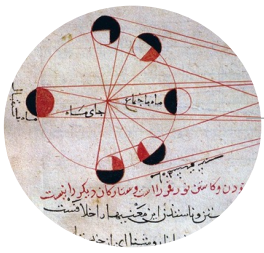
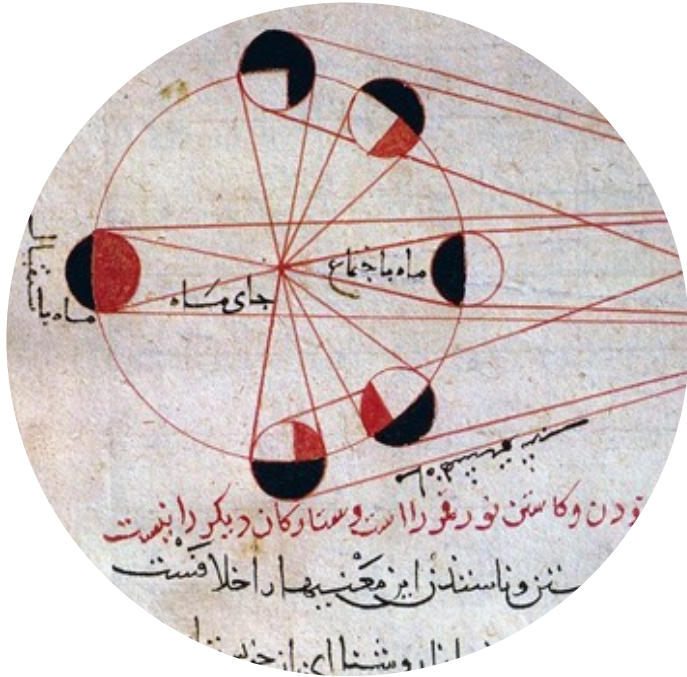


# Social dimensions of modern science: history, scientific values & ethical stewardship

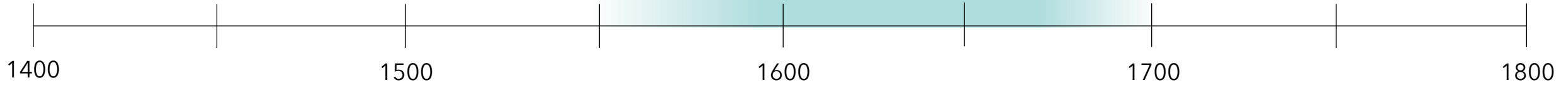


This is a talk about the conditions under which science produces truth,  
and what happens when those conditions fail.



**1.** *Science has always been embedded  
in human systems*

## The Scientific Revolution



### **thinking**

#### **new** scientific thinking:

- empiricism
- mechanism
- experimentation
- scientific societies

### **human values**

- come from outside of science
- retain role for God
- *science for sake of science*

Renaissance

The Scientific Revolution

1400

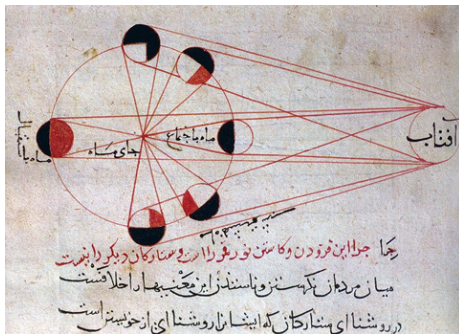
1500

1600

1700

1800

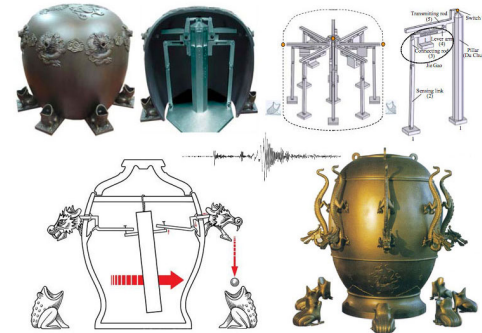
**Islamic science** assimilated and built upon Indian, Chinese, Greek, Aramaic & African scientific traditions.



Middle east

Value	0	1	2	3	4	5	6	7	8	9
Western Arabic	.	١	٢	٣	٤	٥	٦	٧	٨	٩
Eastern Arabic	.	١	٢	٣	٤	٥	٦	٧	٨	٩
Devanagari	०	१	२	३	४	५	६	७	८	९
Gujarati	૦	૧	૨	૩	૪	૫	૬	૭	૮	૯
Gurmukhi	੦	੧	੨	੩	੪	੫	੬	੭	੮	੯
Limbu	᱆	᱇	᱈	᱉	᱊	᱋	᱌	ᱍ	ᱎ	ᱏ
Bengali	০	১	২	৩	৪	৫	৬	৭	৮	৯
Oriya	୦	୧	୨	୩	୪	୫	୬	୭	୮	୯
Telugu	౦	౧	౨	౩	౪	౫	౬	౭	౮	౯
Kannada	೦	೧	೨	೩	೪	೫	೬	೭	೮	೯
Malayalam	൦	൧	൨	൩	൪	൫	൬	൭	൮	൯
Tamil (Graha)	௦	௧	௨	௩	௪	௫	௬	௭	௮	௯
Tibetan	༠	༡	༢	༣	༤	༥	༦	༧	༨	༩
Burmese	၀	၁	၂	၃	၄	၅	၆	၇	၈	၉
Thai	๐	๑	๒	๓	๔	๕	๖	๗	๘	๙
Khmer	០	១	២	៣	៤	៥	៦	៧	៨	៩
Lao	໐	໑	໒	໓	໔	໕	໖	໗	໘	໙

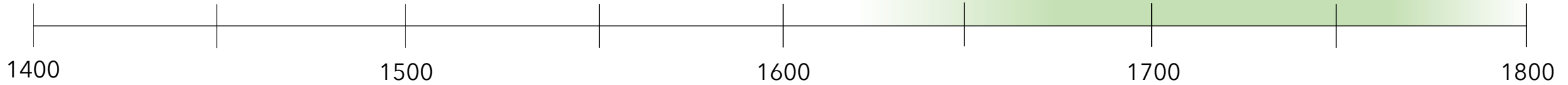
India



China

**Islamic Science** paved the way for the European renaissance and scientific revolution

## The Enlightenment



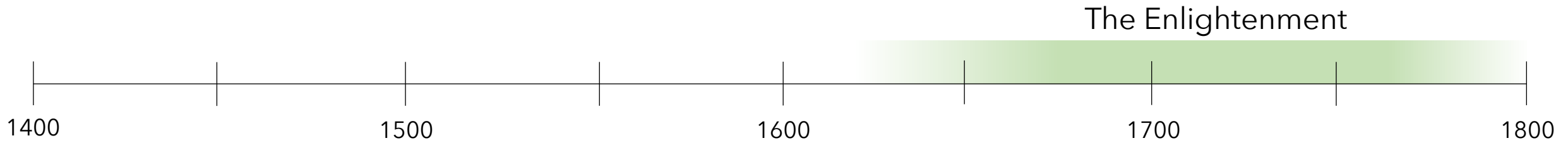
### thinking

apply scientific thinking in **new ways**:

- society
- government

### human values

- reason is a natural law that governs men and society (Locke)
- human values linked to science
- understand mankind via science (*not religion*)



*Science has never been value-free.*

1. origin narrative: "modern science" is European
2. hierarchies of *knowledge systems*, with *European science* placed at the top (superior)
3. These are not just ideas...  
**they shape what counts as knowledge.**

2



2. The “view from nowhere” is a modern scientific **value**

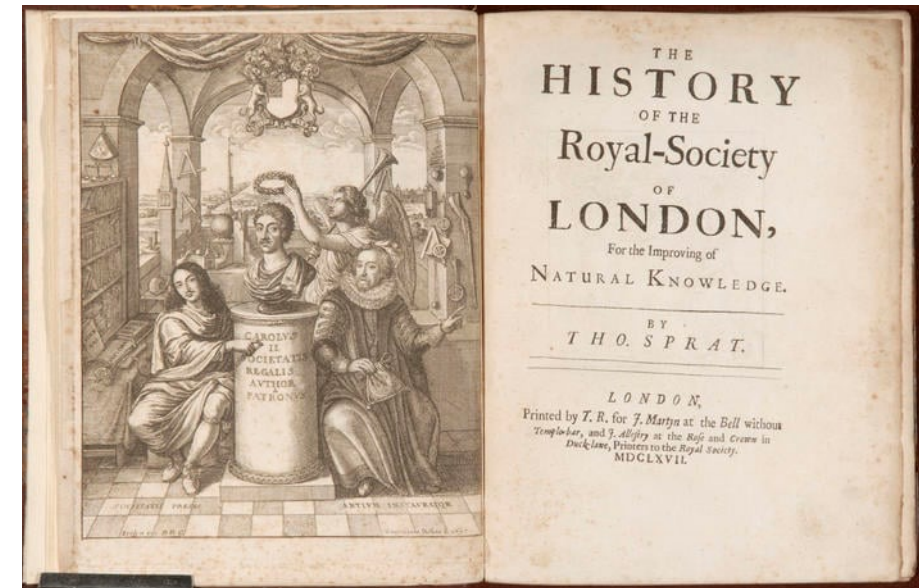
The "God's eye view" in film



## 2. The “view from nowhere” & objectivity in modern science



### The Royal Society ...



founded: 1660

history: 1666

## 2. The “view from nowhere” & modern science



### **Externalist view** of science/scientist:

- science ought to be external to system
- “omniscient being”
  - unbiased
  - infallible
- *objectivity* is a core scientific value

**But... we are not Gods.**

## 2. *The “view from nowhere” & modern science*



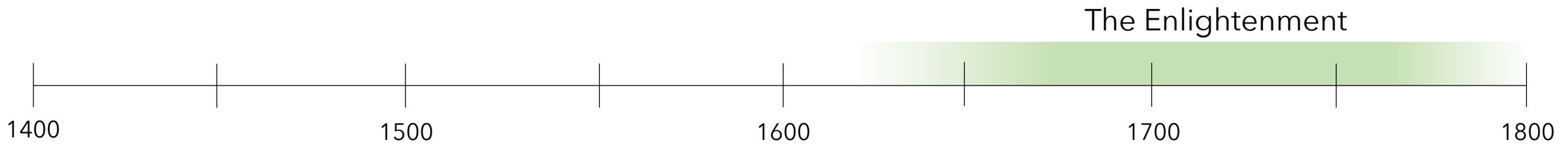
Objectivity is an *aspirational* **core value**... But, it does not remove science from human systems. It only constrains how we operate within them.

# 3



3. *Western science has always been entangled with Western **values**: race and colonialism*

**An example of what happens when scientific institutions reflect and reinforce existing social values.**



*nascent forms of race and racism  
predate enlightenment*

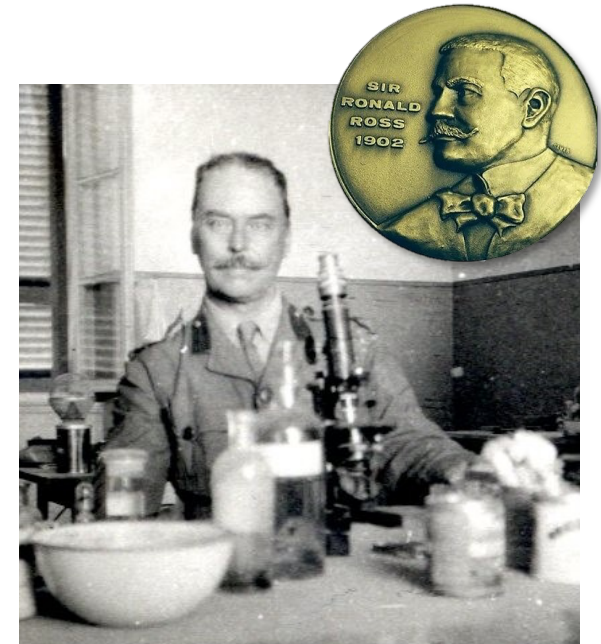
- enlightenment **invents human racial taxonomy** we would recognize today
- Western science is "pointed at race" and it becomes a **mainstream research activity** (birth of race science)
- **permanent (biological) racial hierarchy** justifies simultaneous notions of enlightenment liberalism and slavery

# European colonialism and science

*"Since its birth around the same time as Europeans began conquering other parts of the world, modern Western science was inextricably entangled with colonialism, especially British imperialism."*

— Dr. Rohan Deb Roy

- **knowledge hierarchy**: European science is 'modern' and superior (**progress of knowledge**)
- **civilization hierarchy**: educate and civilize less developed indigenous societies (**progress of societies**)
- **racial hierarchy**: some races are biologically inferior (**progress requires European intervention**)
- **"The gracious gift of science"**: scientific insights promote superior health, hygiene and sanitation among colonial subjects ("**colonization of the body**", David Arnold)

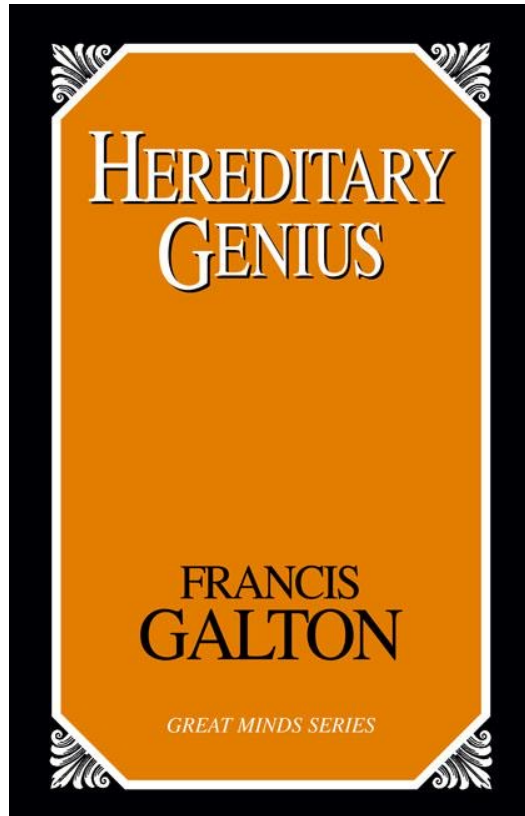


Sir Ronald Ross

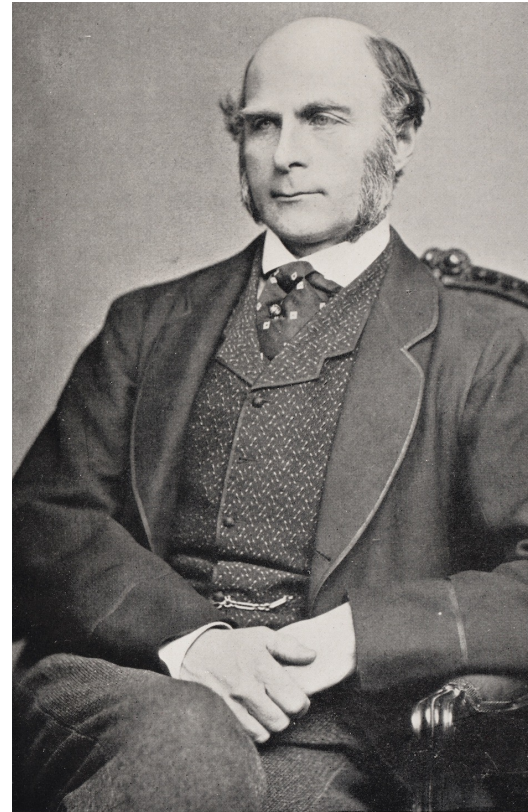
*"... in the coming century, the success of imperialism will depend largely upon success with the microscope".*

1902: Nobel prize for Medicine

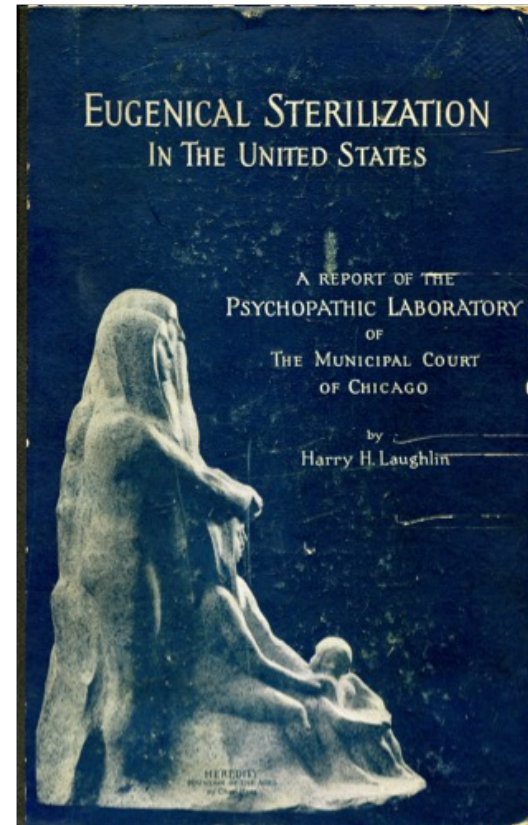
Genetics and heredity transform race science → *Eugenics and racial hygiene*



1869



Francis Galton coined the term **Eugenics** in 1883

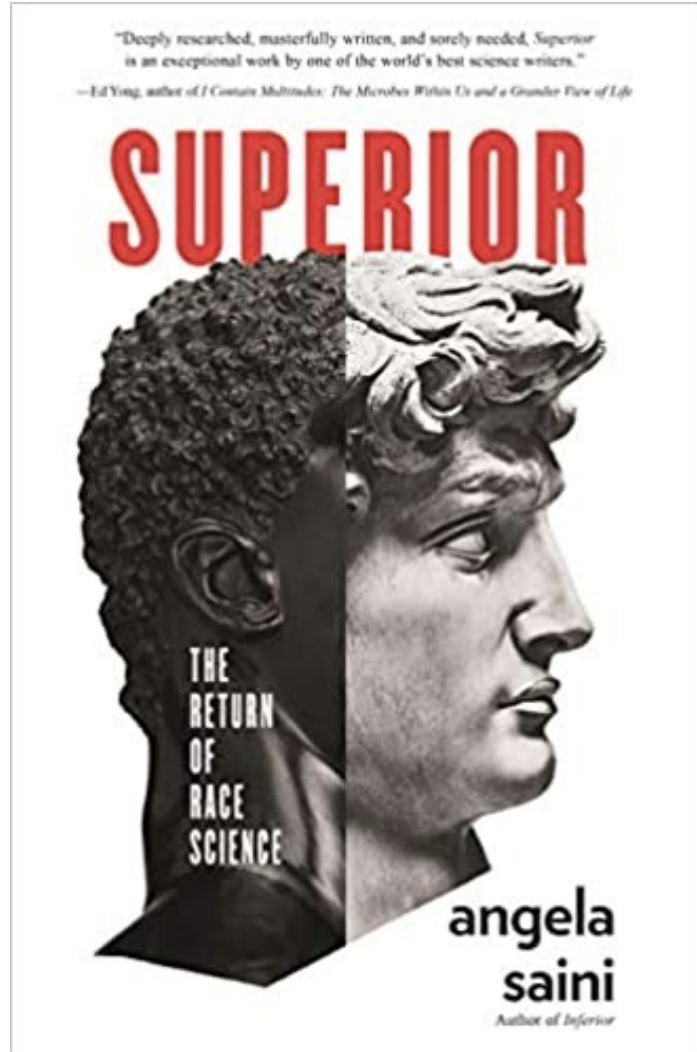


1922



1930's

## Race science during and following World War II



*"The truth, that it was perfectly possible for prominent scientists to be racist, to murder, to abuse people and knowledge, doesn't sit easily with the way we like to think about scientific research. We imagine that it's above politics, that it's a noble, rational and objective endeavor, untainted by feelings or prejudice."*

*"This was never a simple story of good verses evil. The well of scientific ideas from which Hitler and others drew their plans for racial hygiene, leading to genocide, didn't originate in Germany alone. They had been steadily supplied by race scientists for more than a century, from all over the world, supported by well-respected intellectuals, aristocrats, political leaders and women and men of wealth."*

*"The post war narrative of good triumphing over evil glossed over the messier truth. That in fact everyone who pointed a finger at others should have pointed a finger at themselves."*

# 4



4. Where **values** enter science today: gatekeeping.



These dynamics are not just historical.

**Values are built into how science operates today.**

## Science in the Belly of the Beast: My Career in the Academy

JOSEPH L. GRAVES, JR.

Associate Dean for Research and Professor of Biological Sciences, Joint School of Nanosciences and Nanoengineering, North Carolina A&T State University, University of North Carolina–Greensboro, Greensboro, North Carolina



### The Nature of the Beast

*And I stood upon the sand of the sea, and saw a beast rise . . . having seven heads and ten horns, and upon his head ten crowns, and upon his heads the name of blasphemy.*

—Revelation 13:1

I had a difficult time deciding to accept the invitation to write this article. It is true that I am probably the first person of African American descent<sup>1</sup> to earn a PhD in evolutionary biology,<sup>2</sup> be hired in a tenure-track position, achieve tenure, and finally be promoted to full professor. However, I have collected as many failures in my career as I have successes. This fact, I realized, probably makes me the right person for this task because I can honestly say I learned much more about academe through my failures.

Definitions are important. To recognize success you must first know what it is you want to accomplish. You must also know the nature of your opposition. Because all humans are self-interested, it follows that there is the potential for the interests of individuals to clash. In addition, societies

## Joseph L. Graves Jr.

- 1<sup>st</sup> African to earn PhD in evolutionary biology
- evolutionary geneticist
- written extensively on genetics and race in American society (and debunking biological concepts of race)

### Slaying the Beast: The unwritten rules

*“My career has demonstrated that if you adhere to the written rules, you are likely to achieve reasonable success. However, my greatest weakness is that I did not effectively learn and apply the unwritten rules of the academy.*

*...professional scientists have different grasps of nature, history and philosophy of science. These shortcomings often contribute to the **prevailing ethos that scientific research and the scientific community are value-neutral entities. My experience is that they are not...** It is from here that many of the **unwritten rules** of the academy emanate.”*

# scientific gatekeeping

*unwritten norms*

## science requires standards

quality control

---

reproducibility

---

self-correction

---

transparency

## filters participation & perspectives

access / opportunity

---

dominant norms

---

political influence

---

systematic bias

**The structures that protect scientific quality also shape whose perspectives enter science.**

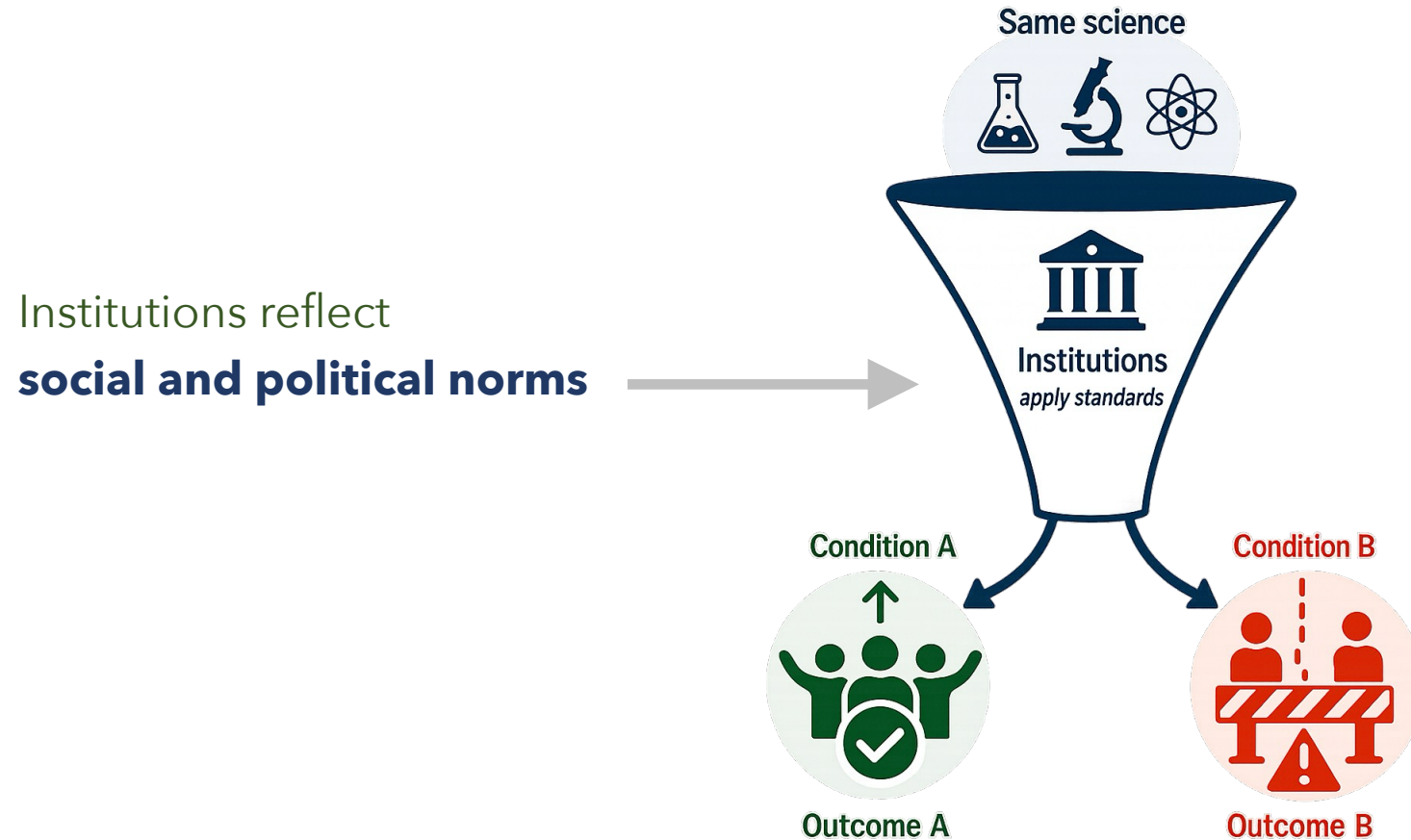
5



5. *Same science → different outcomes*

# Same science, different conditions → different outcomes

---



scientific outcomes depend on the conditions under which science operates

# Same science, different conditions → different outcomes

## the same science

**heredity is real and supported by the evidence**



- heritable variation
- experiments
- natural systems

## different conditions (A & B)

**A. Relatively open scientific competition**

**B. Institutionally constrained competition**

## different outcomes

A. Mendelism (core concept)



- modern genetics
- neo-Darwinism / M.S.
- reject Lamarckism
- revolutionized agriculture

B. Lysenkoism



- somatic heredity
- Lamarckism
- reject Darwinism
- massive crop failures

6



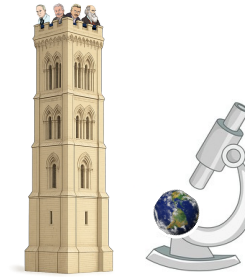
**6.** *Constructing the conditions for truth:*  
***the social contract***

# The social contract:



Society commits to...

- protect scientific **independence**
- stable & long-term **support**
- follow **evidence**, even when inconvenient

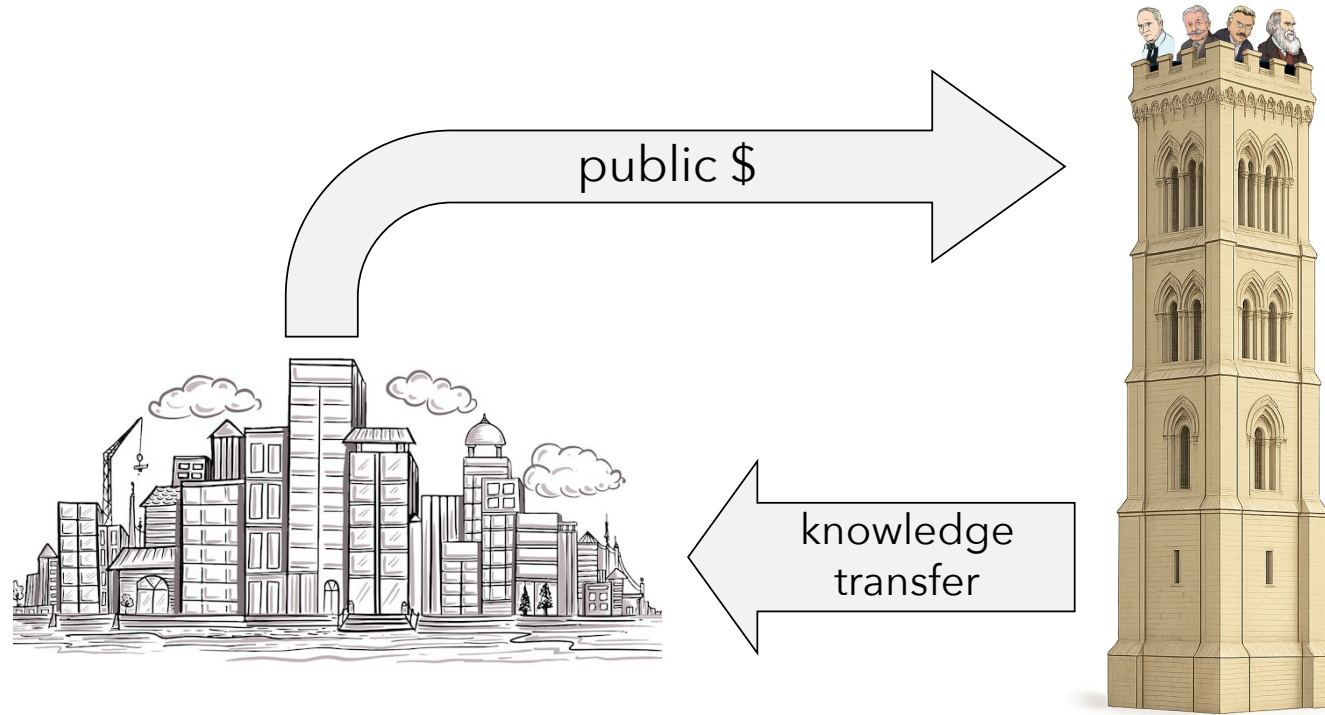


Science commits to...

- **truth**, independent of politics
- **standards** for evidence and transparency
- **mobilize knowledge** for societal good

mutual *social* obligations

Society invests in science → Science produces knowledge

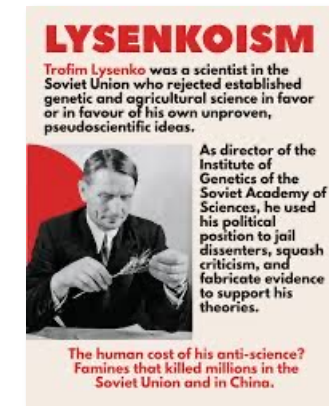
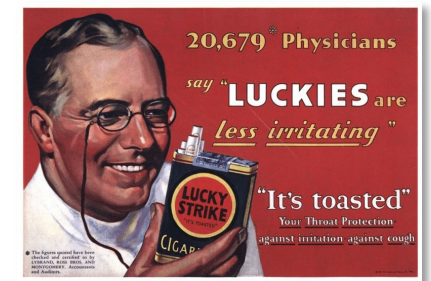
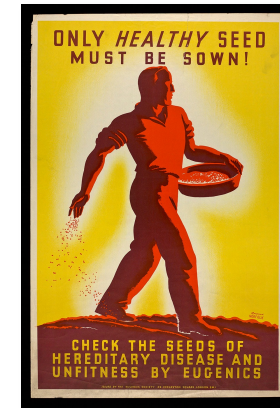


This social contract was an attempt to stabilize **the conditions for truth.**

*Science under pressure*

# Recurring pressure on the conditions for truth

- Race Pseudoscience / Eugenics (socially embedded)
- Lysenkoism (political constraint)
- Tobacco (manufactured uncertainty)
- The replication crisis (distorted incentives)



Systems for scientific truth can be weakened through **direct pressure, strategic doubt, or distorted institutional incentives.**

# The current moment

- instability in scientific institutions
- politicization of expertise
- erosion of public trust
- pressure on long-term support systems

## The pattern is not new.

**Social contracts rarely collapse all at once.** They erode incrementally, through decisions that seem manageable in isolation.

### NSF SCIENCE ADVISORY BOARD FIRED BY TRUMP ADMINISTRATION

Members of the National Science Board, founded in 1950, were given no explanation for their termination.

**By Dan Gristo**

If 22 members of the advisory board that oversees the US National Science Foundation (NSF), a leading funder of fundamental science, were fired on 24 April without explanation, every member of the NSF's National Science Board (NSB) received an e-mail on Friday afternoon saying that "on behalf of President Donald J. Trump, their positions were terminated, effective immediately".

Members of the NSB are appointed by the president and serve six-year terms that are staggered, avoiding complete turnover. Asked about the reason for the termination, a White House spokesperson said that the 2021 Supreme Court decision *United States v. Arthrex, Inc.* "raised constitutional questions about whether non-Senate confirmed appointees can exercise the authorities that Congress gave the National Science Board". Members of the NSB were initially confirmed by the Senate, but have not been since 2012.

"This action to dismiss the NSB is unprecedented," says Dan Reed, a computer scientist at the University of Utah in Salt Lake City and chair of the NSB from 2022 to 2024. "We need a vibrant, independent NSB, one representative of the broad science and engineering enterprise."

Zoe Jolgren, a member of the US House of Representatives from California and the

ranking Democrat on the House Committee on Science, Space, and Technology, criticized the move. "This is the latest stupid move made by a president who continues to harm science and American innovation," she said in a statement. "It unfortunately is no surprise a president who has attacked NSF from day one would seek to destroy the board that helps guide the Foundation."

But House science committee chairman Brian Babin, a Republican from Texas, said, "Every President expects advisors to serve in a manner consistent with executive and legislative priorities. I look forward to seeing when President Trump selects to fill the NSB and re-focus our science agencies on their core mission: pursuing science."

This is not the first time the Trump administration has ousted federal science advisers en masse. Last year, the administration fired all 17 members of the Advisory Committee on Immunization Practices, which played a crucial part in US vaccine policy, and eliminated 14 advisory committees at the NSF. Also last year, Trump issued an order eliminating several advisory committees, including one on long COVID, to reduce government spending and "promote American freedom and innovation".

**Long history**

The NSF and the NSB were established by Congress in 1950. The board meets five times a year and publishes reports on the state of US science and engineering that help to guide the president and Congress. Its next meeting was set for 5 May, and members say a report about the United States ceding scientific ground to China was set to be released.

"Where will advice come from?" asks Roger Beachy, a biologist at Washington University in St. Louis, Missouri. He was appointed to the NSB by US President Barack Obama in 2014 and reappointed by Trump in 2020 before being fired on Friday. "Who will help with what is the future of science in this nation?"

Kevin Stasson, an astrophysicist at Vanderbilt University in Nashville, Tennessee, says that the termination of NSB members fits into a pattern of the Trump administration's approach to science advice, which is being "systematically either dissolved or eviscerated", he says. "It felt like only a matter of time before that happened to the NSB, he says."



The National Science Board advises the NSF.

Nature | Vol 653 | 7 May 2026 | 13

### Without evidence, CDC changes messaging on vaccines and autism

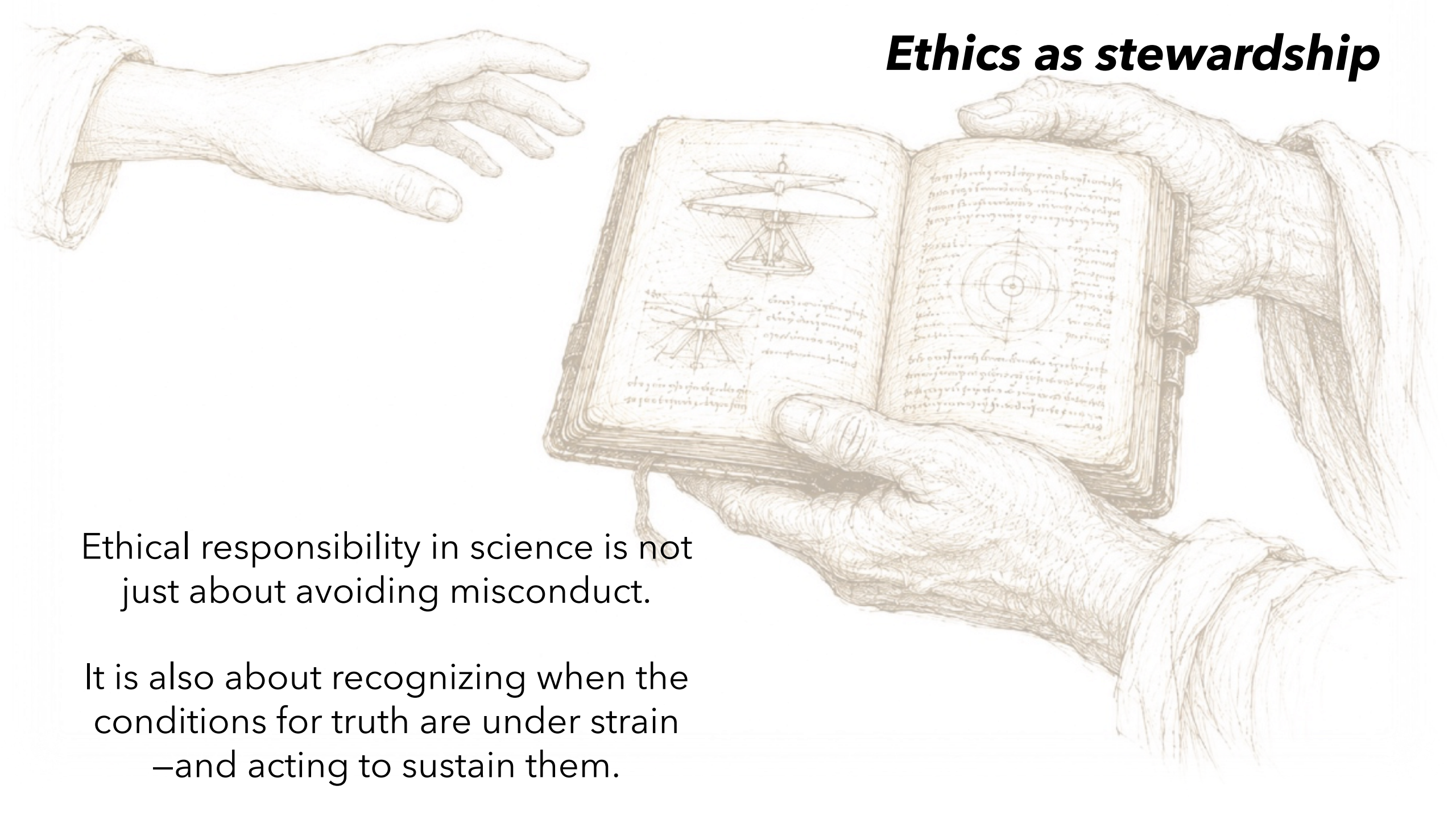
On Wednesday, the CDC reversed its long-held position that there's no link between vaccines and autism. "This is the day CDC died," a former agency official said.



The Centers for Disease Control and Prevention headquarters in Atlanta. ©11/2014 Newsphoto / Bloomberg via Getty Images. P12

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# ***Ethics as stewardship***



Ethical responsibility in science is not just about avoiding misconduct.

It is also about recognizing when the conditions for truth are under strain –and acting to sustain them.