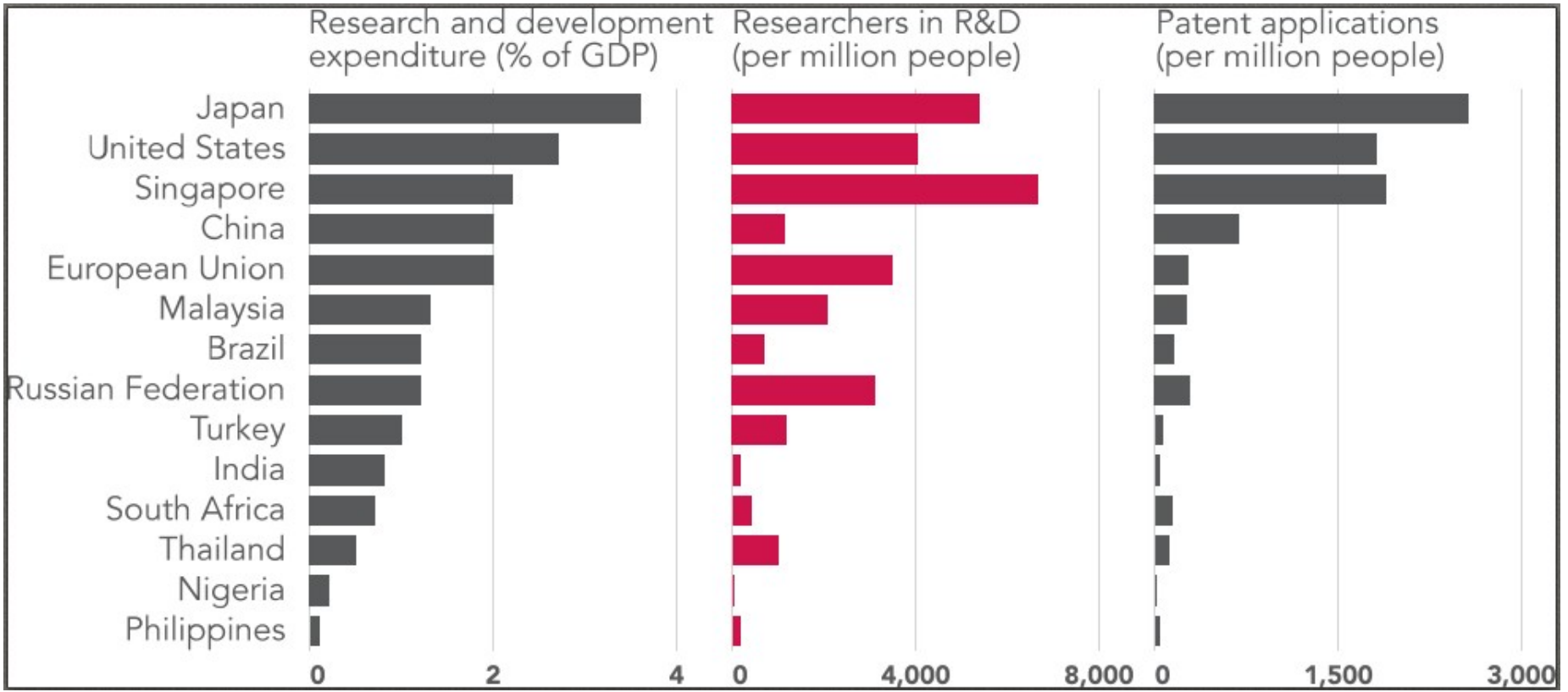


Source: OMB Historical Tables in *Budget of the United States Government FY 2020*. Some Energy programs shifted to General Science beginning in FY 1998.

Funding pattern - International

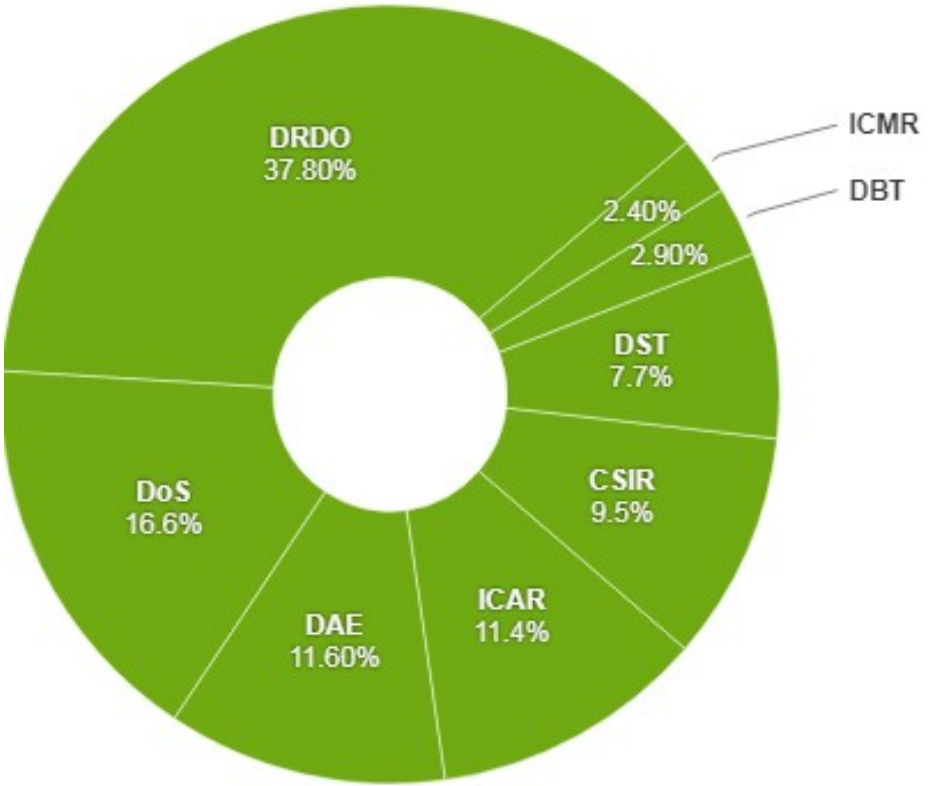


Funding pattern - India



Source: UNESCO

Funding pattern - India



https://thewire.in/science/indias-rd-spending-not-matters

Funding pattern - reasons

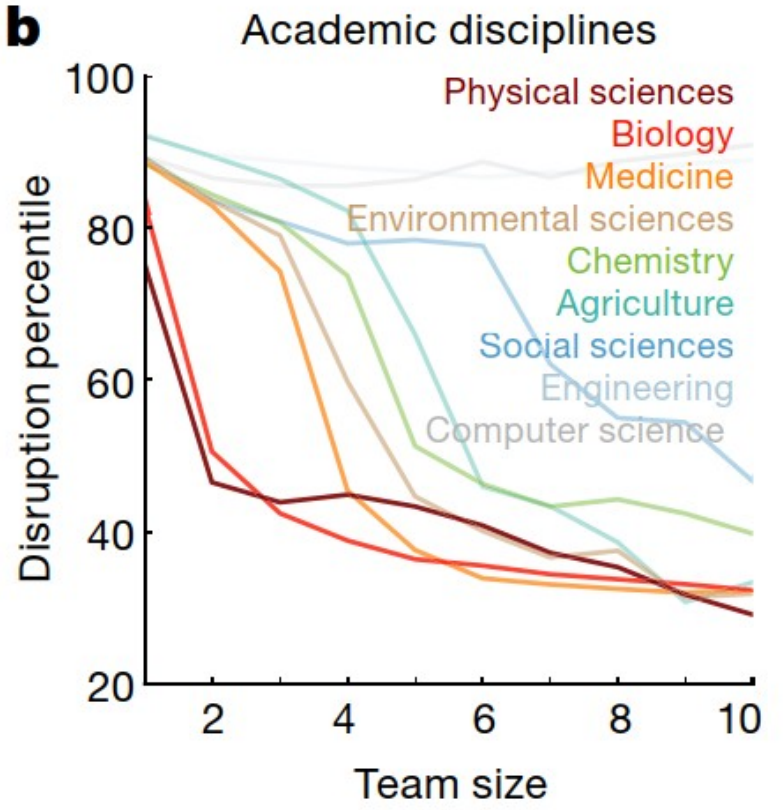
- Funding where promise of tangible results
- Government: Defense / International standing / National development / Investment in future = Sciences
- Industry : Development of technology / Marketable products / Attracting government funding for R&D
- Public: Life beyond survival / Life beyond government and national politics / Understanding of where we came from, where we go, what are we? / ...

Adverse effects of funding crunch

- Job insecurity
- Stress and distraction from quality attention
- Large time spent in proposal writing
- Hesitation to do long-term work
- Breaking of community
- Publish or Perish = mediocrity
- Mobility to industry and technology jobs

What plagues science today?
a brief look

Big science



Large teams develop and small teams disrupt science and technology - Wu et al., Nature (2019)

Scientific output in recent times

- Vastly increased budget but low outcomes
- Previously, average age of scientist doing Noble winning work was 37 years. Now its 47.
- Big teams - Ruthurford’s paper on nucleus (1911) Vs. Higgs particle papers (2012)
- Probably fields are old!

Bad science

- 90% researchers claim ‘reproducibility’ crisis
- Publishing with ‘low statistical power’
- 50% selective reporting of data
- Bacon - “Man prefers to believe what he prefers to be true.”
- Publish or perish pressure - rewarding quantity Vs quality - mediocrity
- Eg. CSIR-IITR - 73 papers (2004-2017) fradualant!

We need to talk about the bad science being funded - Simon Gandevia - The Conversation (2019)

End