

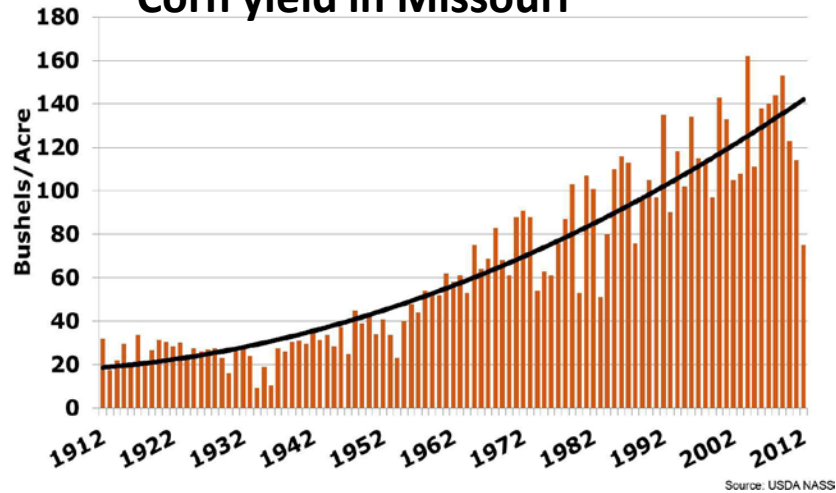
# Science for the Public Good



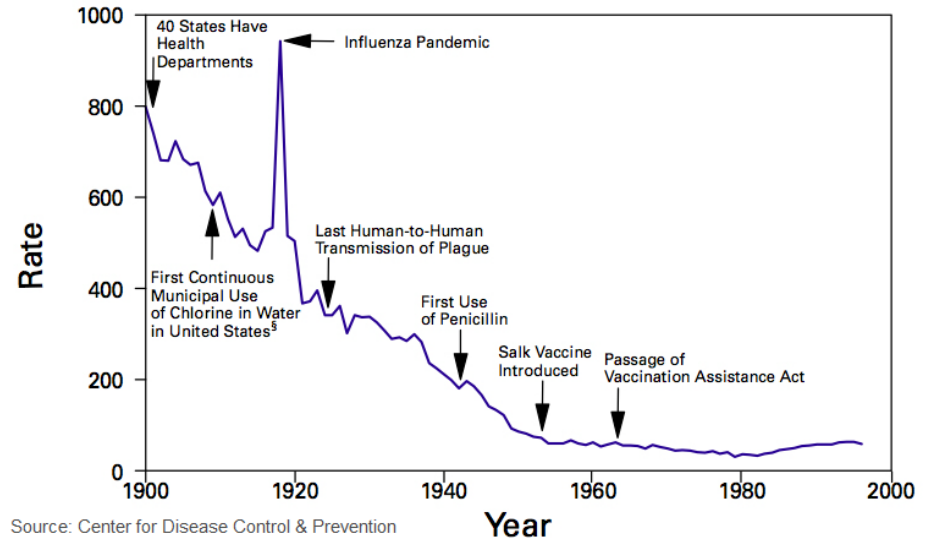


# Improve Human Life

## Corn yield in Missouri



## FIGURE 1. Crude death rate\* for infectious diseases — United States, 1900–1996†



# **“Basic Scientific Research is Capital”**

**Not directed**

**Curiosity driven**

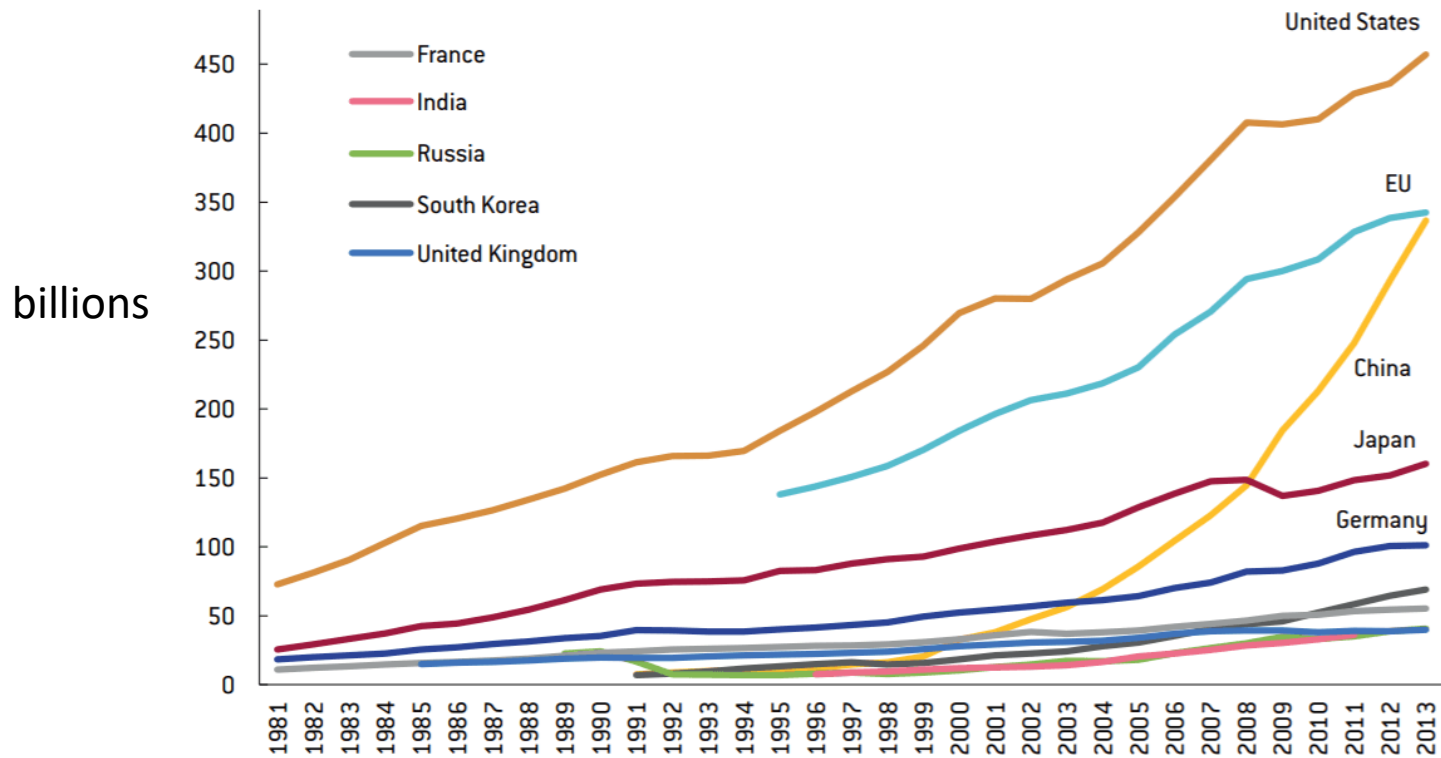
**Relies on prior work  
in many areas**

**Basis for all applied  
research**



**Vannevar Bush**

# Government Policies Support Research

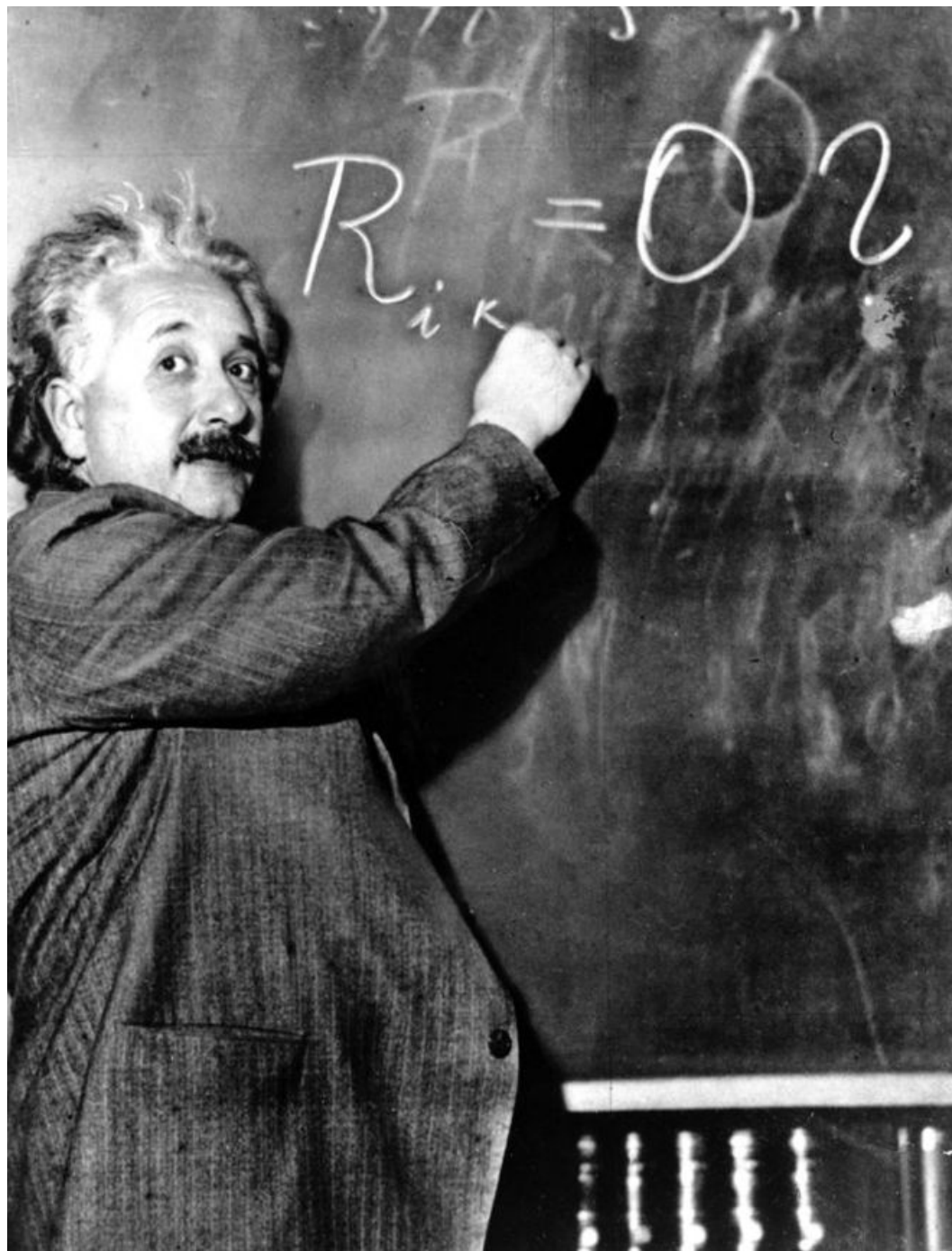


Source: Bruegel based on NSF (2016). PPP = purchasing power parity. NOTES: Foreign currencies are converted to dollars through PPPs. Some country data are estimated. Countries are grouped according to the regions described by The World Factbook, [www.cia.gov/library/publications/the-world-factbook/](http://www.cia.gov/library/publications/the-world-factbook/).

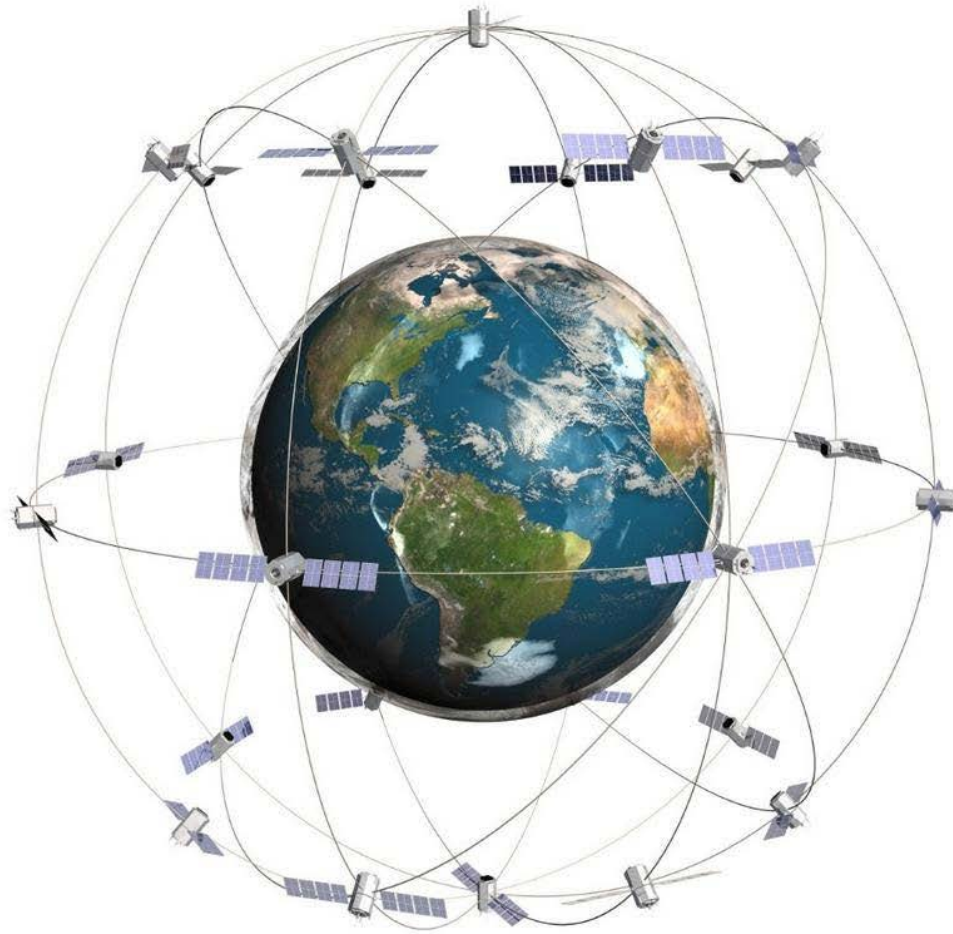
**Not possible to predict the utility of a  
specific research project**

**It may take a long time before  
utility is discovered**





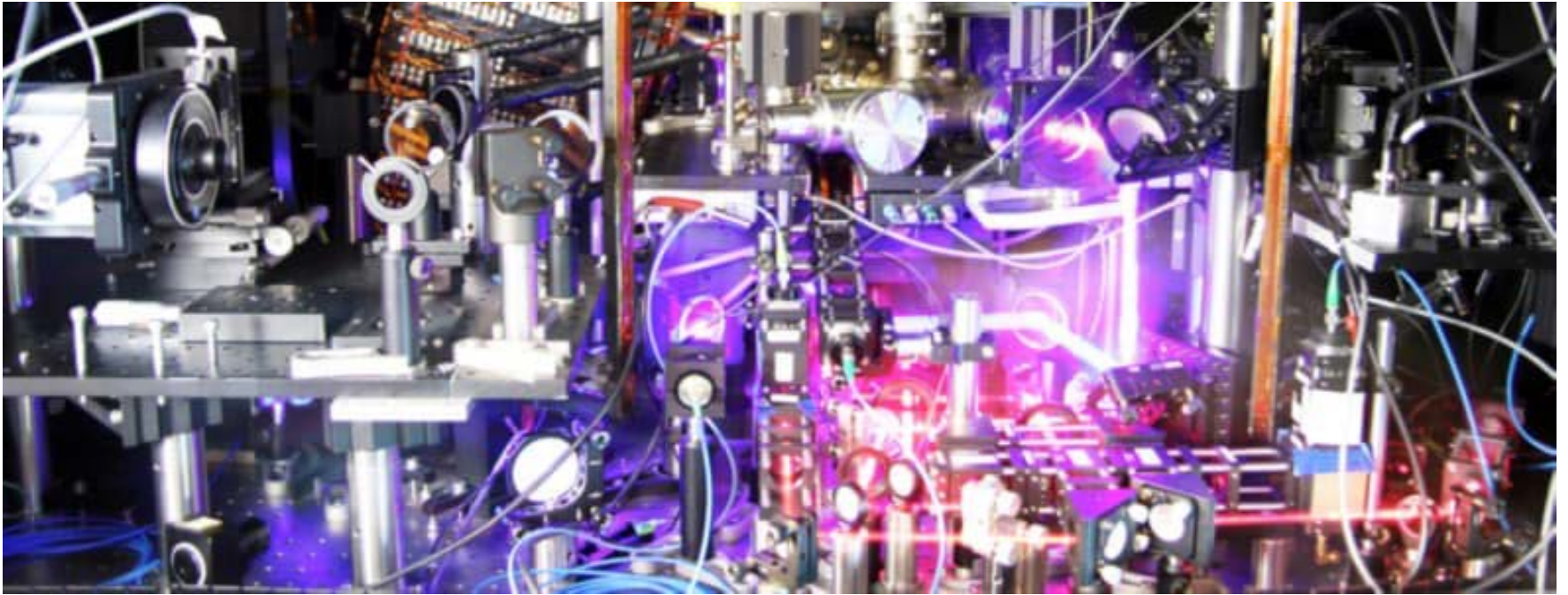
# Global Positioning Satellites





# Strontium Lattice Clock

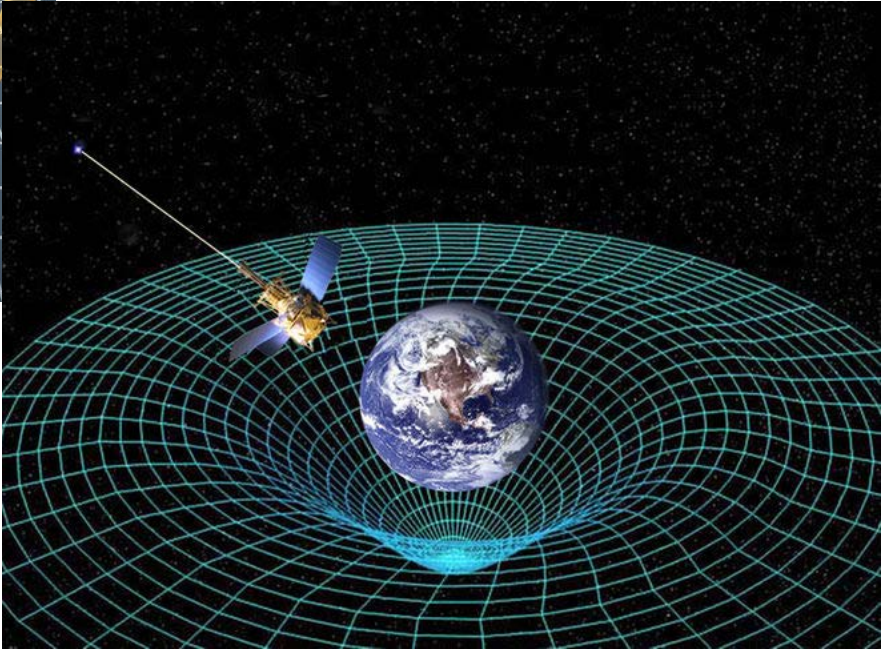
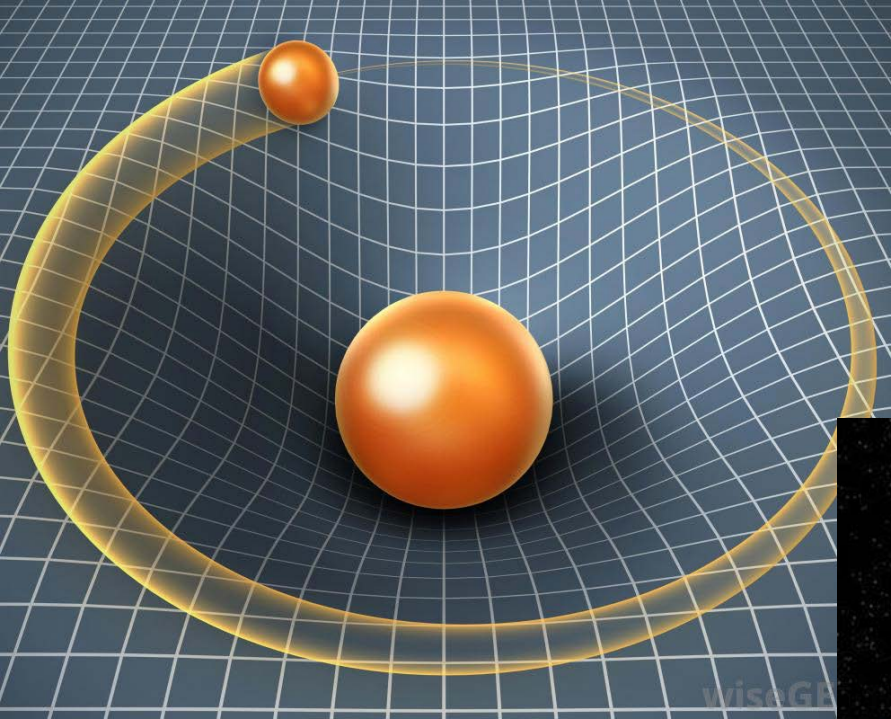
**Accurate – less than 1 second in 15 billion years**

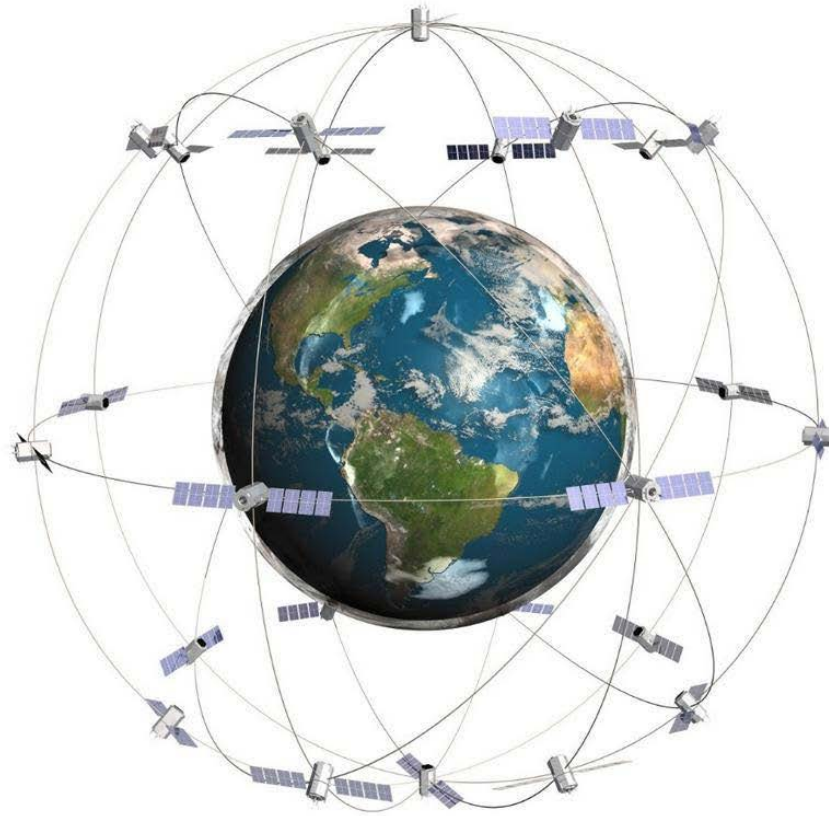


**Distance is determined by the time that light takes to arrive at object**



# Velocity and Gravity distorts time-space



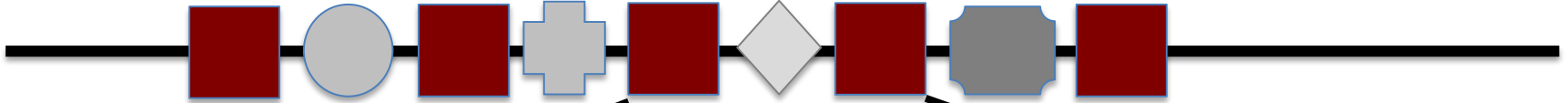
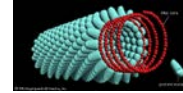


**Gravity distortion of time = 45 microseconds / day**

**Velocity distortion of time = 7 microseconds / day**

**Error of GPS system = 10 km /day**

# Bacterial Genome of *Streptococcus*



**GTTTTAGAGCTGTGCTGTTGAATGGTTCCAAAAC**ttattacggtatggctctgctgttat**GTTTTAGAGCTGTGCTGTTGAATGGTTCCAAA**



# Communicating Science

- Support of scientific enterprise
- Public understanding
- Ability to use facts in decisions
- Facts for Government Policies





# Policy Based on Science

Climate Change

Genetically Modified Foods

Vaccines

Energy

Immigration

Nuclear Arms

Toxicology and pollution

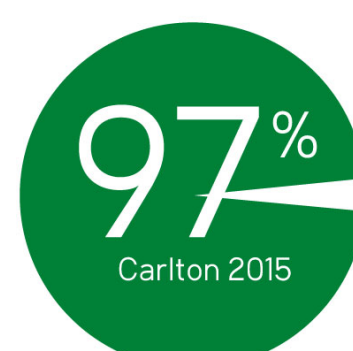
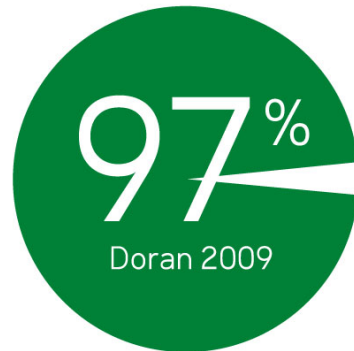
Emerging infectious  
diseases

Etc., etc., etc.

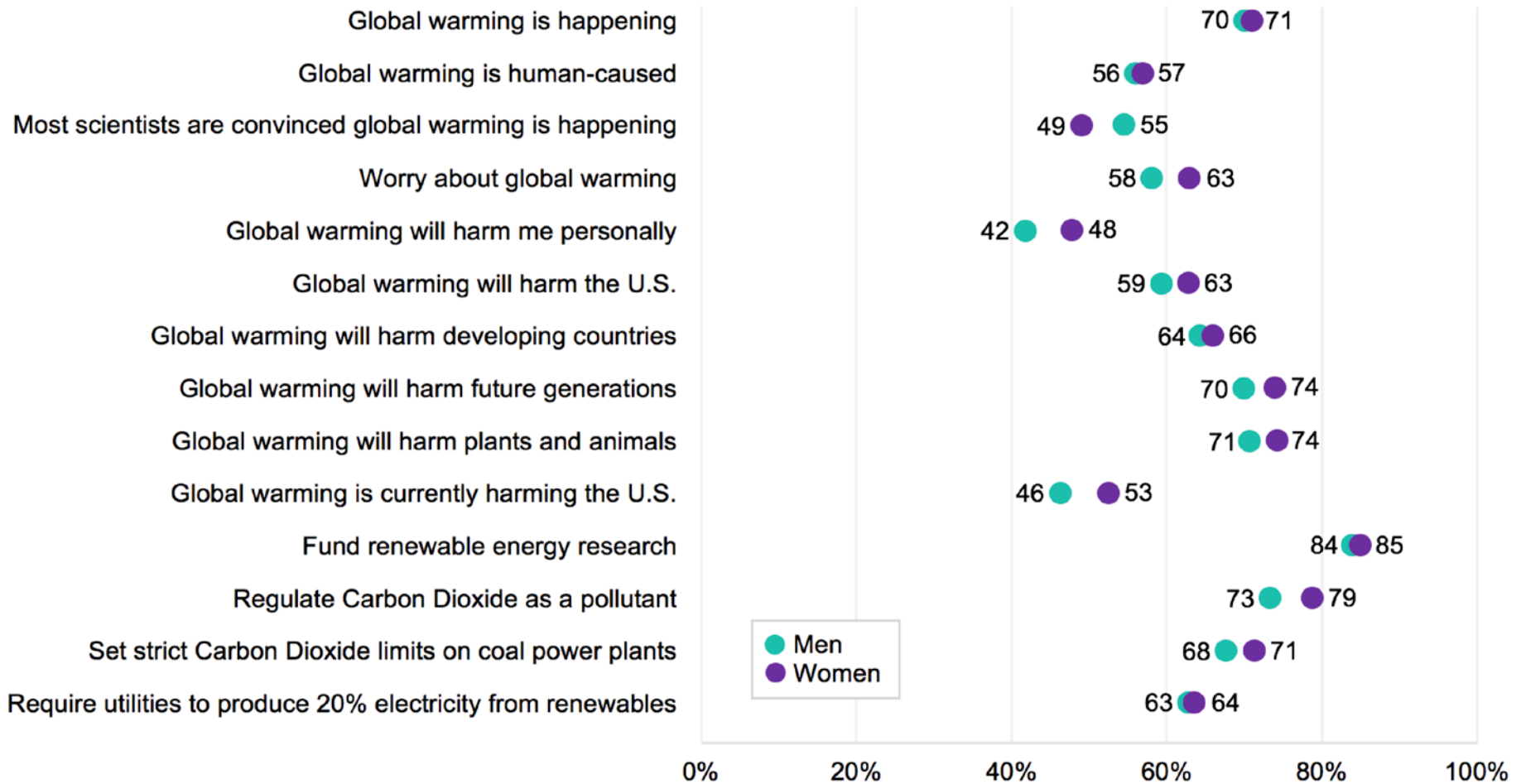


# Facts vs Opinion

Studies into scientific agreement on human-caused global warming



# Fig. 1 Gender Differences in Views and Understanding of Global Warming



Numbers represent the percentage of men and women who report the above beliefs, risk perceptions, and policy preferences.

May 2017, October 2017, March 2018

TRIPLE MSG

FRANKEN-FOOD

MONSANTO

# HUNGRY-MAN

## FRANKEN-FOOD

Frozen Dinner



MICROWAVABLE  
for added carcinogens



**GENETICALLY  
MODIFIED!**  
**TRIPLE MSG**

**FDA  
APPROVED**

**Box Raised  
Tortured  
Chicken**

With  
**TASTY GM Corn,  
Tomato and  
Trout Genes,  
Snail Broccoli,  
Human Gene  
Spliced Potato**

***Promotes Excessive Brain Tumors and Premature Death!***



**SAFETY OF GENETICALLY ENGINEERED FOODS**  
 APPROACHES TO ASSESSING UNINTENDED HEALTH EFFECTS

NATIONAL RESEARCH COUNCIL AND INSTITUTE OF MEDICINE OF THE NATIONAL ACADEMIES

**THE IMPACT OF GENETICALLY ENGINEERED CROPS ON FARM SUSTAINABILITY IN THE UNITED STATES**

NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES

Public Engagement on Genetically Modified Organisms  
 WHEN SCIENCE AND CITIZENS CONNECT

**BIOLOGICAL CONFINEMENT OF GENETICALLY ENGINEERED ORGANISMS**

NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES

WORKSHOP SUMMARY

NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES

**ENVIRONMENTAL EFFECTS of TRANSGENIC PLANTS**  
 THE SCOPE AND ADEQUACY OF REGULATION

NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES

**GENETICALLY ENGINEERED CROPS**  
 RISKS AND ASPECTS

REPORT

The National Academies of SCIENCES • ENGINEERING • MEDICINE

Ecological Monitoring of Genetically Modified Crops  
 A Workshop Summary

NATIONAL RESEARCH COUNCIL

**Field Testing Genetically Modified Organisms**  
 Framework for Decisions

NATIONAL RESEARCH COUNCIL

**GENETICALLY MODIFIED PEST-PROTECTED PLANTS**  
 SCIENCE AND REGULATION

NATIONAL RESEARCH COUNCIL

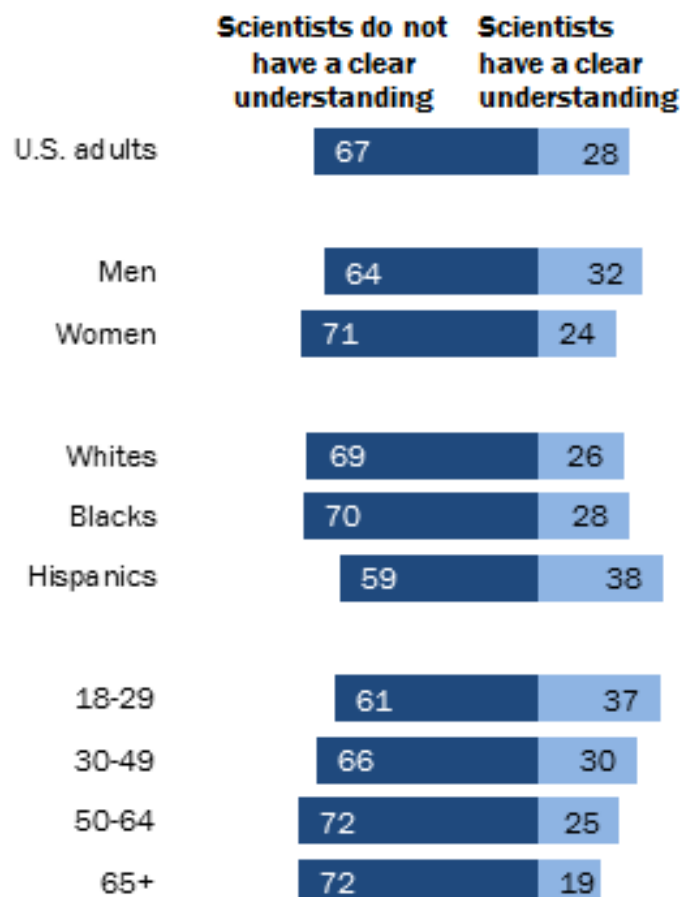
**GENETICALLY ENGINEERED Organisms, Wildlife, and Habitat**  
 A WORKSHOP SUMMARY

NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES

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## Views on Scientific Understanding of GM crops

*% of U.S. adults who say scientists have a clear/not clear understanding of the health effects of GM crops*

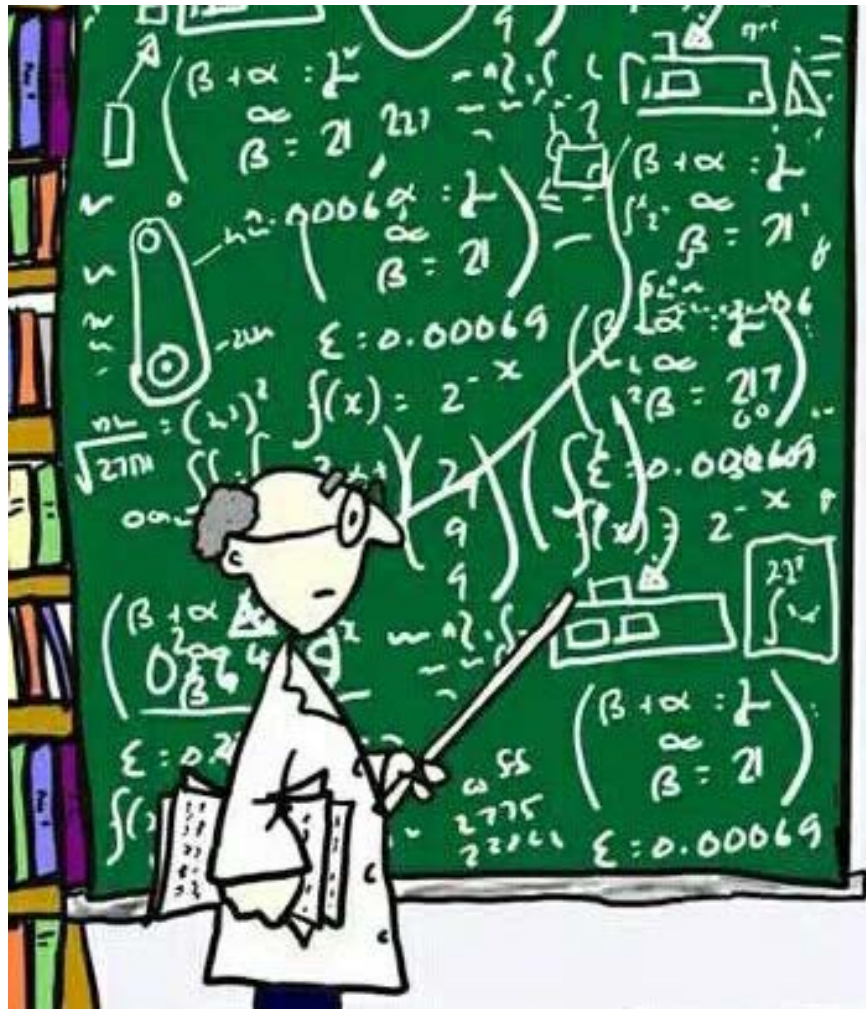


Survey of U.S. adults Aug. 15-25, 2014. Q39. "Don't know" responses not shown. Whites and blacks include only non-Hispanics; Hispanics are of any race.



# Fact vs Fake

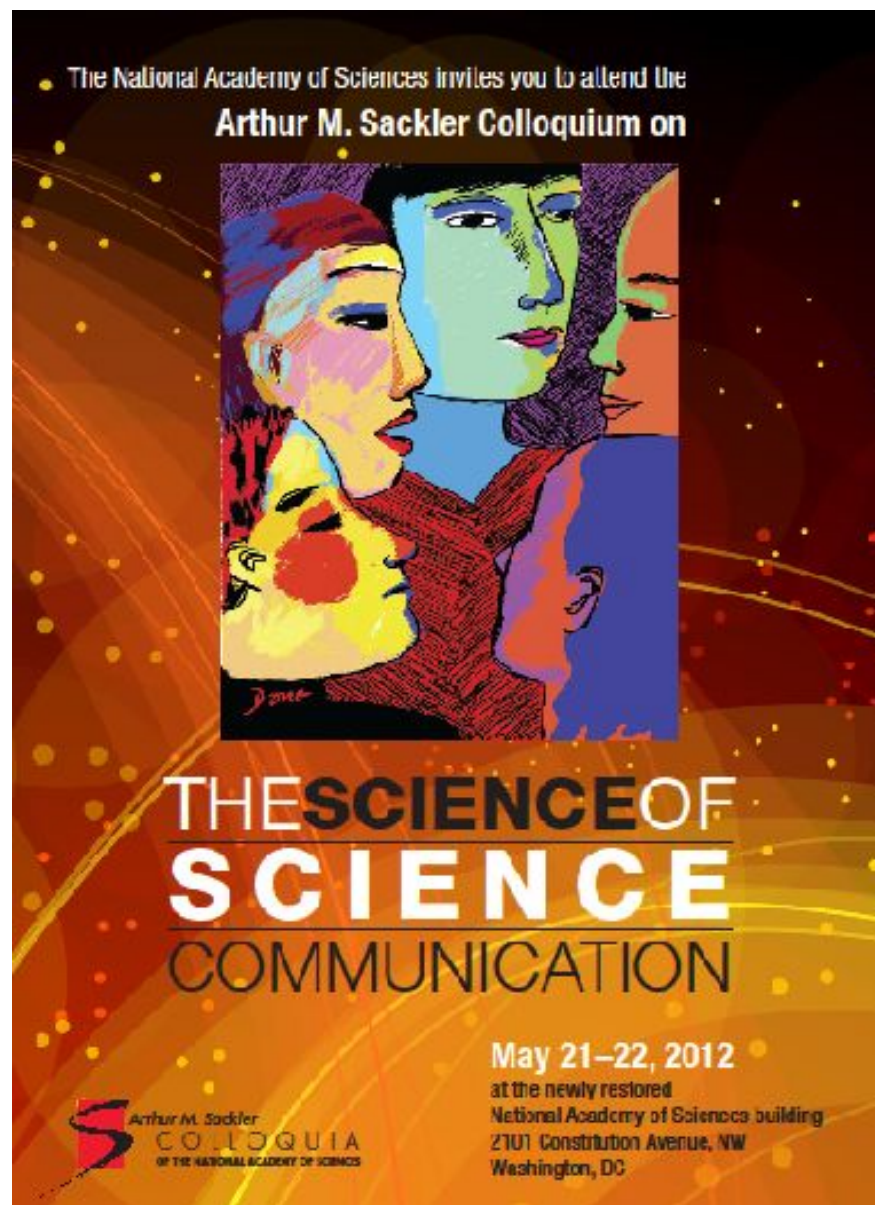
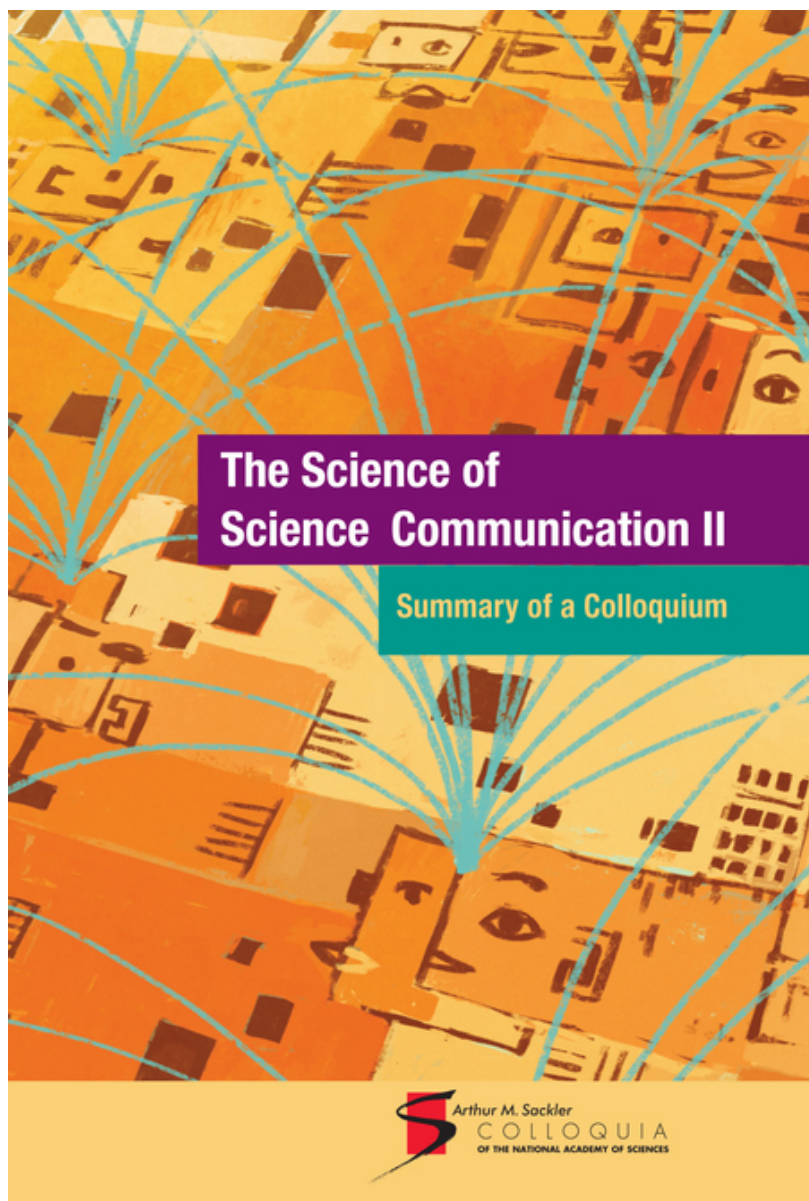




NUH-UH. SOME GUY ON TWITTER JUST SAID YOU'RE WRONG.







# Education

