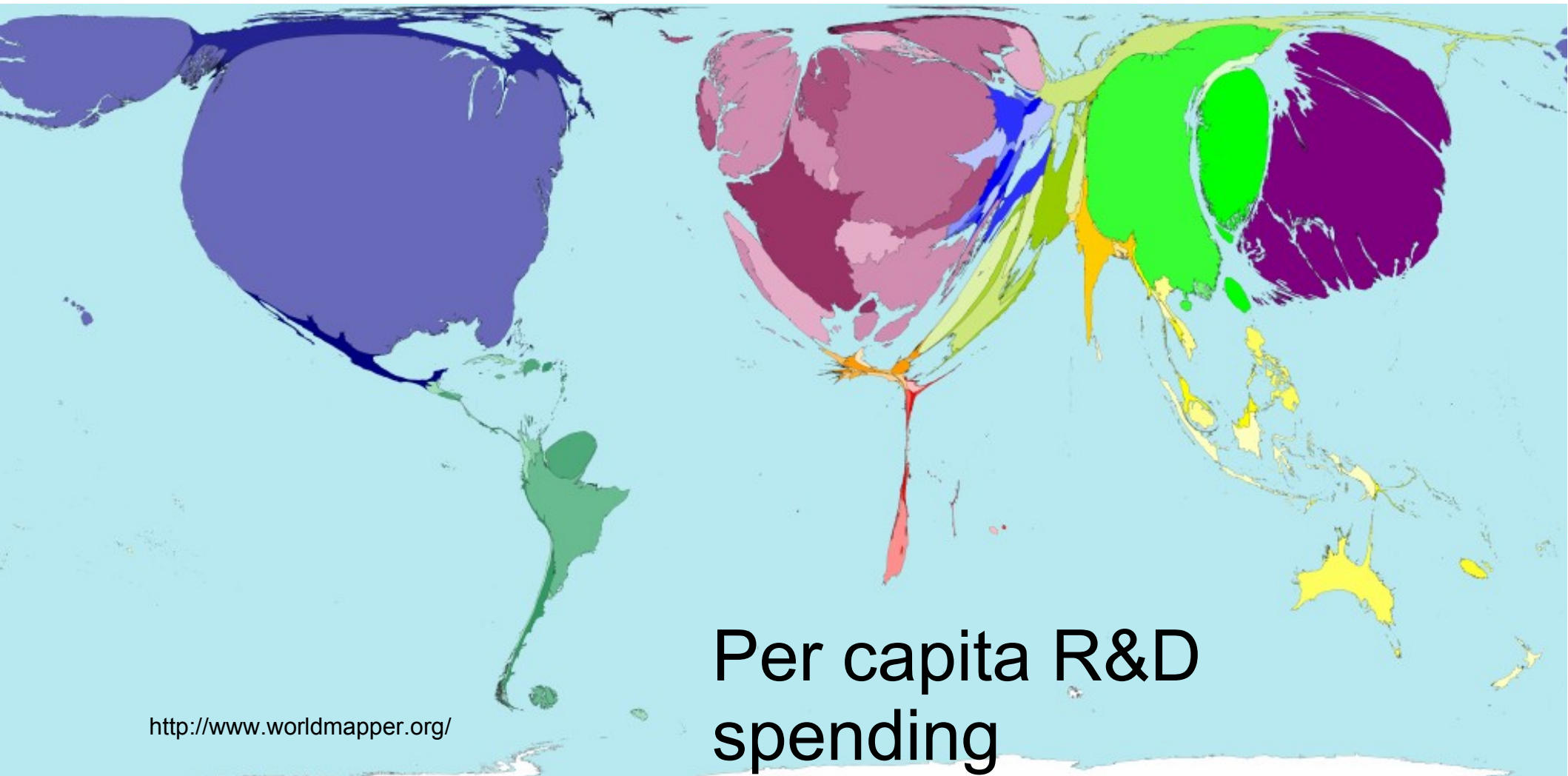
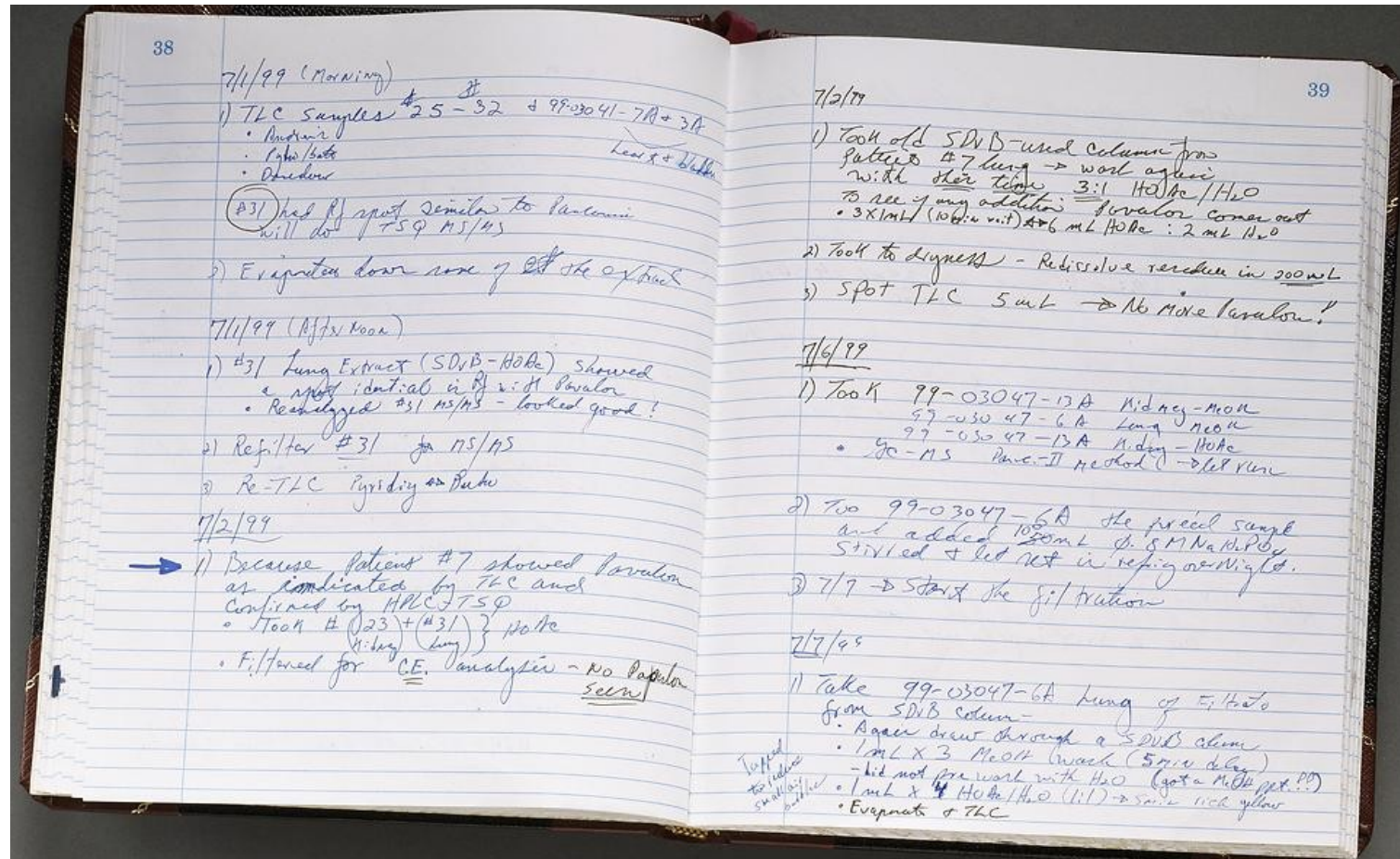


Inquiry 2 reports due Th 8/11

Today: Funding Research



• **In your lab notebook:** Write everything about your experiments. Each entry should have a date. Include notes (intro and conclusions), so when you, or someone else, go back to look at your notebook, the entries make sense.



Notebooks will be turned in as a HW in lab on M 8/8 or T 8/9.

Inquiry 2 oral report:

Should be 15-20 minutes long

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Should be 15-20 minutes long

Each group member will give some part of the oral report.

Inquiry 2 oral report:

Should be 15-20 minutes long

Each group member will give some part of the oral report.

Will be presented via computer using presentation software, etc.

(compatibility?, also bring as a pdf)

Inquiry 2 written report

- **Authors** (Everyone in the group should do enough work to be a co-author.)
- **Title**
- **Abstract** (Do not to exceed 250 words.)
- **Introduction**
- **Results**
- **Discussion**
- **Materials and Methods**
- **References**
- **Responsibilities- Describe who did what part of the work.**

You have \$100 million for research...
How will you spend it?



Human Population Growth

as of 8/4/11 at 11:35am: 6,953,368,991



The Plague

CB
53.22

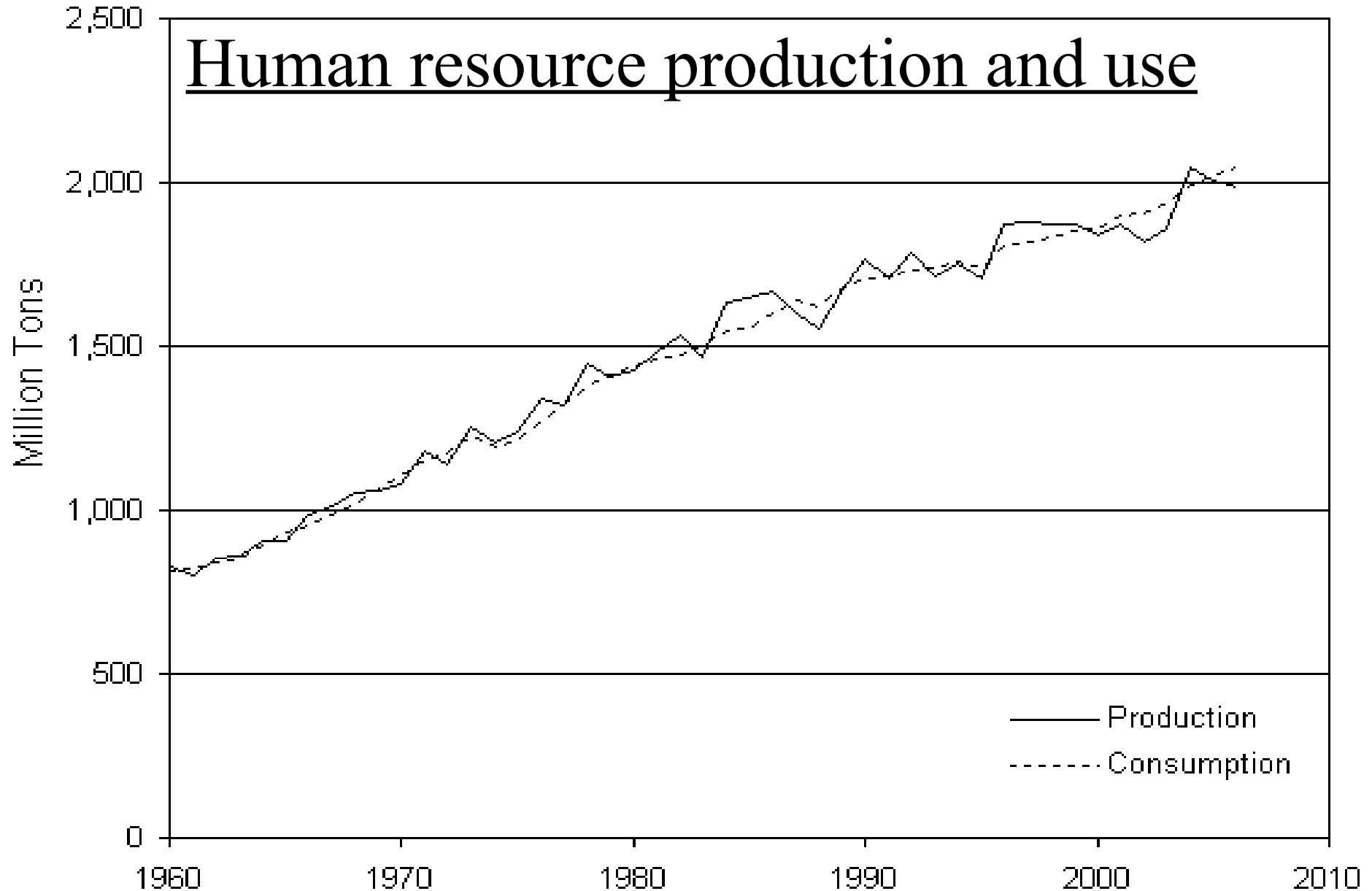
Human population size (billions)

8000 B.C. 4000 B.C. 3000 B.C. 2000 B.C. 1000 B.C. 0 A.D. 1000 A.D. 2000 A.D.

6
5
4
3
2
1
0



Population growth is challenging our ability to produce sufficient food.



Source: USDA

Even though we produce more food than we consume, people are starving.



We consume
an enormous
amount of
energy...

Nobility: ~10:00 min.



Space: the Final Frontier...



about 25,000 species go extinct each year



Communicable Disease Deaths/Year

Influenza ~36,000 (US)
300,000 to 500,000 (world)

HIV ~1.8 million (world)

Malaria ~1 million (world)

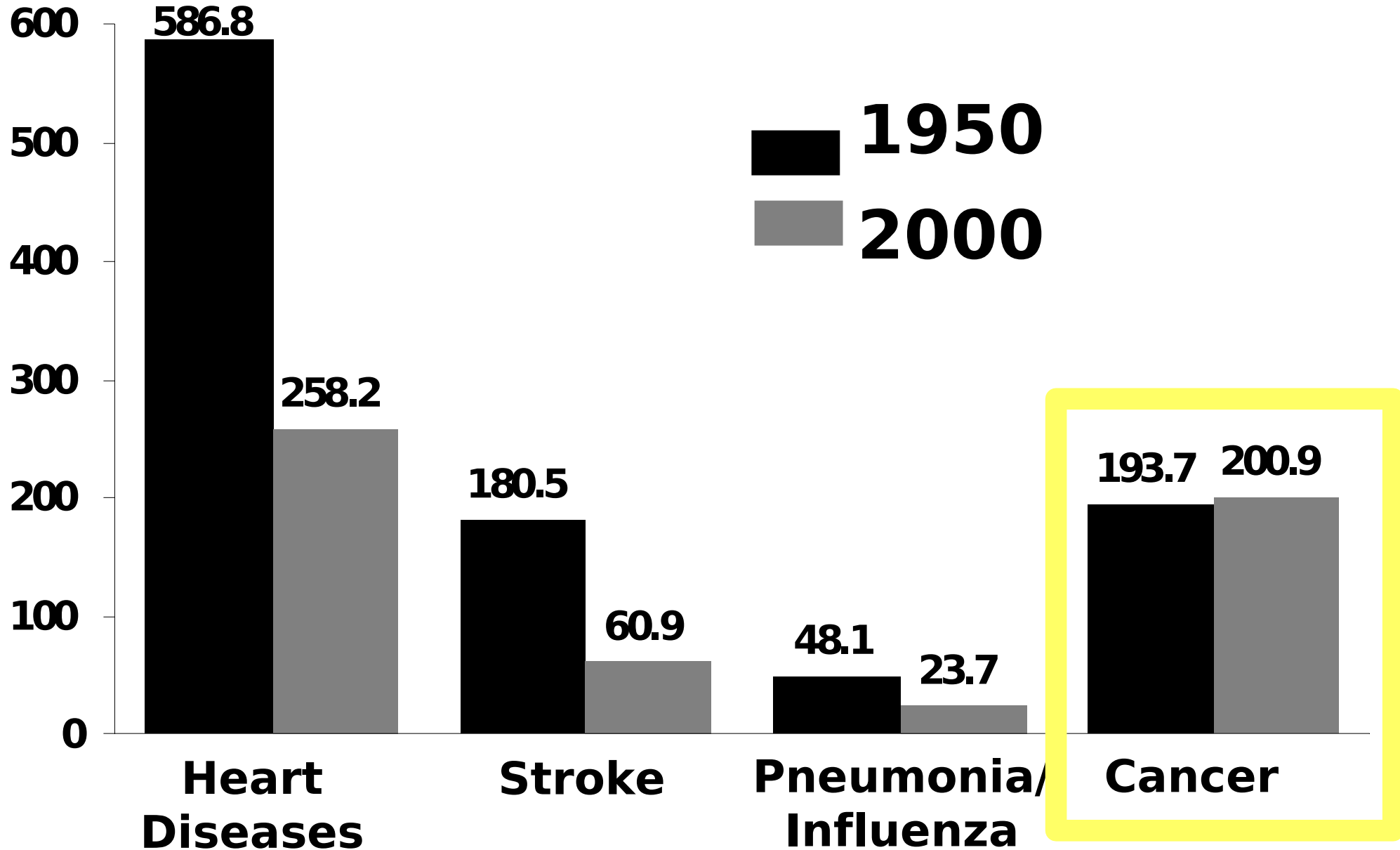


Heart Disease and Stroke cause about 700,000 deaths per year in the US



Change in the US Death Rates* by Cause, 1950 & 2000

Rate Per
100,000



* Age-adjusted to the 2000 US standard population.

Source: US Mortality Volume 1950, National Vital Statistics Report, 2002, Vol. 50, No. 15.

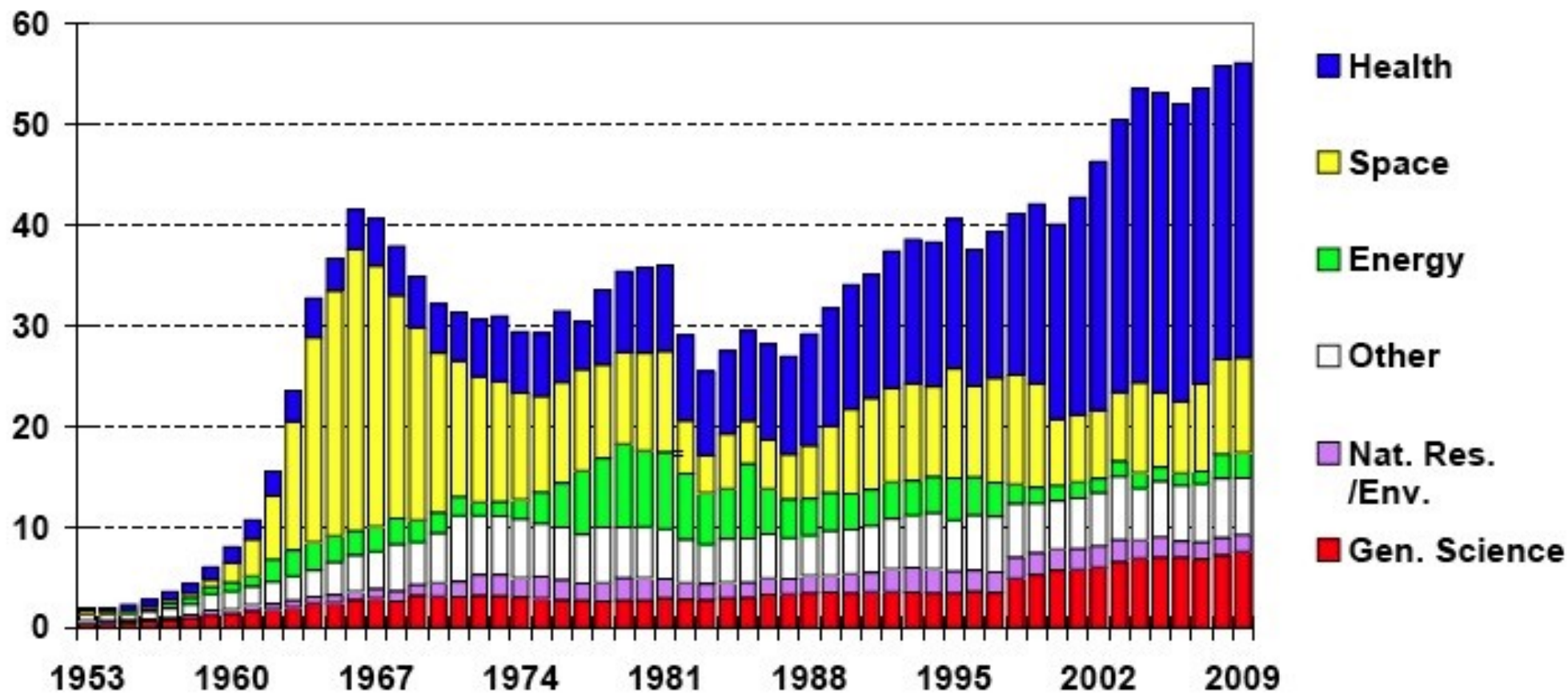
You have \$100 million for research...

How will you spend it?

- Population Control
- Food Production
- Food Distribution and Nutrition
- Energy Production
- Space Exploration
- Natural Resources and the Environment
- Communicable Diseases
- Heart Disease and Strokes
- Cancer

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.

FEB. '08 © 2008 AAAS



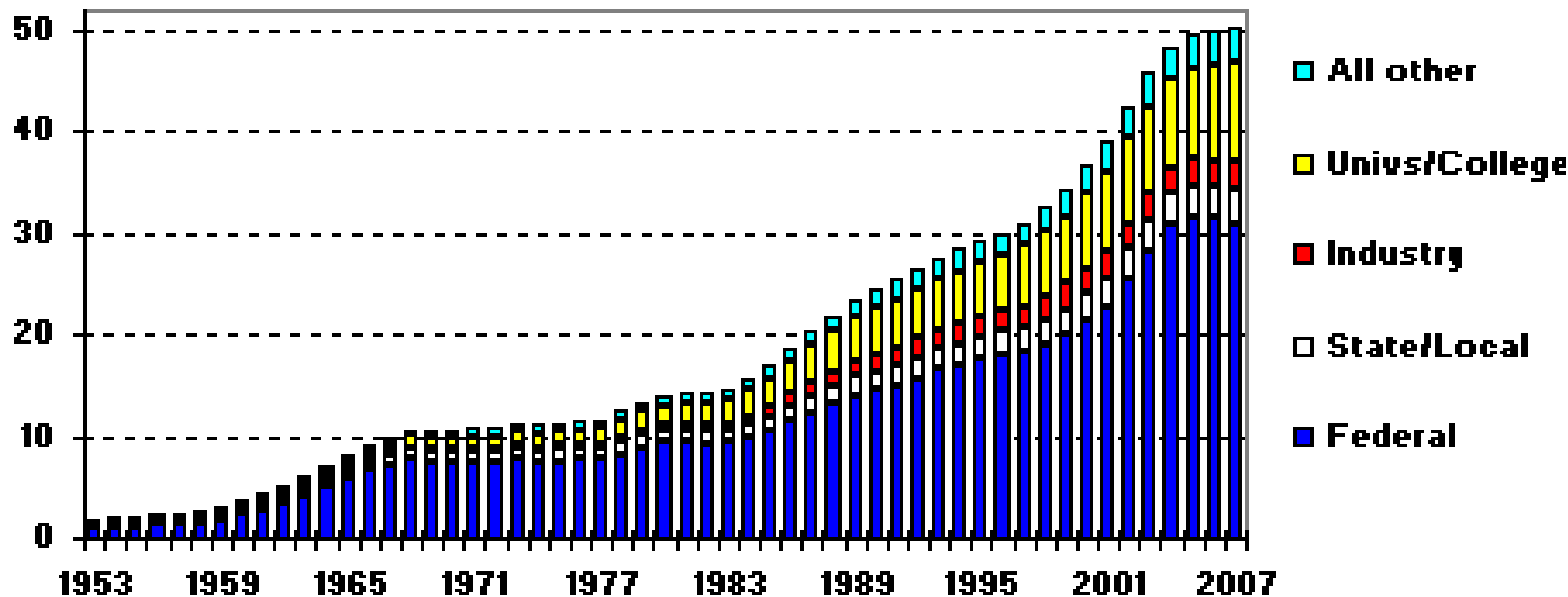
http://www.ted.com/talks/lang/eng/bjorn_lomborg_sets_global_priorities.html

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.
AUGUST '08 © 2008 AAAS

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.

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 Administration- FDA

UT-Austin spent \$640 million in academic research (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

We spend significant money on public research

~\$50 billion in U.S.

Most funding from government.

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More private funding brings potential conflicts of interest.

–Decreased federal money means:

More private funding brings potential conflicts of interest.

–Decreased federal money means:

More R&D by private industry

More funding of research at public institutions by corporations

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.

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.”

We spend significant money on public research
~\$50 billion in U.S.

Most funding from government.

More private funding brings potential conflicts of interest.

Competition has increased, especially for new researchers.

Funding idea could ease 'Valley of Death'

Early funding for technology may increase success rates

The Daily Texan Sept 15, 2010

UT's new chief commercialization officer inherited a commercialization operation that faces lackluster intellectual property revenue and a competitive period between patenting and commercialization that consumes many technologies before they even launch into the market.

But Richard Miller, a former biotech entrepreneur from Silicon Valley, said he has a new idea for UT — the University should fund researchers while they look for license partners in the early stages of development and ensure that venture capitalists get involved in UT research.

In the 2010 fiscal year, which ended Aug. 31, UT researchers submitted about **180** inventions to the Office of Technology Commercialization, which then filed about **300** patents.

This year, **32** of those patents attained third-party licenses

Most patents in the office come from pharmaceuticals, physical and life sciences, computer and nanosciences, and engineering —

for example, Toyota funded research on a car-crash predicting mechanism invented by computer science professor Risto Miikkulainen.

UT spent \$640 million on research in fiscal year 2010, the University accumulated only about \$14 million in revenue.

In 2008, the U. of Utah invested more than \$270 million in research and generated \$26 million in patent revenue, U. Wisconsin earned \$56 million

What is the purpose of public research?



versus

**Technology
Factory**



Information about patents was not covered in class, but I am leaving the slides in case you want to read about them.

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

Patentable inventions must be:

- Useful
- New or Novel
- Non-obvious

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



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.

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.

Patent application may take from 1-5+ years

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

pI

5.0

5.25

5.9

6.15

6.35

kD

250

150

100

75

50

37

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.

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

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.

Examples of current patents:

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



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- Atryn- antithrombin produced in transgenic goats (in milk) has anti-clotting properties
- Evolutec has patents on proteins in tick saliva for use as anti-inflammatory



Examples of current patents:

- Atryn- antithrombin produced in transgenic goats (in milk) has anti-clotting properties
- Evolutec has patents on proteins in tick saliva for use as anti-inflammatory
- 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.

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