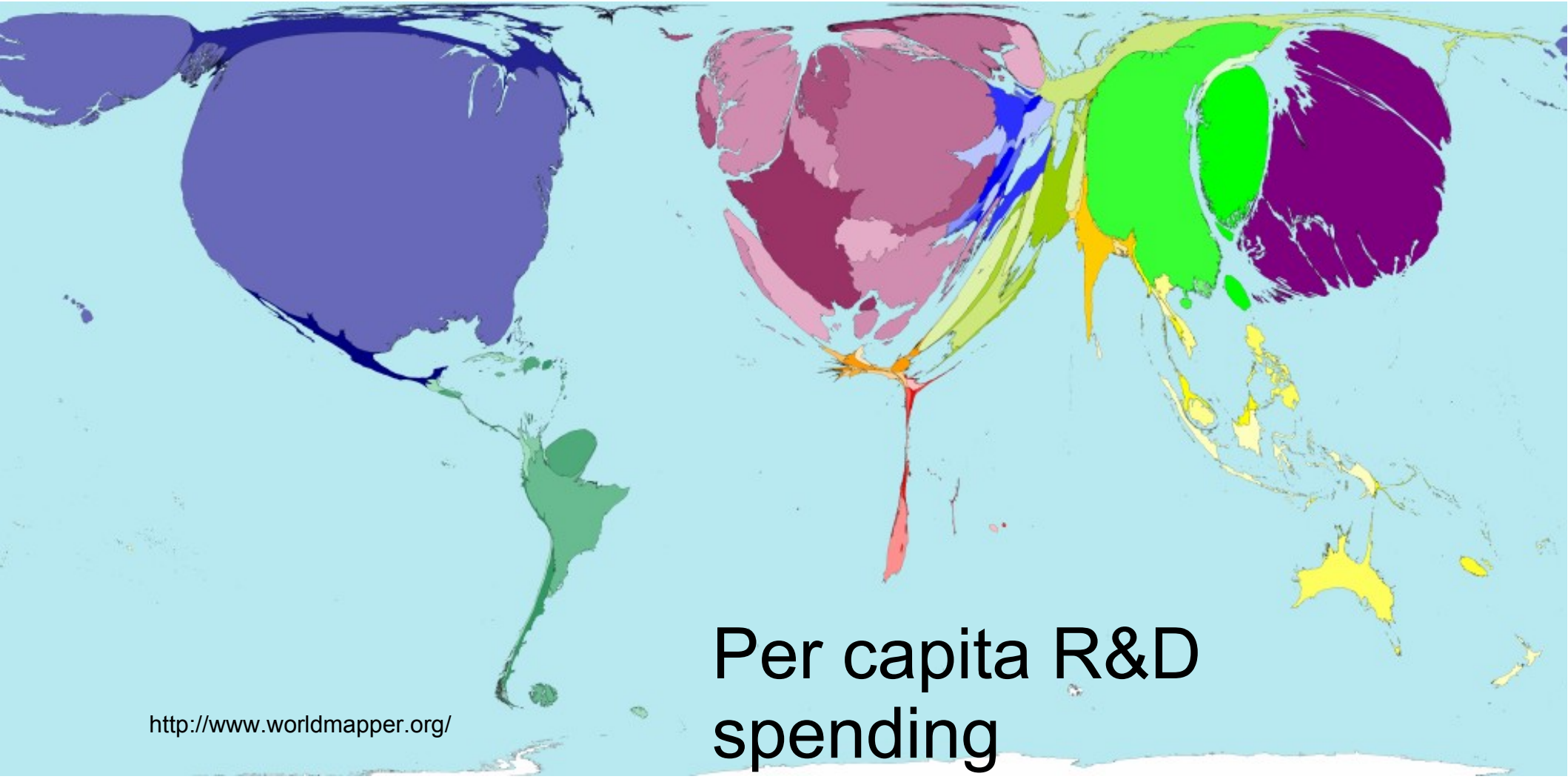
Pre-class Information for week 8, 10/3-7:

Funding Research and Patents

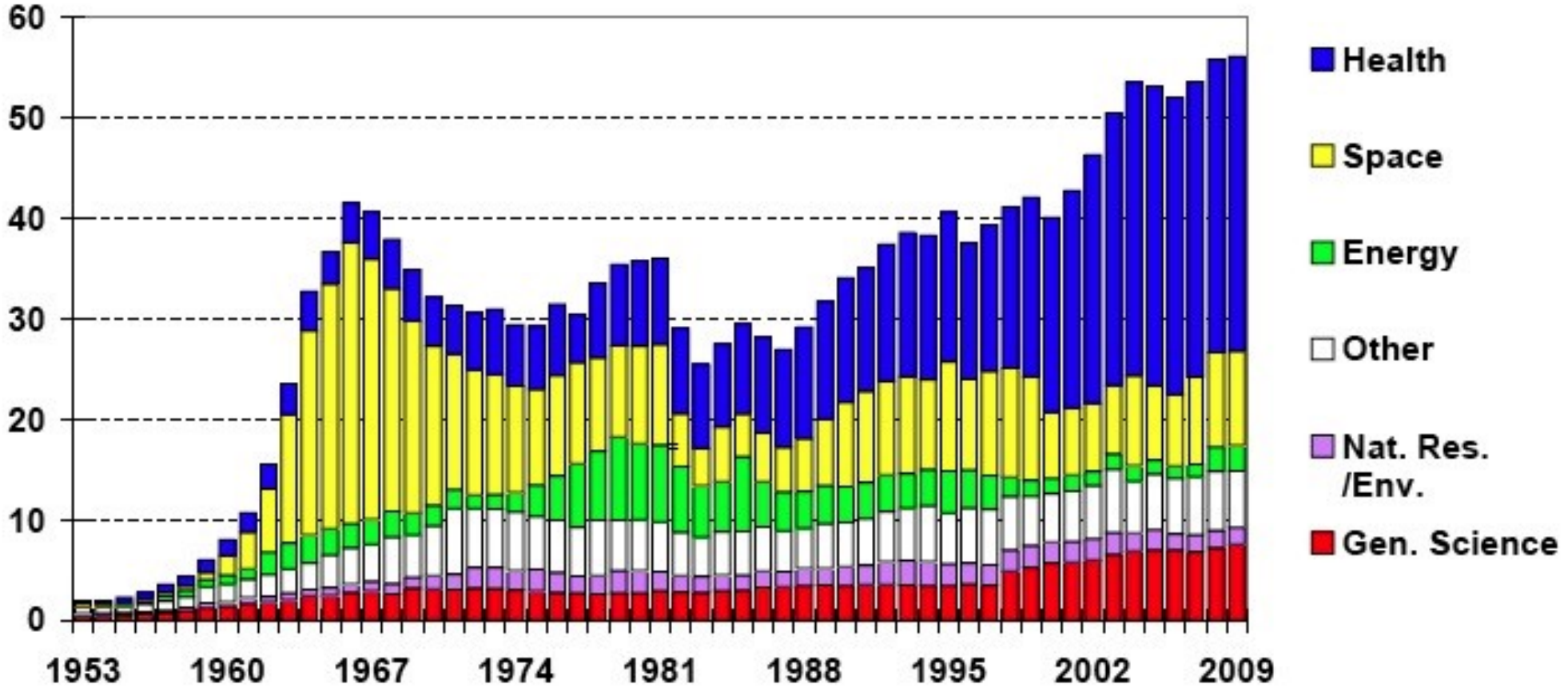


There are many factors that determine what gets researched and how the research gets done, but funding is a major consideration. Money to fund research can come from many different sources. Where the money comes from influences who does the research and what gets investigated. Fundings sources include, the federal government, state and local governments, private organizations, and corporations. The federal government is the largest funding source for research at public institutions.

In class we discussed prioritizing how you would spend money on research. The following figure shows how the U.S. federal government distributes non-defense research money.

Trends in Nondefense R&D by Function, FY 1953-2009

outlays for the conduct of R&D, billions of constant FY 2008 dollars



Source: AAAS, based on OMB Historical Tables in *Budget of the United States Government FY 2009*. Constant dollar conversions based on GDP deflators.
FY 2009 is the President's request.
Note: Some Energy programs shifted to General Science beginning in FY 1998.

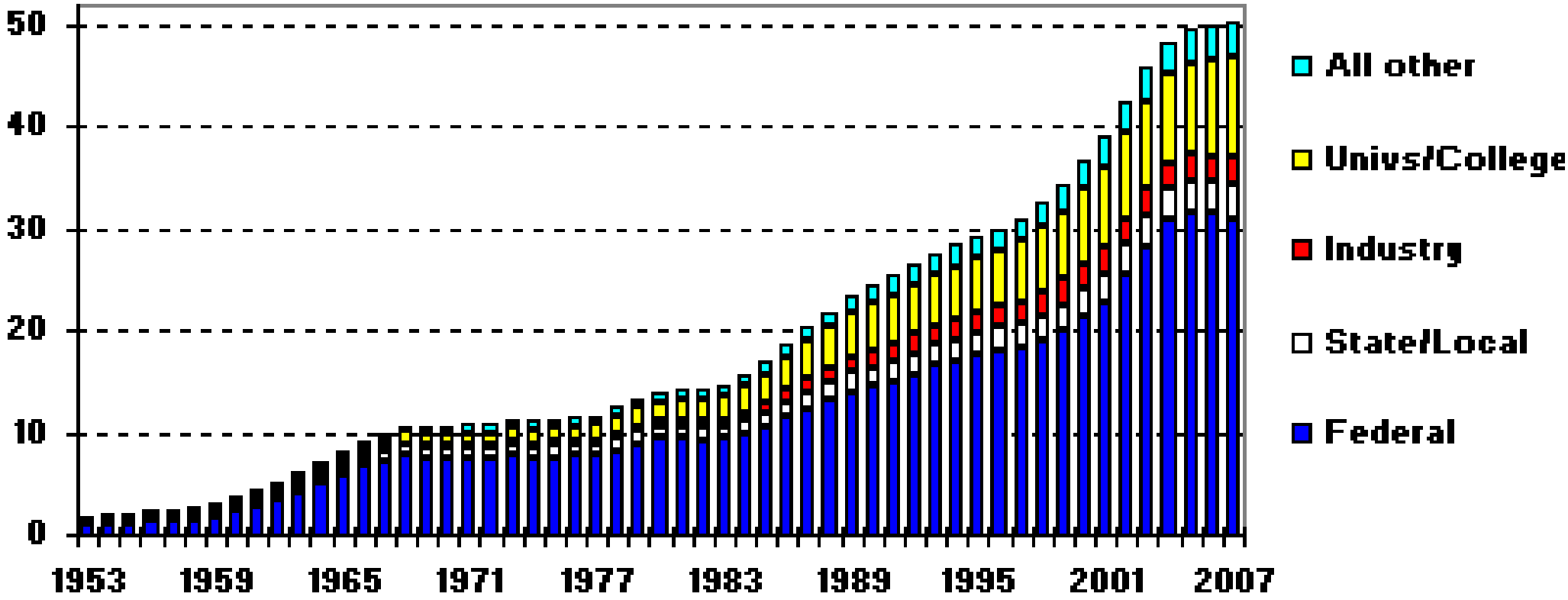
AAAS

This video discusses how economists would prioritize spending research money:
http://www.ted.com/talks/lang/eng/bjorn_lomborg_sets_global_priorities.html

Where does the money come from?

R&D at Colleges and Universities by Source of Funds

in billions of constant FY 2008 dollars, FY 1953-2007



Source: National Science Foundation, Survey of Research and Development Expenditures at Universities and Colleges, Fiscal Year 2007, 2008. Constant-dollar conversions based on OMB's GDP deflators.

While for 2006 and 2007 overall funding has increased, when adjusted for inflation there has been a 1.6% decrease.

In 2007 federal grants supported 62% of University research.

http://www.insidehighered.com/news/2008/08/25/r_d

U.S. government research funding sources:

National Science Foundation- NSF

National Institutes of Health- NIH

U.S. Dept. Agriculture- USDA

NASA

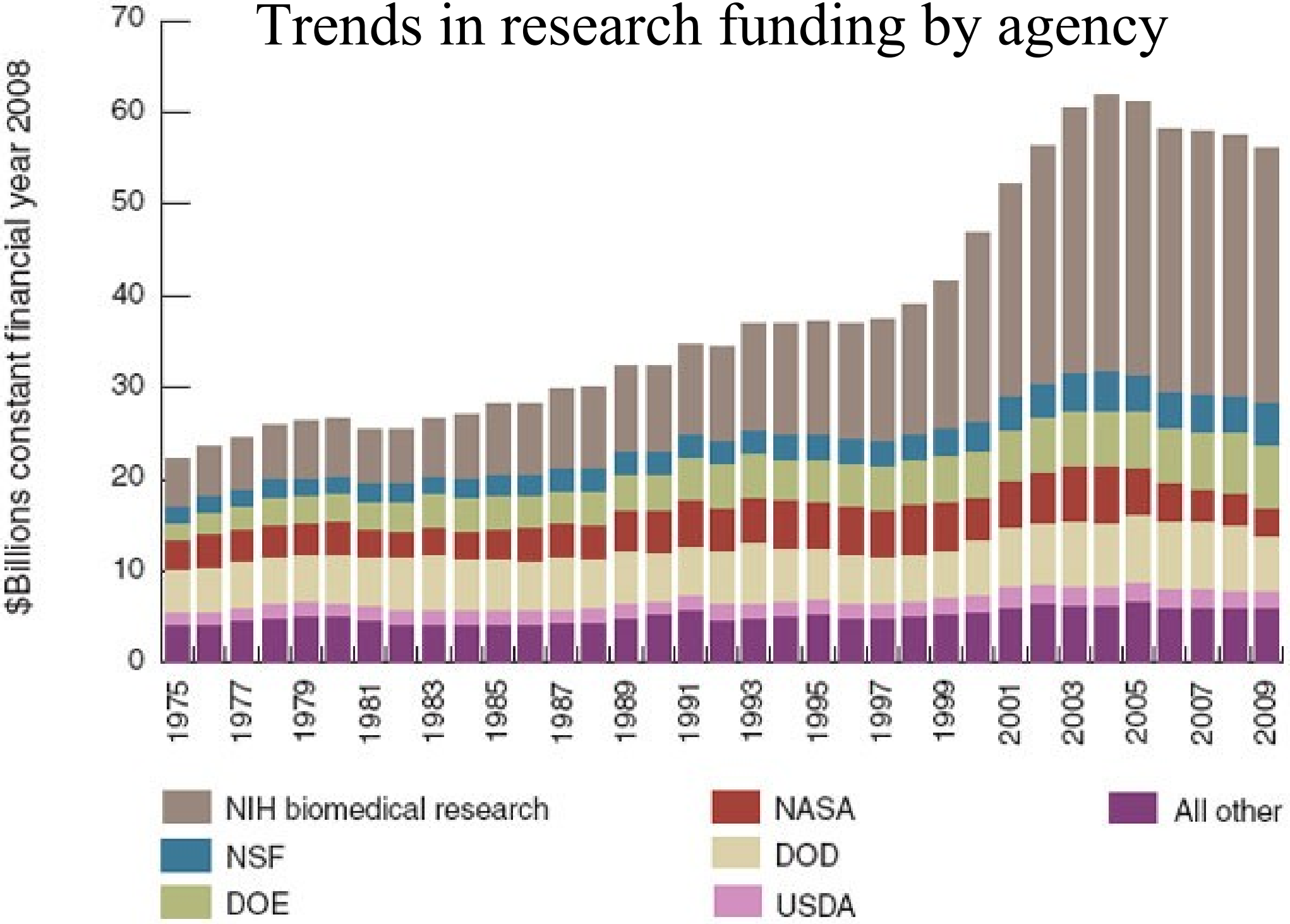
Centers for Disease Control- CDC

Environmental Protection Agency- EPA

Dept. of Defense- DoD

Food and Drug Administraton- FDA

Trends in research funding by agency



Victoria McGovern. Foundation funding and chemical biology. Nature Chemical Biology 4, 519 - 522 (2008)

UT-Austin spent $640 million in academic research (Fiscal year 2010)

Funding Problems

Economic woes = reduced public and private research funds

Where does the money go?

Each researcher pays ~50% of money spent on salaries, equipment, supplies, etc to their institution...

UT receives $0.50 for every $1.00 of research money spent on campus.

Who decides funding?

Similarly to peer review, public granting agencies use panels to rate grant applications.

What does a grant look like?

- Introduction
- Previous results
- Proposed experiments and significance

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- **Decreased federal money means:**

More R&D by private industry

More funding of research at public institutions by corporations

Funding Problems

Conflicts of Interest

A world-renowned Harvard child psychiatrist, Dr. Biederman, whose work has helped fuel an explosion in the use of powerful antipsychotic medicines in children earned at least $1.6 million in consulting fees from drug makers from 2000 to 2007 but for years did not report much of this income to university officials, according to information given Congressional investigators.

http://www.nytimes.com/2008/06/08/us/08conflict.html

Many of his studies are small and often financed by drug makers, his work helped to fuel a controversial 40-fold increase from 1994 to 2003 in the diagnosis of pediatric bipolar disorder, which is characterized by severe mood swings, and a rapid rise in the use of antipsychotic medicines in children.

http://www.nytimes.com/2008/06/08/us/08conflict.html

In 2000, for instance, Dr. Biederman received a grant from the NIH to study in children Strattera, an Eli Lilly drug for attention deficit disorder. Dr. Biederman reported to Harvard that he received less than $10,000 from Lilly that year, but the company told Mr. Grassley that it paid Dr. Biederman more than $14,000 in 2000.

At the time, Harvard forbade professors from conducting clinical trials if they received payments over $10,000 from the company whose product was being studied, and federal rules required such conflicts to be managed.

National Institutes of Health require researchers to report to universities earnings of $10,000 or more per year.

Auditing the potential conflicts of each grantee would be impossible, health institutes officials have long insisted. So the government relies on universities.

http://www.nytimes.com/2008/06/08/us/08conflict.html

Universities ask professors to report their conflicts but do almost nothing to verify the accuracy of these voluntary disclosures.

“It’s really been an honor system thing,” said Dr. Robert Alpern, dean of Yale School of Medicine. “If somebody tells us that a pharmaceutical company pays them $80,000 a year, I don’t even know how to check on that.”

http://www.nytimes.com/2008/06/08/us/08conflict.html

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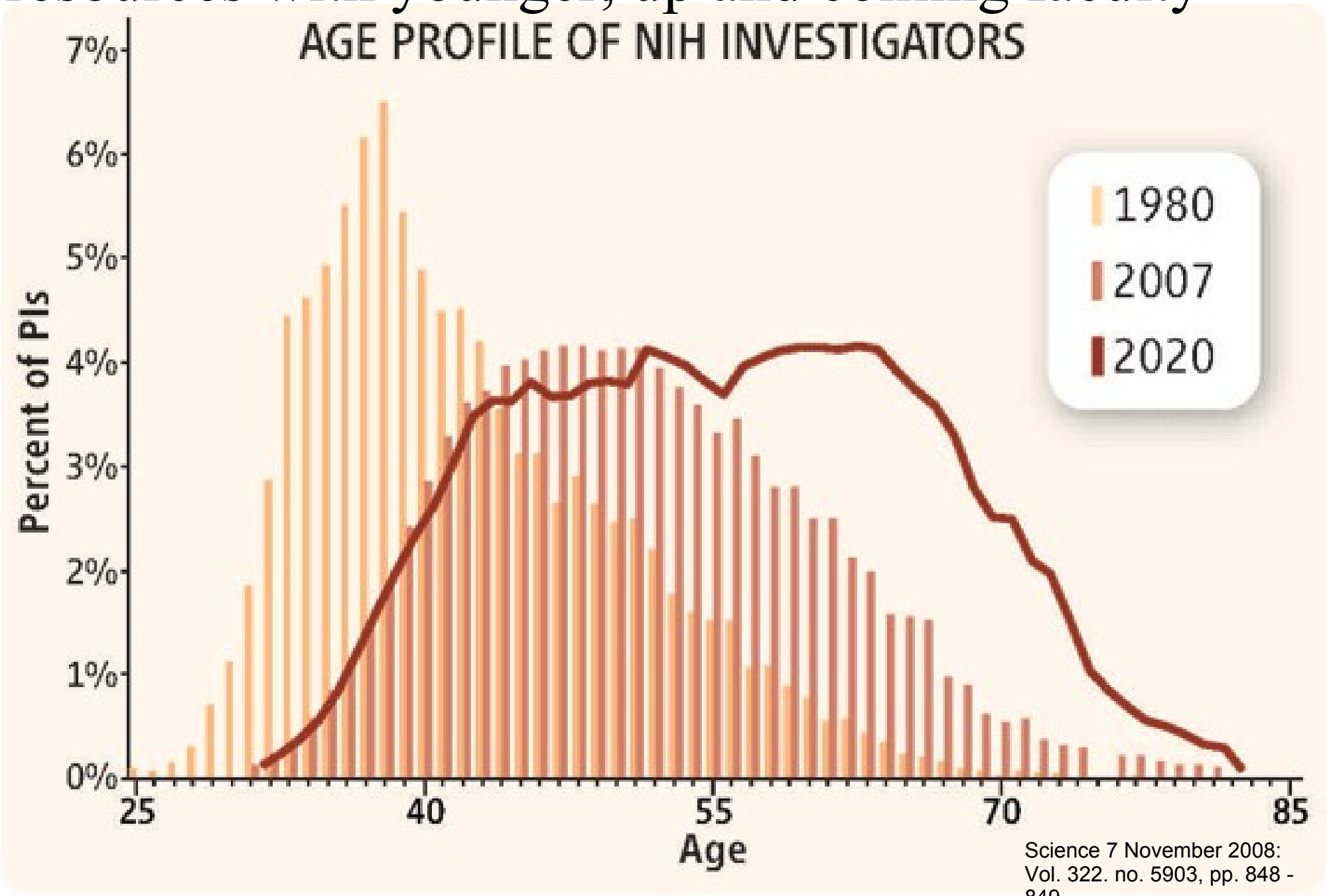
Competition has increased, especially for new researchers.

older, established researchers compete for resources with younger, up and coming faculty



Science 7 November 2008:
Vol. 322. no. 5903, pp. 848 -
849

NIH research funding is more difficult to get now than it was before the NIH budget doubled, especially for early-career researchers.
In 1998, about 32% of NIH applications were funded. by 2007 only 21% were funded.

The percentage of NIH awardees aged 40 or under, were less than 23% in 1998, and declined to just over 15% by 2005.

Science 1 August 2008:
Vol. 321. no. 5889, pp. 644 - 645

Please read:

Funding idea could ease 'Valley of Death'

The Daily Texan Sept 15, 2010

(http://issuu.com/thedailytexan/docs/9-15-10)

Note: This a pdf of the issue, I cannot find a link directly to the article.

Why do funding sources influence results? It can be intentional or unintentional. We do not always make rational decisions, nor are we always conscious of how we made a decision.

See Dan Ariely:

http://www.ted.com/talks/lang/eng/dan_ariely_asks_are_we_in_control_of_our_own_decisions.html

You can watch the whole video or just the part about organ donation that starts at 5:00 minutes.

So... Most funding for research at public institutions comes from the federal government, but that funding has been decreasing (when adjusted for inflation). Which means that research at public institutions is being increasingly funded by private organizations and corporations. This can lead to conflicts of interest and conscious or unconscious changes in what research gets done. So this leads to some basic questions about the purpose of research at public institutions...

What is the purpose of public research?

versus

Technology Factory

We will discuss this question in more depth next week...

Can you own an idea?

- Can you own an idea?

- Would you share your idea if others will profit from it?

- Can you own an idea?

- Would you share your idea if others will profit from it?

- Would you accept someone else taking credit for your idea(s)?

Patents give 20 year monopoly for inventor

www.uspto.gov

Protection of intellectual property was guaranteed in the U.S. Constitution (1787).

The 1980 U.S. Supreme Court ruling (*Diamond v. Chakrabarty)* allowed patents for nonhuman life forms if there was human intervention in their creation.

Scientific Integrity: an Introductory Text with Cases, 2nd ed. (2000) Marcina, F. L. ASM Press, Washington, D.C.

Patentable inventions must be:

- Useful
- New or Novel
  - Non-obvious

Scientific Integrity: an Introductory Text with Cases, 2nd ed. (2000) Marcina, F. L. ASM Press, Washington, D.C.

The patent application must include sufficient information for someone “practiced in the art” to apply the patent.

United States Patent number 7,445,235 by Makabe et al. issued on November 4, 2008

http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=7,445,235.PN.&OS=PN/7,445,235&RS=PN/7,445,235

Patents give right to exclude others from making, selling, and/or using the invention.

Patents are considered personal property and may be sold, licensed, etc.

Scientific Integrity: an Introductory Text with Cases, 2nd ed. (2000) Marcina, F. L. ASM Press, Washington, D.C.

Patents must be filed within 1 year of initial disclosure.

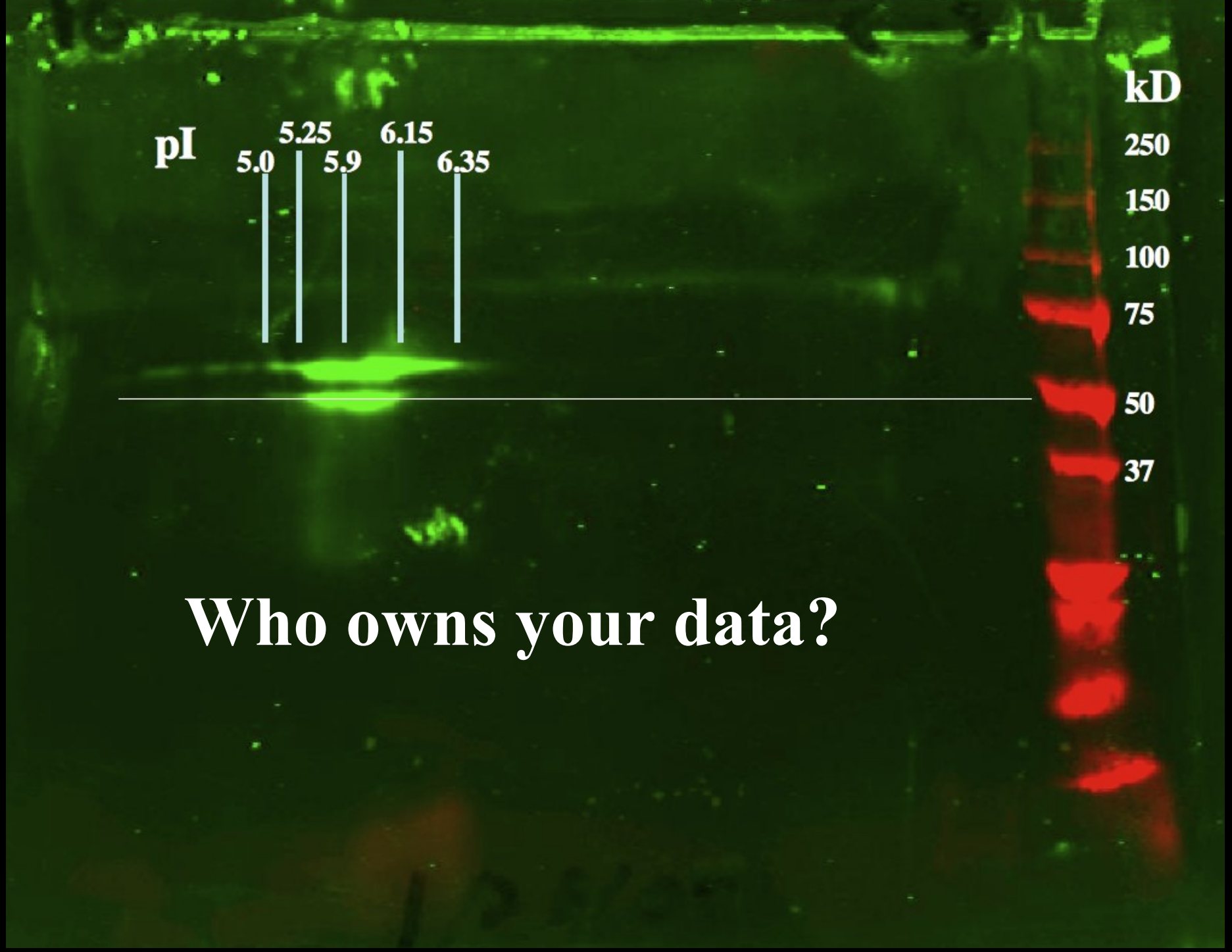
In the U.S. a patent can be nullified if another can prove prior invention.

Scientific Integrity: an Introductory Text with Cases, 2nd ed. (2000) Marcina, F. L. ASM Press, Washington, D.C.

Patent application may take from 1-5+ years

Only registered patent attorneys or agents may represent a patent holder to the patent office.

Scientific Integrity: an Introductory Text with Cases, 2nd ed. (2000) Marcina, F. L. ASM Press, Washington, D.C.



Who owns your data?

Who owns your data?

UT

Employers generally own their employees data.

Employers often receive a royalty-free license to a patent.

Funding agencies also often have rights to patent licenses.

As public funding levels decrease, there is pressure on public institutions (universities and researchers) to seek alternate sources of funding.

Patenting discoveries provides a possible revenue source.

Scientific Integrity: an Introductory Text with Cases, 2nd ed. (2000) Marcina, F. L. ASM Press, Washington, D.C.

Does patenting of DNA sequencing impede research or increase research by adding a profit motive?

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From “Wired Science” License to Green:
Clean Energy vs. Patents
by Lisa Larrimore Ouellette April 21, 2010
http://www.wired.com/wiredscience/2010/04/climate-desk-patents-ouellette/

Scientific Integrity: an Introductory Text with Cases, 2nd ed. (2000) Marcina, F. L. ASM Press, Washington, D.C.

Examples of current patents:

- Atryn- antithrombin produced in transgenic goats (in milk) has anti-clotting properties

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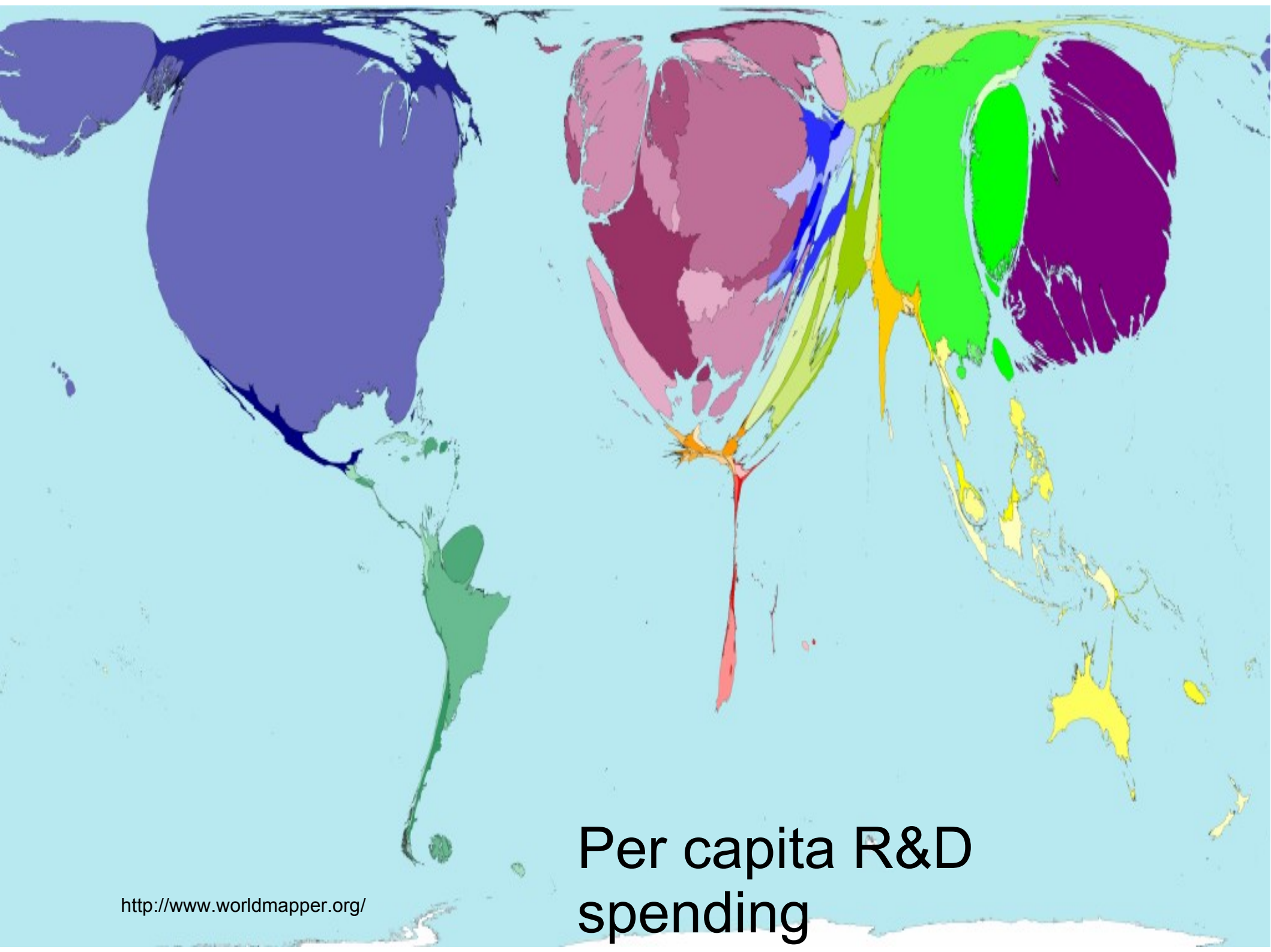
- Evolutec has patents on proteins in tick saliva for use as anti-inflammator
- GTG in Australia has patents on non-coding human DNA for detecting risk of various diseases

U.S. patent issued on cell line developed from indigenous 21 year old from New Guinea.

Possible use in treating leukemia, NIH researchers listed as inventors.

While patents help encourage innovation, there is some concern that they also inhibit innovation, especially in areas with low marketability. Also, the patenting of life has given rise to ethical concerns.


Per capita R&D spending
http://www.worldmapper.org/