Is Science Apolitical?

(and can that be even possible?)

Marco Baity-Jesi

Why do we do Science?

According to Einstein

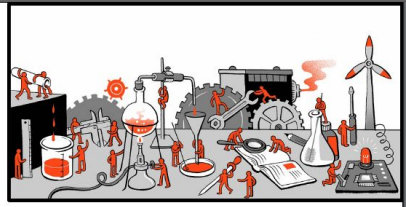
[Principles of Research, address by Albert Einstein (1918) (Physical Society, Berlin, for Max Planck's sixtieth birthday)]

- Status
- Fun
- Curiosity

Why do we do science?

Einstein's opinion (paraphrased):

- **Curiosity** about the bigger picture
- **Fun** solving problems
- Social **status**



For physics, a decent description.

Why does society want us to do science?

+ Extend knowledge of humanity
+ Improve our lives
- Profit
- Military
- Surveillance

} Power

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For UMik scientists (my talk on 24/05/2022)

- To have a positive impact on the world and society

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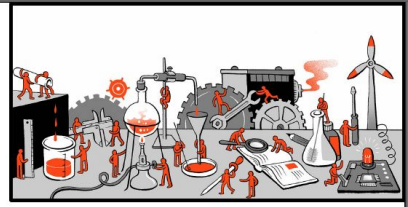

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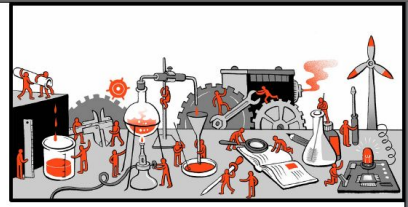

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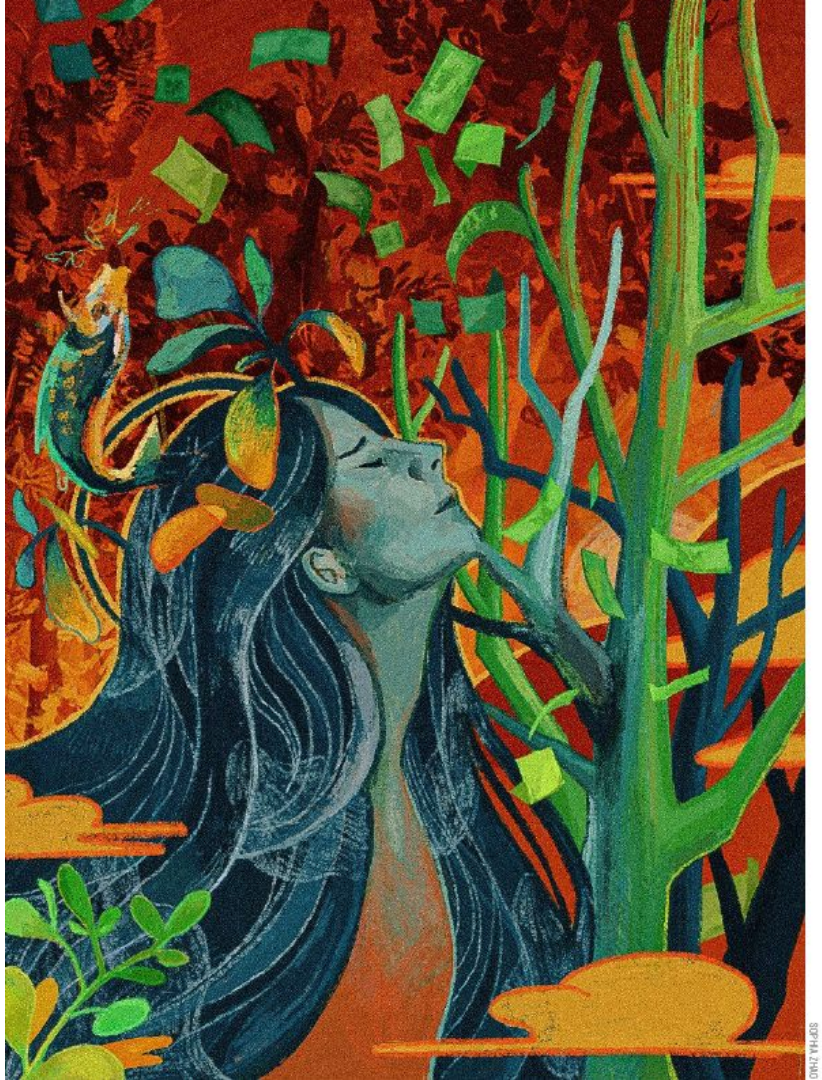
In Practice

Science is very time- and resource-consuming.
We can only afford to do it **because someone pays for it**.

Outline

- What should our Science look like?
- What does our Science look like?
- A Radical Analysis of Science
- What can we do as Scientists



What should our Science look like?

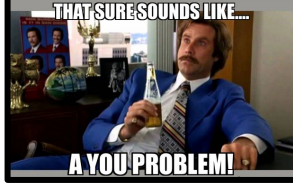
For a “political” science

Scientist point of view
Science as a force of good

Funders point of view

- Create technology, be economically & geopolitically more competitive
- Serve the forces which the government represents (industry, workers, lobbies, ...)

People's point of view:
- Improve life quality
- Protect people's interests



“Science as a Tool” Narrative

Science is **just a tool**, it is knowledge, and as such can be both good and bad, but this is **not the scientists’ responsibility**.

R. Feynman: Science is “an enabling power to do either good or bad—but it does not carry instructions on how to use it.”
Richard Feynman, “The Value of Science,” Engineering and Science 19, no. 3 (December 1955): 13.

“Despite a few bad apples—fraudulent research, scam journals, or a poorly designed study—**science withstands systematic critique** and serves the public good.”
Helen Zhao (describing the “Science as a tool” narrative), Science for the People, Volume 22, Number 1 (2019)

Attractive narrative: *do whatever we want, consequences are others’ responsibility.*

R. Feynman, “*The first principle is that you must not fool yourself — and you are the easiest person to fool.”*
Richard Feynman, *1974 Caltech commencement address*

The “Honest Broker” narrative (Pielke Jr, Roger A., 2007.)

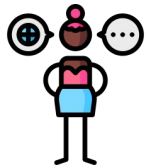
- Empowering Stakeholders. We do not want a technocracy where scientists decide. The government should take the choice.

- Scientific results are more credible if the scientist does not openly state their political opinion.

- Collaboration is easier if political divergences are set aside.

Divergences on how Science should be. But how is it?

I will argue that neither is true in the present world:



Against Apolitical

Science is intertwined with politics, and it has always been.
“Apolitical” vision supports a specific political agenda.

Against Political

Science is not political for the reasons we would like it to be.
We can analyze which interests it serves in its current form.

What does our Science look like?

Science is non-neutral because of…

Its essence

- **Empirical**
- Pursues utility
- **Incompleteness**
- Ideology
- Positivism vs Constructivism
- Not incontestable
- Our way of dealing with uncertainty
- Tradeoffs and limitations of the scientific method

The system which supports it existence

- Historically influenced
- **Biased topic selection**
- **Incentives toward low quality**
- **Flawed narratives**
- Narrowness
- Reproduces/reinforces inequalities
- Responds to political/societal pressure
    - Individuals, Institutions and Entire Scientific Domains are influenced by political agendas

Its application

- Historically influencing
- Instrument of power
- **Crimes in its name**
- **Reproduces/reinforces inequalities**
- Responds to political pressure
- Manipulated to serve specific objectives

Note 1: each of these points does not apply to every field/aspect of Science.
Note 2: by Science we mean a method/institution which was accepted mainstream at some point in history (pseudoscience does not fall into the category but wrong institutional science does).

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Empirical

- Bound by our perception of reality.
- Models are approximations used for interpretation. Theory is approximation of reality.
- Winning theory is the one that:
    - Predicts best
    - We can understand best
    - Confirms our personal biases

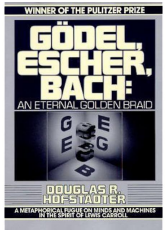
Interpretative Flexibility

Scientific findings or technological artifacts can be interpreted and understood in different ways by various social groups, depending on their perspectives, interests, and contexts

Incompleteness

Gödels Theorem

No formal system can prove everything. Science cannot achieve everything. Alternatives are needed.

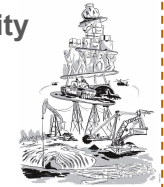


Science is non-neutral because of…

Biased Topic Selection

- Who controls the money controls which science is done
- Active vs passive evidence
- Science that matters

Incentives toward low quality



- Competition
- Speed
- Too much publishing (commodification of the h index)
- Visibility
- Sellability (*e.g.* praising positives)
- Economic pressure

The system which supports it existence

- Historical
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  - Individuals, Institutions and Entire Scientific Domains are influenced by political agendas

Flawed Narratives

- Physiognomics. Assessing personality based on facial features
- Homosexuality genes. Several flawed arguments, which at the time were widely accepted

  Elizabeth Allen et al., "Against 'Sociobiology'," in *Science for the People: Documents from America's Movement of Radical Scientists*, ed. S. Schmalzer, D. S. Chard, and A. Botello, (Amherst: University of Massachusetts Press, 2018), 94-98. [reprint of the 1975 paper]
- Geoengineering. Oversimplification of a complex system, neglection of chaos, in-silico models ignore "the social and geopolitical impacts of simulated technologies"

Science is non-neutral because of…

Crimes in its name

- Forced sterilizations in Puerto Rico
- USA Opioid crisis
- Mauna Kea Observatory

Ethan Siegel, "How The Thirty Meter Telescope Is Changing Astronomy and Politics", Science for the People, Vol 23, no 1, Science Under Occupation

Reinforces Inequalities

Underrepresentation in clinical trials

Regitz-Zagrosek, Vera, and Catherine Gebhard. "Gender medicine: effects of sex and gender on cardiovascular disease manifestation and outcomes." *Nature Reviews Cardiology* 20.4 (2023): 236-247.

Gender bias in science

"Unequal gender representation in the scientific workforce may be explained not by differences *in* gender, but by differences in access to resources *between* the genders"

"Equality for Women in Science," in *Science for the People: Documents from America's Movement of Radical Scientists*, 114-116.

Industrial Zoning

Climate Change Impact

Its application

- Historical
- Instrument of power
- **Crimes in its name**
- **Reproduces/reinforces inequalities**
- Responds to political pressure
- Manipulated to serve specific objectives

A Radical Analysis of Science

Threats related to Science

- Climate change & all other planetary boundaries and local environmental threats
- Militarism (the ideology supporting that complex problems can simply be solved through war)
- Oppression & Social inequality
- Geoengineering
- Surveillance
- (Neo)colonisation
- Extractivism
- …
- Knowledge Winter

The Ivory Tower

Scientists should limit themselves to finding evidence

Thoughts on the impact of their labor on the world should be delegated

- Disenfranchises scientists,
  deprives them of critical thought
- A scientist disconnected from reality
  cannot be an expert about reality
- Scientist as a soldier
  who does not discuss orders

Radical vs Liberal Critique of Science

Liberal Analysis of science

Few bad apples. Call them abuses/misuses of science. Done. #notallmen #bluelivesmatter

The “few bad apples” approach does not analyze, but rather *postulates* that any malfunction is a fluke.

Radical Analysis of science

Holistic view. “**Historicized analysis of the structural causes** of technological and ideological “misfires” as expected downstream consequences of selective support for favored research questions, methods, models, and disciplines; of differential access among stratified groups to funding, training, and modes of communication”

Analyze the “**political entanglements** [...] among the applications, epistemic features, and material basis of science”

Helen Zhao, Science for the People, Volume 22, Number 1 (2019)

The Honest Broker

- Empowering Stakeholders. We do not want a technocracy where scientists decide. The government should take the choice.

- Scientific results are more credible if the scientist does not openly state their political opinion.

- Collaboration is easier if political divergences are set aside.

The (dis)Honest Broker

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The (dis)Honest Broker

Implicitly stating that being open about political opinions is dishonest

What about **private** incentives?
(in a world where billionaires are richer than states we do not want a plutocracy either)

- Empowering Stakeholders. We do not want a technocracy where scientists decide. The government should take the choice.

Only applies in a **fully democratic world** where all individuals are equally represented and protected in all regions

Scientists are stakeholders too, so it is their right to advocate. And they should advocate stronger if they know well the subject matter

- Scientific results are more credible if the scientist does not openly state their political opinion.

We all have our political opinions, this is just **lack of transparency**

We do not advocate for **lying** about the truth

Not having a political opinion is just **yet another political opinion**

Trust in science actually increases with scientists' engagement

It is not about credibility, but about **power**. Scientific findings get manipulated all the time. There always is a scientific work which justifies anything

- Collaboration is easier if political divergences are set aside.

But we are actually in an **ultracompetitive system** which is all but collaborative

Ideology that we cannot **collaborate despite divergences**

The Honest Issue Advocate

F. Doucet, Why Not Honest Issue Advocates? The Honest Broker: more than meets the eye (2021)

“Who wins, and who loses, when scientists claim a unique ability to operate free from politics?” Audra J. Wolfe, Freedom's laboratory: The Cold War struggle for the soul of science (2018)

Everyone has a political stance, be it supporting the current balance of power, being critical of it, or more

By pretending we are neutral, we are creating a **false perception** of ourselves as scientists, and we can push our agenda in an untransparent way

Anti-science movements are thriving because of a **science-establishment binome**

Nichols, T. M. The Death of Expertise: The Campaign against Established Knowledge and Why It Matters. (Oxford University Press, New York, NY, 2017).
Oreskes, Naomi, and Erik M. Conway. "From anti-government to anti-science: Why conservatives have turned against science." Daedalus 151.4 (2022): 98-123.

More **engagement by scientists** would increase trust in Science

V. Cologna et al 2021 Environ. Res. Lett. 16 024011, Majority of German citizens, US citizens and climate scientists support policy advocacy by climate researchers and expect greater political engagement

What we can do as scientists

Ask questions

Science as an instrument. Think about the objective of science.

Why do I want to do science? Am I serving this purpose?

Science as a workplace.
Am I shaping it in the way that I would like society to be?

Science as a service for the people.
Is society making good use of my (and others') Science?

Ask questions

Science as an instrument. Think about the objective of science.

Why do I want to do science? Am I serving this purpose?

If Science is not serving the purpose I do it for, my findings are meaningless

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Am I shaping it in the way that I would like society to be?

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Advocacy

- **You are not a mere instrument**
  As citizens with technical expertise, scientists should advocate for people's rights

- **Debate, Communicate, Unionize**
  Part of being an intellectual is talking and having the right to express oneself

- **Prevent a Knowledge Winter**
  People don't trust Science anymore because it was historically used against them. Gain their trust by showing Science is on their side

Civil disobedience by scientists helps press for urgent climate action

Stuart Capstick, Aaron Thierry, Emily Cox, Oscar Berglund, Steve Westlake & Julia K. Steinberger

Nature Climate Change **12**, 773–774 (2022) | Cite this article

29 Citations | **1579** Altmetric | Metrics

Time is short to secure a liveable and sustainable future; yet, inaction from governments, industry and civil society is setting the course for 3.2 °C of warming, with all the cascading and catastrophic consequences that this implies. In this context, when does civil disobedience by scientists become justified?

Civil disobedience needs scientists

The trusted position of scientists in society affords a respected standpoint from which to demand change; for this reason alone, their participation is valuable as part of social movements. At the same time, the credibility of scientists is influenced by whether they are seen to be acting in line with shared values and promoting the well-being of others[11] and, in the context of climate change, according to whether their actions clearly align with their message[12]. More generally, studies on social influence and leadership show that particular meaning and purpose tends to be ascribed to conduct that incurs personal costs (for example, risk or discomfort) when carried out with the intention of advancing collective goals[13].

Who should stand for good science,
if not scientists themselves?

Disclaimer [this slide was not in the talk]

After the talk, some people came to me, to justify why they do not take action.

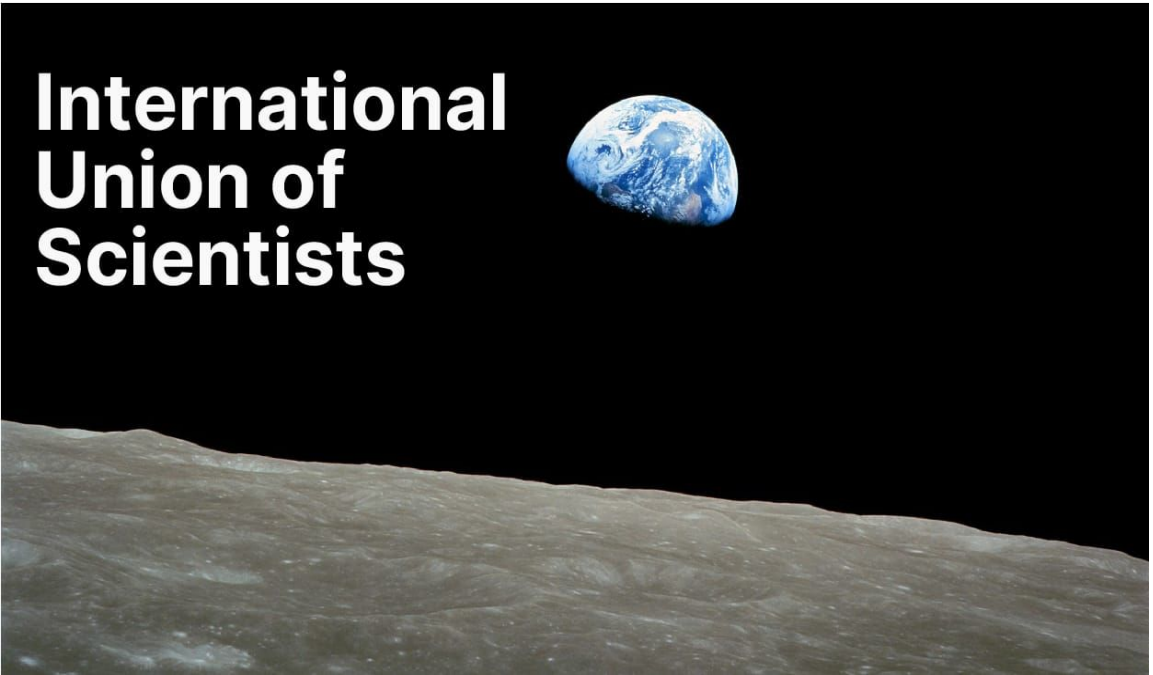
We all lead different lives, with varying levels of energy, circumstances, and motivations. Life is undeniably complex, and it's essential that we avoid judgment—both of ourselves and others. My goal is to inspire and seek support, not to put pressure on you.

If you realize that your research could potentially conflict with your values, **I am not asking you to abandon your research**.

If your energy is devoted to other aspects of life—whether caring for a child, a parent, or simply preserving your well-being—**I am not asking you to act**. I fully understand that activism can be incredibly demanding, often leading to burnout and emotional strain.

What I am asking for is support. Support for those who choose to step forward and engage selflessly, those who put their mental health, jobs, relationships, and sometimes even their safety on the line for the vision of a better world. Your understanding and encouragement mean more than you know.

IUS **I**nternational **U**nion of **S**cientists Against Militarism and the Destructive Use of Science and Technology



From IUS webpage:

*"To **oppose militarism in all its manifestations** will hopefully become a **dominant preoccupation of scientists** and others, indeed for everyone with a global conscience, to motivate them to feel that they must act responsibly in light of such developments that cloud the present and pose dire threats for the future."*

Science for the People

A movement born in 1969, arguing that science should be at the service of the people (instead of for war, for profit, …)

From SftP webpage:

Science can, and must be a positive force for humanity and the planet

We are an organization of scientists, workers, educators, and activists dedicated to building a bottom-up social movement with radical perspectives on science and society.

From Jacobin Magazine:

[...] criticize and challenge **the use of their work for violent and oppressive ends**. From its enduring polemic against the latest variants of biological determinism to its critiques of weapons research and military funding on college campuses — and much more — *Science for the People* became an institution of radical thought and political struggle for its members and subscribers

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In Zurich:

We are setting up a Science for the People, Zurich Chapter in 2025

Reach out to me if interested :)

Science for the People

A movement born in 1969, arguing that science should be at the service of the people (instead of for war, for profit, …)

More groups in Zurich:

- Science Is Political (ETHZ students) @ethzscienceispolitical
- ETHics (on AI ethics)

In Zurich:

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Reach out to me if interested :)

Science can, and must be a positive force for humanity and the planet

Further resources

Capstick, S., Thierry, A., Cox, E. *et al.* **Civil disobedience by scientists helps press for urgent climate action**. *Nat. Clim. Chang.* **12**, 773–774 (2022). https://doi.org/10.1038

Naomi Oreskes; **What Is the Social Responsibility of Climate Scientists?**. *Daedalus* 2020; 149 (4): 33–45. doi: https://doi.org/10.1162/daed_a_01815

J. E. Kotcher, T. A. Myers, E. K. Vraga, N. Stenhouse & E. W. Maibach (2017) **Does Engagement in Advocacy Hurt the Credibility of Scientists? Results from a Randomized National Survey Experiment**, Environmental Communication, 11:3, 415-429, DOI: 10.1080/17524032.2016.1275736

Cyranoski, D. **Japanese scientists call for boycott of military research**. *Nature* (2017). https://doi.org/10.1038/nature.2017.21779

Richard A. Falk's Keynote at **International Convention Against War and Destructive Use of Science: Scientists Against Israeli Apartheid, Occupation, and Genocide in Gaza,** https://youtu.be/-klb-NhVHiQ?feature=shared

Anne E. Urai, Clare Kelly (2023) **Point of View: Rethinking academia in a time of climate crisis** eLife 12:e84991. https://doi.org/10.7554/eLife.84991

Bethanie Carney Almroth et al., **Obstacles to scientific input in global policy**. Science 380, 1021-1022(2023). doi:10.1126/science.adi1103

Caitlín Doherty, **Simply Demanding Trust in Experts Won't Cure Vaccine Skepticism**, Jacobin 04.24.2021 https://jacobin.com/2021/04/science-skepticism-covid-vaccine-skeptics-antivax-big-pharma

Mahmoud A., Ali A., and Jenen H., **Science under Occupation**, Science for the People 10 Oct 2023, https://magazine.scienceforthepeople.org/online/science-under-occupation/

Trent McDonald and Jewel Tomasula, **STEM Organizing in Waves: A Macro and Micro View**, https://magazine.scienceforthepeople.org/labor-special-issue/stem-organizing-in-waves/

Archishman Raju, **Science and Imperialism: Scientists as Workers for Peace**, Volume 25, no. 3, Killing in the Name Of, https://magazine.scienceforthepeople.org/vol25-3-killing-in-the-name-of/science-and-imperialism-scientists-as-workers-for-peace

Are Smart People Ruining Democracy? | Dan Kahan | TEDxVienna

Kahan, Dan M., Ellen Peters, Erica Cantrell Dawson, and Paul Slovic. "Motivated numeracy and enlightened self-government." Behavioural public policy 1, no. 1 (2017): 54-86.

The myth of apolitical science https://www.science.org/doi/10.1126/science.aav4900

One Foot in, One Foot out https://journals.sagepub.com/doi/abs/10.2190/NS.18.2.c

Yes, Science is political https://www.scientificamerican.com/article/yes-science-is-political/

Extra Material

Famous Relatable Examples of Science being Political

- Climate denial [science evidence is dismissed and lobbied against]
- Machine learning [revolutionized labor (services & data mining)]
- Human brain project [failure consuming billions of public money]
- Manhattan project [development of atomic bomb]
- Medication [trade-off with side effects, relationship with death]
- Drones [revolutionizing warfare and objection of consciousness]
- Physiognomics [science used to justify oppression of minorities]
- Blockchain [bitcoins shaped modern culture]
- Gender science [only men's metabolism was studied]
- Genetically modified crops [biodiversity impoverishment and labor]
- Sci-Hub [knowledge as commodity *vs* as common good]

My next talk

- This same talk, with a historical perspective
  Trace the roots of the belief in science as an apolitical endeavor, examining periods such as the Cold War when scientific neutrality became a strategic and ideological priority. By delving into case studies, from climate science and public health to nuclear research and space exploration, we will reveal how science has both influenced and been shaped by political agendas.

- Logical fallacies

- Logical fallacies (with examples from the science-politics discourse)

- Any of the flashed topics more in depth

Some personal thoughts

We should liberate ourselves from this false association that only a neutral science can be good.

This wrong association often makes scientists react with fragility when the non-neutrality of science is exposed.

You could argue that one day, far in the future, Science could be ideal and apolitical. That day, I fear, will not come, because the world will be doomed by inequality, militarism and climate change, after we ignored to acknowledge the political implications of Science

Non-neutral because of its essence

Empirical

Scientific knowledge is empirical, so as the models used for interpretation. Any theory is an approximation of reality, and the theory that wins is (1) the most correct one, (2) the one that allows for the best interpretation, (3) the one that confirms our biases.

Example (1):

Newton’s laws of classical physics have a small bias. Special relativity shows that this bias becomes large for fast objects.

Example (2):

Example (3):

Pursues Utility

Utility is subjective.

Examples:

- Military is useful for many
- Advertising is useful for many

In my view, neither of them is useful.

Even thermodynamics was successful and pursued because it helped boost the industrial revolution.

Gödel’s Incompleteness

Incompleteness Theorem

- Discussed in main slides

Ideology

Ideology is a loaded word. But it simply means that it is a framework to interpret reality, to reach the truth.

I personally believe that Science is a good tool for truth. I do not think it needs to be the only one though.

- Some people think Science is the only way
  Example:

- Some people think Science is not a way to the truth
  Example:

One could argue that Science is as objective as one can get, but this does not make it objective.

Thinking that science is objective and can explain everything is an **act of faith**. Convincing people to have faith is a way of preserving power structures.

Positivism vs Constructivism

Positivism upholds the ideal of science as an impartial, fact-driven enterprise separate from political influence, while constructivism acknowledges that science is shaped by and contributes to social and political contexts.

While a positivist approach can be reasonable, the simple fact that a constructivist approach exists, makes a positivist approach non-absolute.

Furthermore, positivism is associated to dogma and human rights violations.

Incontestable evidence is rare

Science is based on doubt. Theories are only valid until proved wrong.

Often, evidence has big uncertainty.

Incontestable evidence is rare (impossible, if we stick to the book!)

Example

Theories become invalid when there is nobody anymore who understands them.

M. Planck: “A new scientific truth does not triumph by convincing its opponents, and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.”

Uncertainty in Scientific results

Statistical fluctuations have many sources.

We usually assume Gaussian fluctuations.

We only partially account for biases.

No unbiased way of dealing with unknown unknowns.

Tradeoffs of the Scientific Method

We create a model in our head, and then validate it empirically. But the model we created is based on our preconception of reality. So if our mind is not able to conceive something, it will always end up being biased.

Either we’re rigorous and mathematical, and detached from reality, or we find solutions that work but are not rigorous.

Assumes separation between observer and object.

Assumes falsifiability, but sometimes we cannot falsify.

Example

Economics

Non-neutral because of the system which allows it to exist

Historically Political

Scientific institutions exist because they allowed specific systems of power to thrive. Even if one may argue that now it is not so anymore, looking into the past suggests otherwise

- Science funded for military reasons since the beginning of times (Philip the Macedonian)
- Engineering as a science was pushed by the needs during the industrial revolution
- Anthropology and Geography to allow colonization
- Statistics to allow for war and tributes

Biased topic selection

We do the research that gets funded.

We do the research that someone says is useful (“Science that matters”), but how is *utility* defined?

Incentives toward low quality

Discussed in main slides

Flawed narratives

- Science=knowledge. Although Science can lead to knowledge, it is not the only way.
- Science as an ultimate good that can justify anything (pollution, land appropriation, vivisection, human torture)
- Science used to silence voices of underrepresented minorities
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Narrowness

Disciplinary knowledge often seeks fixes to systemic problems, neglecting the wider context.

Beautiful abstract from Levins and Lee Dunn:

“As radical health professionals, we have the triple identity of workers, of activists, and of intellectuals that creates the cauldron in which we live contradictory lives. We share the concerns of other workers for salaries, job security, health and safety at work, and work load. But like teachers and unlike most other workers we are not completely alienated from our work and have a stake in the outcomes of our labors that we are not always free to express or act on. As professionals, we share with our colleagues the intellectual curiosity about the origins of new infectious diseases, how racism exhausts the adrenals, or the egg-laying behavior of mosquitoes in polluted environments but may be in conflict with them around the need for universal free health care, or distorted priority given to molecular approaches to disease. We are partisans in institutions that feign neutrality. As activists, we are unwilling to accept the boundaries of “professionalism” and both learn from and offer our understanding to our communities of struggle. These three moments of our lives sometimes conflict but are also mutually enriching. There is no single formula for navigating this turbulent habitat but there is an array of options for avoiding burn-out and enjoying a life that is politically productive, intellectually challenging, and with lovely people.”

Levins, Richard, and Mary Lee Dunn. "One foot in, one foot out." New Solutions: A Journal of Environmental and Occupational Health Policy 18.2 (2008): 121-128.

https://journals.sagepub.com/doi/abs/10.2190/NS.18.2.c

Reproduces/reinforces inequalities (list from chatgpt)

Healthcare and Medical Research

- **Underrepresentation in Clinical Trials**: Historically, clinical trials have often excluded or underrepresented marginalized groups such as women, racial minorities, and the elderly. This has led to medical treatments and drugs being less effective or even harmful for those groups. For example, many early cardiovascular studies were conducted primarily on men, leading to diagnostic criteria that did not account for the different ways heart disease can manifest in women.
- **Access to Treatments**: The distribution of healthcare advancements is often skewed toward wealthier populations or regions, reinforcing health disparities. Treatments for certain diseases are more accessible in high-income countries, while lower-income regions may be neglected, exacerbating global health inequalities.

2. AI and Algorithmic Bias

- **Racial and Gender Biases**: Artificial intelligence and machine learning systems trained on biased data can replicate and amplify existing societal biases. For example, facial recognition software has been shown to be significantly less accurate for people of color compared to white individuals, leading to higher rates of false identification and potential wrongful arrests.
- **Algorithmic Discrimination in Hiring**: Recruitment algorithms designed to screen job applicants can perpetuate gender and racial biases if trained on data that reflects historical hiring disparities. This reinforces existing patterns of inequality in the job market.

3. Genetics and Eugenics

- **Historical Eugenics Movements**: In the early 20th century, the pseudoscience of eugenics was used to justify forced sterilization and discriminatory policies that targeted marginalized groups, including ethnic minorities and people with disabilities. These practices reinforced social hierarchies and systemic oppression under the guise of scientific improvement.
- **Modern Genomics**: While genetic research has advanced our understanding of health, the focus on certain populations in genomic studies can lead to inequalities in medical knowledge and treatment. The overrepresentation of European ancestry in genomic databases means that individuals from non-European backgrounds may not benefit equally from precision medicine and genetic counseling.

4. Environmental Justice and Public Health

- **Pollution and Industrial Zoning**: Scientific and industrial advancements have led to economic growth, but they have also contributed to environmental inequality. Industrial facilities and waste sites are often located in or near low-income and minority communities, exposing these populations to higher levels of pollution and associated health risks. The field of environmental justice has emerged to highlight how these scientific and industrial decisions disproportionately affect disadvantaged groups.
- **Climate Change Impact**: Climate change, driven by scientific and industrial progress, disproportionately impacts developing countries and marginalized communities that are less equipped to adapt. While wealthier nations can invest in mitigation strategies and infrastructure improvements, poorer regions face greater vulnerability to extreme weather, food insecurity, and displacement.

5. Technological Advancements and Digital Divide

- **Access to Technology**: While technological progress has led to widespread benefits, it has also highlighted and widened the digital divide. Communities with limited access to high-speed internet and modern technologies are at a significant disadvantage in education, employment, and access to information. This reinforces socio-economic gaps, as those without adequate technology access are left behind in the digital economy.
- **Education Inequality**: Online learning and technological tools are more readily available to students in wealthier areas, while those in underfunded schools or rural regions may not have the resources needed for a comparable education. This disparity can lead to long-term socio-economic consequences, reinforcing cycles of poverty and limited upward mobility.

6. Sociological Research and Cultural Bias

- **Implicit Cultural Assumptions**: Sociological and psychological research sometimes embeds cultural biases that assume norms reflective of dominant groups, leading to skewed interpretations and generalized findings that may not apply to all demographics. This can influence public policies and social programs that inadvertently reinforce existing social hierarchies.
- **IQ Testing and Standardized Assessments**: Early intelligence tests and some standardized assessments were developed with cultural biases that favored specific groups. These tests often disadvantaged minority and lower-income populations, reinforcing stereotypes and impacting educational opportunities and outcomes.

7. Pharmaceutical Pricing and Patents

- **Cost of Medication**: Scientific advancements in pharmaceuticals have led to life-saving drugs, but the cost of these treatments can be prohibitively expensive. Patent laws and the prioritization of profit can limit access to essential medicines for lower-income populations, reinforcing health inequalities.
- **Global Vaccine Distribution**: The unequal distribution of COVID-19 vaccines is a stark example of how scientific advancements can reinforce global inequalities. Wealthier nations were able to secure large stocks of vaccines early, while many developing countries faced significant delays in access, exacerbating health disparities.

Responds to political/societal pressure

- Entire Scientific domains are influenced by political agendas
  - Statistics: the math of the state (used for war and taxation). Moroney, Michael Joseph. Facts from figures. Vol. 236. Harmondsworth, Middlesex: Penguin books, 1956.
  - Anthropology born to tell colonizers how to better subjugate and exploit people
- Scientific Institutions as Political actors
  - ETHZ militaristic agenda
  - USA universities militaristic agenda
  - Chicago School on overturning South American governments and promoting neoliberalism
  - New White Paper of Horizon Europe which advocates an enhancement of Dual Use https://research-and-innovation.ec.europa.eu/system/files/2024-01/ec_rtd_white-paper-dual-use-potential.pdf
- Individuals
  - Millikan's experiment
  - Bell Labs falsification
  - Example of people persisting in error because they needed to feel accepted and could not admit failure

Non-neutral because of its use

Historically political in its application

- Science allowed for the rise of Atheism
- Science helped the switch from Ancient Regime to Capitalism
- Historically used for war
- Statistics: we take decisions based on typical behavior, neglecting the individual

Instrument of power

- Atomic bomb & military
- Creating new markets
- Market competitiveness
- Surveillance

Crimes in its name

From a chatgpt query:

Nazi Human Experiments: During World War II, Nazi doctors conducted horrific medical experiments on prisoners in concentration camps, leading to death, trauma, and permanent disability. These experiments were justified under the guise of advancing medical and military knowledge.

Tuskegee Syphilis Study: From 1932 to 1972, the U.S. Public Health Service conducted a study on African American men with syphilis, deceiving them into believing they were receiving treatment while actually withholding effective treatment (penicillin) to observe the progression of the disease.

Unit 731 Experiments: The Imperial Japanese Army's Unit 731 carried out brutal biological and chemical experiments on prisoners during World War II, resulting in thousands of deaths. The experiments included vivisection, exposure to pathogens, and weapon testing.

Forced Sterilizations: Under eugenics programs in the early to mid-20th century, many countries, including the United States and Sweden, performed forced sterilizations on people deemed "unfit" to reproduce. This was done in the name of improving the genetic quality of the human population.

MK-Ultra: The CIA conducted experiments on unwitting subjects as part of Project MK-Ultra during the 1950s and 1960s. These experiments aimed to study mind control and involved administering drugs like LSD without consent, leading to psychological trauma.

Radiation Experiments: During the Cold War, both the United States and the Soviet Union conducted radiation experiments on unsuspecting individuals, including injecting plutonium into patients to study its effects without their informed consent.

Forced Organ Harvesting in China: Reports and investigations have highlighted that in recent decades, including after 2000, there have been ongoing forced organ harvesting practices targeting prisoners, particularly political prisoners and religious minorities like Falun Gong practitioners. These acts have been framed as advancing medical science and meeting transplant demands.

Environmental and Social Harm from Large-Scale Deforestation Studies: In some cases, studies or projects supported by scientific claims have contributed to large-scale environmental harm. For example, after 2000, deforestation projects and development plans disguised as "scientific agricultural research" or resource management have led to the displacement of indigenous communities and the destruction of biodiversity, particularly in the Amazon and Southeast Asia.

Usage reproduces/reinforces inequalities

- Revolutionizes labor, and this favors who holds the capital, making the workers weaker. It could also work how Keynes (or even Adam Smith) thought, and in that case we would have more power to the workers. In any case, it has a political impact.
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Usage responds to political pressure

This relates to the “Science as tool” narrative. Although we might devise something for one reason, it might be used for another.

The point is that it will be used for the reason that is wanted by who holds the power. In a world with high inequality, the unethical use of science can be almost deterministically predicted.

Example: Dual-use research

Is manipulated to serve specific objectives

- Funding for science to confuse citizens about Climate Change
- Funding for science to confuse citizens about the effect of tobacco
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Disclaimer 1

I will argue that science is non-neutral/biased

This does **not** mean:

- that scientists' results are wrong or that scientists are in bad faith or trying to be impartial
- that a specific scientific work cannot be neutral
- it is not worth doing

But rather that:

- There is a system of incentives that privileges some outcomes with respect to others
- We direct our attention and set boundary conditions according to criteria set by the Zeitgeist

Science is based on rejection of dogma, so an honest scientific approach is able to critically investigate itself. If you treat science as dogma, you are biased (but you won’t realize, so sweet dreams)

Disclaimer 2

I will provide lots of arguments. Some are more ripe than others.

Not all arguments apply to all branches of science, it’s ok if you don’t feel identified.

If at least 1 out of my arguments convinces you, that is enough for the big picture.

To avoid getting lost into details:

- Prioritize questions about the big picture
- Only afterwards we can get into the specific arguments (even at the apéro)