

# CURRENT NATIONAL INNOVATION METHODS: APPROPRIATE FOR AI?

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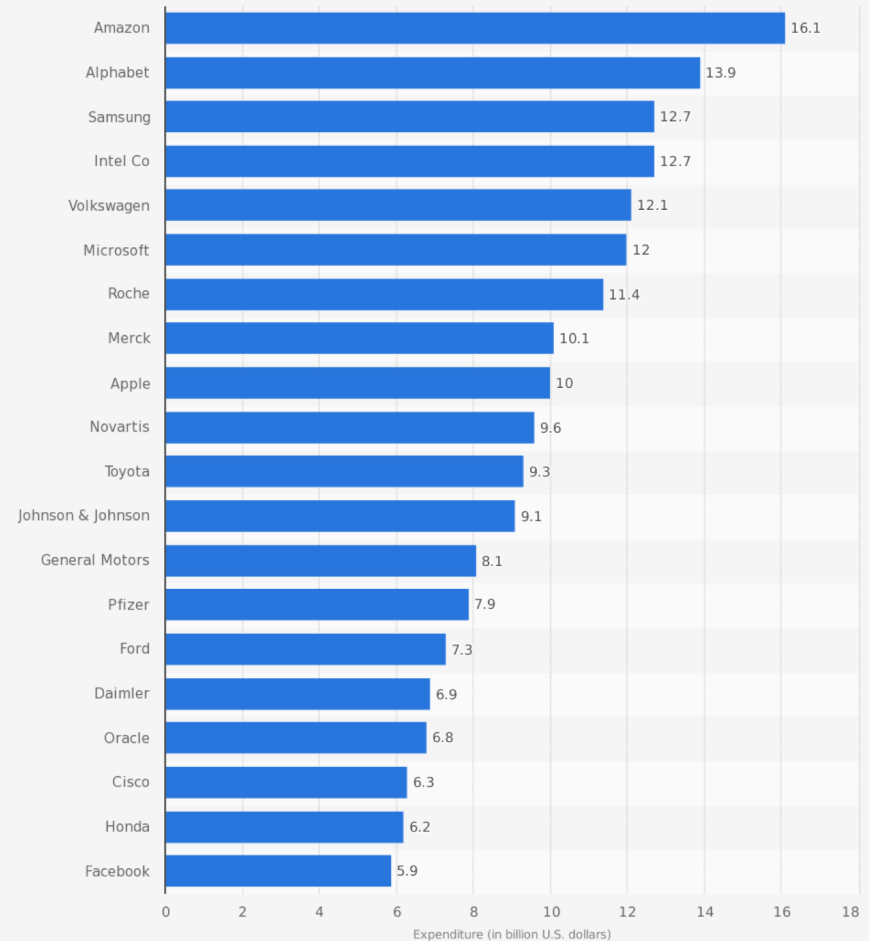
## AGREED (IMPORTANT) CONSEQUENCES OF AI

- Reduced demand for existing skills/ jobs
- Development bottlenecks: Shortage of people who can do AI development. (This won't be permanent)
- Result: increasing wage inequality
- The most important application of AI to work is Intelligent Assistance (IA)  
Helping skilled people work better. 737 Next Generation;  
robot surgery
- AI systems = probable effects on income and political power distributions:
  - Between technology owners and different kinds of workers.
  - Between consumers and Facebook

# NATIONAL RESEARCH & INNOVATION SYSTEM: WHAT IS THE SYSTEM?

- I. Startups for new ideas.VC model = lots of trials
- II. US Government R&D
- III. Big companies' R&D
  1. Amazon
  2. Alphabet
  3. Samsung
  4. Intel
  5. VW
  6. Microsoft
  7. Roche

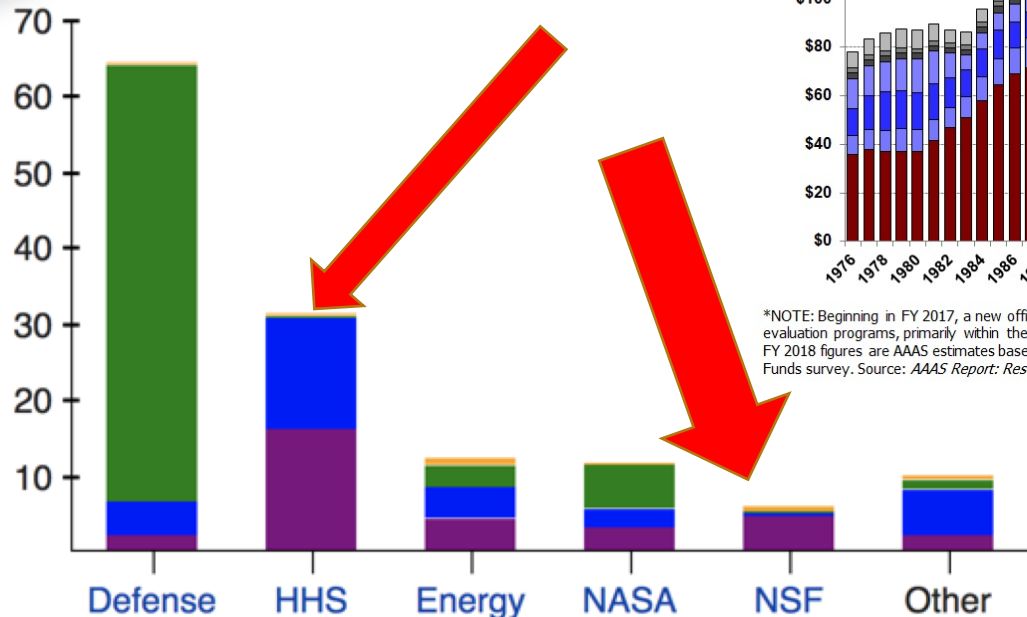
Ranking of the 20 companies with the highest spending on research and development in 2017 (in billion U.S. dollars)



# GOVERNMENT BASIC RESEARCH?

USG research= mostly medicine  
 Basic research = tiny

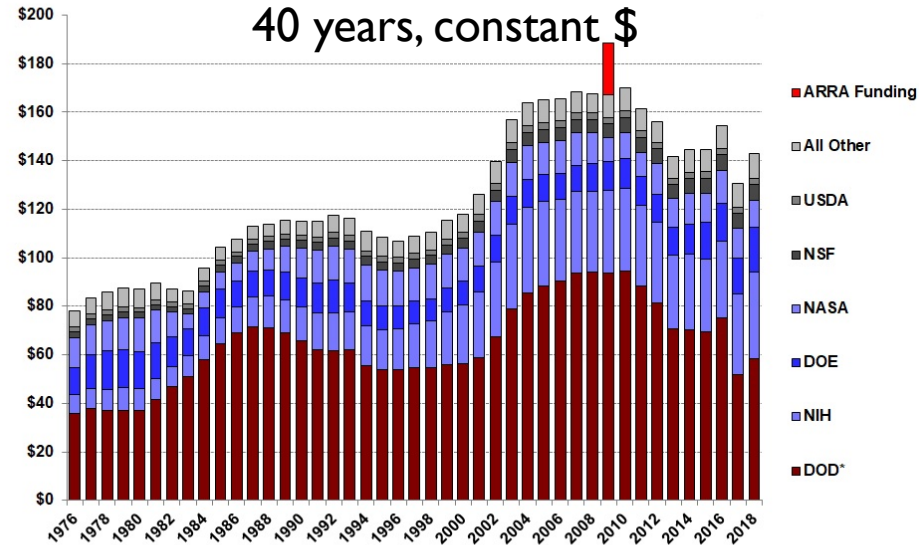
in the Obama administration's FY2015 proposal:<sup>[8]</sup>



## Trends in R&D by Agency

in billions of constant FY 2018 dollars

40 years, constant \$



\*NOTE: Beginning in FY 2017, a new official definition of R&D has been adopted by federal agencies. Late-stage development, testing, and evaluation programs, primarily within the Defense Department, are no longer counted as R&D. FY 2018 figures are AAAS estimates based on omnibus-enacted appropriations. 1976-1994 figures are NSF data on obligations in the Federal Funds survey. Source: AAAS Report: Research & Development series and analyses of FY 2018 omnibus legislation. © 2018 AAAS

# AI => MAJOR CHANGES OF 3 TYPES

- **I. Free-standing AI applications:**
  - Autonomous vehicles, Smart aircraft
  - Engineering & business tools e.g. design
  - Smart appliances?? Tend to evolve to group II.
- **II. Networked applications of AI**
  - Running physical world: Internet of Things, smart home
  - Personal assistants (Alexa)
  - Business decisions - eg supply chains
  - These have Externalities everywhere: cyber crime, privacy, personal control, consumer manipulation.
  - *Cars which shut off if late on your car loan, or get an arrest warrant, or miss alimony payment or...*
- **III. Side effects = Employment, economic & political power,**  
Direct effects: ads, political campaigns, social network manipulation
- We have few successful R&D models for Group II + III

# EXISTING R&D SYSTEM

- **Independent products:** e.g. Autos, Consumer electronics, New materials
  - *Free-standing AI applications will fit here. Autonomous cars.*
- **Standards-based networked products:**  
Cellular networks, Computers, Cloud
- **Social networks** = oligopolies  
FAGA (Facebook, Amazon, Google, Apple)  
(no longer?) Cable networks
  - Work well for a few winning companies.
  - Why: Network externalities
  - Very bad with social and personal externalities.
  - *Network AI systems here: Personal assistance, social interaction, collaborative systems (decentralized work)*
- **Govt. subsidized research priorities:** Pharma (but not health care)
  - *Might AI problems get government research subsidies? Not successfully*

## WHERE NATIONAL INNOVATION SYSTEM HAS DONE BADLY

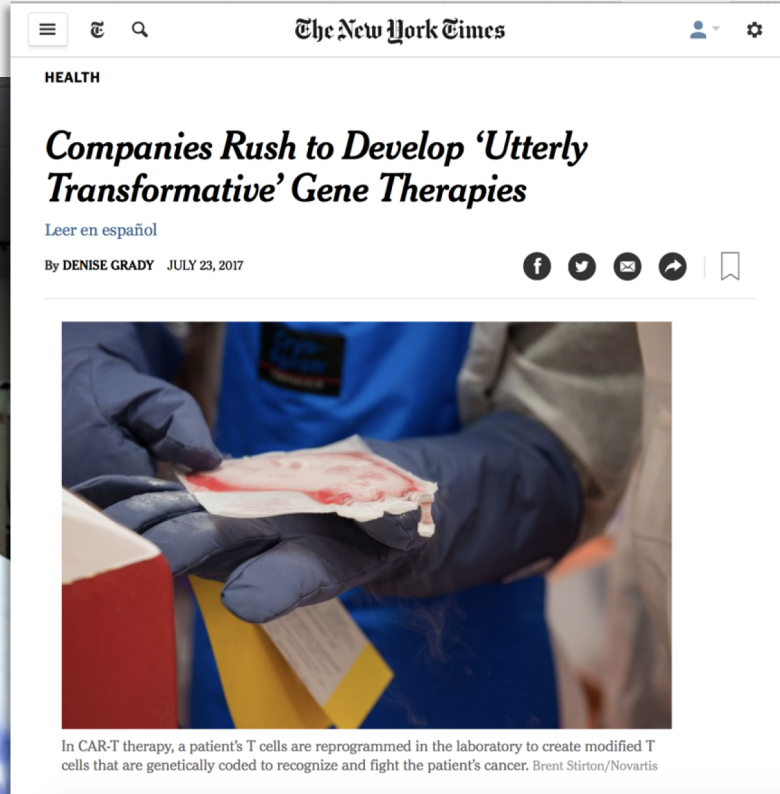
- Cyber-security.
  - No financial incentives
  - No regulatory pressure (unlike aviation)
  - Decentralized products
  - The 1970s IBM, 1990 Microsoft might have done better
- Health care:
  - Life expectancies stagnant
  - Birth weight, maternal mortality,
  - Threat of drug resistance
- Carbon emissions



The New York Times  
**HEALTH**

# Setting the Body's 'Serial Killers' Loose on Cancer

After a long, intense pursuit, researchers are close to bringing to market a daring new treatment: cell therapy that turbocharges the immune system to fight cancer.  
By **ANDREW POLLACK** AUG. 1, 2016



## Companies Rush to Develop 'Utterly Transformative' Gene Therapies

Leer en español

By DENISE GRADY JULY 23, 2017



In CAR-T therapy, a patient's T cells are reprogrammed in the laboratory to create modified T cells that are genetically coded to recognize and fight the patient's cancer. Brent Stirton/Novartis

Odds of survival can greatly improve for people with the most common type of lung cancer if they are given a new drug that activates the immune system along with chemotherapy, a major new study has shown.

The findings, medical experts say, should change the way doctors treat lung cancer: Patients with this form of the disease should receive immunotherapy as early as possible.



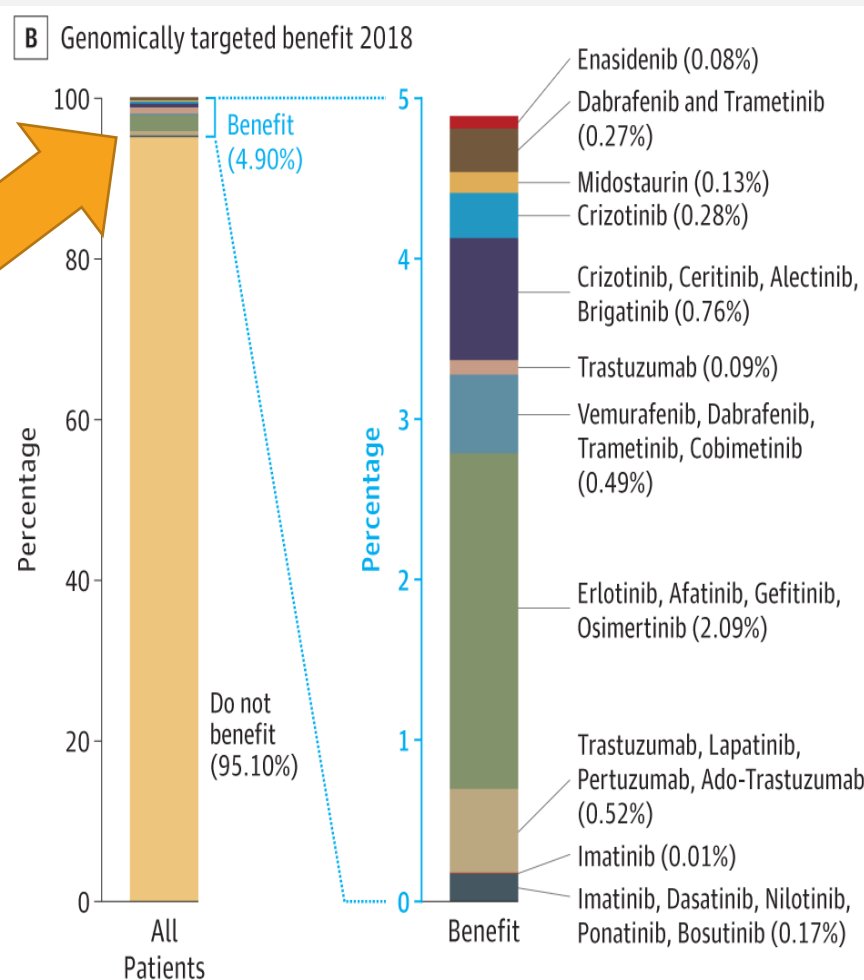
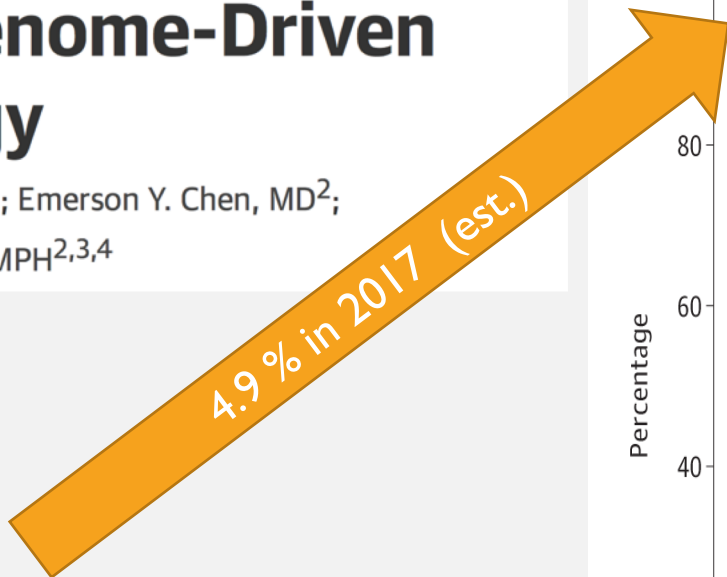
# Original Investigation

April 17, 2018

## Estimation of The Percentage of US Patients With Cancer Who Benefit From Genome-Driven Oncology

John Marquart, BA<sup>1</sup>; Emerson Y. Chen, MD<sup>2</sup>;

Vinay Prasad, MD, MPH<sup>2,3,4</sup>



## CAN SOCIAL SCIENCE DEVISE A SOLUTION?

1. In principle
2. Biggest problems require major shifts  
Who controls research, new standards from FAGA companies
3. AI likely to reinforce rather than weaken wealth and power distribution
4. Externalities will continue to worsen: privacy, security, income distribution, happiness