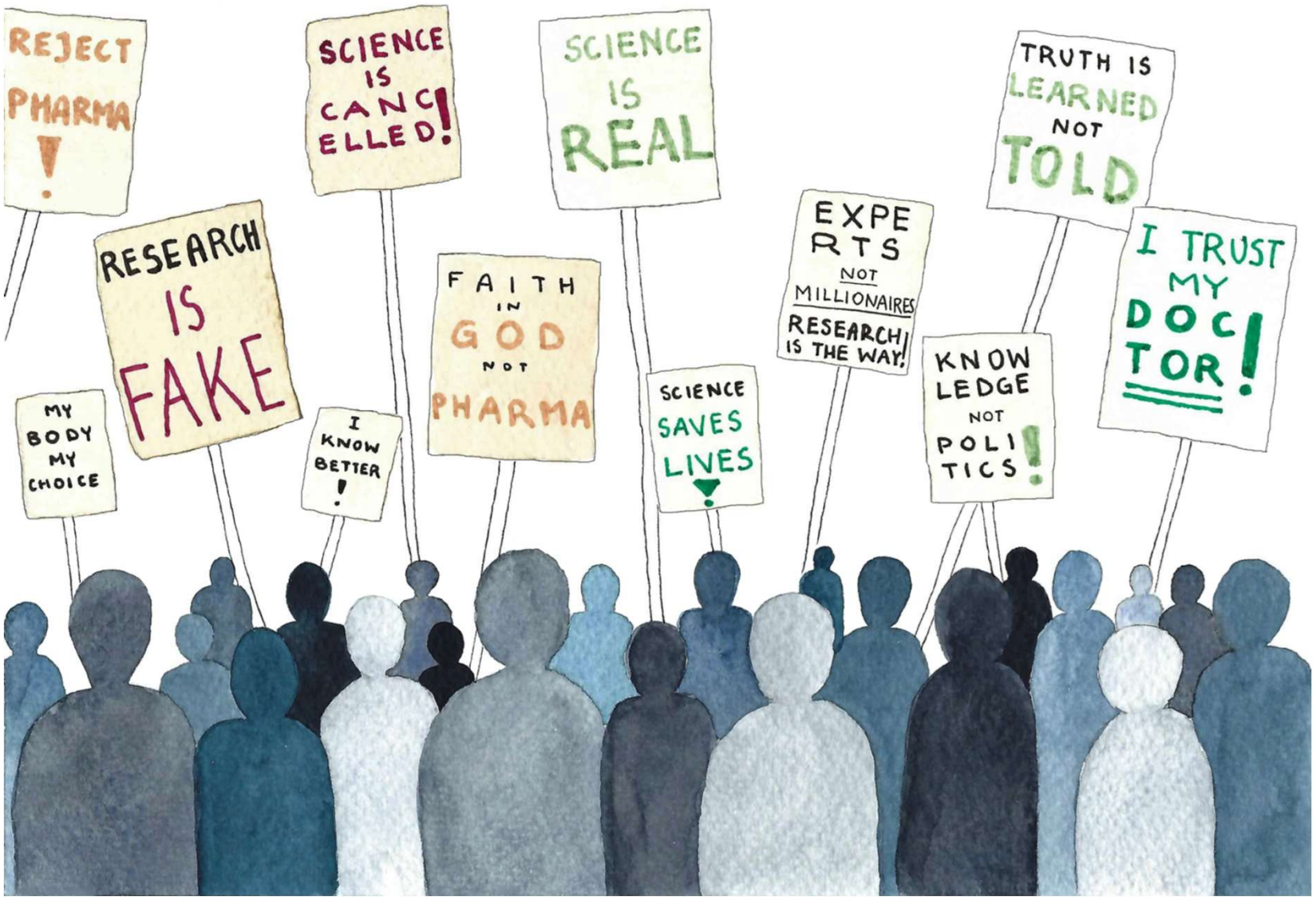
Trust in Science

Background and Discussion-What the data tells us now, then,why, and where.

Martin Stevens Halesworth u3a Feb 2026


REJECT PHARMA!
SCIENCE IS CANCELLED!
SCIENCE IS REAL
TRUTH IS LEARNED NOT TOLD
RESEARCH IS FAKE
FAITH IN GOD NOT PHARMA
EXPERTS NOT MILLIONAIRES
RESEARCH IS THE WAY!
I TRUST MY DOCTOR!
MY BODY MY CHOICE
I KNOW BETTER!
SCIENCE SAVES LIVES
KNOWLEDGE NOT POLITICS!

Why this talk

- Initially an article in The Economist — July 2025…. Borrowed !
- I subscribe to some online fact checking sources.
- My own experience — moving from lab work (data driven) to Social Science based — policy early on too often and with hindsight more driven by anecdote than evidence
- **-AND the the evidence is ?**
- **And – the move to post/alternative truth (lies) becoming more mainstream.**

A quick outline

- What is //is not science’
- Trust in science –historical perspectives
- Some recent research
- Microplastics –a cautionary example
- What can be done
- Questions and discussion

Science a working definition

- Science is both a **body of knowledge** and a **systematic process** for discovering how the universe works.
- It is **not** a collection of static facts, but an ongoing pursuit of understanding based on evidence, observation, and experimentation.
- Science is limited to explaining natural phenomena through empirical evidence and testable hypotheses. It **excludes** several significant areas of human experience and understanding.

Science does not include..... **Values and Judgments**

Science can describe ***what is*, but it cannot determine *what should be*.**

- **Moral Judgments:** Science can explain the biological or psychological effects of an action (e.g., the impact of pain), but it cannot prove if that action is "right" or "evil". Decisions on ethics, such as the morality of cloning or euthanasia, rely on philosophical and cultural values rather than lab tests.
- **Aesthetic Judgments:** While science can analyze the frequency of a musical note or the chemistry of paint, it cannot determine if a symphony or painting is "beautiful". Beauty is a subjective human experience beyond measurable data.

Is not —- The Supernatural and Existential

Science is restricted to the natural world it **cannot investigate anything that exists outside.**

- **Supernatural Explanations:** e.g. the existence of God or divine intervention are outside the realm of science because they cannot be tested or falsified.
- **Purpose and Meaning:** can explain human reproduction, but it cannot answer *why* we exist or what the ultimate purpose of life is. (42?--is fiction)
- **Origin of the Universe:** While science traces the history of the universe back to the Big Bang, it cannot explain what preceded it or why the fundamental laws of nature exist at all, as scientific explanation presupposes those laws.

Subjective and Non-Repeatable Truths

Scientific method requires data that is measurable and repeatable, which excludes many personal and historical realities.

- **Experiential Truths:** Science cannot "prove" subjective feelings like love or exactly what it feels like to see say the color blue.
- **Historical Truths:** While historians use evidence, the events themselves are unique and cannot be repeated – science cannot "prove" an historical event like a specific election as it proves a chemical reaction.
- **Consciousness:** Modern science is currently unable to explain how physical brain processes result in the subjective experience of consciousness.

Non-Scientific Areas of Knowledge

Many academic fields are "non-sciences" because they use different methods of inquiry: **Formal Sciences:** Disciplines like **Mathematics** and **Logic** provide the framework science uses but are themselves based on deductive reasoning and empirical observation.

- **Pseudoscience:** This includes claims that *pretend* to be scientific but lack falsifiability or rigorous testing, such as **astrology** or some say **homeopathy**.
- **Humanities:** Fields such as **History**, **Literature**, and **Philosophy** offer vital information about the human condition and values that science is not designed to capture.

The Fundamental Criteria — be reliable

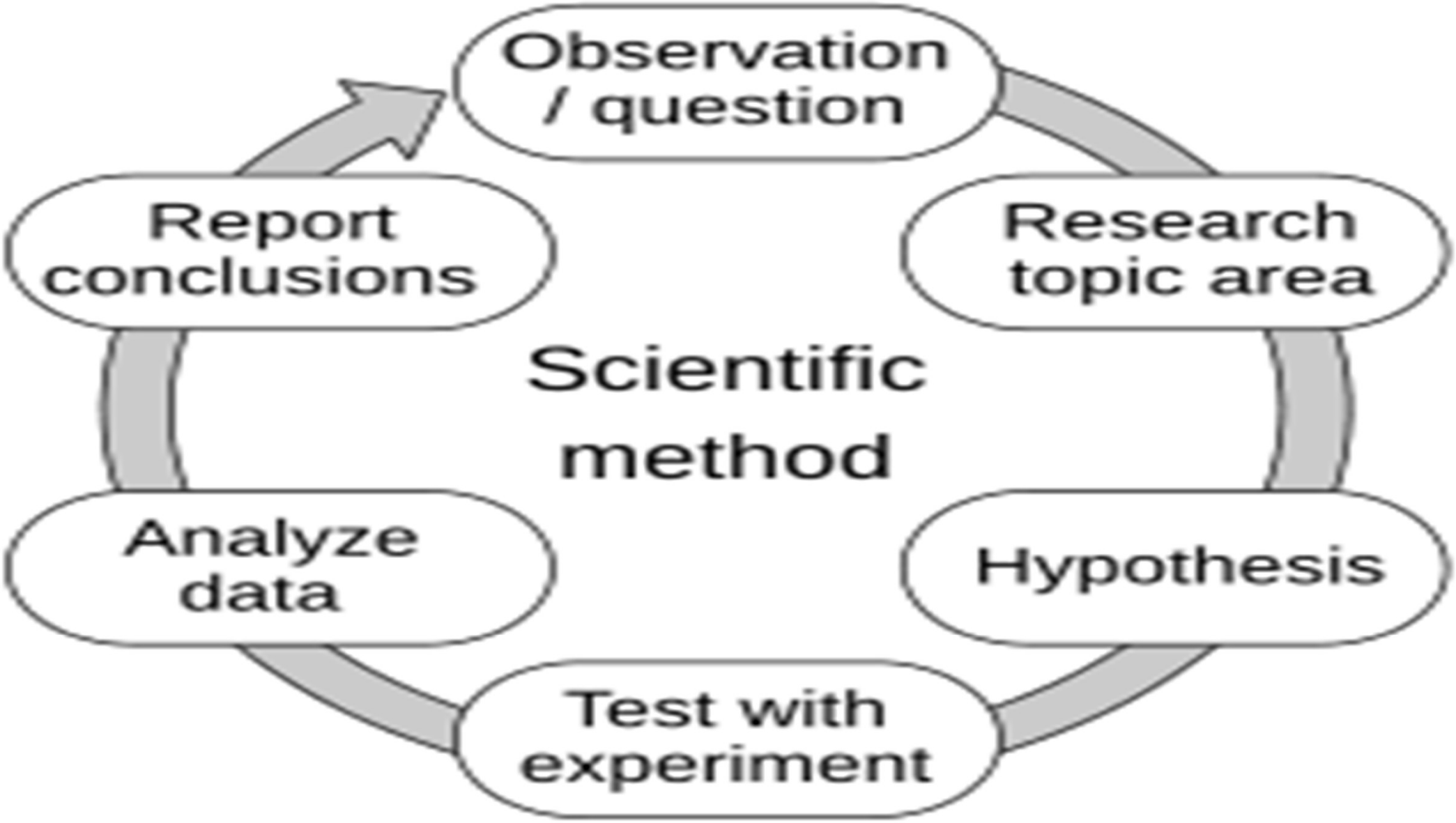
Reliable science must adhere to core rigorous standards:

- **Systematic and Logical:** It follows an orderly methodology where each step builds logically on the previous one.
- **Empirical and Objective:** Conclusions are based on verifiable data and physical evidence rather than personal opinions or feelings.
- **Falsifiable:** A sound hypothesis must be testable and capable of being proven wrong.
- **Reproducible:** Other researchers must be able to follow the same methods and achieve consistent results.

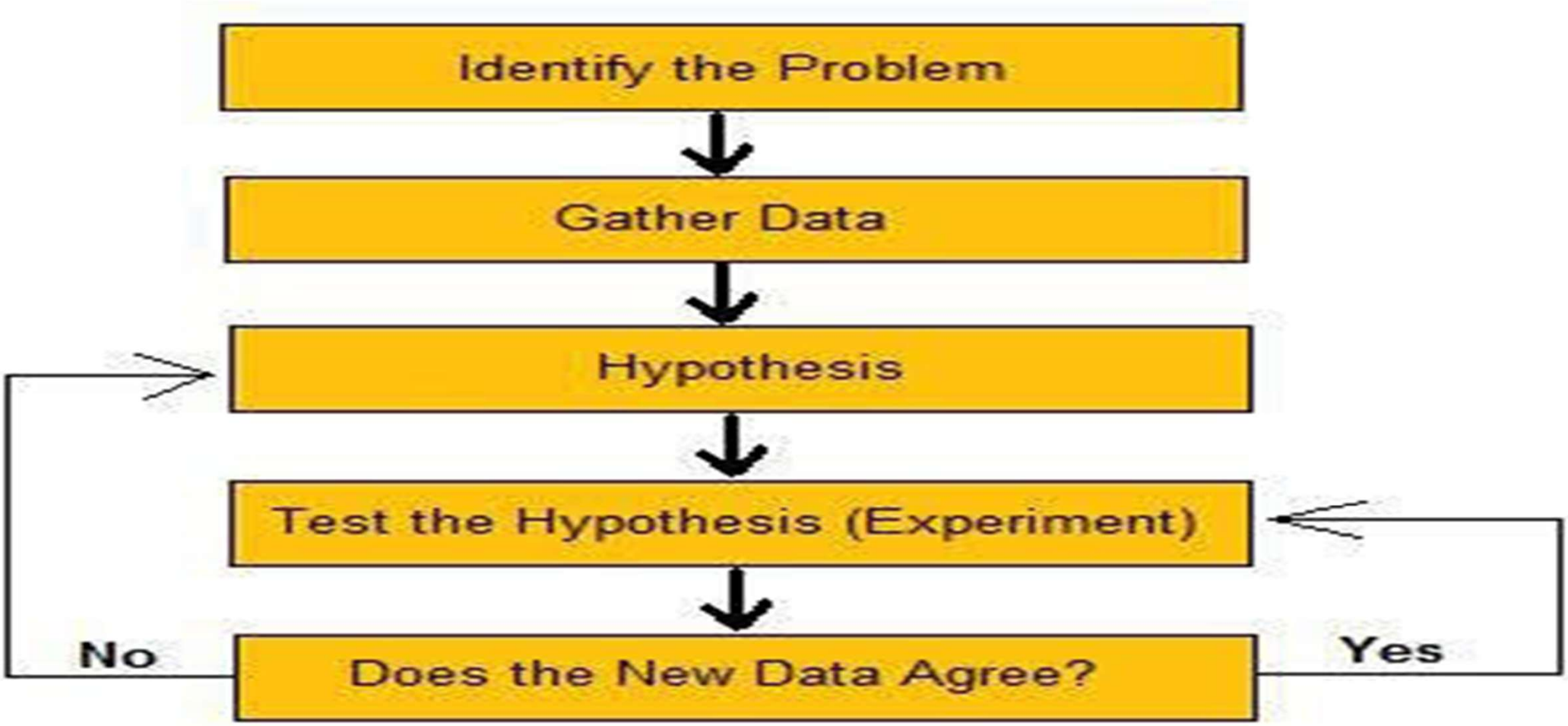
Trustworthiness for the Public.. Questions we should ask more often ?

For a non-expert, good science is recognisable by:

1. **Peer Review:** Findings have been scrutinized by independent experts **before** publication.
2. **Self-Correction:** The scientific community constantly questions its own findings and updates them as new evidence emerges.
3. **Useability:** Quality research is actionable and expressed in language that can reach both specialised and non-research audiences.


Observation / question
Research topic area
Hypothesis
Test with experiment
Analyze data
Report conclusions
Scientific method

Or another way of looking at it



Trust in Science –the historical perspective

The history of trust in science is complex and has evolved significantly over time , particularly with:

- The establishment of formal scientific institutions,
- The rise of political polarization,
- High-profile global events like pandemics.

Trust in Science : Historical Foundations

- **Antiquity to the Scientific Revolution:** Specialised knowledge commanded a degree of respect. In antiquity, experts in mathematical based sciences (astronomy, optics) were recognized for their unique skills.

- **The Scientific Revolution and the Age of Enlightenment** in Europe laid the groundwork for science as a source of authoritative, universal truths.

- **The Role of Institutions:** A pivotal moment was the establishment of institutions like the **Royal Society in 1660.** This era emphasized empirical evidence and organised skepticism, where experiments were witnessed by peers to ensure trustworthiness.

This peer review process developed as a cornerstone of modern scientific credibility.

Modern Era and Fluctuations

- **Post-WWII Stability:** For most of the late 20th century, especially in the United States and West , trust in science remained relatively high and stable compared to other institutions like the government or media.

- **Factors Influencing Trust:** Historically, trust has been heavily influenced by perceptions of a scientist's expertise and moral integrity, though these can be reduced if a scientific claims conflict with an individual's pre-existing beliefs or worldviews.

Challenges and Polarization: Trust in science has faced various threats over time:

Historical Misconduct: Science's fraught history with racism and unethical experimentation on non-white human subjects has led to a warranted lack of trust in some communities.

Manufactured Doubt: Certain industries (like tobacco and fossil fuels) have actively worked to manufacture skepticism about scientific findings that threaten their commercial interests, often by raising doubt about established facts (e.g., climate change// public health).

Attempts to deny delay/discredit settled science

Tobacco industry –links with lung disease. Denied lied and delayed

Carbon based Energy sector (oil /coal/gas) – Climate change /breakdown… as above Exxon ! US coal industry . Deny then delay.

Pharmaceuticals — do not always publish / conceal negative data. / hide side effects/ pay for sales.

Creationists / **eugenicists** conflicts with ‘faith/political’ position may fund research set up(pseudo) institutes

Challenges to Trust 2

- **Political Polarization:** In recent decades, particularly since the 1990s and drastically since 2018 in the U.S., political ideology has become a major predictor of trust in science. This has created a significant gap between liberals and conservatives in their general trust in scientific institutions.
- **Global Crises:** COVID-19 highlighted the importance of trust in science for collective problem-solving (e.g., mask-wearing, vaccinations) but also led to a dip in trust in some countries. which has since started to recover. The changing nature of scientific information (as new discoveries are made) was sometimes perceived as a lack of integrity rather than an inherent part of the self-correcting scientific method.

Trust in Science –recent research data–2025

A 2025 international study on public trust in science, conducted across 68 countries, has found that most people trust scientists. Additionally, a majority of survey participants expressed the belief that scientists should play a greater role in policymaking.

Published in Nature Human Behaviours, this research was conducted by TISP, a Harvard University-based consortium led by Dr Viktoria Cologna (Harvard University, RTH Zurich) and Dr Niels G Mede (University of Zurich), which includes 241 researchers from 169 institutions worldwide, including the University of Bath.

The study, which includes 71,922 respondents—2,008 of them from the UK—provides the largest global dataset on trust in scientists since the COVID-19 pandemic.

Key Findings

Widespread trust: Across 68 countries, the study finds that a majority of the public have relatively high trust in scientists

Majority also perceive scientists to be qualified (78%), honest (57%), and concerned about people's well-being (56%).

- **Desire for scientists' engagement:** A large majority (83%) agree that scientists should communicate science with the public. Only a minority (23%) believe that scientists should **not** actively advocate for specific policies. 52% believe that scientists should be more involved in the policymaking process.

Factors that typically impact on trust in science 1.

Education Higher education generally correlates with higher trust, less consistent globally than U.S..

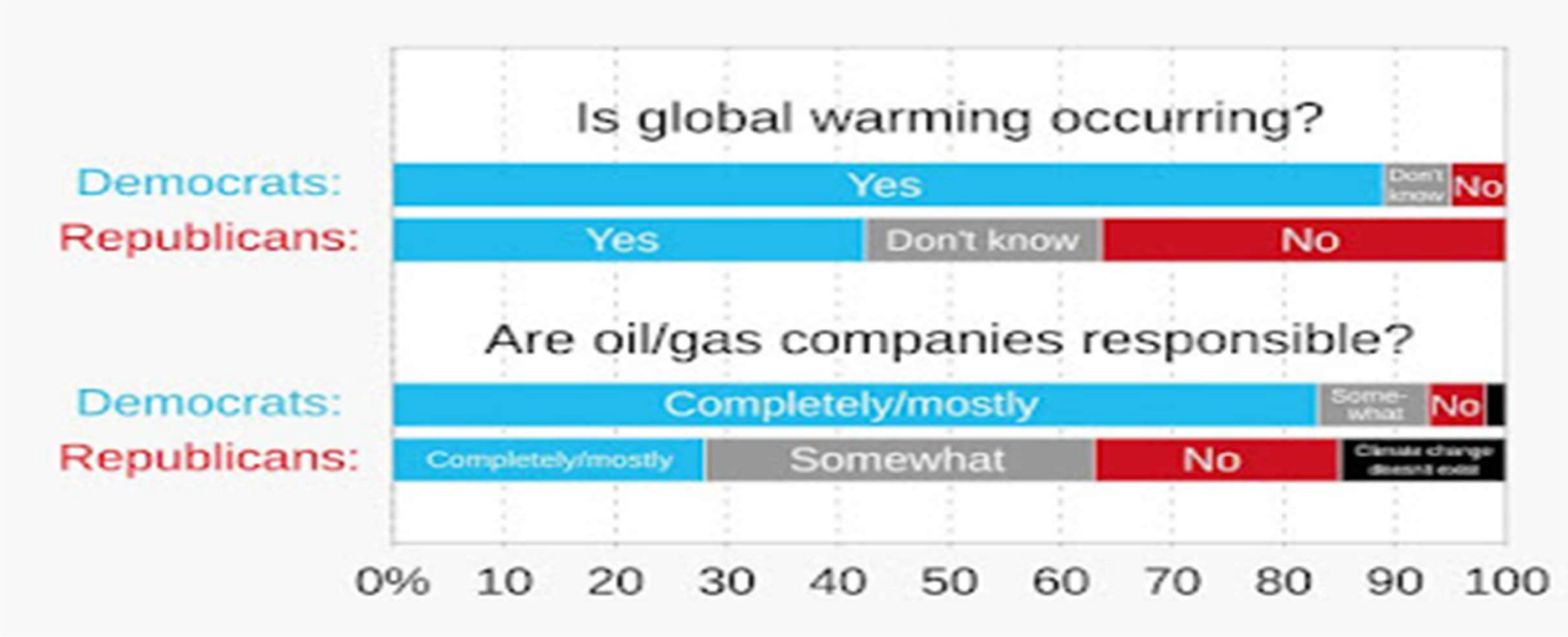
Religiosity: Positive correlation globally (especially in Muslim-majority countries), but sometimes negative in certain Christian contexts where science and faith are viewed as in conflict.

Political Alignment Conservative orientation (small c) is linked to lower trust in North America and Europe, but this pattern is not seen globally.

Factors affecting trust. 2

- **Scientific Field** Natural sciences (STEM) are more trusted than social sciences or economics.
- **Social Influence:** People are more likely to trust facts that align with their social community's values rather than objective data alone.

And this might be an example—of US trust level– correlation



Trust in Science : Global Rankings

- Most Trusted: Egypt topped the list, followed by India, Nigeria, Kenya, and Australia.

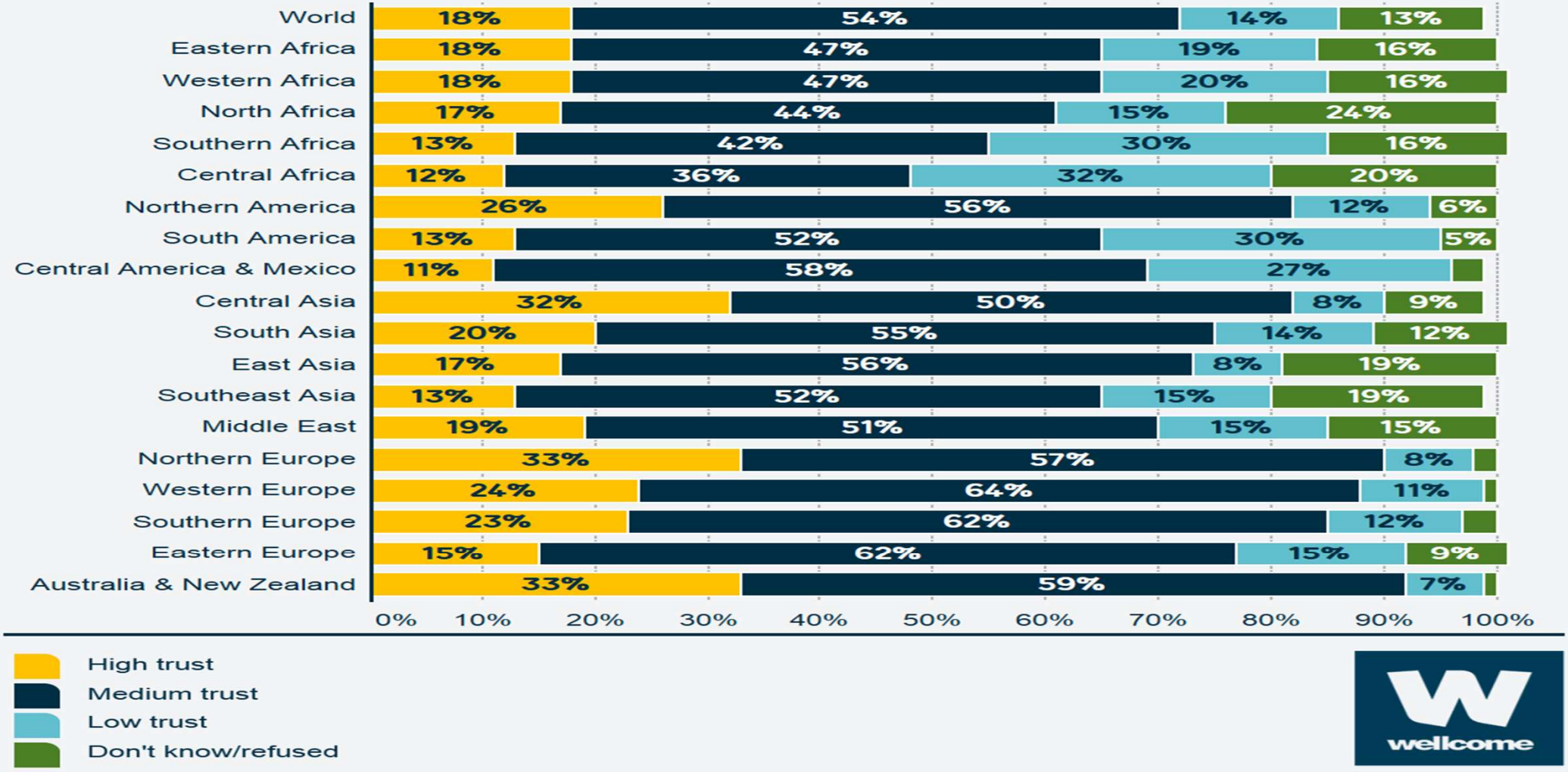
- Middle : The UK ranked 15th, three spots behind the US, but ahead of Canada (17th) and Sweden (20th).

- Least Trusted: At the bottom, Albania ranked 68th, followed by Kazakhstan (67th), Bolivia (66th), Russia (65th), and Ethiopia (64th).

Chart 3.1: Trust in Scientists Index showing levels of trust by region

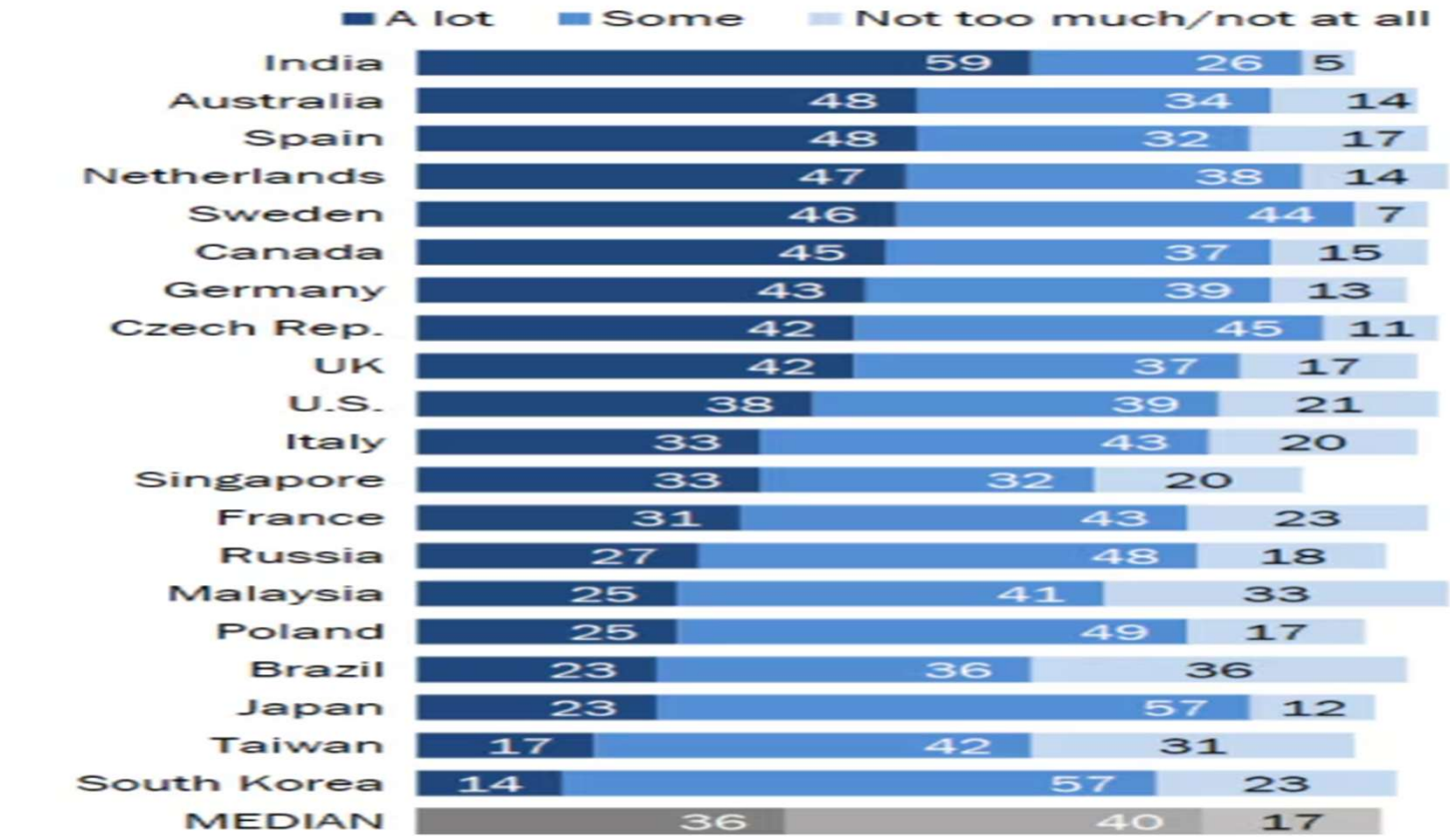
Percentage of people who answered 'high trust', 'medium trust' or 'low trust'

Wellcome Global Monitor Trust in Scientists Index



Majorities have at least some trust in scientists to do what is right

% who say they have _____ trust in scientists to do what is right for (survey public)



Note: Respondents who did not give an answer are not shown.
Source: International Science Survey 2019-2020. Q2d.
"Science and Scientists Held in High Esteem Across Global Publics"

PEW RESEARCH CENTER

...UK data.....local findings

Source: Dr Eleonora Alabrese, an economist from the **University of Bath, collected responses for part of the UK sample. She said:**

The UK has a generally high level of trust in science, ranking above many European countries, including Denmark, Germany, Sweden, and Belgium.

Trust in scientists is higher among women, older individuals, and those with more education.

Interestingly, a conservative political orientation is linked to lower trust in science in North America and parts of Europe. However, this pattern does not hold globally, suggesting that the political leadership may influence such attitudes in different regions. AND —-------

— UK lead researcher comment/conclusion

Dr Eleonora Alabrese said:

'While trust in science remains generally high, even a small decline in trust from a minority could influence how scientific evidence is used in policymaking.

These findings are crucial for scientists and policymakers working to maintain public trust in science.'

A current example – micro /nano plastics, what when the science isn't settled

- Agreed they are found everywhere in the wider environment including inside us
- BUT –some research suggested and reported they were found in our cells -- brains /placentas and testicles. A plastic spoons worth in our brain?!!
- Some leading researchers now cast doubt that there is strong evidence for this 'inbody' pollution –or that there is evidence **CURRENTLY** that it is detrimental or not to health
- Seems to be there is a problem with technology to count and record – false positives?
- Exploited by commercial interests, lobby groups and scientific sceptic 'bandwagon jumpers '

Microplastics... a sorry outcome.

Some are/ were intentionally added by manufacturers — cosmetics// body scrubs.

Some result from breakdown of larger items , –bottles,packaging.

Fears have increased for both the environment and people

Many new researchers entered field — exciting and new –a sort of science goldrush

Prestigious journals published papers – picked up by science journalists .. then mainstream media , then tabloids/ social media

Jumped on by plastics/petrochemical industries to undermine the proposed UN plastics treaty

Microplastics 2— a cautionary tale

Then came a steady drip of criticism from other more sceptical scientists– a pattern emerged of researchers questioning the validity of their findings.

Seems that scale is the problem -microplastics are tiny –nanoplastics even harder to analyse—- seems the measuring technology and protocols may not have caught up with new research –seems they were sometimes learning on the job and that some results were likely false positives –as more established researchers pointed out.

A number of journals then pointed this out – into the scientific and then mainstream media —- **QED less trust in science!**

Resulting in

A spoonful of plastics in your brain headlines— quote picked up by usually trusted media sources from

Guardian / Times / i/ CNN / New York Times/Nature.

My own A I (gemini) search brings these up as (trusted) sources without a critical look at the science.

Bias in Science –our own, publishers, and researchers

From Rod Liddle –Sunday Times – about recent 2 well publicised studies. Using the Micropastics debate

Studies commissioned by (progressive) university depts to prove what they already believe. Finessing data gently to fit the idea.

When research is found to be fraudulent or flawed– (eg climate change) lept upon by sceptics with other agendas.(eg UEA)

More so with increasingly polarised old and new media **we tend to line up behind whichever expert best aligns with our point of view and consider the rest to be mistaken or malevolent**

So—--

So maybe

– Are people only experts if they agree with us ?

So

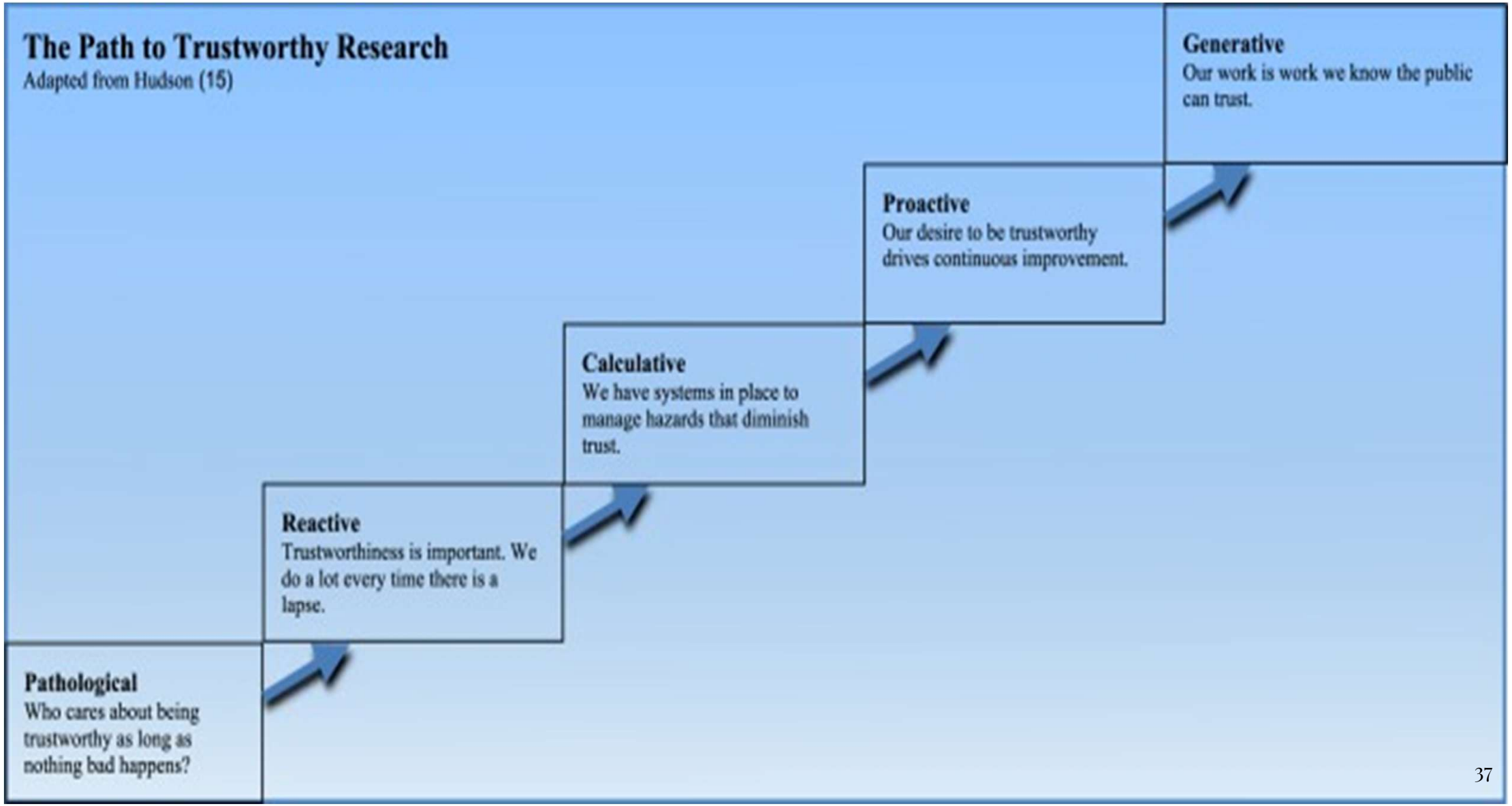
– Scientists should try everything they can to disapprove their theories rather than simply look for evidence that supports them'–

This principle is known as **falsifiability**, a cornerstone of the modern scientific method popularized by the philosopher **Karl Popper**.

The core of this idea is that a theory can never be definitively "proven" true—no matter how much evidence you gather—but it can be proven **false** with just one contradictory observation.

So what is to be done ? For Scientists & Institutions:

- Transparency & Integrity: Be honest, acknowledge errors, share data openly and promote research integrity.
- Engagement: Involve the public as co-creators, not just recipients, and connect science to relatable, real-world values (e.g., climate to crop yields).
- Clear Communication: Avoid complex jargon; use accessible language and variety of media and presenters. What is received NOT what is said.
- Humility: Acknowledge uncertainty, avoid "follow the science" simplicity, and show genuine empathy for public concerns.
- Address Internal Issues: Tackle hyperspecialization, publish-or-perish culture.


The Path to Trustworthy Research
Adapted from Hudson (15)
Pathological
Who cares about being trustworthy as long as nothing bad happens?
Reactive
Trustworthiness is important. We do a lot every time there is a lapse.
Calculative
We have systems in place to manage hazards that diminish trust.
Proactive
Our desire to be trustworthy drives continuous improvement.
Generative
Our work is work we know the public can trust.

For Policymakers:

- Support Independence: Protect science from political/economic agendas.
- Nuance & Transparency: Be open about uncertainties when developing policy but demonstrate how knowledge gaps are to be addressed.
- Collaborate: Deepen engagement (talk AND listen)with wider public and experts.--not just the influential.

Key Strategies: must include…motherhood and apple pie?

- **Education:** Boost digital and scientific literacy.
- **Collaboration:** Build coalitions across sectors (public, private, civil). Less silos!
- **Values :** Connect scientific goals with shared societal values.

By focusing on these interconnected areas—integrity, communication, engagement, and policy—trust in science can be better fostered and maintained.

For the Public: That's us !

- Stay Curious: Ask questions and seek reputable sources.
- Understand the Process: Recognise science evolves and isn't always a perfect consensus.
- Engage: Participate in conversations and help shape research priorities.

What might **we** do when we have doubts

- Challenge when settled science is being denied– ask what is the evidence ..where did they see it. You might be wrong !
- Be aware of our own — and others – paymasters / researchers motivations and our and their world view
- Like art –ask who commissioned the research/ painting and why. academia/ commerce/faith.
- What is the source of the story ? What wider agenda // ask are they perhaps promoting /grinding
- Be suspicious of online 'influencers' — where sources are not linked/stated/checkable.
- Be more sceptical of pseudoscience in adverts – beauty/wellness/ pharma/dental.

That's all from me !

For further thought and discussion.

Thanks to Ken, Malcolm and Tony for their input