A Flock of Dodos and the Battle Against the Zombies:

Scientific Expertise and a *Scientific Expert Epistemic Injustice*

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To

The Dodos and the Zombies

and,

dearest Oliver

Abstract

In this thesis, I define a unique kind of epistemic injustice that occurs due to epistemic pathologies that develop between scientific experts and non-experts. The epistemic pathologies I have in mind are pseudoscience and science denialism. I argue that these pathologies produce *epistemically detrimental dissent*—dissent that is counter-productive to scientific inquiry—and 'downgrades' the epistemic authority of scientific communities and their members. This downgrading results in epistemic harms where individual scientific experts are especially vulnerable. I sketch the *ideal* relationship between scientific experts and non-experts to use in my analysis of the epistemic pathologies. I explain the notion of scientific expertise by considering the kind of epistemic authority scientific experts have, where it can only come from a scientific consensus and collective knowledge produced within a particular community. This specific community—a *scientific community*—is diverse and has specific underlying mechanisms necessary to deliver the knowledge we hope to get from science. When scientific experts testify, they provide *preemptive reasons* for belief, where preemptive reasons for belief can only be provided when someone has epistemic authority. Preemptive reasons for belief are the kinds of reasons that replace our reasons, and this means that we no longer rely on our reasons for belief. From this, I show how the epistemic pathologies between scientific experts and non-experts are the result of the *rejection* of epistemic authority or the claim that the non-expert *possesses* the kind of epistemic authority that only scientific experts can have. The rejection of the epistemic authority of scientific experts 'downgrades' their epistemic authority, which is the key to understanding the epistemic injustice and distinct harms involved. I define the epistemic injustice as a *scientific expert epistemic injustice* which occurs when scientific experts are epistemically harmed due to the *wrongful* downgrading of their epistemic authority when they testify about matters relevant to their scientific expertise.

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Terminology and Abbreviations

COP24	United Nations Climate Change 2018 Conference
Dodos	Scientific Experts
ESP	Extra-Sensory Perception
Flat Earther	Flat Earth Theory proponents
Flerfers	See ‘Flat Earther’
Flerfs	See ‘Flat Earther’
Globers	Believers in the established theory that the earth is spherical
Glofers	See ‘Globers’
Globetards	See ‘Globers’ (this version is often used in a derogatory sense by Flerfers)
Globeturds	See ‘Globers’ (this version is often used in a derogatory sense by Flerfers)
Globe Defenders	Traditional spherical earth model adherents who engage in public discourse to defend the established science (on social media and other platforms, they are often not scientists or scientific experts, but as non-experts do an admirable job)
IPCC	Intergovernmental Panel on Climate Change
SETI	Search for Extra-Terrestrial Intelligence (as a field of study)
SETI Institute	Search for Extra-Terrestrial Intelligence Institute
TFE	The Final Experiment
UFO	Unidentified Flying Objects
UFOlogy	The study of Unidentified Flying Objects and related phenomena.
UN	United Nations
WHO	World Health Organisation
Zombies	Antagonistic Non-Experts (such as pseudoscientists and science denialists)

Preface

The birds

In a faraway land, a tower stretches into the skies, surrounded by jellyfish of a radiant gold that fly through the air as if swimming through the deepest corners of the oceans. The tower stretches as far as the eye can see. Staring for too long would blind one, the sun scorching beyond it.

The day it appears, it stands alone in the stark desert.

A few desert creatures start moving about it curiously. A bat-eared fox, curious, its ears antennas, cupped in anticipation. A wake of giant Nubian vultures. They circle the tower, their naked pink heads barely visible in the sun. A black-footed cat and its cubs make their appearance at night. The three cubs play on the sand while the mother sits, alert to predators and prey.

The tower stands for days, weeks, months. Until one day, a girl rides up to the tower on a bicycle and stops. At first, she stares in awe. She sits down on the sand at the feet of the giant and takes out a dry piece of bread wrapped in cloth. She eats. Drinks water out of a small bottle.

An hour after settling down next to the tower and enjoying its shade, she sees what looks like a bird flying through the air, darting towards her. It flies straight towards her, screaming into the air.

The girl jumps onto her bicycle and rides away as fast as possible.

When she reaches home, she tells everyone in her village about what she saw. The elder children mock her; the adults dismiss her childishness.

One day, a man happens to see the same tower when he passes.

Word quickly spreads through the surrounding villages. At first, people are afraid of the tower. Later, people overcome their fears, and a steady stream finds its way to the tower. The more people come to see the strange tower, the stranger the stories to explain its existence.

Aliens.

The second coming of the Christ.

Time travellers.

Humans from a faraway planet.

God.

A superior animal.

Robots.

Giants.

Budha.

At night, the golden jellyfish emanate rays of light that illuminate the skies, turning them into a flaming spectacle.

One day, a single voice is heard crying out from the tower. The voice is muffled. Unrecognisable. But it is unmistakable: the voice comes from the tower.

The villagers grow scared.

The first man to visit the tower returns. A strange robotic bird flies from the tower and dances around his head in the sky. It whispers to him.

As quickly as the bird appears, it retreats into the tower.

The man quickly rides back to his village. He tells the people what he had seen and that the bird had told him a prophecy: One week from that day, a storm will come. A great flood will tear apart their homes and kill many of their children.

The other villagers mock him and tell him to go away. He leaves the village, returning to the tower, where he sleeps at its feet.

On the day of the prophecy, the skies darken, and the waters pour down. Soon, the word spreads that his village has been torn apart, and many children have been killed.

Later that day, some villagers come to the tower and beg the man to answer.

What had happened?

Why had he done this to them?

The bizarre jellyfish circle above their heads while he says nothing.

They sit before him for hours as if waiting for another prophecy.

In the night, a voice suddenly bellows from the tower. Screeching. Bawling. Moaning.

The people below kneel in front of the tower, praising it.

In the following week, more and more people come to the tower and kneel beneath it.

Another week later, the tower suddenly opens at the top, and robot birds fly from it, circling the heads of the humans below.

The grass, trees, and plants surrounding the tower start greying and dying. The grey circle spreads out further and further, reaching a herd of cattle. The cattle start dropping dead, one

by one.

Death spreads further and further, the voices becoming increasingly perceptible.

A thousand birds dart into the skies with the flying golden jellyfish, leaving the tower behind. They fly higher and higher into the sky, then turn around and plummet to the ground. They attack any human they can find. As far as they fly, everything turns grey and dies.

Humans further away from the tower start turning on each other. They claw at each other, eating away at each other's flesh.

Soon, they fall to their knees and crawl around the earth. Their teeth and hands sharpened into bright, bloody swords. Words are lost. And all that is left are the echoing screams of the birds.

Blood soaks into the earth, staining everything. The cries of the birds start withering away. As each bird ends its song, it drops out of the sky, falling into the blood-soaked earth, into pits of bones, blood, and rotten flesh.

The birds have no one to sing to.

No one to hear their cries.

Their songs die with their rotting corpses.

Contents

Introduction

Much Ado About Dodos and Zombies

Explaining why science is essential is similar to explaining why the earth is not flat but, in fact, spherical. Bluntly put, it seems like the simplest thing to answer: we can see how science is good for us, providing us with medicines to cure diseases that used to kill people within days, with accurate weather forecasts, with technology that can take us to the depths of the ocean to discover species whose existence we could never have imagined, or technology that can take us to the moon and, perhaps even someday into a Black Hole, leading us to a whole new dimension to pursue our curiosities and lead us to more discoveries. Then, there are the intimate scale considerations. Susan Lindee points out that even thinking about frozen peas, toasters, and recycling bins provides us with a glimpse into the essential nature of science: when considering the fundamental technologies that surround us and that we use every day, we trust the science, technology, and knowledge that has provided us with these things (2019, p. 164). Lindee says we implicitly trust science "because it 'works'" (2019, p. 164).

However, there seems to be an elephant dangling on our earth's flat edge. Why is it that even though we have all of these scientific wonders, people still believe that the earth is flat? And—furthermore—they so *vehemently* hold onto their beliefs that they will threaten people who believe differently, curse them, and become exceptionally unpleasant people? Something has gone very wrong if we have gone from discovering the potential wonders in space to questioning the shape of the object beneath our feet, which was established many centuries ago.

In this thesis, I explain a unique epistemic injustice towards scientific experts resulting from epistemic pathologies that develop in the relationship between non-experts and experts. The epistemic pathologies I am interested in are pseudoscience, science denialism, and conspiracy theories that involve pseudoscience and science denialism. I argue that due to the aforementioned pathological relationships between scientific experts and non-experts, there is the production of *epistemically detrimental dissent*—dissent that is counter-productive to

progress in scientific inquiry—and this epistemically detrimental dissent effectively 'downgrades' the epistemic authority of scientific communities and its members, resulting in many kinds of distinct epistemic harms.

In this preamble, I will introduce the idea of an 'ideal relationship between scientific experts and non-experts' that will be built on in this thesis. I will suggest a few ways this relationship can go wrong and produce concrete harm to the broader public. Keeping in mind the concrete harm to the broader public is crucial as it helps contextualise pathological relationships between scientific experts and non-experts. The pathologies between scientific experts and non-experts have very real impacts on our well-being. Think, for example, of newly inaugurated President Donald Trump and his newly sworn-in Secretary of Health and Human Services, Robert F. Kennedy Jr. Kennedy is the founder and the former chairman of the board of the Children's Health Defense, which has the mission of:

> […] ending childhood health epidemics by eliminating toxic exposure. We will restore and protect the health of children by eliminating environmental exposures, holding responsible parties accountable, and establishing safeguards to prevent future harm of children's health. Protecting Children. Exposing Harms. Seeking Justice.[1]

However, upon closer inspection, this organisation is rife with conspiratorial speculation, science denialism, and other antagonistic stances towards scientific communities and their members. Kennedy has some powerful anti-vax ideas. Consider the impact someone like Robert F. Kennedy Jr. *could* have (and is already having) regarding health policy-making in the USA. The WHO gathered on the 28th February 2025 to discuss the composition of the new flu vaccine and which specific viruses it should target, amongst other relevant questions.[2] Originally, the U.S. Government planned on not attending the event. If the U.S. Government did not send a representative, it would have meant that the next winter's flu virus would not have been as effective. The effectiveness of the winter flu vaccine is directly connected to a broad representation of scientific experts from across the world attending this crucial event as they bring scientific data that helps to determine many of the specifics of the

[1] See some background information on the Children's Health Defense here: https://childrenshealthdefense.org

[2] More information: https://www.who.int/news-room/events/detail/2025/02/17/default-calendar/immunization-and-vaccines-related-implementation-research-advisory-committee-(ivir-ac)---february-2025.

vaccines. This initial fear of the U.S. Government's withdrawal from the event illustrates only of the consequences of the U.S. Government's changing involvement in global health matters. Even though they attended the event, the recent reorganisation of U.S. health matters is increasingly alarming, and this kind of withdrawal and the consequences might become increasingly threatening.[3] This kind of harmful withdrawal from the international scientific community is already becoming apparent in many other matters, such as the Trump administration's efforts to withdraw from crucial cancer research with Australia—that has a history of many years.[4]

One of the fundamental problems that non-experts have is when they are unable to distinguish between values that are relevant to scientific enquiry (objectivity, truthfulness, etc.), values that are relevant in policy-making (democracy, freedom of speech, etc.), and subjective values that individuals—whether they are non-experts or scientific experts—hold that affects their beliefs and consequent actions (such as more personally held values around religion, ideology, culture, etc.). I will provide a few examples of the scientific domains often 'thrust into battle' because of these pathological relationships, where domains such as Climate Change Science, vaccines and epidemiology, or Evolution Science are the big targets. I will consider why these domains are often targeted while discussing the broader impacts of these relationships between non-experts and scientific experts going wrong.

My approach in this project is to construct an understanding of the ideal relationship between scientific experts and non-experts by understanding what their testimony provides us with, i.e., what kinds of *reasons* for *belief* (or *acceptance* of their testimony) are provided when a scientific community or its members testify? This provides me with a framework to understand their epistemic authority, construct a definition of 'scientific expertise', and understand the place of the individual scientific expert within the scientific community. Having an account of these notions and how they fit together provides the basis for analysing the epistemic pathologies I am interested in. For the most part, when non-experts claim to possess the epistemic authority that only scientific experts can have or reject the epistemic authority that scientific experts have, these epistemic pathologies emerge.

Understanding this ideal relationship between scientific experts and non-experts and the epistemic pathologies, I can construct a definition of the unique kind of epistemic injustice I have in mind: a *scientific expert epistemic injustice*. This injustice occurs when scientific

[3] https://www.statnews.com/2025/02/24/us-who-flu-vaccine-meeting-london/
[4] https://www.theguardian.com/australia-news/2025/mar/14/australian-university-sector-accuses-trump-administration-of-blatant-interference-in-research

experts are epistemically harmed due to the *wrongful* downgrading of their epistemic authority when they testify about matters relevant to their scientific expertise. Effectively, I analyse a problem and define a certain kind of injustice that results from it.

The areas of science most susceptible to the epistemic pathologies I have in mind are those where the public interest in the particular scientific domain is significant. Some areas of scientific research seem far more removed from our everyday lives and draw little attention from non-experts, except for some 'geeks' who might have a special interest in those areas for whatever reasons. Domains of science that are constantly the topic of heated disagreements in public are Climate Change Science, vaccines, the state of COVID-19 (especially during the first two years of the pandemic), Evolution Science versus Intelligent Design Science, the causal connection between smoking and lung cancer, and—historically speaking—the use of heavy metals in paint (shockingly—these were even used in beauty products decades ago!), the genetic engineering of crops etc. Sometimes, people could decide how to act in response to these contested topics, which could be decisions on life and death. Why are these areas of science where these pathological relationships are most likely to develop?[5]

Very simply, these are the areas of science where the relevance to our everyday lives creates the belief that what goes on in those areas of science should be the topic of public conversations and discussions that are democratic and a reflection of the values of freedom of speech and inquiry. This interest in the science means that the internal processes of the relevant scientific communities are held up to closer scrutiny, and the processes are often exposed, meaning that there are far higher risks of the science being misunderstood, manipulated by those with vested interests, or misrepresented in the media with an entourage of consequent further misrepresentations and 'misinformation' being spread. There seems to be no way of putting the genie back in the bottle, considering how social media and the media work nowadays. Many 'experts' now have degrees from the 'University of Google' (as called by Jenny McCarthy), or, if I may extend this idea, the 'The University of Facebook' or the 'University of Twitter', and, most scarily to me, the 'The University of TikTok' (Kaufman et al., 2018, p. xxi).[6]

Some of the immense challenges we face today in making scientific progress are those

[5] Naomi Oreskes discussed many of these cases in length and provided references for more detailed reading (2015).

[6] The fantastic sci-fi series "The Peripheral" (2022) shows a medical doctor who received his qualification from "The University of TikTok". However, he seems to be considered a very highly qualified medical expert. This is a fascinating and terrifying detail!

that follow from the advancement of social media and technology and the influence these have on the average non-expert's understanding of significant scientific problems (Kaufman et al., 2018, p. xxi). However, it is essential to realise that the problem of distrust and scientific ignorance is not the result of the advancement of social media and other platforms where misinformation can be spread so quickly. Distrust and scientific ignorance are not new things; perhaps it is just the form and how it is disseminated that has changed with the advancement of technology. There is a far higher degree of availability and access to information—whatever the *quality* of that information might be—than before.

Non-experts understand how scientific findings could lead to policies against their values. When there are mandatory lockdowns because of a pandemic, it seems to restrict people's fundamental freedoms. When there are mandatory reductions in greenhouse gas emissions, it could potentially affect people's economic well-being and free market values. When we are told that we have to get certain vaccines, it can also be seen to be a restriction on fundamental human rights and the decision to do what we want to our bodies.

However, not only does the general population of non-experts feel interested in these issues because implementing specific policies could significantly influence them. Major industries will also be substantially impacted if policies change. There is strong evidence that the fossil fuel industry contributes to anthropogenic climate change, so restrictions on greenhouse gas emissions will affect them tremendously. If, as has happened, the scientific findings tell us that there is a causal connection between smoking and lung cancer, the tobacco industry could suffer huge losses. This will also be the case if legislation is passed against alcohol, sugar, or ultra-processed foods.

In short, the kinds of targeted sciences can become *hyperpoliticised*. To explain the idea of science being hyperpoliticised, consider the example of 'Intelligent Design Science', first known as 'Creationism'. At first, Creationism was a vestigial science. Before Charles Darwin's *On the Origin of the Species* (1859), questions regarding science and creation were not focused on whether God had *created* living things and the universe but on *how* it was done (Gordin, 2021, p. 46). The contested topics were things like whether everything in existence was created all at once, whether the various races of humans were the result of postcreation differentiation (monogenism) or whether individual races were *created* separately by a Creator (polygenism) (Gordin, 2021, p. 47). When Darwin's theory of evolution became the dominant topic of discussion, Creationism did not fit as well into the picture as before. This was when 'scientific naturalism' was introduced, and it was decided that the supernatural had to be excluded from scientific explanations, essentially pushing

'Creationism' outside of any mainstream science (Gordin, 2021, p. 47).

Today, even though Evolutionary Science is so well-established that it is taken as scientific fact, Creationism has returned under the name of 'Intelligent Design Science', where the central claim is that evolutionary theory on its own cannot accurately capture the intricate details of creation and that the natural world is irreducibly complex (Haack, 2007, p. 273). This argument uses a kind of induction to lead to the conclusion that a Creator (or some alternative version of an intelligent designer) *has* to exist and *had* to be involved in the creation of the earth and its diverse, irreducibly complex species (Manson, 2003, p. 1). Intelligent Design theorists realised that using religion as the argument's foundation cannot compete with scientific arguments. By phrasing it as 'Intelligent Design *Science'* and referring to the irreducible complexity of the world and the inability of Evolution Science to explain it, they present the theory as a competitor for Evolution Science (McIntyre, 2015, p. 67). By phrasing it as 'Intelligent Design Science', the new strategy was to show that Evolution Science was simply *bad* science and Intelligent Design Science was an equivalent—or even *better*—alternative (McIntyre, 2015, p. 65).

The rephrasing and positioning of the theory in the realm of science have supported the claims that Intelligent Design has to be taught in schools as an alternative scientific theory to what Evolution Science presents. When scientists rejected the idea of teaching Intelligent Design Science as an alternative to Evolution Science, the Intelligent Design Science proponents respond by claiming that the controversy had to be taught "in the name of educational freedom and scientific openness" (McIntyre, 2015, p. 65). There have been many court trials in the USA, where the proponents of Intelligent Design have attempted to bring Intelligent Design Science into the school curricula.[7] Here, we have a case where an area of science became hyperpoliticised. Some other cases are Climate Change Science, vaccines and epidemiology, and the science regarding smoking and its connection with lung cancer.[8]

The blueprint for the hyperpoliticisation of science comes from the early 20th-century developments in electricity generation in the USA, as Oreskes shows (2015). In the early 20th century, electricity generation was still the product of private industries, meaning there was

[7] Think about some of the American court cases regarding Evolution and Creationism/Intelligent Design Science, some of the major ones being *Epperson v. Arkansas* in 1968, *Segraves v. State of California* in 1981, *McLean* v. *Arkansas Board of Education* in 1982, *Edward v. Aguillard* in 1987, *Webster v. New Lenox School District* in 1990, *Peloza v. Capistrano School District* in 1994, *Freiler v. Tangipahoa Parish Board of Education* in 1997, *Rodney LeVake v. Independent School District 656, et. al.* in 2000, *Selman et. al. v. Cobb Country School District et. al.* in 2005, and *Kitzmiller et. al. v. Dover* in 2005).

[8] Naomi Oreskes and Eric Conway discuss many of these hyperpoliticised sciences in detail in *Merchants of Doubt* (2010).

unequal access as it was far too expensive for many people (Oreskes, 2015, p. 4). Urban areas had reasonably good access, but rural areas, where some of the 'hardest' physical labour workers lived, had little or no access (Oreskes, 2015, p. 5). At that time, electricity was considered modern, a sign of progress and well-being. Private sector monopoly over electricity was not a good thing, and even firm defenders of free market capitalism were starting to agree with this view (Oreskes, 2015, p. 5). The private sector engaged in questionable practices, leading to even *less* access for poorer people and outright exploitation by the wealthier classes who could pay the price (Oreskes, 2015, p. 6).

Some political leaders eventually spoke out against the apparent problems. In 1923, research projects were launched to consider the feasibility of public projects that could help make electricity available to more people (Oreskes, 2015, p. 6). Eventually, some of the findings showed that public electricity would work out cheaper than privately produced electricity, and at this point, the industry began to fight against the public projects aimed at making electricity available to more people (Oreskes, 2015, p. 7). The private sectors tried to fight the facts by claiming that the findings were inaccurate and that public electricity would not be cheaper, they attempted to undermine politicians who were supporting the public electricity projects and prevent their re-elections, they worked on increasing advertising, they used academic influence to push their narrative that private electricity would be cheaper, all to make the public believe that the private electricity industry would best serve the interests of citizens (Oreskes, 2015, p. 7). They mainly used political narratives to drive their narrative, saying that public electricity control would be socialistic and 'un-American' (Oreskes, 2015, p. 7).

1. So, What About Values in Science?

When we talk about science and its potential impacts on our fundamental human rights, values, politics, and many other aspects of our lives, there are very legitimate questions regarding the extent to which non-experts should be able to question science and its implications. Regarding scientific issues that could significantly impact my life, I want to know what is happening and have a say about the relevant policies. However, the idea that non-experts wish to and *can* weigh in on highly specialised issues opens the door to many problems, such as when the ideological views or other vested interests of non-experts influence science to the degree where we can no longer rely on the 'scientific facts' presented

to us as being true.

This is primarily where epistemic pathologies between scientific experts and non-experts develop. When non-experts believe that certain scientific matters can impact their lives, they are more likely to question the science. If they misunderstand or (antagonistic non-experts) misrepresent it, they are more likely to be susceptible to epistemic pathologies. If non-experts do not understand where the boundaries between science and other non-science (but science-related) debates are, they are primed to get confused about straightforward scientific matters. To me, it seems like there is a confusion about how to understand scientific facts *alongside* cultural and societal values (such as freedom of speech, democracy, etc.) and the part these societal values play alongside science.

For example, how will we respond when we have researched anthropogenic climate change and have an established consensus? Through the implementation of policies that restrict carbon dioxide emissions? Or should we pay more attention to investments in green solutions? Should we impose taxes on international travel? How do we go forward with the knowledge produced via our scientific communities, and how do we make decisions based on that knowledge? Once we start deciding what the *responses* to the science should be, we must consider our societal, cultural, and ethical values. Many non-experts have trouble distinguishing the answers we get from science and the proposed *responses* to those answers. For example, when they read that the scientific consensus is that carbon dioxide emissions contribute to anthropogenic climate change, they might mistake that as scientific experts telling us *how to act*. They understand it as scientific experts telling us *we must impose limitations*. Non-experts realise that imposing limits on emissions will have terrible consequences on our economies, general well-being, etc. The *evidence* scientific communities and their members provide is only the *basis* for deciding about the best response to the evidence.

The media is also not very good at distinguishing between what scientific experts tell us and what politicians, governments, and other actors say about it. The situation is further complicated when individual scientific experts cross the line and tell us what we *should* do when they are not the legitimate authorities on the practical matters and responses to those issues. Listening to their proposed responses is often good—and crucial—but this should not be mistaken as directives. For example, scientific experts could tell us that *a* way to address anthropogenic climate change would be to reduce carbon dioxide emissions. Still, the exact details of how to do that, how to implement the policies, and other relevant social, ethical, and political factors would be entirely different discussions.

When non-experts can better see the distinctions between science's answers and the complex questions regarding our *responses* to those answers, they will better understand the distinct roles of science, governments, and other relevant political actors. It is about distinguishing societal values and values in science and scientific inquiry, such as truthfulness, objectivity, etc., that help it go well *and* understanding that a presentation of the scientific consensus is not necessarily the same thing as a directive about how we should act. This distinction looks intuitive, but it is a far more difficult task to draw a clear line between these values. The question is *how* to balance the values essential to a flourishing society and those that help keep scientific inquiry's integrity intact. Many will argue that drawing a clear distinction is impossible.

Naturally, science and its processes are not value-neutral—scientific communities are made up of individuals who all hold subjective values, biases, and beliefs that could affect what they do. I firmly agree with Helen Longino, David Hull, and Naomi Oreskes, amongst many others, that science is value-laden. Individual scientists bring their subjective values to their research, which can affect how they go about their projects. However, I believe there is still a boundary that can be identified where science can—and *should*—be done as objectively as possible before the public processes imbued with societal and cultural values affect it. We first need to have a scientific consensus on particular issues on the table, which is probably the closest approximation to the truth. Then, we can try to understand their significance in a world where social, political, and cultural values play crucial roles.

My project is not about producing an answer as to how non-experts can identify scientific experts and communities, how non-experts can identify scientific corruption or fraud, how to understand science better, how to understand the differences between scientific values and cultural values better, or anything that will be a guide as to how to negotiate those kinds of problems. These questions fall within the range of a completely different type of project. My tentative answer to many of these questions is simple: there are significant problems in basic scientific education at the most fundamental stages of education. I believe that scientific experts and scientific communities must work to make scientific knowledge more accessible in specific ways. But scientific experts are there to provide us with certain things: we want them to research within their specialised domains and provide us with their findings. So, the answer is not only about scientific communities and communication. There are limits to what they can do and what we should expect from them.

My project is rather about analysing a specific problem: I want to analyse the epistemic pathologies that develop when things go wrong between scientific experts and non-experts

and consider how these result in epistemic harms to scientific experts and scientific communities. How I define 'scientific expertise', 'scientific communities', and 'scientific consensus', amongst other relevant notions, are not geared towards providing answers for non-experts but to *analyse* the problem. The way I define these notions is to help us do a precise analysis of the problem and the related harms and injustices. I believe that it is only when we can understand the problem by drawing the very hard boundaries between certain things—such as expertise versus *scientific* expertise, or pseudoscience and science denialism—that we can eventually make better attempts at 1. finding ways to eliminate or reduce the epistemic pathologies, and 2. understanding the more nuanced cases where analysing the problems and finding the answers could be far trickier.

2. A Clearer View of the Epistemic Pathologies

In considering the exact nature of pathological relationships between scientific experts and non-experts, I first consider the ideal relationship. The ideal relationship is where the non-expert acknowledges the preemptive reasons for belief that a scientific expert provides when testifying to some relevant question. In giving an account of preemptive reasons for belief and epistemic authority, I primarily draw on Joseph Raz, Linda Zagzebski, and criticism from Jennifer Lackey. The preemptive reasons for belief are provided as the scientific expert has *epistemic authority*. What gives epistemic authority is the scientific expert's awareness of the *scientific consensus* and their ability to articulate it accurately, which is a reflection of the *collective knowledge* on a particular issue, and this kind of knowledge is provided via the mechanisms at work within a scientific community. Please note that, as I will discuss at length in Chapter 2, simply being capable of accurately *articulating* the scientific consensus is insufficient to be a scientific expert. This would mean that a non-expert who can accurately convey the consensus has to be called a scientific expert, which seems counter-intuitive. As will be explained, what is further necessary is that they had been initiated into the relevant scientific community and its traditions and have epistemic superiority in the appropriate domain, which would come from the right educational qualifications. This is an *understanding condition*, i.e., there has to be an understanding of the relevant scientific traditions, methodologies, processes, etc.

Collective knowledge is the product of the mechanisms at work within a scientific community. These mechanisms are the self-regulating processes, the processes of

coordination and competition, the focus on attaining status amongst peers, and the diversity of the scientific community. These things make a scientific community good at achieving its goals, which are *necessary* for success. I draw on Helen Longino and David Hull to construct an account of what a scientific community looks like and to explain why it is good at providing the kind of knowledge that we expect from such a community.

The pathological relationships develop when the response to the epistemic authority of scientific experts goes wrong in various ways: 1. when non-experts claim to *possess* the epistemic authority that only scientific experts can have, or, for various underlying reasons, 2. when non-experts attempt to cast doubt on that authority through various rhetorical mechanisms, and they *reject* the epistemic authority of scientific experts. The case of pseudoscience exemplifies the first, whereas science denialism is a case of the second. In both pathological relationships, there is *epistemically detrimental dissent*, where such dissent is counterproductive to scientific progress. It effectively inhibits the production of new scientific knowledge. I will draw on Biddle and Leuschner to define the notion of *epistemically detrimental dissent* (2015).

In the case of pseudoscience, the epistemically detrimental dissent is more covert as the pseudoscientist pretends to have epistemic authority on some issues. Still, in making these claims, they do not necessarily leverage a direct attack on scientific experts in the same way science denialists do. With cases of science denialism, the creation of epistemically detrimental dissent is very intentional, intending to cast doubt on scientific experts. The pathological relationship is overt in its production of epistemically detrimental dissent.

3. Demarcation

Even though an analysis of the epistemic pathologies I have in mind in defining an epistemic injustice towards scientific communities and experts technically falls within the framework of the existing work on demarcating scientific claims from other non-scientific claims, I am not attempting to provide the kind of demarcation that these discussions go into. My project aims to characterise the ideal relationship between scientific experts and non-experts to identify harms and, eventually, some injustices towards scientific communities and scientific experts. I approach this by considering the sociological setup of a scientific community and its members, which is most effective in achieving my goals. The sorts of epistemic failings I am concerned with are social and moral.

Many traditional discussions regarding the demarcation criteria for science are metaphysical: they are attempts at describing the nature of scientific knowledge. These are essential questions. That debate is premised on the idea that there is a distinction to be made, and I take this as a starting point. However, in addressing this distinction, I focus on the sociological features of science. When we diagnose a problem between a scientific expert and a non-expert, it is better to consider what the relationship ideally looks like and then identify what is going wrong. When we understand how scientific experts have a certain kind of authority, i.e., an epistemic authority, and what it means for someone to have that kind of authority, we will better understand what goes wrong when it does. Scientific knowledge is epistemically special in specific ways, and scientific communities and scientific experts have a special epistemic authority that reflects that.

4. A Note on Terminology: 'Dodos' and 'Zombies', 'Non-Experts' and 'Antagonistic Non-Experts'

When talking about *non-experts*, there is a distinction between two groups of non-experts that is relevant. The distinction I want to draw is imperfect and often unclear in pseudoscience and science denialism cases. Still, it is crucial to attempt to draw a rough distinction. Firstly, we have those non-experts who are not directly involved in the production of science denialism and/or pseudoscience. They might also be far removed from the pseudoscientific or science denialism communities, and their engagement is somewhat superficial. By 'superficial', I mean that they could more aptly be described as 'consumers' of science denialism and pseudoscience insofar as they might disseminate the pseudoscience or science denialism, even believe it, and perhaps even tell their families and friends about it or post about it on social media. Although their engagement is superficial, I think the epistemic harms I identify are still *wrongful*. In these cases of a more superficial engagement, we often have non-experts who might unknowingly become complicit in some of the wrongs towards scientific communities and scientific experts. Here, I imagine friends who go onto social media or YouTube and, because of scientific ignorance, end up believing some person who makes many false claims about vaccines. My friend might tell other friends about the 'information', and they could believe her. Still, she is not engaging in the production of science denialism or pseudoscience thoughtfully and proactively.

I will use the term *antagonistic non-experts* to refer to those who directly engage in

activities that cause harm to scientific communities and scientific experts on a far larger scale. Here, I have in mind the industries that actively produce science denialism to distract from the scientific consensus because of their vested interests, as well as pseudoscientists who claim *to have epistemic authority* of some kind. These kinds of *antagonistic non-experts* are often involved in some community—whether it is more formal, such as when the Flat Earth Society has an international conference or other more informal gatherings, on Facebook groups or other such platforms—where there is a far more proactive engagement. Some Flat Earth theorists, for example, have YouTube channels and websites where they regularly post videos and other 'materials' meant to prove their claims.[9] Furthermore, some of them even charge money for these things. It is often the case that *non-experts* are the target audiences of the *antagonistic non-experts*.

It is important to note that some *antagonistic non-experts* will use proper scientists to support their claims. Sometimes, we might even have scientists who construct the whole narrative of denial or the relevant pseudoscience. I will show how these scientists have lost their status as 'scientific experts'. When a scientist is corrupted in this way, they can no longer be called a 'scientific expert' regardless of their educational background or many other indicators that we often take as indicators of scientific expertise. The right educational background is not the only requirement for saying that a scientist is a *scientific expert*. My claim of them losing their status as a 'scientific expert' will become far more precise in the following two chapters, in which I will analyse scientific expertise, epistemic authority, and what a scientific community is.

I have nicknamed scientific communities and their members 'Dodos' and a 'Flock of Dodos' and antagonistic non-experts 'Zombies'. I found the phrase 'Flock of Dodos' from the title of a documentary film titled *Flock of Dodos: The Evolution-Intelligent Design Circus*, directed by Randy Olson (2006). This expression seemed *so apt*, and I *could not resist* the temptation to make it a central feature of this thesis. The reason for this is simple: with the onslaught of antagonism towards scientific communities and their members, especially those who come under fire because of the relevance of their scientific domain to everyday political and social issues, there is a risk of the notion of 'scientific expertise' and its use and meaning—the *epistemic authority* that comes with being a *scientific expert* and the

[9] Some of these YouTubers are David Weiss (AkA FlatEarthDave: https://www.youtube.com/channel/UCSxKBShys3kLEZJqJPS0WAg), Mark Kendall Sargeent (https://www.youtube.com/@markksargent), Patricia Steere (https://www.youtube.com/@PatriciaSteere/videos). (These channels were all accessed on 6 February 2025).

reasons for belief that it provides—to become extinct, in a sense. Scientific communities are like flocks of Dodos, and there is the risk of extinction through the constant attack of the Zombies—the antagonistic non-experts. I believe that calling antagonistic non-experts 'Zombies' makes further sense: Zombie arguments are the kinds of arguments that keep returning and 'never die' (as will be discussed in Chapter 4) (Weart, 2011, p. 48). I believe that the antagonistic non-experts also 'keep returning' in a similar way as the zombie arguments. Finally, the last known dodo egg is in my hometown, East London, South Africa, and the dodo is a bird that is very dear to me.

5. The Impacts of these Epistemic Pathologies

When the epistemic pathologies that I describe emerge, there is the risk that non-experts fall for the tricks of the antagonistic non-experts and become suspicious, doubtful, and simply resistant to taking the testimony of scientific communities and their members seriously. This is especially true when we face traumatic events, such as COVID-19; we hope to find answers to understand the unfolding events (Douglas & Sutton, 2015, p. 99). When the answers provided by officials seem unclear and conflicted, we are especially prone to falling for the narratives propagated by antagonistic non-experts, especially when the scientific ignorance of non-experts is exploited.

A prominent example of the harm that could result from these pathologies, especially when a potent political force is behind the dissemination of science denialism, is the case of Donald Trump during the COVID-19 pandemic. There was a significant difference in the response to the COVID-19 pandemic between Democrats and Republicans in the USA (Morris, 2021). This was because of the wildly divergent beliefs related to COVID-19 and the resultant response based on those beliefs. It is widely known that Trump very publicly spoke out against the pandemic for various reasons (sometimes quite incoherent). Sometimes, he just dismissed the pandemic by saying it was not serious and under control; sometimes, he claimed it was nothing different than the common cold (Morris, 2021, pp. 2414-2415). Those states in the USA that were pro-Trump were far less likely to adopt behaviours that would help to mitigate the spread of COVID-19 in comparison to the Democratic states, and this was very clear in the statistics on infection numbers, death rates, and other statistics that

showed the spread and extent of the COVID-19 virus.[10]

Further to this example, a significant body of emerging evidence shows how reduced uptake of the MRI vaccines has led to the outbreak of diseases that were eradicated in the past (Blanco & Matute, 2018, p. 45). Parents want to make the right decisions for the health of their children but fall victim to anti-vaccine narratives by science denialists as well as pseudoscientists and their 'alternative' preventative treatments. Another example is the conspiratorial beliefs during the COVID-19 pandemic. A study by Vitriol and Marsh showed how beliefs regarding the scientific consensus on the virus influenced social behaviours and adherence to the COVID-19 lockdown mandates (2021, p. 1). COVID-19 conspiratorial beliefs decreased the acceptance of the scientific consensus, whereas the understanding of the virus predicted increased belief and acceptance of the scientific consensus (Vitriol & Marsh, 2021, p. 1).

6. Flat Earth Pandemonium

In December 2024, there was an interesting experiment that took place, which was called 'The Final Experiment'.[11] Will Duffy, a Glober and pastor at a small church in Denver, Colorado, orchestrated the experiment, offering to pay for himself, another Glober, and two further Flat Earthers. The idea behind the experiment was for a group of Flerfers and some Globers to go to Antarctica to witness the 24-hour sunshine at this particular time of the year. The reasoning behind this specific experiment was based on a fundamental claim in Flat Earth Science: on the dominant Flat Earth model, there can't be 24 hours of continuous sunshine (and, by extension, months of constant sunshine).[12] It was fascinating to watch the build-up in the months before the experiment and, once it was in motion, in real time. Many prominent Flerfers turned down the opportunity to go on the trip in the months running up to the experiment. At the same time, three prominent Flerfers eventually agreed to go, namely Jeran Campanella, Sean Griffin, and Austin Whitsitt.[13]

In the months leading up to the experiment, there was plenty of chaos, predictions of what would happen, disagreements between Flerfers and Globers—both in online video interviews

[10] See Morris for a full discussion and breakdown of the study done (2021).
[11] For information on the experiment: https://www.the-final-experiment.com.
[12] See 12:20 in this discussion by Glober Dave McKeegan, where he shows David Weiss, a prominent Flerfer, confirming this claim: https://www.youtube.com/watch?.v=qVAMbRujaAU
[13] For a full list of participants: https://www.the-final-experiment.com/participants.

and podcasts and more informally on social media platforms—and preparations for the experiment. Some prominent Flerfers who turned down the opportunity, such as FlatEarthDave (David Weiss), started theorising that the whole experiment was faked, and plenty of support grew for these views and claims.

Since the experiment with the recording of the 24-hour sun and the testimony of the Flerfers saying that they did see the sun, there has been pandemonium amongst the Flerfers. For the most part, there has been an outright rejection of the event's integrity, with accusations of conspiracies (NASA staging the whole experiment, allegations that the Flerfers who went were 'shills', they were paid, that the entire thing was staged in Hollywood, amongst many other theories).[14] As the fallout of this event is still in the process of unfolding, it is quite a task to unravel the chaos.

Even though this event—and the Flerfers' responses—have proven challenging for anyone who has some faith in scientific communities, experts, and the established scientific consensus that the earth is spherical, there is some reason for hope. I will discuss this event in more detail in Chapter 3, on pseudoscience, and in the Conclusion of the thesis.

7. Outline of Subsequent Chapters

In this thesis, I want to analyse scientific expertise and communities and explain why we are obligated to believe—or at least *accept*—their testimony about matters relevant to their domain of expertise. I will analyse some of the epistemic pathologies that emerge in the relationships between scientific experts and non-experts, such as pseudoscience, science denialism, and science-related conspiracy theories, and work towards defining a unique kind of epistemic injustice toward scientific experts that results from such pathologies, namely a *scientific expert epistemic injustice*.

In Chapters 1 and 2, I will lay the foundation for understanding the ideal relationship between a non-expert and a scientific expert *qua* epistemic authority. This relationship is unique in some way, as we appeal to scientific experts when we need certain kinds of information that we do not have. To understand this relationship better, I will consider its various features and what it means to be a scientific expert *qua* epistemic authority.

In Chapter 1, I will explain what the testimony of an epistemic authority does, i.e., what

[14] See SciManDan's YouTube channel for an extensive insight into the resulting chaos: https://www.youtube.com/@SciManDan.

happens when an epistemic authority testifies about some matter. When an epistemic authority testifies, it provides us with *preemptive reasons for belief*, which are unique kinds of reasons. I draw primarily on Joseph Raz, Linda Zagzebski, and criticisms from Jennifer Lackey to understand this better. Essentially, preemptive reasons for belief are unique as they *replace our reasons* about the matter. Only epistemic authority can provide us with these kinds of reasons for belief. One of the arguments to support a preemptive reasons for belief account for acceptance of the testimony of an epistemic authority seems very intuitive—namely, the track record argument. According to this account, scientific experts *qua* epistemic authorities have better chances of getting to the truth about the relevant matters. They have a better track record than me or anyone who is not an epistemic authority on the appropriate matter. This makes it reasonable—and logical—for me to defer to their epistemic authority when forming beliefs about these matters.

The track record argument in Chapter 1 leads to the main argument in Chapter 2. In this chapter, I will answer what scientific expertise is and how it is authoritative in the distinctly epistemic sense, providing us with preemptive reasons for belief. I do this by appealing to a sociological understanding of scientific communities and the scientific expert's role in that community. A scientific expert has epistemic authority as they 1. accurately articulate the scientific consensus position that has been reached within a scientific community, specifically with regards to questions in that particular domain, and 2. they have been initiated into the scientific domain in question (an *understanding* condition, meaning they have the requisite educational background, they know the relevant traditions, they know the requisite observational techniques, methods, etc.) by those who have engaged in the scientific domain in question and have a thorough grasp of the questions and existing answers in the domain. Because of the particular sociological set-up of a scientific community, scientific expertise can be defined in terms of this relationship with a scientific community.

I will mainly draw on David Hull and Helen Longino to describe this community. Scientific communities are diverse communities with specific mechanisms that help them to provide us with answers to questions. The answers these kinds of communities provide are mostly correct because of the way these communities work. These communities have self-regulating mechanisms that help them provide us with consensus claims on relevant questions. Furthermore, these consensus claims are *collective knowledge* as it is the product of a community of scientific experts. I will further consider how the testimony of a collective of scientific experts is better than that of an individual scientific expert. The reason is not that it is more epistemically authoritative but instead provides a further kind of consensus, namely

a *communicative consensus*. A communicative consensus results from a scientific community's deliberations on *how* to communicate particular scientific issues to a non-expert audience and *what* to communicate. This kind of consensus provides non-experts with a decreased margin of error; non-experts have lower chances of making an error in their judgment of the legitimacy of claims to scientific expertise when the claims are made by a collective of scientific experts.

In Chapter 3, I will analyse the first pathological relationship between scientific experts and non-experts, namely that of pseudoscience. When pseudoscientists present their theories, they effectively claim to have the sort of epistemic authority that only scientific experts can have. This means that they claim to provide the same kinds of preemptive reasons for belief that only an epistemic authority can provide. Pseudoscientists are primarily defensive when making these claims in response to accusations of not being scientific experts. When presenting themselves as scientific experts, they fake those features of science and scientific communities that make them look like a scientific community. This behaviour often goes along with an accusation of 'dogmatism' or 'scientism' towards scientific communities and the claim that what the pseudoscientist does is revolutionary. I will consider the failings of pseudoscientists and pseudoscientific communities by comparing them to scientific communities as they are, effectively claiming to provide answers to scientific matters that are just as good, or even better, than what scientific communities offer.

In Chapter 4, I will consider the case of science denialism, which is another pathological relationship between scientific experts and non-experts. In science denialism, I am specifically interested in cases where rhetorical strategies are intentionally employed to cast doubt on established science. The fundamental rhetorical strategy is to exploit the non-expert's scientific ignorance and combine that with an appeal to values—such as political, religious, and ideological—that fall outside of scientific enquiry, where the appeal to the values effectively aids in undermining established scientific facts. The science denialism cases that are especially prominent are those of the tobacco industry and the fossil fuel industry. When employing this rhetorical strategy to cast doubt on the established scientific claims, the science denialists implement them through various argumentative tropes, such as conflating science and politics, science and morality, accusing scientists of dogmatism, or appealing to democratic values and announcing a 'scientific controversy'. In the case of science denialism, the key to understanding this pathology is how it systematically erodes the epistemic authority of scientific experts and scientific communities to lead to the rejection or lack of acknowledgement of that epistemic authority in their audiences.

In Chapter 5, I will consider the epistemic *harms* towards scientific communities and scientific experts that will eventually be fundamental in the kind of the epistemic injustice I have in mind. Epistemic harms towards scientific communities and their members make them *worse off epistemically*. They are worse off epistemically because of the impediments on their epistemic agency. There are primary as well as secondary epistemic harms. The primary epistemic harm is intrinsic, and it is an impediment to the epistemic agency of a scientific expert insofar as there is a rejection of the unique kinds of reasons for belief they provide. I use *epistemic agency* to further refer to the ability to partake in the epistemic practices within scientific communities, i.e., be involved in the knowledge production and dissemination practices, where the impediment of epistemic agency in these senses are secondary epistemic harms. The epistemic harms toward scientific experts and scientific communities result from the epistemically detrimental dissent produced via the various pathologies. Biddle and Leuschner have worked to provide an understanding of the notion of *epistemically detrimental dissent* as something that *impedes* knowledge production in scientific communities. The harms towards scientific experts and scientific communities can be to an individual or the community, but the individuals are more vulnerable. Scientific communities are far more robust against the potential harms, although individual scientific experts' vulnerabilities also make the scientific community more susceptible to harm.

In Chapter 6, I will define the unique kind of epistemic injustice I have in mind. A *scientific expert epistemic* occurs when scientific experts are epistemically harmed due to the *wrongful* downgrading of their epistemic authority when they testify about matters relevant to their scientific expertise. When there is the rejection or lack of acknowledgement of the epistemic status of scientific experts (i.e., the 'downgrading' of their epistemic authority) due to epistemically detrimental dissent, the intrinsic epistemic harm is in the *downgrading*, which is harm to their epistemic agency *qua* a specific kind of epistemic agent—one who is a scientific expert *qua* epistemic authority who provides us with very unique types of reasons for belief.

Chapter 1

Believing the Dodos: Epistemic Authority and Preemptive Reasons for Belief

When we have difficult questions and need answers to guide our actions and beliefs, we often turn to someone we consider an expert on the relevant matter. If my car breaks, I would ask someone knowledgeable about cars to help me. If I have to consider how to treat a medical condition like chronic eczema, I will ask a doctor, a nurse, or a dermatologist. We realise we do not have the relevant knowledge to make an informed decision about how to act or what to believe (and sometimes, how we should act as a consequence of the belief). These needs can be fulfilled by asking someone more likely to have the requisite knowledge. We ask the expert to step in and speak about the issue at hand as we take them to be an authority of some kind on the particular matter, and their testimony provides us with reasons for belief or action.

In this chapter and the following, I will lay the foundation for understanding the ideal relationship between a scientific expert *qua* epistemic authority and a non-expert, where scientific experts are people who hold epistemic authority on specialised matters. I focus on the nature of our relationship to a certain kind of epistemic authority, namely, *scientific* experts *qua* epistemic authorities. Scientific experts have a specific sort of epistemic authority relevant to the scientific matters I am interested in. I could be an epistemic authority on my cell phone's location, but that is not the same kind of epistemic authority that a scientific expert has. Again, a mechanic might be an epistemic authority of some sort on the workings of my car. Still, they do not possess the same epistemic authority as a scientific expert. In the following chapter, I will turn to questions regarding what scientific expertise *is*, how scientific experts can *have* epistemic authority, and where the epistemic authority *comes*

from. However, the main question I wish to answer in this chapter is what the testimony of a scientific expert, as an epistemic authority, *does*.

When an epistemic authority of this kind testifies, what does it do, or what does it provide us with? Intuitively, there seems to be a difference between my lawyer friend's testimony about the state of climate change and a climatologist's testimony about the matter. When a scientific expert *qua* epistemic authority testifies about a matter, our reasons for belief seem to come from elsewhere than normally. I will show that when a scientific expert *qua* epistemic authority testifies, it gives us *preemptive reasons* for belief. These preemptive reasons for belief replace our reasons for belief about the relevant matter, where *epistemic authority* provides these kinds of reasons. Only *authority* can provide preemptive reasons; practical authority provides preemptive reasons for action, whereas epistemic authority provides reasons for *belief* (or acceptance of testimony). Preemptive reasons are *their* reasons for what they tell us about the matter; those evidence-based reasons are transferred to us and become our reasons. The fact that the epistemic authority's reasons replace our reasons means that we do not have to look for answers elsewhere or rely on our understanding of the subject.

Ideally, when a scientific expert *qua* epistemic authority testifies to a non-expert, we no longer need to rely on our reasons for belief about the matter and can accept their testimony preemptively. Understanding the ideal relationship between a scientific expert and a non-expert will help us better identify the epistemic pathologies that develop from these relationships. The epistemic pathologies I have in mind and will analyse in Chapters 3 and 4 are science denialism, pseudoscience, and related conspiracy theories.

In constructing an account of what epistemic authority *does* in the ideal relationship between scientific experts and non-experts, I will primarily draw on Joseph Raz (1985; 1986), Linda Zagzebski (2012), and criticism from Jennifer Lackey (2021). In § 2, I will discuss the appeal to arbitrators and practical authorities, what that says about epistemic authority, and the reasons we have for belief (or acceptance of testimony). In § 3, I will discuss epistemic authority and preemptive reasons for belief. In § 4, I will discuss a very intuitive argument in support of the preemptive reasons for belief account, which is the *track record argument*: a scientific expert who has epistemic authority on particular questions within a specialised domain would have better chances of getting to the truth about matters related to the subject, i.e., they have a better *track record* for getting to the truth. It is *reasonable* to defer to scientific experts when I want to know the truth about a matter. This argument will be crucial in supporting my claims regarding the epistemic authority of

scientific experts and scientific communities that will follow in Chapter 2, where the track record of scientific communities and their members can be explained by considering why the scientific community is good at providing us with primarily correct answers.

1. The Appeal to Arbitrators and Practical Authorities: What it Says about Epistemic Authority

Imagine I want a swimming pool on a property I share with my boyfriend. My boyfriend is concerned that the roots of the gum tree just outside of our property have invaded the property. As these trees have robust root systems that can cause significant damage to the foundations of any construction, it would not be a good idea to build a swimming pool where I would like to. We could, eventually, have financial losses if we built the swimming pool and have costly maintenance problems. However, we are unsure about the matter, and I am very keen on having a swimming pool. After careful thought, we contact a contractor who builds swimming pools and ask him to survey our property and decide for us. We give him explicit instruction that we do not want to make significant changes to our house and other property features but only want him to help us decide whether to build a swimming pool and the impact of the gum tree. The contractor visits our property, and after carefully inspecting it, he decides it would not be a good idea as he has seen problems resulting from this scenario multiple times. Indeed, these trees can cause significant damage to the foundations of a construction, as we worried. We accept his directive and we do not build the swimming pool.

This scenario where we appeal to someone else to step in and *decide for us* about a matter is a classic example of an appeal to someone to act as an arbitrator. Joseph Raz uses the notion of an arbitrator and the authority that an arbitrator possesses to understand better what it means to be an authority and have the power to dictate how others *should* act, especially regarding legal and political authorities (1985, p. 9). When two people disagree about some *p*, they might ask an arbitrator to settle the dispute (Raz, 1985, p. 9). When an arbitrator is called upon in this way, the arbitrator's decision on the matter will *generate* reasons for the disputants to act, as the arbitrator's decision is based on reasons that the disputants do not have access to (Raz, 1985, p. 9). The arbitrator is meant to decide based on the reasons applicable to the particular situation and the disputants in question (Raz calls these reasons 'dependent reasons') (Raz, 1985, p. 9). The arbitrator's reasons then *replace* the disputants' reasons for action, and the arbitrator's decision is final (Raz, 1985, p. 10).

The arbitrator's decision—and resulting directive—is a reason for us to act; we *ought* to obey his directives (Raz, 1985, p. 9). What happens is that the arbitrator's reasons are binding because it has a normative power, and he exercises this normative power when giving directives. The reasons a disputant might have had before the arbitrator's decision are no longer relevant, as the arbitrator's reasons (with a resulting decision and directive) have replaced the disputant's reasons. Any relevant prior reasons the disputants might have had can no longer be relied upon to justify any actions once an arbitrator has made a decision (Raz, 1985, p. 10). When the disputants obey the arbitrator's decision, they accept his judgement of the reasons involved and not their judgment (Raz, 1985, p. 10). In the above scenario about the decision to build a swimming pool, we replace our reasons for whatever action we had in mind with the arbitrator's reasons and act according to what he says we should do.

For Raz, an authority's directives are comparable to an arbitrator's (1985, p. 9). An authority is someone who has been given some right to rule, but the right to rule "is understood as correlated with an obligation to obey on the part of those subject to the authority" (Raz, 1985, p. 3).[15] I.e., the authority has a *normative power,* and the subjects have to respond to that power through obedience. An authority is legitimate "only if there are reasons to accept it, that is, sufficient reasons to follow its directives regardless of the balance of reasons on the merits of such action" (Raz, 1985, p. 8). Someone can only be an authority if the subjects of that authority have agreed to obey the authority, i.e., they have established that there are sufficient reasons to accept their authority (Raz, 1985, p. 8). Consider the example of a well-functioning democracy: some person or political party only gain authority and power once they have been voted for, and thereby, through a legitimate selection process, they have been given normative power over the subjects under question, and that power is now acknowledged, and the person or party has the *right* to give directives.

Also, consider the example of the contractor who acted as an arbitrator for my boyfriend and me in our decision to build a swimming pool. If the contractor had attended to the evaluation of our situation and then given the directive to demolish our house and build the swimming pool in the location where our home was, something had gone wrong. When we appealed to the contractor as arbitrator, some of the reasons relevant to the decision he was meant to make on our behalf had been ignored. He ignored that we did not want any other significant changes made to our property. We judge him as *not* possessing authority and have

justification to challenge and refuse to obey him. Raz's account acknowledges that there can be cases where we have specific grounds for rejecting and challenging their decisions. Sometimes, those reasons for rejection could be because the authority had overstepped the range of their authority (1985, p. 14).

Authority then has to do with the *source* of a directive: the directive comes from someone who has a *legitimate claim to authority*, i.e., the person who is giving a directive has a *right* to do so (Friedman, 1973, p. 126). However, often, authority is restricted. A legitimate authority could only have authority regarding a specific matter. If a traffic officer tells me I must get on a plane and go to Paris, there are reasons to reject his directive. Once the subjects have accepted a person or institution's claim to authority, the subjects are obligated to obey and accept the authority's decisions and directives.[16] What this means is that we could say that in accepting someone as a legitimate authority and accepting that the person has the right to give a directive as to how I should act, we are, in a sense, 'surrendering our private judgment' (Friedman, 1973, p. 129, my italics):

> The idea being conveyed by such notions as the surrender of private judgment … is that in obeying, say, a command simply because it comes from someone accorded the right to rule, *the subject does not make his obedience conditional on his own personal examination and evaluation of the thing he is being asked to do*. Rather, he accepts as a sufficient reason for following a prescription the fact that it is prescribed by someone acknowledged by him as entitled to rule. *The man who accepts authority is thus said to surrender his private or individual judgment because he does not insist that reasons be given that he can grasp and that satisfy him, as a condition of his obedience*. Conversely, to have authority is not to have to offer reasons in behalf of what one has prescribed as a condition of being paid obedience.

This means that when an authority gives a directive, obedience is the abdication of one's judgments and the acceptance of the decisions of another (Friedman, 1973, p. 129). The authority has a normative power that generates reasons for us to act (Raz, 1985, p. 9). If the relevant and legitimate authority decides, for some reasons that are unclear to us, that we

[16] It is possible that, at times, subjects might not want to obey the authority's directives. What is essential, is that when an authority is recognised as being the legitimate authority, they have been given the right to use force at times when there is a lack of obedience, and it could be a type of coercion that is still approved of by many of the authority's subjects (Friedman, 1973, p. 127). However, there might be a time when the subjects no longer acknowledge the authority, sometimes for legitimate reasons (say, in a dictatorship or a corrupt government).

have to start driving on the opposite side of the road and they give us this instruction, we would have to obey—we are *normatively* required to do so (an example roughly taken from Zagzebski, 2012, p. 106). Suppose my friend tells me I should walk to campus daily rather than taking the bus. In that case, I will listen to my friend and consider her reasons for saying so by directly interrogating those reasons myself. I might even start walking to campus daily, but I am not obligated to do what she says. She has no right to expect that I will be obedient and accept her advice as a directive. The reasons she has provided for that action are simply reasons added to my reasons for deciding the matter.

When my friend gives me advice, I have to explain why I acted on her advice. I have to explain why I chose to act according to *her* advice rather than another way. My reasons will be related to the reasons she provided on the benefits of walking (such as it is beneficial to improving mental health, cardiovascular health, weight loss, etc.) combined with other reasons about the matter and, in opposition to that, the reasons against her advice. I will explain how I came to decide that her advice is good. When I act in response to a directive given by an authority, my reason for acting or obeying accordingly would be *that I was told to perform this action—I was instructed to do so by an authority*. I acknowledge that they had the right to give me a directive, regardless of what I might have thought. In the first case, I can rely on my reasoning and private judgments regarding the matter (the reliability of my friend and advice given by her combined with reasons I hold about the matter). In contrast, in the second case, I cannot do so, and may not, due to a normative requirement from the authority of the directive. In the first case, the relevance of the person who gives me advice is different to the second: my friend does not possess the normative power and authority that makes reasoning about the matter irrelevant in the same way as reasoning about the directive given by authority becomes irrelevant.

This demonstrates an essential feature of authority and preemption: Authority is content-independent (Zagzebski, 2012, p. 106). An authority can give me any number of directives I have to obey, and they can even change the directive without changing my reasons for accepting it. Consider that an authority instructs us that when a traffic light is orange, it means we must drive; when it is green, we must stop, and when it is red, we must slow down. The fact that a legitimate authority gives directives generates our reasons to obey. I might think that the change in the laws makes no sense, will increase accidents, and cause plenty of confusion, but I act accordingly due to the authoritative nature of the directive. Suppose the legitimate authority changes these laws again within a few weeks. In that case, our duty to obey remains for the *same reasons* as before, i.e., that the authority gave the directive and

that we are obligated to obey.

Raz suggests that these reasons related to obeying an authority's directives are unique kinds of reasons for action, and those special kinds of reasons are generated simply through the directive given by an authority (1985, p. 18). I will now turn to the idea of epistemic authority. Thereafter, I will turn to understanding preemptive reasons for belief as unique kinds of reasons for belief.

2. The Appeal to a Scientific Expert as *Epistemic Authority*

I remind the reader that in this chapter, I am not *defining* the notion of epistemic authority, and the current discussion is about what epistemic authority *does,* i.e., what sorts of *reasons* for belief (or acceptance of the testimony) an epistemic authority provides. I am specifically interested in the epistemic authority that *scientific experts* have. For example, I am an epistemic authority on the current balance in my bank account. However, there is something very different about my epistemic authority on the truth about my bank balance versus a climatologist's epistemic authority on the state of anthropogenic climate change. In this thesis, I focus on explicating the notion of *scientific experts* qua *epistemic authorities*.

The conversation between a non-expert and a scientific expert *qua* epistemic authority differs from everyday conversations between friends, colleagues, etc. In the case of a conversation with a scientific expert, we have an epistemic authority whose testimony represents their specialised knowledge of a specific domain. In contrast, when we converse with a non-expert, most cases are conversations between epistemic peers.[17] Consider the following example: I am attending a public lecture on anthropogenic climate change that a world-renowned climatologist is presenting. The audience and I are all non-experts, and the climatologist explains the current state of the knowledge on the matter and provides a broad

[17] Epistemic peers are when two speakers in a conversation 1. are "equals with respect to … [their] … familiarity with the evidence and arguments which bear on the question", and 2. are "equals with respect to general epistemic virtues such as intelligence, thoughtfulness, and freedom from bias" (Kelly, 2006, pp. 174-175), relativised in two ways, concerning time *t*, and concerning a specific proposition *p* under question (Matheson, 2015, p. 21). This could be simplified by saying that they would be epistemic peers about *p* at *t* if 1. there is equality in evidential possession (if they are to be evidential peers about *p*, they have to be equal in terms of their evidence about *p*), and 2. there is equality in evidential processing (if they are to be epistemic peers in evidential processing about *p*, they have to be equally good at evidential processing about *p*) (Matheson, 2015, p. 22). Being peers in terms of evidential possession does not mean that they have to have the same body of evidence about *p*, but only that they have bodies of evidence about *p* that are *equally good*. Similarly, equality in evidential processing does not mean that they have to process the evidence identically, but simply that their faculties to process evidence about *p* are *equally good*, all things considered.

explication of some of the leading consensus claims. Some audience members later ask the climatologist questions about the matter. In this conversation, we have non-experts appealing to a scientific expert. Through the lecture, we gain some insight into the current state of affairs, but we do not have direct access to the reasons for what the climatologist says. We are informed and take what the climatologist says as reasons for believing or accepting the information.

In the conversation with the scientific expert, we treat our epistemic superior as a scientific expert *qua* epistemic authority.[18] When we consider someone a scientific expert *qua* epistemic authority, we acknowledge that they can tell us what we should believe (or what we should at least accept as accurate). It is their *epistemic authority* on the matter that provides us with unique kinds of reasons for belief. We often also appeal to a scientific expert in this way when we have doubts or our views conflict with those of other non-experts, and we are attempting to find out the truth about the matter. When a conversation between a non-expert and a scientific expert occurs, the appeal to an arbitrator is similar to the model Raz presents, where an authority possesses a similar power as an arbitrator (1985, p. 9). Raz focuses on cases of practical authority, i.e., how we should *act* when given directives by an authority. In contrast, I am concerned with what it means when an epistemic authority tells us what to *believe* about a particular matter.

It is important to note that there are two ways in which we can understand someone to '*have* authority'. One way is when someone 'is *in* authority', and the other is when someone 'is *an* authority' (Friedman, 1973, p. 122). This distinction is critical to understanding the epistemic pathologies I will discuss later in the thesis, as non-experts often mistake scientific experts' testimony as a command for *action*. When a scientific expert testifies, this confusion about our obligations is frequently exploited by antagonistic non-experts. The former is when a person "occupies some office, position, or status which entitles him to make decisions about how other people should *behave*" (Friedman, 1973, pp. 122-123, own italics). In contrast, when we consider someone as being '*an* authority on something', we consider the person as having beliefs or testifying about something where we should believe or accept their testimony as accurate (Friedman, 1973, pp. 122-123).

Traditionally, we would say that a judge or police officer is '*in* authority' and a teacher or priest is '*an* authority'. A police officer has the authority to command me to obey specific

[18] I use an adjusted version of Jennifer Lackey's phrase *expert-as-authority* (2021, p. 135). As I talk about a specific kind of expert, namely a *scientific* expert, I feel it necessary to make an adjustment. She also talks about scientific experts more specifically, but I still find her term too open.

laws. In contrast, a priest has the authority to tell me about their religion's accepted beliefs, traditions, and rituals, which provides me with knowledge. Friedman notes that an expert is *an* authority (1973, p. 123). When a scientific expert *qua* epistemic authority testifies about *p*, they are '*an* authority' on domain *D* related to *p*. Scientific experts cannot command our actions (unless, for example, those '*in* authority' give scientific experts the right to do so). Still, they provide us with preemptive reasons for believing (or accepting) *p*. Legitimate authority obliges us to acknowledge that authority. However, the acknowledgement of the authority might present differently, either commanding action or belief (or acceptance of belief). Furthermore, being '*in* authority' as a practical authority is different to being '*an* authority' as an epistemic authority insofar as the epistemic authority is an epistemic authority regardless of non-experts elevating them to that kind of position. For a practical authority, some process has to occur where subjects of that authority elevate the authority to that position via, for example, elections.

Zagzebski's account makes some adjustments to Raz's account of authority (as modelled on the idea of an arbitrator's authority) to fit a notion of epistemic authority. She phrases the connection between the authority's beliefs and the normative requirement on the hearer to adopt those beliefs as follows (Zagzebski, 2012, p. 107):

> The fact that the authority has a belief *p* is a reason for me to believe *p* that replaces my other reasons relevant to believing *p* and is not simply added to them.

What is important to note is the emphasis that Zagzebski places on the fact that the subject will conclude that they will be *better off epistemically* if they accept the epistemic authority's testimony about *p* than if the subject attempted to form their own belief about *p* (Zagzebski, 2012, p. 111). George Cornewall Lewis explains the principle of authority in beliefs that is especially relevant (N.d., pp. 6-7, my italics):

> The principle of authority … [is] the principle of adopting the beliefs of others, on a matter of opinion *without reference to the particular grounds on which that belief may rest.*

Lewis's explanation of a 'principle of authority' fits well with Zagzebski's notion of

epistemic authority. What I find particularly useful is the explication of two essential features: 1. believing (or accepting testimony) on authority has to do with the person who testifies to some *p*, i.e., the speaker has to *possess* the relevant epistemic authority, and 2. the hearer does not rely on their judgment about the matter when forming a belief, meaning that they rely on different kinds of reasons than the usual (such as first-person evidence about *p*) to support their belief. What is different in the cases I am interested in is that it is not about "a matter of opinion", as Lewis's account is (N.d., pp. 6-7). In the cases I have in mind, it will be about a particular kind of epistemic authority that is not based on "a matter of opinion"—the *source* of the epistemic authority will be the kind where it is not simply 'opinion' but *collective knowledge* (as will be discussed in the following chapter).

For Zagzebski, the next step is to compare the *kinds* of reasons an epistemic authority's judgment provides in a directive about how to *believe*. For Zagzebski, the authority in both cases is identical. When an epistemic authority testifies, we gain reasons for belief that are the same *kinds of reasons* when an arbitrator or authority gives us directives (Zagzebski, 2012, p. 115). In the next section, I will explain these special reasons, i.e., *preemptive reasons* for belief. I agree that the kinds of reasons provided by practical and epistemic authorities are the same, even though they require different responses, namely, action in the first case and belief (or acceptance) in the second.

3. Epistemic Authority and Preemptive Reasons for Belief

When we appeal to a scientific expert, it reveals something about our understanding of the *quality* of the *reasons for belief* we have available to us: we make a judgment that the reasons or knowledge we possess might not be sufficient to accurately judge whether or not *p* and that the scientific expert's beliefs about *p* would probably be better as they are an *epistemic authority* on the matter. In the appeal to a scientific expert to testify, we appeal to them as an epistemic authority on the matter: we ask the scientific expert to speak *qua* epistemic authority. We appeal to them as we believe they can answer specific questions within a specialised domain with epistemic authority about the matter we do not possess.

However, a scientific expert's epistemic authority is not contingent on our appeal to them to testify. Even when they testify to a matter without our appeal, their testimony carries the same epistemic authority and preemptive reasons for belief (in the following chapter, I will explain where their epistemic authority comes from and why they have the epistemic

authority). In this sense, it is similar to a traffic officer possessing the authority to give you a fine for parking your car in an area where you are not allowed, but they do not have to exercise their authority to have it (Fricker, 2007, p. 9).

When a scientific expert testifies about a relevant matter, they are the speaker *S* who tells us, the audience *A,* something about the matter at hand. They have the *epistemic authority* to testify and to influence our beliefs. But even when they do not testify about the matter, they still possess epistemic authority on the relevant matter. As the scientific expert has the epistemic authority to tell us whether or not *p*, they have a normative power that *makes the reasons for us to believe (*or at least *accept* what we are being told*) available*. If I were a climatologist and I told you about the current state of anthropogenic climate change, the reasons for belief already existed before I told you about their existence. By telling you about them, I have made them available to you. These reasons are unique kinds of reasons, called *preemptive reasons* for belief, and these kinds of reasons can only be provided by an epistemic authority.

When we deal with preemptive reasons, the situation is binary—it is an all-or-nothing scenario where the authority's reasons completely *replace my reasons for belief or action,* and the reasons are not simply added to my own. Raz explains preemptive reasons for action as follows (1985, p. 13, his italics):

> *The fact that an authority requires performance of an action is a reason for its performance which is not to be added to all other relevant reasons when assessing what to do, but should exclude and take the place of some of them.*

Applying this to epistemic authority, when we preemptively accept a scientific expert *qua* epistemic authority's reasons for belief regarding *p*, we acknowledge that the scientific expert has the best reasons to inform our beliefs as they are an epistemic authority. They will have the best reasons as they have made an expert evaluation of the available evidence, a kind of evaluation that we, as non-experts, cannot perform. We acknowledge them as scientific experts *qua* epistemic authority. When we believe preemptively (i.e., based on their epistemic authority), we do not have to *first* listen to their testimony to decide if we will accept their reasons. The nature of preemptive reasons is that the epistemic authority that provides the preemptive reasons has the authority to instruct us in our beliefs (or our acceptance of their

testimony).

Linda Zagzebski extended this notion of authority and preemptive reasons, i.e., when "a normative power … generates reasons for others to do or to believe something preemptively" to consider its uses in considerations of belief and the relation to epistemic authorities, eventually showing that due to preemptive reasons, it is rational to believe upon epistemic authority (2012, p. 103). In these cases, the speaker stands in my place to decide whether *p* (Zagzebski, 2012, p. 107). Zagzebski phrases the connection between an epistemic authority's beliefs and my duty upon hearing what their beliefs are as follows (2012, p. 107):

> The fact that the authority has a belief *p* is a reason for me to believe *p* that replaces my other reasons relevant to believing *p* and is not simply added to them.

Zagzebski draws a close connection between the epistemic authority's *beliefs* and our acceptance of those beliefs (2012, p. 107). I want to briefly highlight a difference between Zagzebski's and my understanding of preemptive reasons for belief, although this will be discussed in full in the following chapter. For now, I will say that due to the nature of scientific expertise *qua* epistemic authority, where the epistemic authority comes from collective knowledge, it is not necessary for the individual scientific expert *qua* epistemic authority to hold the belief that their testimony is about. It is sufficient that they have good reasons for claiming the truth about *p*. For example, a climatologist might articulate to me the current consensus on a particular feature of climate science, such as the ice core findings in the Arctic circle, but the individual climatologist does not have to believe exactly what she claims. She could simply have very good reasons for believing what she says is true, such as that the claims come from a reliable scientific community. For now, based on my analysis, I will formulate the connection between the epistemic authority's claims and my acceptance of those claims as follows:

> The fact that an epistemic authority has reasons for claiming the truth of *p* provides preemptive reasons for believing (or at least accepting) *p* that replace my other relevant reasons for belief about *p*.

As I will show later, it is simply enough that someone *is* a legitimate epistemic authority on the specialised domain and can tell me the established truth about the matter. The kind of epistemic authority a scientific expert has does not mean that they must hold all the relevant beliefs about the scientific claims involved (as will be explained later), but simply that they have good reasons to believe that what they claim is right. For Zagzebski, there is a very close connection between the epistemic authority and the particular belief the topic of testimony and the hearer's belief about the matter.

Remember that Friedman (1973, p. 129) stated that when a person *accepts* authority, they "surrender their private or individual judgment" as they *do not ask for reasons* that would convince them of what is being claimed by the authority, and in not asking they are obeying the authority and the normative power of the authority. As Zagzebski further explains, which I agree with, we do not only surrender our judgment; the reasons that the authority knows to support what they say replace my own (2012, p. 107). Accordingly, scientific expert testimony is not simply another piece of evidence, as experts offer preemptive reasons for belief, specifically (and exclusively) within the domain of their scientific expertise (Lackey, 2021, p. 135).

Arnon Keren highlights a distinction between Zagzebski's account for preemptive reasons for belief, and Raz's account for preemptive reasons for action that I agree with and that is useful to understand how preemptive reasons for belief work differently than the preemptive reasons provided by practical authorities (Keren, 2014, pp. 66-69). Keren points out an important distinction between the preemptive reasons for *action* from a practical authority and the preemptive reasons for *belief* from an epistemic authority by considering Raz's account of preemptive reasons for action. Considering this difference, it shows that an epistemic authority's preemptive reasons for belief come in degrees and are not as strong as the preemptive reasons for action that an authority's directives provide (Keren, 2014, p. 67). Consider Raz's take on the 'no-difference thesis', which Raz claims is false (1986, p. 30, my italics):

> …[t]here is nothing which those subject to authority ought to do as a result of the exercise of authority which they did not have to do independently of the exercise, they merely have *new reasons* for believing that certain *acts* were prohibited or obligatory all along.

The no-difference thesis means that authority does not change our reasons for *action*. When an authority gives a directive, the *directive itself* is not a reason for action; it simply provides information about the balance of reasons that exist "separately and independently of such utterances" (Raz, 1986, p. 29). The reasons for the particular action already existed before the directive was given.

Some cases make the no-difference thesis seem true *prima facie*. For example, suppose the authority tells us that we are prohibited from murdering others. In that case, we might think that we already have some kinds of reasons for believing that murder is wrong, and therefore, we just gain new reasons to *act* accordingly. Perhaps, in this case, we are right to think that there are some other existing reasons, and this just adds to the balance of reasons for prohibiting murder. However, prior reasons confirming our beliefs regarding a directive are irrelevant to considerations about the normative power of preemptive reasons for action generated by practical authorities.

Consider the case where an authority can one day give us a directive to drive on the right-hand side of the road and, the next, give us a directive to drive on the left-hand side. The change in the directive could be based on some practical reasons related to traffic organisation and coordination. In both directives (the first being to drive on the right-hand side of the road, the second to drive on the left-hand), the authority *created* reasons for action, and the subject believes that there are obligations to act accordingly. The directive is *a reason for action*: Before the directive about driving on a specific side of the road, no one had any reasons or duties to do so. The reasons for action are about the authority's decision on practical coordination. There was more than one perfectly safe or practical option, and the duty to do φ was created when the authority decided to command φ. This means that when we think about the preemptive reasons provided by an authority, we are committed to seeing them as reasons for *action* in both cases: the prohibition of murder and the directives about driving.

When an authority gives its subjects a directive, it *generates or creates* preemptive reasons for them to *act* accordingly. Zagzebski believes the no difference thesis (or what she calls 'content-independent reasons') is also false for epistemic authorities (2012, p. 107). This means that if a climatologist told me *p* about the state of climate change, I would have reasons for believing them in the same way as when they had told me something completely contradictory, such as *q*. However, Keren points out that, *in a weak sense*, an epistemic authority *generates* reasons for belief; in this case, the no-difference thesis is true (2014, p.

67). In this weak sense, 'generating reasons for belief' means that when an epistemic authority tells us that *p*, it provides a reason for us to believe *p* (Keren, 2014, p. 67). I now know what the epistemic authority believes, which is also a good reason for me to believe *p*.

However, when an epistemic authority testifies about their belief *p*, it would be *misleading* if they did so when they did not themselves have good reasons for *p* (Keren, 2014, p. 67). In this stronger sense, we cannot talk about the epistemic authority 'generating reasons': Epistemic authorities can only provide us with good reasons for belief if they possess good reasons for that belief, and in that sense, an epistemic authority has the normative power to *transfer* preemptive reasons for belief to us. When an epistemic authority testifies, it means that it is about the balance of reasons that *already exist.* They tell us about those already existing reasons when they testify. In this strong sense, they are not generating reasons for belief; they are *transferring* reasons for belief (Keren, 2014, p. 67).

I agree with Keren about the truth of the no-difference thesis in this case, and that it is more accurate to talk about reasons for belief being *transferred*. Again, epistemic authority makes me aware of *existing* reasons, meaning they are not generating new ones. This further means that the epistemic status of the belief that is transferred to us is no stronger than the epistemic status of the belief that the epistemic authority has (Keren, 2014, p. 69). According to my account, the status of the transferred belief is no stronger than the strength of the reasons for the claim that the epistemic authority makes. When a practical authority gives a directive, it does not say anything about the strength of a belief. We simply have reasons to do *φ*. When an epistemic authority testifies to *p*, it is because they have reasons for claiming the truth of *p*, and our preemptive reasons for believing *p* have the same strength as the reasons the expert holds—those reasons are *transferred* to us.

When we talk about a scientific expert *qua* epistemic authority, we can say that the scientific expert *qua* epistemic authority's claim *p* (with supporting reasons of a particular strength) transfers preemptive reasons (that match the strength of their reasons for the claim) to me to adopt their beliefs and those preemptive reasons for belief displaces my reasons. Even though the reasons for belief differ in that the epistemic authority transfers the reasons to us rather than generating them, the epistemic authority still has the normative power that makes it a duty to believe (or accept). Consider the example of a climatologist testifying to the current state of climate change. The climatologist could tell me, 'The current consensus on anthropogenic climate change is 97%'. What is transferred to me is the *strength* of the reasons for the climatologist's claim. I now have reason to believe that 'the consensus on

anthropogenic climate change is 97%' and not that 'the consensus on anthropogenic climate change is 90%'. The *strength* of the reasons for belief is transferred to me and replaces my own.

In the following chapter, I will discuss what a scientific expert *qua* epistemic authority is and how we can say that they have epistemic authority. But first, I want to turn to the track record argument, which supports the idea that epistemic authority provides preemptive reasons for belief.

4. The Track Record Argument for Preemptive Reasons for Belief

One of the main arguments in favour of preemption, which I believe is very strong and intuitive, is that some epistemic subjects have excellent *track records* for getting to the truth about particular matters, meaning that they are more likely to get to the truth about that specific matter than I would be if I do not have the same track record. I want to remind the reader that, for now, I am sketching an *idealised* picture of the relationship between a scientific expert and a non-expert by focusing on what the testimony of an epistemic authority *does*. In the following chapter, I will explain what scientific epistemic authority, or scientific expertise, *is*. The track record argument presented here will work very well in supporting the definition of scientific expertise *qua* epistemic authority that I provide in the next chapter, as the kind of epistemic authority that scientific experts have essentially come from a scientific community that is uniquely able to reliably produce us with primarily right things—i.e., a *scientific community* is the kind of community that has a good track record.

Here, I will talk about the track record of a particular *kind* of epistemic subject, namely a scientific expert *qua* epistemic authority. Raz (1986, pp. 68-69) explains the intuition behind the track record argument as follows:

> Suppose I can identify a range of cases in which I am wrong more than the putative authority. Suppose I decide because of this to tilt the balance in all those cases in favor of its solution. That is, in every case I will first make up my own mind independently of the "authority's" verdict, and then, in those cases in which my judgment differs from its, I will add a certain weight to the solution favoured by it, on the ground that it, the authority, knows better than I. This procedure will reverse my independent judgment in a certain proportion of the cases. Sometimes even after giving the argument favoured by the authority an extra weight it will

> not win. On other occasions the additional weight will make all the difference. How will I fare under this procedure? If, as we are assuming, there is no other relevant information available, then we can expect that in the cases in which I endorse the authority's judgment my rate of mistakes declines and equals that of the authority. In the cases in which even now I contradict the authority's judgment the rate of my mistakes remains unchanged, i.e., greater than that of the authority. This shows that only by allowing the authority's judgment to pre-empt mine altogether will I succeed in improving my performance and bringing it to the level of the authority.

Zagzebski has built on this discussion by referencing empirical studies that show that preemption leads to better results, even providing an intriguing example that shows how *rats* are better at preempting than humans (2012, pp. 113-116).

All of this seems perfectly intuitive: is it not the case that I automatically preempt on a subconscious level in my daily life, according to this track record method? Even about practical matters. Imagine I am a city tourist and ask a local for directions to a specific tourist attraction in Seville. The local tells me that the attraction is currently closed for some reason. I decide to act on the information given; the local probably has better knowledge of the area and is better positioned to have the truth about the matter. Again, this is a different *kind* of epistemic authority, but it is helpful to see how we preempt even in everyday life and how it is rational to do so.

However, in the case of scientific expert testimony, my reasons for accepting the testimony would be even stronger if the scientific expert's track record of getting the truth is high: preemptively, I should take the scientific expert's testimony and replace my reasons for belief with theirs, and I should accept their testimony due to their epistemic authority. John Hardwig (1985, p. 336) writes:

> Because the layman is the epistemic inferior of the expert (in matters in which the expert is expert), rationality sometimes consists in refusing to think for oneself … appeals to epistemic authority are [thus] essentially ingredient in much of our knowledge.

When discussing preemptive reasons for belief, we have to *completely* screen off any other background evidence we might have for belief regarding the subject matter, and we

have to do so because it is normatively required.

There are some objections to the track record argument that seem fair. One is that we sometimes have perfectly rational reasons for rejecting a scientific expert's testimony, and a preemptive reason for belief account does not allow for the rational rejection of the kind of testimony that provides preemptive reasons for belief (Lackey, 2021, p. 137). Consider that I know a particular scientist involved in producing fraudulent research in the past, and this scientist now testifies to *r*. This *background knowledge* provides a fairly good reason for me to reject his testimony. What this background knowledge produces is a reason for me to believe that this scientist is *not* a scientific expert, and they probably do *not* have the relevant epistemic authority to provide preemptive reasons for belief. However, to the extent that we take them to be an epistemic authority, we need to take them to be in a position to provide us with preemptive reasons for belief. I do not believe this objection is as strong as it intuitively seems. In some cases, we might question someone's epistemic authority, and it would be perfectly reasonable to do so.

In the next chapter, I will describe the scientific community and explain how the source of a scientific expert's epistemic authority is the kind of knowledge produced in that community. I will show why scientific experts have better track records on scientific matters by appealing to the sociological set-up of a scientific community and how the scientific expert fits within that framework. Because a scientific community is structured in a specific way, it can reliably produce things that we can accept as accurate—or, at the least, as the closest estimate to the truth.

5. Conclusion

In this chapter, I started outlining the ideal relationship between a scientific expert and a non-expert. I focused on showing what the testimony of a scientific expert *qua* epistemic authority does: It provides us with preemptive reasons for belief, which replace entirely my reasons for belief. These are the sorts of reasons that can only come from an epistemic authority of a certain kind.

I have provided the main idea behind the track record argument for accepting preemptive reasons for belief when scientific experts testify: Scientific experts *qua* epistemic authorities generally have a better track record of getting to the truth about a matter than a non-expert does. This idea of scientific experts having good track records connects with what will follow

in the next chapter. I will show that the good track record that scientific experts *qua* epistemic authorities have comes from the specific kind of community that a scientific community is. Because of its sociological setup, this community produces knowledge and claims we can mostly take as accurate. The knowledge it produces is *collective knowledge*.

Understanding what scientific expert testimony *qua* epistemic authority *does* and what it *is* will help us better understand the epistemic pathologies that arise in the relationships between scientific experts and non-experts. Understanding what epistemic authority does, what scientific expertise is, how scientific experts have epistemic authority, and our reasons for accepting their testimony will provide the necessary framework to understand what goes wrong in science denialism, pseudoscience, and related conspiracy theories. In the end, the epistemic injustice I will define will be about the rejection or the lack of acknowledgement of the epistemic authority of scientific experts.

Chapter 2

A Dodo and its Flock: Scientific Communities, Scientific Expertise, and the Source of Epistemic Authority

In the previous chapter, I started outlining the ideal relationship between a scientific expert and a non-expert by showing what the testimony of a scientific expert *qua* epistemic authority *does*: when a scientific expert *qua* epistemic authority testifies about a matter in a specialised scientific domain, it provides us with preemptive reasons for belief where these preemptive reasons replace our reasons for belief. In this chapter, I have two primary goals. The first is to explain *what* scientific expertise and epistemic authority are and *how* scientific expert testimony is *epistemically* authoritative. The reason for finding answers as to what epistemic authority *does* (as provided in the previous chapter) and what epistemic authority *is* will be crucial in the following chapters, where I analyse the pathological relationships we find between scientific experts and non-experts. The second goal is to explain the intuition that when a group of scientific experts testify together, their testimony provides something better than when an individual scientific expert testifies.

I will explain what epistemic authority is by elucidating what a *scientific expert* is by referring to the epistemic superiority of a scientific expert, their ability to articulate a scientific consensus, and their initiation into a specific kind of community—a scientific community.[19] How can a scientific expert be defined by appealing to the scientific

[19] Take note that I am not attempting to define 'expertise' in the broader sense, where an individual might, for example, be an expert on the question of the location of their house. Regarding the question about the location of my house, I might be the expert on the location of my house, and it is *epistemic* authority of some kind, but this is not a scientific question. My expertise regarding the location of my house does not need to be defined in the same way as we would explain the epistemic authority that a scientific expert has, where the epistemic authority comes from a scientific consensus, as I will show in this chapter. When we talk about scientific expertise, we have in mind those people who are best able to provide answers to questions within specific domains where those answers are provided via certain kinds of mechanisms that are at work only in

community? A scientific community is one that very reliably gets things *right* (or corrects itself when it gets things wrong) and achieves its goals. This, essentially, supports the argument that I provided in the previous chapter about scientific experts having good track records for getting things right within the relevant domain, and their track records are far better than a non-expert's track record would be. This means there are very good reasons for preemptively believing or accepting the testimony of a scientific community or its members.

In showing how a scientific community effectively achieves its goals, I will appeal to Helen Longino and David Hull. Using Hull and Longino makes sense as the pathological problems with pseudoscience, science denialism, and conspiracy theories are best understood through understanding the sociological setup of a scientific community and the sociological setup of antagonistic non-experts who engage in the aforementioned epistemic pathologies. Helen Longino provides a sociological explanation that shows how *objectivity* is possible in science through the workings of a diverse community of scientists. In such a community, the presence of subjective values are not fundamentally a bad thing as this kind of community can effectively eliminate subjective values that prove to be harmful by influencing individual scientists and their findings; this kind of community effectively uses subjective values to achieve its goals of objectivity (1990; 2002). David Hull explains the underlying mechanisms in such a diverse scientific community that make it effective at achieving its aims (1988; 1997; 2001).

Because of the kind of community a scientific community is, namely one that is diverse and has the underlying mechanisms that Hull provides, the scientific community works toward producing a *deliberative acceptance consensus*, i.e., a consensus that is the result of deliberations of a high quality where opposing arguments are heard and given a fair chance, where, even when there might be disagreement amongst the scientific experts on particular aspects related to the issue at hand, the consensus claim (or set of claims) reflects the position that is accepted after deliberations (Moore, 2017, pp. 132-133; Beatty & Moore, 2010, p. 198). This is why a scientific expert can be defined through the scientific community: a scientific expert accurately articulates the consensus position on a specialised topic that can only result from this kind of community, which is best geared towards achieving its goals and being right. Furthermore, a scientific expert would *understand* the scientific community's traditions, methodologies, and other relevant features and the consensus claims produced via the community.

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those kinds of communities that engage in scientific activities.

I acknowledge that there have been many attempts at demarcating science from non-science and that my goals in this chapter effectively fall within the framework of this ongoing discussion. I will narrow my discussion to the scientific community, primarily using Hull and Longino, giving a sociological explanation. The kind of epistemic pathologies I am interested in require a social approach. When non-experts either 1. reject or 2. attempt to undermine scientific experts, there are social or moral failings, meaning that it seems most natural to consider the pathologies along social lines. There is a failure to acknowledge or recognise epistemic authority.

What is provided through discussing the scientific community and the deliberative acceptance consensus that comes from this community is a way to understand why a collective of scientific experts have a strengthened testimony and *what* it is about that testimony that makes it stronger. When an individual scientific expert testifies, they have the authority and strength of authority that comes from providing testimony about the consensus on a particular question. Their testimony provides the *collective knowledge* from the scientific community that effectively works through a deliberative acceptance consensus. When a collective of scientific experts testify, *what* they testify is the same as what an individual scientific expert testifies: collective knowledge (as a consensus claim/s) from the scientific community. The testimony carries the same epistemic authority that a scientific consensus does. However, when the collective of scientific experts testify, the testimony has the additional level of consensus about *how* the collective knowledge will be communicated via testimony, i.e., there is a *communicative authority*. When a collective of scientific experts testify, we have better reason to believe that the speaker(s) are scientific experts, effectively eliminating more doubt non-experts might have.

In § 1, I will discuss Helen Longino and David Hull to show why a scientific community mostly gets things right by discussing objectivity in science and the underlying mechanisms in scientific communities. I will also discuss the idea of scientific consensus in scientific communities, after which I will consider an objection to Hull that is relevant to my position. In § 2, I will define scientific expertise and epistemic authority and discuss collective scientific expertise and the strength thereof.

1. Why Science Tends to be Right

In this section, I present a characterisation of science that helps to show why it is good at

achieving its goals, explaining why it has such a good track record. Science takes place within a specific kind of sociological setup: 1. it is a diverse community of individuals where that diversity helps to eliminate harmful subjective biases and values, and 2. this kind of scientific community has specific underlying mechanisms that help it to achieve its goals. To support my argument, I appeal to Helen Longino's ideas on subjectivity and objectivity in science and how the diversity of individuals in scientific communities work towards producing objective scientific findings (1990; 2002). I then appeal to David Hull's explanation of the underlying mechanisms at work in a diverse scientific community that are necessary to be good at doing what it should do: producing science that is, for the most part, *right* (1988; 1997; 2001). I use Hull and Longino because when talking about the scientific *community* and its sociological set-up, we can best understand the epistemic pathologies I have in mind when we deal with pseudoscience, science denialism, or scientific kinds of conspiracy theories.

What this kind of scientific community produces through the mechanisms that are at work and are necessary, is, essentially, the kind of established consensus claims that we wish to have from science, i.e., a *deliberative acceptance consensus*, which is a consensus that is the result of an ongoing rigorous deliberative process where those scientific experts involved in establishing the state of consensus do not have to agree on all relevant issues that are interrogated. Still, they collectively decide on claim *C*, which is the position they agree to support as a community.[20] When discussing a scientific consensus, we believe (and hope) that there must have been some rigorous interrogation process to establish that claim and that those involved would have been well-suited to their engagement in these interrogations. We do not want to be presented with a 'consensus' position resulting from a decision by a group of people without specialised knowledge on the topic.

The knowledge produced is primarily correct and reliable when established through the mechanisms in the kind of scientific community I will discuss in this section. I remind the reader that I propose to define a *scientific expert* as someone who 1. accurately articulates the scientific consensus on the relevant topic, and 2. has been initiated into the relevant scientific traditions. This section will help to show how it is possible to define the expert through reference to the scientific community and established consensus claims: a properly functioning scientific community is good at producing results that are *primarily right* and,

[20] Many discuss this kind of consensus in detail, and I combine those discussions to adopt this definition of a *deliberative acceptance consensus* (Moore, 2017; Beatty and Moore, 2010; Gilbert, 1987; and Oreskes, 2015).

crucially, we would want a scientific expert to present us with information that accurately articulates those claims that are mostly right.

1. 1. Helen Longino: Scientific Objectivity and Diverse Scientific Communities

Helen Longino's discussions of a scientific community offer a few valuable tools. Most crucially, her account shows that we can acknowledge the influence of subjective values in science whilst saying that those subjective values are not necessarily bad and can play a crucial role in producing objective science (1990; 2002). Furthermore, 1. it emphasises the role of the social deliberative processes in science, 2. it emphasises the importance of diversity in scientific communities (not only diversity in terms of culture, race, sex, and those usual features that we identify as being indicator of diversity, but also diversity in thinking and perspective where the former is usually a basis for the latter), and 3. it helps to outline the sociological set-up of a scientific community that produces the kind of consensus that we would hope science produces, and that scientific communities primarily provide us (1990; 2002).

Longino's account provides the framework to emphasise the intuitive role of a *community* in the notion of scientific consensus: a scientist who works in isolation cannot produce a *consensus*, as a consensus, per definition, means that there is an involvement of more than one individual in the production of such a consensus. If we want to talk about what a 'scientific consensus' is, we have to consider the social nature of science. Science is social in a variety of ways: 1. individual scientists are dependent on one another for those things that are used in science (such as ideas, methods, instruments, etc.), 2. to become a scientific expert, one has to be initiated 'into scientific inquiry' (which requires education, knowledge of traditions, knowledge of observational techniques, methods, etc.) by those who have engaged in the specialised domain for a long time and are familiar with the relevant tradition, 3. science happens within a community and its survival relies on the continued valuing of what is done, where that valuing requires the relevant community (Longino, 1990, p. 67).

Scientific knowledge is not the product of an individual scientist but a scientific community (Longino, 1990, p. 67). On the other hand, scientific knowledge is not simply the *collection* of the knowledge products of individual scientists, but it is the result of a vigorous interrogative process within that community (Longino, 1990, p. 68). If the product of science (i.e. scientific knowledge that is the result of a vigorous interrogation process involving

multiple scientists) can only be the product of a community, it is crucial to consider the role of the scientific community in producing that knowledge when we try to understand why science is usually correct and who we should take as scientific experts.

When we think about science, we have in mind those sorts of things that we take to be facts or 'established truths' or those things that have the closest proximity to the truth that provide us with direction when we make decisions about our health, technology, economy, and other such things. A part of this expectation is that what science presents to us as established truths (or consensus claims) will be objective claims. In other words, we expect that what science presents will not be influenced by contextual values (such as social, political, personal or ideological). There has, for a long time, been a debate about how the undeniable presence of contextual values in science can be consistent with the idea that science possesses those constitutive values that we believe govern science and make it epistemically good (values such as truth, objectivity, predictability, etc.) (Longino, 1990, p. 4).

Cognitive rationality (which is considered to be fundamental in producing objective scientific truths) and sociality (nonevidential factors, such as the aforementioned contextual values) are usually dichotomised, and it is said that they definitionally exclude one another (Longino, 2002, p. 1). Accordingly, if we want scientific findings to be objective, no subjective values can be involved in the process, as those subjective values immediately eliminate any possible objectivity. What Longino provides is an account of how the presence of subjective values in science is not a fundamental flaw or problem that cannot be overcome, as the presence of subjective values is, in fact, crucial to work towards objectivity in science (1990; 2002).

What is important to note is the difference between objectivity as a *characteristic of a scientific methodology* versus the objectivity of *an individual scientist* (Longino, 1990, p. 66). I agree with Longino that these two notions of objectivity in science are often conflated: a connection is drawn between the idea that if the scientist accurately pursued their research using whatever the accepted methods are, the results would be objective (Longino, 1990, p. 66). What this misses is how and when we can say science is objective. Individual scientists inevitably have their subjective values that can, at any point, influence the objectivity of scientific projects. Just because the *methods* might be considered objective does not mean that the subjective values of an individual scientist have been dealt with or eliminated.

For Longino, it is because of the *scientific community*, and, specifically, a *diverse* scientific community with the variety of subjective values that individuals hold, that we have

a better chance of reaching our goal of objectivity in science: when there is a communal interrogation process, we have a better chance of eliminating contextual values (such as social, political, personal or ideological values) (Longino, 1990, p. 4). As Longino explains (1990, p. 79, own italics):

> The objectivity of individuals in this scheme consists in their [scientists] participation in the collective give-and-take of critical discussion and not in some special relation (of detachment, hardheadedness) they may bear to their observations. Thus understood, objectivity is dependent upon the depth and scope of the transformative interrogation that occurs in any given scientific community. This communitywide process ensures (or can ensure) that the hypothesis ultimately accepted as supported by some set of data do not reflect a single individual's idiosyncratic assumptions about the natural world. *To say that a theory or hypothesis was accepted on the basis of objective methods does not entitle us to say it is true but rather that it reflects the critically achieved consensus of the scientific community.*

Here, Longino provides an account of how science can provide us with an objective view of the world, even when individual scientists are prone to subjectivity and bias, and how objectivity in science is intimately connected to the intensity and quality of the interrogation process. An example of how this interrogation process would play out is that of peer review. Through peer review, an individual scientist's research goes through a process of interrogation and harmful subjective values that might be influencing the author could be identified and addressed (Longino, 1990, pp. 68-69).

The source of objectivity in science is *in its social nature*: it is because science is the type of endeavour that incorporates collective enterprises and pursuits that we can say it is objective (Longino, 1990, p. 62). Objectivity in the views and theories that science presents requires that those contextual values that influence individual scientists can be restricted or blocked at the level of background beliefs (Longino, 1990, p. 73). Naturally, a scientific community can also be influenced by background beliefs, biases, or ideologies that the community collectively hold. Consider, for example, how racial and/or sexist biases have influenced some scientific communities as the members of those groups were predominantly, or entirely, white and male.

However, when more individual scientists are involved (and when there is a greater diversity amongst those scientists), there is a far better chance that problematic contextual

values and background beliefs can be eliminated (Longino, 1990, p. 73). The kind of interrogation that happens when there are many individual scientists involved helps to eliminate contextual values, providing transformative criticism that helps to distinguish between those claims that are objective and those that do not make the cut. What happens is that scientific knowledge as a product transcends individual scientific contributions or even those of smaller communities of scientists within the larger community (Longino, 1990, p. 69).

Naomi Oreskes helps to explain this idea of a diverse community and the usual processes we find in science that *enable* this road to objectivity (2019). What Oreskes emphasises that aids in explaining the positive influence of diversity in scientific communities are the matters of *perspectival* and *thinking* diversity (2019, p. 137). This kind of diversity is often synonymous with the other types of diversity we intuitively think of—such as race, gender, religion, etc. (Oreskes, 2019, p. 137). The maximisation of objectivity in science is more likely to be achieved "when there are recognized and robust avenues for criticism, such as peer review, when the community is open, non-defensive, and responsive to criticism, and when the community is sufficiently diverse that a broad range of views can be developed, heard, and appropriately considered" (Oreskes, 2019, p. 53). The natural social environment of science is that of strict procedures and adjudication practices designed to increase the odds (and *ensure*) that whatever findings come out on the other end is robust, sufficiently supported, and empirically reliable (Oreskes, 2019, p. 57). When the interrogation process involved in science is social and collective, the conclusions reached will be non-idiosyncratic and non-partisan to the maximum degree possible (Oreskes, 2019, p. 58). It is only when this kind of social interrogative process takes place, where subjective background beliefs and values can be identified, articulated, and investigated, where we can have science that successfully incorporates hypotheses into our 'established knowledge' that is independent of an individual's values and beliefs (Longino, 1990, p. 74).[21]

Longino's description of a scientific community's social structure is insufficient to explain the *success* of scientific projects and progress. Her account provides a framework to understand how subjective values in science are not a problem and can *contribute* to the objectivity of science if the members of the scientific community are diverse, which is what she mainly aimed to do. The presence of diverse individuals' subjective values contributes to

[21] What is important to note is that David Hull, who will be discussed in the next section, also emphasises how an individual scientist is more likely to be influenced by biases and produce less reliable results than a community of scientists could (Hull, 2001, p. 341).

science's objectivity. We could, however, see how this explanation applies to various communities where the presence of harmful subjective values could be overcome through diversity in that community. This is evidence that it is not sufficient to explain the successes of scientific communities, specifically. Imagine where the jury in a court case is predominantly male and white, and the defendant is a black man: it could easily be the case that some harmful subjective values make their way into the discussions and, as the group of jurors are not diverse, those biases go unchecked and negatively affect the outcome of the process. The jury would have improved significantly if attention had been paid to diversifying the jury and ensuring that biases and subjective values were kept in check through interrogation. Here, we have a case of the diversity and subjectivity of individuals in a community contributing to the objectivity of the community.

Therefore, although Longino's account helps us understand how objectivity in science is possible, it does not explain how this diverse scientific community successfully progresses towards its goals. To fill in the gaps, I believe David Hull's explanation of the various mechanisms that underlie a scientific community and help it be successful is necessary (1988; 1997; 2001).

1. 2. David Hull: The Underlying Mechanisms in Scientific Communities

For Hull, conceptual development in science is the goal of science (1988, pp. 12-13). There is a strong interrelationship between social and conceptual development in science, as conceptual development in science is reliant on the processes of coordination and competition within the scientific community: accurate testing of scientific ideas and theories only becomes possible when there is the interaction between many scientists within a community where those scientists have interests over a broad spectrum (Hull, 1988, pp. 12-13). Hull's idea of many scientists who bring different interests and perspectives to the scientific process connects well to Longino's idea of the diversity of a scientific community and how that diversity helps to work towards producing objective science (Longino, 1990; 2002).

As I will show in this section, Hull's explanation of the underlying mechanisms in scientific communities does well in showing, in a more concrete way, how things, in *fact*, operate in a scientific community, enabling objectivity in science. The mechanisms that function in the social organisation of scientific communities help to produce the kind of consensus that we want, and this community's self-policing nature helps eliminate the

subjective types of values that can be problematic in science. Again, I do not say that subjective values *are bad*, but they need to be kept in check so that they can work towards providing objectivity in the way Longino's account explains the value of subjective values. Because of the self-policing mechanisms in a scientific community (that Hull describes), subjective values can work towards producing objectivity.

Hull explains how a scientific community is so effective in producing what it is supposed to, namely scientific findings that are mostly *right*. What Hull's explanation further does is help to show how the underlying mechanisms in the scientific community, even when they work towards the subjective values and goals of the individual scientists, benefit the process and can help to produce what the scientific community is meant to deliver. Hull emphasises different sociological aspects of the scientific community, which are compatible with Longino's account and help broaden our understanding of how a scientific community functions, providing claims and theories that are mostly right. The combination of Hull and Longino's accounts describes a scientific community's mechanisms that enable a scientific consensus, i.e., it gives an abstract epistemic idealisation.

What Hull's explanation implicitly acknowledges is how a scientific community and scientific progress and the success of the community are heavily dependent on the epistemic labour of others, upon which he builds his explanation of the enabling mechanisms that are built into the scientific community that direct scientists towards a process of coordination and competition that makes it successful at achieving its goals. When there is a significant dependence on a division of epistemic labour, we fear that errors, whether innocent or fraudulent, can slip through the cracks and significantly impact the overall progress within that community. However, even though scientific work is so divided because of the epistemic division of labour, scientific communities are still very good at reaching their goals. Something within these communities directs them to be successful in this way. This is what David Hull explicates.

For Hull, one of the main driving forces for scientific experts is that of status; they care about what their peers think about them and their status amongst their peers (2001, p. 344). Regarding rewards for work, science is a winner-takes-all environment, and it is a high-resolution activity as most of the credit in science only goes to a handful of scientists (Hull, 1997, p. S120). We can see the competitive nature of science in how the first scientist to publish a significant result or discovery will be the one to get all of the credit (Hull, 1997, p. S120). One of the essential ways in which scientists can be given credit is the process through which other scientists *use* their work; for Hull, it is even a case that the biggest reward in

science is when a scientist's work is used by others (Hull, 1997, p. S120; 2001, p. 341).

The process of *use* means that a scientist gets citations, they cite other scientists whilst getting recognition through publication, and their work gets replicated (although understanding science in terms of the underlying mechanisms means that work does not *have* to be tested as mistakes will be revealed and corrected very quickly) or their research becomes established knowledge that other scientists use as fundamental in their research (Hull, 1997, p. S120). According to Hull, this kind of recognition, which is the most important in science, can only come from scientists. i.e. the community of peers (Hull, 2001, p. 350).

Because it is so significant to one's status as a scientist that one's findings are used, one of the main criteria for the success of science research is *use*: a scientist looks at other scientists' work and considers whether those findings can be used fruitfully in their own work (Hull, 2001, p. 343). This key idea of the *use*-value of scientific findings is crucial to understanding the underlying mechanisms that make a scientific community work. The underlying mechanisms work in various ways in the community: the scientist wants their work to be used, and they will use other scientists' work if that work is good. Scientists desire recognition and status, which result from having their work used by other scientists whilst also using other scientists' work (Hull, 2001, p. 344). This drive for status and the use of their work further encourages the quick publication of significant results as scientific experts want to get the credit for the work, but also because they want other scientists to use their findings. This push towards speedy publication helps to propel scientific progress: the quicker scientists publish their results and significant findings, the faster it is for other scientists to use the results and make further discoveries based on those results.

When a scientist uses another's research, it is beneficial if they can find something useful for their research, but it is also good for the scientist whose work they are using (Hull, 2001, p. 350). What is interesting is that there is a tension between *use* in science and the *status* of individual scientists: scientists want to be used, as being used means being accepted, and being accepted means taking part in the citation and acknowledgement processes that are built into science, but when a scientist engages in these practices, it is also at the risk of their working coming across as less original (Hull, 1997, p. S120). If you want to be accepted and used, you will be more likely to achieve this if you cite and use other scientists' work, and your research naturally flows from previous work (Hull, 1997, p. S120). Taking part in these practices of citing and being cited might make one's findings seem less original (Hull, 1997, p. S120). However, if one does not reference others as much, it might make one's work seem

more original, but other scientists are less likely to reference it (Hull, 1997, p. S120). Even though these limitations seem to be restrictive to individual scientific experts and their work, it means that it is more likely that the research is accurate. The jumps between ideas are smaller, decreasing the chances of significant error.

The scientific environment is simultaneously competitive and cooperative, resulting from the selection processes involved in science, where the use and *being*-used processes contribute to this tension between cooperation and competition (Hull, 2001, p. 344). Scientists are dependent on each other as it is within this scientific community and its processes that scientists can achieve their goals (recognition and credit) whilst still competing with each other to get that credit through the use of their work (Hull, 2001, pp. 343-344). A scientist can get credit only within the community of active, *practising* scientists (Hull, 1997, p. S121). When a scientist is active within this scientific community of use and *being*-used, it means that their work's worth can be measured: if other scientists use it, it has *increased* worth (Hull, 1997, p. S121).

What is helpful in Hull's sociological explanation is that it shows how individual scientists can work in isolation and autonomously in everyday practice and that there is a powerful investment for scientists to look out for themselves (1997, p. S119). As the status they so desperately seek depends on the community of scientists, they are forced to engage in cooperation and competition and introduce their work to the scientific community for interrogation. Being forced to engage in this process further helps to make incremental and more accurate progress.

When a scientist's work is used in this process, it has undergone a selection process: individual scientists work towards solving particular issues, and numerous alternative solutions can be produced by the various scientists working on the problem (Hull, 2001, p. 341). They work towards delivering the solution that they hope will be selected from those competing solutions and will end up being the solution that other scientific experts use. In this sense, when working in their field, a significant (if not *the* most important) evaluative criterion in considering the research of other scientists in their field is to decide if the research can be used in their research (Hull, 2001, p. 343). When these judgments about when to use someone's work are good, it is not only good for the scientist who uses it, but it works towards the larger good for scientific progress: when good research is used, progress is made, and the scientists involved get used, and there is recognition and an increase in status (Hull, 2001, p. 350).

Within this system of use in the scientific community, individual scientists get punished

or rewarded for their work: the reward is what scientists want and what they pursue, and they only get this from doing their best with what they are supposed to do, i.e., science that is geared towards providing truth (Hull, 2001, p. 342). Scientists within this system are policed (and self-police) in a way where their goal, namely *status*, is contingent on their participating in the cooperation and competition process, meaning that the scientific community creates an environment where self-policing is crucial (Hull, 2001, p. 348). If a scientist wants credit, it would be best for them to be fair in their citations: when using another scientist's work, you will only get the acknowledgement and use you are striving to get if you fairly and accurately cite and use other scientists (Hull, 2001, p. 351). If you do not engage in this process and system of acknowledgement, giving and receiving, you will not get what you want.

Much of what I have discussed so far comes down to the idea that the scientist's reputation—or *status*— is crucial, as they get rewarded for their work's reliability and utility (Hull, 2001, p. 344). When a mistake is made, this system of publishing and awarding credit helps to leave a paper trail. Errors can be traced back to the guilty party: the work of the guilty party will end up being treated with more caution, and sometimes it will be rejected outright in the future (Hull, 1997, p. S121). Not only do scientists know that their mistakes will usually be revealed, but as Stuart Firestein, professor of neuroscience, says in his revealing book with the title *Ignorance: How it Drives Science* (2012, p. 21):

> One of the more gratifying, if slightly indulgent, pleasures of actually doing science is proving something wrong—even yourself at an earlier time.

Proving and disproving things is part of the cooperation and competition process and further contributes to status. Firestein mentions Albert Michelson, who was awarded the Nobel Prize for physics in 1907. This instance of the Nobel Prize award is unique because Michelson did not receive the prize for proving some revolutionary new theory but for conducting an experiment that *did not work* (Firestein, 2012, pp. 22-23).

What happens when a mistake is found in a scientific paper? Naturally, there are various causes for errors. Sometimes, the scientists' work was fraudulent, perhaps fabricating data to push towards some result. Consider, for example, Dr Andrew Wakefield, whose article on the link between autism and the MMR vaccines was proven to have been the result of fraudulent activities. As these results were widely publicised and the reactions to the findings were very

strong, many scientists pursued studies to test the connection that Wakefield claimed (McIntyre, 2020, pp. 144-145). After some thorough investigations, it was confirmed that the results had to be from fraudulent activities and not mere errors. This example shows the paper trail left when a mistake is made in science (intentional or not) and how the error can be traced back to its origin. In the case of Dr Wakefield, precisely because the research was fraudulent, he left the research positions he had held at multiple institutions (Ramsay, 2001, p. 1972).

What about when an innocent mistake is made? Hopefully, most scientists will have the integrity to acknowledge their errors and direct research in the right direction, away from their mistakes. Lee McIntyre (2020, pp. 147-148) gives an example of a scientist who made a crucial mistake and self-corrected publicly, displaying the integrity we hope to find in scientists when they make mistakes. It is the example of British astronomer Andrew Lyne, who published a paper in *Nature* that described his discovery of a planet that was orbiting a pulsar, which would have been an extraordinary discovery. He was invited to present a paper at the American Astronomical Association meeting. A few weeks before he was due to present his paper, he discovered that his calculations had contained an error that meant that the planet he had found had disappeared. Instead of attempting to hold on to his findings, he acknowledged, while presenting his paper, that he had made a crucial error, and his colleagues gave him a standing ovation (McIntyre, 2020, p. 148). This is an example of a scientist who properly reconsidered their work and interrogated anything that might seem erroneous. Furthermore, this is an example of where an individual scientist self-corrected. This is an obvious example of self-policing in the scientific community and how it works to direct science towards the truth.

However, there are also cases where the mistake—even if it may have been innocent—is too big to be corrected, and the scientists involved end up being pushed out of the scientific community. Think about the cold fusion science disaster. The chemists involved, B. Stanley Pons and Martin Fleischmann decided to announce their groundbreaking scientific discovery at a press conference (discussed at length in McIntyre, 2020, p. 100). What was startling about the event was that the scientists had yet to produce any papers to detail the experiments that led to the discovery. This meant that no other scientists had yet been involved in checking their results to see if there were any inconsistencies. The findings had not gone through the scientific community and its underlying self-regulation mechanisms. Even if the scientific mistake was innocent, it was a case of extreme scientific negligence: their research had not been peer-reviewed. Once other scientists were able to attempt to reproduce and test

their findings, it became clear that their findings were full of errors that could have easily been corrected through peer review. Following this, both scientists had rocky careers, stained by this failure.

This failure could be interpreted as revealing some weakness in science. Instead, it is an event that can give a lot of courage insofar as science has this self-correcting characteristic clearly described in this sociological account of the scientific community. Of course, I do not claim that science always self-corrects when it goes wrong. But it has this built-in mechanism that gears it towards finding the underlying errors and correcting them, and we can usually rely on science to do this because of the kind of community it is. When mistakes are discovered, it not only boosts the status of the scientists involved in the discovery but also means that science is redirected, again moving towards the truth. A very apt way to describe this feature of science, which effectively redirects itself when a mistake is detected, is to say that it is 'self-correcting'. What do I mean by saying that it is self-correcting? Saying that science is self-correcting picks out these features of the scientific process and community that help identify and eliminate errors. The underlying mechanisms in the scientific community explain how this self-correction process plays out and how it is possible. As long as individual scientists are interested in their work being used and building their reputation in their peer scientific community, they will be keenly interested in self-policing to avoid making any errors that could harm their status.

1. 3. Scientific Consensus: Abstract Presentation of Science's Workings

One of the main things about science is that scientific knowledge is fundamentally consensual, i.e., for something to be presented as a consensus view means that the relevant scientific *community* has collectively accepted that claim or theory as 'established scientific knowledge', and thus consensus is a pertinent marker for the reliability of that claim (Oreskes, 2015, p. 3). Broadly speaking, consensus is when an agreement exists about a particular topic in a group of inquirers (Moore, 2017, p. 82).

The kind of community I have thus far described is the one that is most likely to fulfil our expectation that we are presented with objective truths in the form of a consensus. This is where we have a large, diverse community of scientists who self-police and are interested in their status in the scientific community. The self-interest will work towards the broader range of goals of the community itself. This means that scientists will be interested not only in self-

policing for factual errors but also in interrogating their work to identify any harmful subjective values they can detect. By eliminating these contextual values, they have a better chance of their work being used by other researchers. So, not only does the scientific community help to identify contextual values when they interrogate another member's work, but the individual scientific expert already has a vested interest in doing their best to identify and eliminate these contextual values before other scientific experts interrogate their work.

Hull's account of a scientific community essentially explains how a deliberative acceptance consensus is reached in the factual operation of a scientific community. It is an abstract epistemic idealisation of the interrogative process of ideas and the mechanisms that drive the process. When we have a scientific community operating in this way, where we have a diverse group of scientists and the scientific process proceeds through the necessary underlying mechanisms, we end up with what we could call a *deliberative acceptance consensus*, i.e., the kind of consensus where there is a collective agreement amongst the scientific experts that some position *p* best represents the current state of the research on the particular issue.[22] Through the processes of deliberation within the scientific community, which proceeds through the workings of the underlying mechanisms (the process is by its nature *deliberative*), there is a point where the scientific community collectively agree and accept that *p* best represents the position of the group, and that the individual scientific experts will support that position as the position of the group (Moore, 2017, p. 126).

What this kind of consensus allows is that there might be some disagreement amongst the individual members of the group in question. According to Beatty and Moore's explanation, the allowance for disagreement amongst group members is crucial (2010, p. 198). I agree, as a scientific consensus must allow for partial disagreement. The consensus is partly substantial (regarding the *content* of the consensus position) and is based on the deliberative procedures that will enable the consensus to emerge from the deliberative process. The deliberative process involved in this kind of consensus allows for the accurate and fair consideration of various arguments and positions relevant to the issue, which is given fair consideration within the process. When the minority views cannot be dismissed, the majority view is challenged and pushed towards refinement because of the increased deliberative quality (Beatty & Moore, 2010, p. 200).

As Moore says, a deliberative acceptance consensus is reached once the minority is

[22] Moore (2017) and Beatty and Moore (2010) provide in-depth discussions of a *deliberative acceptance consensus* and how it differs from many other forms of consensus.

convinced that their arguments have been treated fairly (2017, p. 132).[23] The deliberative acceptance consensus position allows for the social nature of the scientific community: the consensus position is not merely an aggregation of votes amongst scientists. Instead, it reflects the interrogative process that led to the consensus position. The deliberative acceptance consensus result, even though there might be a vote, will eventually not simply be a report on the aggregation of votes, but it is a reflection that there is agreement that the *quality* of deliberations has resulted in a particular accepted consensus position. It is an affirmation of the process that led to the acceptance of the consensus (Beatty & Moore, 2010, p. 207).

The *procedures* behind this kind of consensus are crucial to its status. This deliberative acceptance consensus, which arises from the scientific community and its mechanisms working well, is an abstract presentation of science's workings. The underlying mechanisms show how things in a scientific community operate, and this factual operation effectively works through a deliberative acceptance consensus. The scientific community is geared towards deliberation and interrogation, and the tension between coordination and competition enables this.

1. 4. An Objection to Hull: Individuals with Corrupted Motivations

Jon A. Krosnik presents an objection to Oreskes's account of what makes scientific communities so good at what they do, which is essentially also an objection leveraged at Hull's account of the mechanisms that underlie a scientific community (in Oreskes, 2019, pp. 202-211). This objection is relevant to the kind of scientific community I describe. The objection is that individual scientific experts' motivations can become corrupted and no longer align with the pursuit of finding and publishing the truth (Oreskes, 2019, p. 208). Scientists could be motivated by prestige, money, and other things that trump their motivation to pursue and publish the truth. His main claim is that these problems are relevant

[23] What is interesting to note is that the deliberative acceptance kind of consensus can, overall, lead to a healthier relationship with the minority. As Beatty and Moore explain, 1. when a unanimous vote is required to establish a consensus position, the minority's vote has far greater strength than it should sometimes have (think of some self-important individual or someone who might have some bad intentions with their vote), and 2. when a minority vote can have such power in the overall decision, the individuals who hold the minority view could be silenced or targeted (2010, p. 204). In a deliberative acceptance consensus, the minority have a better chance to have a fair opportunity to present their case without fearing being silenced, but also not having too much power.

in *all* domains of contemporary science "because of the incentive structure that rewards rapid publication at the expense of care and diligence" (Oreskes, 2019, p. 229).

Krosnik presents a handful of examples to support this claim, mainly focusing on psychology and biomedicine (Oreskes, 2019, p. 228). What he essentially points out is the 'replication crisis', where there are significant problems in replicating the findings of publications due to many issues, and very much due to statistical analysis problems—where the misuse of statistics in these disciplines has been demonstrated very well in the past (Oreskes, 2019, p. 229). One of the examples he points out is outright fraud (Oreskes, 2019, pp. 203, 231). Oreskes rightly points out that fraud—data fabrication, in the specific example—is not specific to *science* (2019, p. 231). We find that in all domains of our social life. This perhaps means there is a need for better oversight over specific scientific processes, but it does not categorically mean that there is something bad about science (Oreskes, 2019, p. 231).

Some of the other examples he uses to support his claims that corrupted motivations amongst scientists are a *problem* are examples that help to show how science is *good*, contrary to his claim (Oreskes, 2019, p. 231). Krosnik explains an example where a paper claimed to demonstrate extra-sensory perception (ESP), and the paper "set off a firestorm, because the results seemed implausible and could not be reproduced" (Oreskes, 2019, p. 203). Oreskes rightly defends this example by showing how this paper is "the opposite of fraud" and is evidence of science working as expected (2019, p. 231). This example shows how the scientific community remained open-minded about findings and interrogated ideas that initially seemed to need to be stopped (Oreskes, 2019, p. 231). This case certainly does not seem to be a case of corrupted motivations at first glance.

What the highlighted examples reflect are *individual* cases of papers where there might have been a 'problem' (whether of fraud or sincere curiosity and open-mindedness): these papers are not representative of a scientific consensus in the relevant communities (Oreskes, 2019, pp. 231-232). Furthermore, as these papers do not represent the scientific consensus in the relevant scientific communities, we can claim that these examples never produced anything that amounted to scientific or collective knowledge (Oreskes, 2019, p. 232). The objection supports the sociological explanation of a scientific community and how these scientific communities make progress. Any individual scientific paper does not represent the scientific consensus on a particular topic, and we should be sceptical of individual papers (Oreskes, 2019, p. 233). Some websites offer lists of research papers that have been retracted, and these websites are not evidence of science gone wrong; instead, they are evidence that

science is doing what it is meant to do.

I believe there is a warning in this objection—that scientific experts are corruptible—but these examples do not show an existing problem of the degree that Krosnik describes that even spans most contemporary scientific communities (Oreskes, 2019, p. 210). For that to be true, it would have to be a systematic failure to the degree where we doubt most of the findings that scientific communities produce, which is untrue. For the most part, the examples that Krosnik offers can be refuted by emphasising the role that scientific communities play—their self-regulating processes, the self-correction in the communities, the rewards and punishments, and the consensus that arises from all of the processes.

Furthermore, we have to talk about *scale*. When we talk about an 'established consensus' taken as fact by an entire scientific community, we are not talking about smaller groups of scientists who work on projects together, for example, in a particular laboratory, institution, university, or organisation. We talk about something more significant: the scientific community within the specific domain includes many smaller groups of scientific experts. The scientific community can produce knowledge that crosses limitations of smaller groups of scientific experts who might be more fallible. A smaller group of scientific experts could be more fallible to error, fraud, bias, corruption, or other epistemically and morally harmful influences. But the scientific community, when considered on the whole, is far more robust.

2. Scientific Experts, Epistemic Authority, and Collective Scientific Expertise

In the previous chapter, I explained that scientific experts have *epistemic authority*, which provides certain kinds of reasons for belief, namely, *preemptive* reasons for belief. These reasons are unique as they mean that non-experts do not have to find their reasons for belief about the relevant matter. The scientific expert's reasons replace the non-expert's reasons for belief. I have now shown why science tends to be correct—why it has a good *track record*—by describing the sociological setup of a scientific community. This description explains how things, in fact, work in scientific communities. With all of its underlying mechanisms, this kind of community produces a deliberative acceptance consensus, which we hope to get from science. Furthermore, only this kind of community, i.e., a scientific community, can produce this kind of consensus and the knowledge we want from science. The sort of knowledge it produces is *collective knowledge*.

I will now explain the notion of 'epistemic authority', how scientific experts can possess

this kind of authority, what a scientific expert is, and what *collective* scientific expertise and authority are. When considering the idea of a collective of scientific experts and their epistemic authority, I will explain why I believe there is no increase in the epistemic authority of their testimony, as the *source* of their epistemic authority is the same as the source for an individual scientific expert's epistemic authority. However, intuitively, there is some difference between a collective of scientific experts testifying versus an individual scientific expert testifying. I will explain this difference by considering the idea of a *communicative consensus*, which is a consensus regarding how scientific knowledge is to be communicated and precisely *what* is to be communicated. A *communicative consensus* comes from a group of scientific experts who reach a consensus on these matters.

2. 1. Scientific Experts *qua* Epistemic Authorities

I have now reached the point where I can say what epistemic authority *is* and how we can say there is such a thing. The definitions of scientific expertise and epistemic authority go hand in hand, as a scientific expert is a person who has a certain kind of epistemic authority. This particular kind of epistemic authority gives them the 'scientific expert' status. When we want to say that someone *is* (more broadly speaking) an *authority*, we must be able to tell when that claim to authority is legitimate and what that legitimate authority would look like. In this case, specifically, we are talking about *epistemic* authority in the context of science. Remember that it is possible to have epistemic authority about other matters, such as the location of my house. However, that kind of epistemic authority would be different from what epistemic authority about scientific issues would be.

Epistemic authority about scientific matters comes from accurately articulating the scientific consensus about a matter, where the scientific consensus can only come from the specific kind of community I have described. Not only that, the person involved would have to have been *initiated* into the relevant scientific traditions and have the epistemic superiority that is *relevant* to the domain. Consider, for example, a specialised journalist—a scientific journalist. Although this might be an increasingly rare kind of journalist, considering some of the troublesome scientific reporting done in many mainstream publications these days, good scientific journalists would be able to present the scientific consensus on the matter to non-experts accurately and hopefully in ways that will be meaningful and comprehensible.

However, just because this scientific journalist *can* and *do* accurately articulate and

present the scientific consensus does not make them a scientific expert *qua* epistemic authority. We could say that this scientific journalist has a degree of authority and expertise in the matter. Still, they are not a *scientific expert* with the kind of epistemic authority a scientific expert has. Something more is required. What is needed is an *understanding* of the consensus in terms of the processes that produces the consensus: the relevant scientific domain, the methodologies used, the methods of reaching a consensus, and the workings of the relevant scientific community. Essentially, a deep understanding of *how* the scientific consensus would have been reached within that specific domain. This is why we need the scientific community, the initiation into all its traditions and methods, the epistemic superiority and education that comes with that, and all other sorts of things for someone to have the kind of epistemic authority that a scientific expert has.

When a schoolteacher teaches science and accurately presents the consensus on Evolution Science, we would not call her a scientific expert on the topic. Some further level of education and some formal qualifications are necessary to do so. Here, the knowledge she presents is a *product* of a community of scientists, but she does not have the kind of epistemic authority to call herself a scientific expert. The teacher could, furthermore, not accept and believe Evolution Science and be a Creationist, but we would still call her a reliable testifier and a good teacher if she accurately presented Evolution Science to her students.[24] Regarding scientific experts, personal beliefs and testimony can also be separated. As mentioned earlier, when a consensus is produced in the processes within the scientific community, all the scientific experts involved in producing that consensus do not *have to* agree about all the relevant details about the matter (on the level of substance).

Similarly, scientific expertise *qua* a specific kind of epistemic authority is also not something that comes—exclusively—from being a scientist with the right qualifications, or a public appeal to them for their opinion on the matter, or a scientist who offers up their opinion as authoritative. Suppose a climatologist claims that there is no connection between human activity and the current increases in global warming. In that case, we should immediately question their scientific expertise and, by extension, their epistemic authority on the matter, as we know that their position is contrary to the now widely established consensus on the connection between human activity and global warming. We should—and hopefully will—conclude that they *cannot* be considered a scientific expert and epistemic authorities,

[24] This example and variations are discussed by Lackey (1999, p. 477), Graham (2000, p. 377), and Faulkner (2000, p. 595).

regardless of their formal qualifications. Similarly, even though an astrophysicist and a climatologist are both scientific experts on issues within specific domains, we would not consider a climatologist to have epistemic authority on astrophysics as they do not have the necessary formal qualifications. Furthermore, something also seems wrong if the astrophysicist is not involved in studying the relevant questions in climatology, which implies an involvement in the relevant scientific community. We are missing something that would make them a legitimate epistemic authority on that particular matter.

I believe this intuitively leads to thinking that being a scientific expert means associating the label 'scientific expert' with the idea of 1. someone who is part of a scientific community, as well as *understands* the relevant questions, methods, traditions, and has the proper education in the appropriate domain, and 2. I hope that what they testify to represents the established consensus that can only come from a scientific community. This means that 1. we do not label someone as a 'scientific expert' on specialised questions for being a member of *any* scientific community. Think about it this way: I ask a climatologist about the state of anthropogenic climate change. In asking, I hope their testimony will align with some established consensus rather than merely express their opinion. If I am hopeful that their testimony will provide me with the established consensus, I am hopeful that they are a member of a *specific* scientific community and that they have an understanding of the workings of that scientific community which means the methods, relevant traditions, and proper education for membership to that particular scientific community. Intuitively, we (most people, I believe and hope) would not be very likely to acknowledge someone as a scientific expert if they do not have the formal things that help distinguish scientific experts, such as the right qualifications and educational background.

And then, 2. I hope their advice will be based on knowledge or information that cannot only come from an *individual* scientist with some relevant qualifications. It implies the presence of other scientific experts who have also provided their input on the matter. Being a scientist with the right qualifications does not automatically make one a *scientific expert*. Still, having the right qualifications gives us some formal indicators that help us evaluate a person's claims of scientific expertise and epistemic authority.

Being a scientific expert directly implies having *scientific epistemic authority*, meaning that when the scientific expert testifies, they provide us with preemptive reasons for belief. Therefore, scientific epistemic authority is directly contingent on a person's status as a *scientific expert* (their ability to accurately articulate a consensus position and that they *do*, in fact, accurately articulate the scientific consensus when required to) that can only come from

the kind of scientific community I have described before. That kind of scientific community is the best at producing consensus claims that are primarily right and at producing scientific experts who accurately articulate the consensus claims that arise from the mechanisms within the scientific community.

My definition of a *scientific expert* is, therefore, as follows:

> Scientific experts *qua* epistemic authorities, 1. are people who accurately articulate the consensus position on the relevant question within the specific domain (meaning that they are sensitive to the social set up of a proper functioning scientific community and partake in the rigorous interrogation of ideas, theories, etc. within that community or, at least, accurately present the consensus even if they are not directly involved in research), and 2. they have been initiated into scientific inquiry (meaning that they have the requisite educational background, knowledge of the relevant traditions, they have knowledge of the requisite observational techniques, methods, etc.) by those who have engaged in the scientific domain in question and have a thorough grasp on the domain in question.

Please note that this formulation acknowledges that the person would be educated in the subject matter and its traditions, well versed in the current problems and areas of inquiry, and knowledgeable of the relevant methodologies. This is an *understanding condition*, i.e., they should have an understanding of the scientific community and the practices within that community, which would mean that even if they could not explain the intricate details of a consensus claim and they do not *agree* with all the details, they understand why and how that consensus has been reached. This definition of a scientific expert also acknowledges the successful processes of scientific communities insofar as a scientific expert would be someone who accurately articulates a consensus position resulting from the right community. This definition also acknowledges the significance of the scientific expert's role in informing the non-expert on matters of importance: it allows for our intuitive understanding that scientific experts play an active role in society and that non-experts often delegate to them.

Note that number 2 in my definition allows someone to be still considered a scientific expert and epistemic authority even when they are not actively engaging in *new scientific research*. To some, this idea might seem misplaced. However, it is crucial to allow for this occurrence, especially when we consider the idea of a collective of scientific experts and the testimony they present. I will explain in more detail what collective scientific expertise and

testimony are, but I will briefly comment here. Consider, for example, the Intergovernmental Panel on Climate Change (IPCC), which actively compiles reports on the current state of Climate Change Science. The involved scientists could undoubtedly be called scientific experts as they 1. are engaged in producing consensus claims that accurately represent the current state of affairs, and 2. have been initiated into the specialised field. So, even though they might not be actively involved in producing any *new* research, they are sensitive to the developments in the relevant specialised domain in a far more substantial capacity than, for example, a specialised scientific journalist. However, determining a scientist's status as a scientific expert might be far more challenging when they are not actively producing new research. To me, this question about *identifying* scientific experts differs from *defining* it.

I will now turn to discussing the notions related to a collective of scientific experts, their epistemic authority, and the strength of that epistemic authority.

2. 2. Collective Scientific Expertise, Collective Epistemic Authority, and the Strength of Collective Scientific Expertise

When scientific experts testify, something interesting happens. An individual scientific expert effectively testifies to a scientific consensus position, which implies the involvement of other scientific experts and is a product of a community of scientists. In that sense, we might want to intuitively label the individual's testimony as a case of *collective testimony,* as the communicated knowledge is the product of a community and a form of *collective knowledge*. However, I believe that this analysis is far too quick. The *testimony* is individual testimony even though the *knowledge* that is transferred is the product of a collective, i.e., it is *collective knowledge*. Within scientific expert testimony, I believe we can identify some differences in the strength of the testimony, depending on what is involved in producing the testimony and if it is collective testimony or individual testimony, regardless of whether the knowledge presented is the product of a collective, and collective knowledge. However, it is essential to note that the strength of that testimony is not increased because it has strengthened epistemic authority, but that the increased strength comes from something else. What is that something else?

In some cases, a further process occurs after an individual scientist can prove themselves as a scientific expert by accurately articulating the consensus position. These additional processes can be called instances of collective scientific expert testimony, where the source

of the epistemic authority remains the same: the scientific consensus. Still, the increased strength is due to a *communicative consensus* in the testimony.

2. 2. 1. Collective Scientific Expert Testimony

What would constitute collective scientific expert testimony? Due to the unique features relevant to scientific expert testimony, we must rethink what we call a case of collective scientific expert testimony. This is crucial in showing how some kinds of testimony have increased communicative strength with additional guarantees provided via the communicative consensus.

Some kinds of testimony can be appropriately called *collective testimony*. Various philosophers write on 'collective testimony' and its connection to knowledge. Some questions include whether someone could testify to *p* if they cannot articulate the ground for holding the belief *p*, etc. (see Faulkner, 2018, for example). However, I believe that considering how a scientific community works and how a scientific consensus is produced shows how it is possible to testify to *p* even though you might not be able to articulate the grounds for *p*. When we talk about scientific knowledge and we look at how it comes about that science tends to produce primarily correct answers, we can see how someone could testify to *p* while not being able to articulate the reasons for *p*. Let me explain. Because of the significant division of labour in scientific work due to the highly specialised nature, there is an epistemic dependence in the scientific community that is kept in check through policing and self-policing in the community. Having epistemic authority on the relevant matter seems to be a requisite for being able to testify to *p* without being able to articulate the exact reasons for *p*.

This seems counterintuitive at first, as we believe that a scientific expert would be able to explain the exact details of the grounds that support the consensus position. But remember that the kind of consensus we associate with a scientific consensus, i.e., a *deliberative acceptance consensus*, does not require all the scientific experts involved to agree on all the relevant details about the matter. Furthermore, it does not require all the scientific experts to *understand* the minute details of everything pertinent. The kind of community that a scientific community is, i.e., one that self-regulates due to the underlying mechanisms, means that there are good reasons for testifying to *p* when it becomes the established position on the matter.

However, testimony that transfers scientific collective knowledge does not automatically

make it an instance of *collective testimony*. A schoolteacher could teach Evolution Science. Her testimony about the matter could transfer knowledge that is, essentially, *collective knowledge* (according to the understanding of collective testimonial knowledge that I adopt, that would mean that it is knowledge that comes from multiple people and that someone in the group of knowers would have knowledge about *p* that is non-testimonial, i.e. not knowledge that is transmitted strictly via testimony) (Faulkner, 2018, p. 108). For me, however, her testimony is not collective testimony.

What would make something a collective testimony when it comes to science? Due to the unique features relevant to scientific expert testimony, we have to rethink what we call a case of *collective testimony*. Consider, for example, the reports presented by the IPCC. Besides the fact that individual scientists involved are scientific experts, there is a further process that takes place within the relevant community: the research that is produced within the scientific community by the relevant scientific experts is taken and goes through a further process where the consensus position is refined into some claim (or an extended set of claims) that serves as a way to present a consensus position on the state of affairs. We often find this extended process when significant issues have broader social and political relevance (for example, Climate Change Science, COVID-19, and other health-related issues). When the consensus is presented in this way, the individual scientific experts collectively add their names to the claim (or set of claims) made. They take shared responsibility for the position that is testified. This kind of collective scientific expert testimony transfers *collective knowledge* to the hearer. It gives the audience more confidence by reducing doubts about what is being communicated. Therefore, there is no greater epistemic authority regarding the collective knowledge or consensus claims being testified, but there is an increased authority regarding the *communication* involved.

Within this process, we can identify the individual scientific experts who were involved in conducting science at the basic level of experimentation, the recording of results, where these scientific experts form a part of the divided cognitive labour that eventually leads to the production of the consensus as we understand it within the kind of community that a scientific community is. But sometimes, such as in the IPCC, we have a body of scientists who take it a step further to process all of the relevant findings and present it in a form where it is a claim (or a set of claims) that reflects the status of the consensus, usually to communicate it to people outside of the scientific community.

Consider again the IPCC. These scientific experts at the IPCC work in a coordinated effort, with a joint commitment to provide a testimony that reflects the current state of affairs.

Within a body such as the IPCC, various levels and ways of engagement are involved in producing consensus reports. Some scientists are called 'contributing authors' who help to prepare the scientific information that will be integrated into various chapters by the 'coordinating lead authors', who have the responsibility for the development of full chapters, the standard of the chapters, and that the various parts of chapters are fully integrated into the chapter. 'Lead authors' on a report look at the overall report, identifying the necessary chapters, and making sure everything that is provided by those who work under them has been completed and integrated in keeping with the standards, styles, and timelines (from *Annex 1 of Appendix A to the Principles Governing IPCC Work document*).[25]

What is essential is that the scientists involved, all the way to the bottom, are *scientific experts* in the matter at hand and engaged in the kind of scientific community I have thus far presented. In the final processes where the existing research is compiled and presented in a final consensus claim (or set of claims), such as in the IPCC reports, we have the whole process presenting what is the result of this kind of community of scientists in a more concrete and digestible format for non-experts who might have to use the information in practical terms, such as in policy-making, etc. This document is a concrete representation of what a scientific community produces: a consensus of the type we hope a scientific community provides. In this consensus communication, there is an increased strength for the non-expert: the non-expert believes that the margin of error has been reduced.

When a scientific consensus is presented by a collective of scientific experts, it is because of the coordinated effort (that comes from the tension between cooperation and competition) that can only occur in a *scientific* community. Not only that, but when we have the further process where the research findings are processed into the sort of consensus claims that a body such as the IPCC communicates, it can only come from a group of scientific experts who collectively work towards this goal of producing such a set of claims. It is only a collection of scientific experts, i.e., a collection of scientific experts *qua* epistemic authorities, who can provide a properly collective kind of testimony that provides preemptive reasons for belief due to its epistemic authority.

[25] To see this document:https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-principles.pdf. (Accessed: December 2024).

2. 2. 2. Epistemic Authority: Is there an Increase in Epistemic Authority in the Testimony of a Collective?

As I have established thus far, when we have a scientific expert as *qua* epistemic authority testifying about questions related to their specialised domain, there is a strength to the testimony that can only be provided due to their status as an epistemic authority of a specific kind, namely a scientific expert. When we say that a scientific expert, i.e., someone who can articulate the established consensus on a given issue and has been initiated into the relevant scientific domain, has *epistemic authority*, it means that the testimony has a particular strength to it that a non-expert's testimony would not have if they were to make some claim about the relevant issue, even if the non-expert's claims were accurate. Scientific experts *qua* epistemic authorities provide us with unique reasons for belief, namely *preemptive reasons for belief*.

When a collective of scientific experts *qua* epistemic authorities testify (such as a collective who testifies when we have the presentation of a report by the IPCC), we intuitively feel that there is something better about the testimony. Why is this the case? In this case, we have a transfer of collective knowledge and a proper case of *collective scientific expert testimony*.

> The fact that the collective of scientific experts *qua* epistemic authority makes claim *C* (in some form where it is clearly stated that those involved give their support to the claim) is reason for me to believe *C* that replaces my other reasons relevant to believing *C* and is not simply added to them.

What happens here is that claim *C*, which the collective of scientific experts make, is a consensus position in the form of a claim, where the claim would be an instance of testimony. The collective's claim represents a *communicative consensus* where they collectively take responsibility for what is communicated. Remember that scientific experts could disagree on various issues at the level of substance but still collectively support *C* as the consensus position. Here, we accept that the testimony to *C* reflects a claim that best represents the current state of affairs, and those involved in the claim have agreed upon *C* as representing the consensus.

When an individual scientific expert testifies, they transfer *collective knowledge* to the hearer. When a group of scientific experts testify, we have a collective of scientific experts with a *communicative consensus*, as well as *collective knowledge*. The larger the collective of experts and the communicative consensus, the more non-experts believe they have good reason to accept the testimony. This is simply because there is less margin for error in their judgment of the claim to epistemic authority and scientific expertise.

Consider, for example, the IPCC's report on the current state of anthropogenic climate change. As a non-expert, the margin of error in my judgment about the claim of scientific expertise is reduced when the collective of scientific experts increases. The more scientific experts are involved in presenting the consensus, the less likely I will make an error in my judgment of their scientific expertise.

3. Conclusion

In this chapter, I extended the discussion of the ideal relationship between a scientific expert and a non-expert in the first chapter to now include an explanation of why scientific experts have epistemic authority, what epistemic authority is, where a scientific expert's epistemic authority comes from, and what a scientific expert is. A scientific expert is someone who 1. accurately articulates the consensus in that domain and 2. has been initiated into the relevant scientific community and its traditions. The source of the epistemic authority that scientific experts have is the kind of knowledge that is produced within the scientific community, i.e., collective knowledge that can be presented in consensus claims. Only this kind of community—a scientific community—can provide us with the knowledge we hope to get from science. When a collective of scientific experts testify, such as in a report presented by the IPCC, there is a communicative consensus, meaning that non-experts have some guarantees that the margin of error has been reduced.

In the following two chapters, I will discuss the epistemic pathologies I have in mind, namely that of pseudoscience, science denialism, and related kinds of conspiracy theories. In this discussion I will use the understanding of what scientific expertise is, what kinds of reasons it provides us for belief, and what a *scientific community*—as a unique kind of community—is. When there is a rejection of the epistemic authority of scientific experts (in the case of science denialism), or there is a false claim to possessing the same kind of epistemic authority that scientific experts have (in the case of pseudoscience), these

pathologies emerge.

Chapter 3

One Species of Zombie: Pseudoscience and the Claims to Epistemic Authority

In the previous two chapters, I presented a sketch of the ideal relationship between a scientific expert and non-expert by focusing on what the testimony of a scientific expert *qua* epistemic authority *does* (in Chapter 2), what scientific expertise and epistemic authority *is*, and what the role of the scientific community is in defining scientific expertise and providing a scientific consensus, where scientific consensus is the *source* of a scientific expert's epistemic authority (Chapter 3). Someone is a scientific expert *qua* epistemic authority if they: 1. accurately articulate the scientific consensus position that has been reached within a scientific community, specifically with regards to the questions relevant to that domain, and 2. have been initiated into the scientific domain in question (meaning they have the requisite educational background, know the relevant traditions, know the requisite observational techniques, methods, etc.).

In this chapter, I will consider one of the epistemic pathologies between scientific experts and non-experts, namely when antagonistic non-experts claim to possess the kind of epistemic authority only scientific experts have. When they testify about the relevant issue and claim to have epistemic authority in a specific specialised domain (which is mostly *not* a scientific domain at all, such as in the case of 'Flat Earth Science'), they essentially claim to provide preemptive reasons for belief about the relevant pseudoscientific domain and the claims they make. As the source of epistemic authority comes from a consensus that is provided by a specific kind of community—a *scientific* community with all of its mechanisms—pseudoscientists essentially make claims about the *type* of community they are and that their community has the kinds of mechanisms that only a scientific community can have. They claim that what they say is as good, or even *better*, than what scientific experts and scientific communities say.

Pseudoscientists often compare themselves to scientists such as Galileo or Copernicus,

claiming that what they are doing in their work has a similar revolutionary value to those scientists we consider revolutionary (Gordin, 2021, p. 42). They also claim that the 'scientific establishment' is persecuting and suppressing them in the same way as, for example, Galileo (Gordin, 2021, p. 42). What seems crucial is that pseudoscientists do not understand what it means to claim science is 'revolutionary'. In explaining this misunderstanding, I will draw on the sociological setup of the scientific community I sketched in the previous two chapters and add to that discussion by drawing on Thomas Kuhn's notions of normal and revolutionary science (2012).

Although I believe there are problems with Kuhn's account of scientific progress, understanding his ideas of normal and revolutionary science within the sociological framework I have sketched helps. Kuhn's notion of 'normal' science fits well within the understanding of a scientific community and its processes, 'normal' science being, essentially, about scientific questions that fit within the current framework of the relevant scientific community; "normal-scientific research is directed to the articulation of those phenomena and theories that the paradigm already supplies" (Kuhn, 2012, p. 24). 'Normal' science is what pseudoscientists misunderstand and consider 'scientism' and a part of the 'dogmatic establishment'.

What pseudoscientists miss is that the theories they support have often made their way through the processes of the relevant scientific communities, and those ideas *have already been rejected*. Their claim to 'revolutionary' ideas fails for this simple reason: it has usually gone through the processes of scientific communities and already been dismissed as something that is not worthy of further consideration as there is inadequate empirical support, they have been rejected as irrelevant anomalies, or the methods have been rejected (Gordin, 2021, p. 16). Consider Flat Earth Science, Creationism (or Intelligent Design 'Science'), homoeopathy, and other such typical cases of pseudoscience. In these cases, the existing scientific communities with the requisite scientific expertise on relevant matters do not believe it merits further enquiry. They have already not survived the mechanisms at work within scientific communities.

What pseudoscientists present as legitimate 'science' cannot even be considered a competing paradigm with the proper production of collective knowledge and consensus claims when considered alongside scientific communities, their sociological set-up, the collective knowledge they produce, and the consensus claims they make.

In § 1, I will present a working definition of pseudoscience and provide two key examples of such theories: Flat Earth Science and Intelligent Design Science. In § 2, I will discuss

some of the fundamental failings of pseudoscientific communities and their members by considering 1. the sociological set-up of their communities and their claims to 'scientific consensus' and 'revolution'. In § 3, I will discuss how scientific epistemic authority can be faked and how pseudoscientists effectively do it. One of the main strategies of pseudoscientists is to defend themselves against accusations that what they do is 'pseudoscience' and to claim that they possess the same epistemic authority as scientific experts have. They do this by building arguments that make them look scientific to other non-experts, i.e., they essentially fake those features of science and scientific communities that make scientific communities a certain *kind* of community. It is crucial to note that I am not judging individual pseudoscientists' *intentions*, by which I mean if they are intentionally manipulative or simply scientifically ignorant and believe that they are honest in what they believe to be actual scientific pursuits.

1. What is Pseudoscience?

In this section, I will provide a framework for understanding pseudoscience. I will use this framework to show what goes wrong with pseudoscience in the rest of the chapter. As mentioned before, I will immediately limit my discussion of pseudoscience to the *sociological* setup of a scientific community. I believe that pseudoscience, as an epistemically pathological relationship between scientific experts and non-experts, is best understood when taking this approach. Pseudoscience and other epistemic pathologies result from moral or social failings, meaning it is most natural to consider them along social lines.

There seems to be a strong intuitive agreement amongst scientists and philosophers of science that some kinds of fields are *pseudoscience*, including fields such as astrology, psychokinesis, homoeopathy, clairvoyance, UFOlogy, Intelligent Design Science (a variant of Creationism), parapsychology, and Scientology, to list a few. Most scientists and philosophers of science agree that these pseudosciences have nearly no epistemic credibility and can potentially have dire consequences when people are exposed to them and believe them. Think, for example, of children who are not vaccinated due to their parents' decisions and people who are desperate and pay pseudoscientists money for 'medical' treatments, among so many other examples (Boudry, 2022, p. 85).

I consider pseudoscience to have some *normative* features that recur throughout theories that we intuitively categorise as pseudoscience. When we talk about some of the norms of

pseudoscience, we instead talk about distinctions between what is presented as scientific knowledge and what is considered established scientific knowledge and scientific epistemic practices in scientific communities and those that are not (and are often practised in pseudoscientific communities). This approach seems most apt, as it allows for discussion of the pseudoscientific *community* and the *kind of knowledge* that it claims to produce. As a reminder, reliable *scientific* knowledge, which is a form of collective knowledge, can only be produced via the mechanisms of the kind of community I have described.

Hints at norms relevant to the kind of framework I intend to provide reveal themselves in phrases philosophers use to describe pseudoscience, such as "something that masquerades as science" (Pigliucci & Boudry, 2017, p. 3), "the pseudoscientist pretends to be, and often aims to be, a scientist" (Derksen, 1993, p. 19), "a pseudoscience is an activity that is being falsely presented as science, either explicitly or by mimicking the forms of a science" (Dawes, 2018, p. 285), "refers to activities which purport to be science but aren't really" (Haack, 2007, p. 115), and (I paraphrase and summarise) pseudoscience is concerned with epistemically unreliable issues that present itself as being the most reliable knowledge about the particular matter (Hansson, 2013; Pigliucci, 2015; Zaboski & Therriault, 2020). These descriptions highlight the distinctions between scientific and 'fake' knowledge, dodgy epistemic practices, and legitimate scientific inquiry. The descriptions reflect etymological features of the notion of 'pseudoscience', i.e. science that is 'pseudo', defined as "a spurious or pretended science; a branch of knowledge or a system of beliefs mistakenly regarded as based on scientific method or having the status of scientific truth." (*Oxford English Dictionary*).[26]

The term *pseudoscience* is immediately normatively loaded when considered from this perspective. This is reflected in the intuition that we would not call a scientific expert a pseudoscientist or a theory a pseudoscientific theory simply if the scientific expert proposed an erroneous theory. When we call something 'pseudoscience', we immediately make some normative judgment about what we have labelled as pseudoscience. When discussing pseudoscience, we intuitively think of Flat Earth or Intelligent Design theorists. Calling someone a 'pseudoscientist' is a pejorative expression, and no one would willingly call themselves a pseudoscientist. When we call someone a pseudoscientist, we seem to be saying that they are guilty in some way and that what they say is to be rejected immediately.

Furthermore, even though we value particular sciences for their practical outputs (such as

[26] To see the definition: https://www.oed.com/dictionary/pseudoscience_n?tab=meaning_and_use#27717304. (Accessed: 25 December 2024).

epidemiology, virology, etc.), we would not classify research that does not produce things with these practical sorts of applications as pseudoscience (think of philosophy, history, economics, pure maths, etc.) (Boudry, 2022, p. 87). Another kind of science we would not call pseudoscience is what Michael Shermer calls 'borderlands science' (2013, p. 206). This collection of sciences includes fields that are pursued by scientists who are considered mainstream scientific experts. Still, they work in fields of inquiry that have not been confirmed or falsified as yet, such as string theory, hypnosis, inflationary cosmology, and the Search for Extraterrestrial Intelligence (SETI) (Shermer, 2013, pp. 206-7).

What is important to note is that there is a difference between UFOlogy and SETI. Firstly, SETI is not pseudoscience as it makes no claims to have found any evidence for extraterrestrial life yet, whereas, with UFOlogy, the claims are that there *is* evidence for extraterrestrial life (Shermer, 2013, p. 206). The proponents of UFOlogy claim they are scientific, but their 'community' does not resemble the kind of community that a scientific community is (Shermer, 2013, p. 206). What is important here is that we know that borderland science always has the *potential* to become proper mainstream science if the evidence changes. But it is further necessary to note that in these cases of 'borderlands science', the kind of community that we call a *scientific community* with the features that such a community has is present. The SETI Institute is a body of over 100 scientific experts in fields that would be relevant in searching for extraterrestrial intelligent life.[27] What differentiates this research centre that works in the field of SETI from other groups of non-experts who claim to have evidence and knowledge about UFOs is that they are still a part of the larger scientific communities in their respective fields. They go through the processes that help a scientific community achieve its goals and produce collective knowledge. The scientific experts have the relevant qualifications, and their publication records attest to their involvement in the processes that are part of a scientific community.

Pseudoscience does not develop when there is *insufficient* scientific information. Instead, it develops on the fringes of science, often as a part of or a result of the usual scientific processes (Gordin, 2021, p. 100). Boudry describes pseudoscience as 'relational' insofar as "it can only emerge in a cultural environment in which science already exists and is regarded as an epistemic authority worth emulating" (2022, p. 89). When there is an engagement with scientific problems, and specific results are confirmed and supported by a consensus view, opposing or contradictory scientific ideas are often pushed to the fringe and sometimes

[27] See the website for the SETI Institute: https://www.seti.org.

ultimately dismissed, being considered pseudoscience and not appropriate topics of study in mainstream research (Gordin, 2021, p. 100). When a scientific expert holds on to a theory even when it has been disproven or pushed to the fringe, they could eventually be treated as pseudoscientists by mainstream scientific experts who have moved on to new fields of inquiry within their domain. The former scientific expert will no longer be considered someone who accurately presents the scientific consensus if they hold on to pseudoscience and it affects their views and what they claim to be the truth to questions within their domain. It is often the case that non-experts pursue these fringe ideas, believing they are being scientific in these pursuits or abusing the fringe ideas for personal gain.

Even though pseudoscientists sometimes reject the traditional models and sometimes even propose 'other ways of knowing, ' they attempt to present themselves as possessing the same epistemic status as that of scientific experts (Boudry, 2022, p. 89). When a pseudoscientist claims to be an epistemic authority on a matter, they are effectively being insensitive to scientific experts *qua* epistemic authorities (the insensitivity is often exacerbated and accompanied by the accusation of 'scientism' leveraged at scientific experts). Furthermore, they are faking the epistemic authority that scientific experts have and that only scientific experts *can* have due to those features that define scientific expertise. In faking epistemic authority, pseudoscientists effectively claim to provide preemptive reasons for belief. I will discuss *how* they fake possessing scientific epistemic authority in § 3.

We generally have two kinds of pseudoscientists: 1. those who are 'true believers' and 2. those who do not believe in the 'science' they produce and do it for some other benefit (financial, economic, political, etc.). The 'true believer' pseudoscientist fully believes they pursue proper science when engaging in their pursuits; they do not consider themselves anti-science (Gordin, 2021, p. 100). The 'true believer' kind of pseudoscientist reveals a fundamental ignorance of science, its processes and methods, what constitutes 'good' empirical research, what a scientific community is, what scientific consensus is, etc. When we have those who are intentionally deceptive in producing their 'science', the claim to being an epistemic authority is not motivated by the belief that they *are* an epistemic authority but rather by the fact that they have other goals in mind. Think, for example, of someone who claims to be an epistemic authority on health issues and proposes a homoeopathic treatment.

The person may know they are not an epistemic authority, but they keep up the appearance for financial gain. In these cases, there is an apparent moral failing on the part of the pseudoscientist. For now, I will put aside the question about moral failure, although it is essential. I believe that what happens in these cases of intentional deception could be morally

different to some of the usual instances of pseudoscience where we deal with 'true believers' although they are epistemically very similar. Both cases display an imitation of science to present themselves as scientific experts and scientific communities with epistemic authority. This will be discussed in more detail in the next section by considering the kind of community a scientific community is and what pseudoscience does.

1. 1. What Pseudoscience is *Not*

Before continuing, I will briefly mention what I *exclude* when using the term 'pseudoscience'. This is crucial, as some phrases are often used interchangeably or sometimes simply confused. I believe that pseudoscience, non-science, bad science, scientific fraud, science denialism, and some other variations of these classes are primarily different. However, there are cases where there might be some overlap. When we talk about *non-science*, we could be talking about many kinds of intellectual pursuits, such as literary criticism, history, political philosophy, and ethics. In these examples, we aim to gain some knowledge, and some forms of empirical evidence might be required, but it is not science in the same sense as I have in mind here, contrasted with pseudoscience. Furthermore, we make no value judgment about something when we label it as 'non-science' (Ladyman, 2012, p. 46). When saying that something is 'non-science', we do not mean to say that there is anything bad about it; instead, it is not the type of thing we would call 'science'.

There have been many scientific mistakes throughout history, which is perfectly natural. A scientific expert does not have to be labelled a pseudoscientist simply for making a mistake, and similarly, we would not call every erroneous scientific theory a pseudoscientific theory (Ladyman, 2012, p. 46). Fraudulent science, another kind of science where something is misrepresented in some way or another, is when scientists purposefully misrepresent scientific findings for ulterior motives. Even though *pretence* is central in pseudoscience and fraudulent science, they are not the same (although it can sometimes happen that there is an overlap between fraudulent science and pseudoscience). Pseudoscientists might be deceptive but not always intentionally deceptive as scientists are when committing fraud (Ladyman, 2012, p. 48).

Science denialism is another distinct thing. The differences between science denialism and pseudoscience will be discussed in more detail in the following chapter, but I will mention a few things here. Some philosophers, such as Hansson (2021), argue that science

denialism is the same as pseudoscience. I disagree with this. Even though science denialism might employ pseudoscientific strategies as a part of its denialist strategies, the difference is that science denialism does not always employ pseudoscience. Science denialism often takes the form of a rhetorical strategy that aims to cast doubt on specific scientific claims and the consensus on the issue (Gordin, 2021, p. 93). Being a pseudoscientist without necessarily engaging in science denialism is also possible, although there is a strong likelihood that a pseudoscientist would also be a science denialist. In the next chapter, I will show that science denialism is another way the ideal picture of the relationship between a scientific expert and a non-expert can go wrong.

1. 2. Examples of Pseudoscientific Theories

Here, I briefly present two examples of pseudoscientific theories for future discussions. I primarily focus on Creationism (or Intelligent Design Science) and Flat Earth Theory, as these are dominant and potentially influential (and harmful) pseudosciences.

1. 2. 1. Flat Earth Theory

At the centre of flat earth beliefs are multiple scientific misunderstandings that most people - even those with an elementary education - would be able to understand. Evidence of the spherical nature of the earth is very easily understandable. Believing that the earth is flat requires beliefs, misunderstandings, and a significant ignorance of science that spread over a spectrum of sciences - geography, physics, mathematics, astrophysics, and many others. It is not only an isolated instance of a pseudoscience that contradicts one isolated area of science, such as, for example, when there are claims about vaccines and homeopathic remedies for illnesses. When you believe that homeopathic remedies are the best for curing a mood disorder, for example, it would be coherent with accepting that the earth is a sphere amongst many other things. Flat Earth pseudoscience provides the believer with a whole worldview that contradicts most scientific theories and claims, many—or even most—of which have been accepted as mainstream scientific claims and theories for decades or centuries.

Some of the fundamental accepted claims in flat earth theories are (Fernbach & Bogard, 2024, p. 188):

1. The earth is a flat disc with land and water in the center surrounded by a thick wall of ice.

2. Earth is covered by a dome a few hundred (or thousand) miles from the surface, and the heavenly bodies (i.e., the sun, moon, and stars) are impressions on the dome.

3. All images and videos of Earth, the moon landing, rocket launches, and other astro-nautical events are elaborate hoaxes perpetrated by a cabal, including those at National Aeronautics and Space Administration (NASA), which is controlled by Nazis.

From this established knowledge that the earth is flat, for example, they work to explain: 1. how the moon and sun cycles work, 2. how seasons work, 3. how ocean currents work, 4. what accounts for the fact that we are affected by something that keeps us on the ground (as most of them don't believe in gravity), 5. how navigation makes sense, 6. how daylight and night work, etc. The Flat Earth Society is probably the most well-known organised body of 'Flat Earthers' or 'Flerfers' who hold some belief that the earth is, in fact, flat and not spherical ('Globehead', 'Globetard', and 'Globeturd', amongst others, being words for spherical Earth believers). When searching Amazon and using the phrase 'flat earth', thousands of books and other products (from clothing to kitchenware to films, etc.) are listed. Some of these items mock flat earth believers, while others are serious.

The key book that fuels the flat earth pseudosciences is that of Samuel Birley Rowbotham, titled *Zetetic Astronomy: Earth Not a Globe!* (1865) (originally written under his pseudonym, Parallex, and circulated as a pamphlet in 1849). This text contains some general ideas behind the reasons to question our belief in a globular earth that become apparent in many other pseudosciences. The idea is that scientists are not doing science in the *right* way, and we have to resort to our investigations to get to the truth, often meaning in flat earth beliefs, our *own* sensory observations and experiments (Rowbotham, 1865, pp. 3-4):

None can doubt that by making special experiments and collecting manifest and undeniable facts, arranging them in logical order, and observing what is naturally and fairly deducible, the result will be far more consistent and satisfactory than by framing a theory or system and assuming the existence of causes for which there is no direct evidence, and which can only be admitted "for the sake of argument." All theories are of this character—"supposing instead of

> inquiring, imagining systems instead of learning from observation and experience the true constitution of things. Speculative men, by the force of genius may invent systems that will perhaps be greatly admired for a time; these, however, are phantoms which the force of truth will sooner or later dispel; and while we are pleased with the deceit, true philosophy, with all the arts and improvements that depend upon it, suffers.

He claims that scientific theories make assumptions that cannot be empirically supported, and we must return to our empirical investigations. What is crucial to note here, and is almost admirable, is that flat earth pseudoscientists are, in a sense, radical empiricists who reject anything that they had not personally investigated, and they are proud of this (Fernbach & Bogard, 2024, p. 190). The problem, however, is that Rowbotham (and consequent Flat Earthers) does not understand how legitimate assumptions can be made within scientific enquiry when an assumption is based on other observations and conclusions logically drawn from prior knowledge. Rowbotham further quotes Copernicus (1865, p. 4):

> It is not necessary that hypotheses should be true, or even probable; it is sufficient that they lead to results of calculation which agree with calculations. * * Neither let anyone, so far as hypotheses are concerned, expect anything certain from astronomy; since that science can afford nothing of the kind; lest, in case he should adopt for truth things feigned for another purpose, he should leave this study more foolish than he came. * * The hypothesis of the terrestrial motion was nothing but an hypothesis, valuable only so far as it explained phenomena, and not considered with reference to absolute truth or falsehood."

He follows this with 1. the claim that all theories since Copernicus have been the same insofar as it just took assumptions and built all of the ideas thereupon, 2. the claim that none of these theories were ever tested and proven, and 3. that this implies that all theories that led from Copernicus and Newtonian theories have been built on faulty foundations (Rowbotham, 1865, pp. 4-5).

Not only did this book make these claims about the legitimacy of science and the theories upon which plenty of it has been built in general, but it further presents so many details about geography, the curvature of the planet, our ability to see certain things, falsehoods about gravity and the misuse of certain words, such as 'level', etc. Today's Flat Earthers use this book with all its false claims, calculations, and everything else and consider it fact. They

pursue the same simplistic "empirical experiments" that Rowbotham claimed refutes the globular model of the planet.

A recent book that is a straightforward reiteration of Rowbotham's arguments and faulty mathematics is that of Eric Dubay, titled *Flat Earth FAQ* (2023) with some extended arguments on many of the 'issues' raised in Rowbotham's book in other of Dubay's books, such as *200 Flat Earth Proofs* (2015). I am going to jump to point 13 in Dubay's 200 Flat Earth Proofs, where he claims the following:

> In a 19th century French experiment by M. M. Biot and Arago a powerful lamp with good reflectors was placed on the summit of Desierto las Palmas in Spain and able to be seen all the way from Camprey on the Island of Iviza. Since the elevation of the two points were identical and the distance between covered nearly 100 miles, if Earth were a ball 25,000 miles in circumference, the light should have been more than 6600 feet, a mile and a quarter, below the line of sight!

I refer to a video by YouTube pseudoscience debunker ProfessorDave, who presents a few straightforward facts that debunk this claim by Dubay (2015).[28] Firstly, the 'summit' that Dubay refers to is simply a vague reference to some position on Desierto las Palmas, and we are left to question exactly where this point on the 'summit' was. Secondly, it cannot be found when searching for evidence of this experiment. Where did Dubay get this data? Thirdly, Dubay probably means the 'Island of *Ibiza*'. Fourthly, he has the distance of the supposed measurements wrong. The distance between the two 'points' should be around 80 miles, even if there is some uncertainty about the precise position of the lamp on the 'summit'.These are just a few errors. It is obvious how the rest of the maths in this calculation cannot be accurate if that one detail about the distance is wrong. This is just one case of such mathematical errors.

Alongside the mathematical errors, he added some claims that give a modern twist to the pseudoscience, such as the problems with aeroplane flights and routes—all of which are wrong and can be confirmed with a quick Google search. One of the flight-related claims Dubay makes is that "On a globe, Johannesburg, South Africa to Perth, Australia should be a straight shot over the Indian Ocean with convenient re-fueling possibilities on Mauritius or

[28] See the video here: https://www.youtube.com/watch?v=UBfEhIJLYfY.

Madagascar, but in actual practice most Johannesburg to Perth flights curiously stop over either in Dubai, Hong Kong, or Malaysia" (2023, p. 123). His primary objection to flight routes is that many Southern Hemisphere departure points to other Southern Hemisphere destination points 'curiously' stop somewhere in the Northern Hemisphere. He claims this seems strange considering shorter direct paths and that these 'longer routes' would only make sense on a flat earth. Now, I am somewhat confused by his argument as I have been on a direct flight from Johannesburg to Perth many years ago, and the flight was roughly only 9 hours. According to his argument, this flight would have made no sense as it would take far longer on a globe than a flat earth.

He is contradicting himself and ignoring some very fundamental logical reasons why airlines fly specific routes more regularly: there is, most probably, a smaller demand for direct flights from Johannesburg to Perth than there are from Johannesburg to the Northern Hemisphere, and for financial reasons it would not make any sense for airlines to increase the number of direct flights. And most readers who know anything about travel could think of many other reasons for the indirect routes. A result of this argument is that many Flat Earthers have taken Dubay's argument and misrepresent it. I have seen many Flat Earthers who even go so far as to say that there are no direct flights between Johannesburg and Perth. I must have dreamt up that flight!

Another string of claims that Dubay makes about flight routes goes even further than the Johannesburg-Perth claims. Dubay says the following about the route between Sydney and Santiago (2023, p. 124):

> […] firstly, it has yet to be proven that these flights even exist since no unedited video footage exists online, and every time flat earthers have attempted to book the non-stop flight, it fails to go through, gets canceled and refunded days before departure, or changes to a non-direct flight.

I will leave it up to the reader to judge the claim's legitimacy. However, there is the taste of a conspiracy theory (I will briefly discuss conspiracy theories at the end of the following chapter). Flat Earth Scientists take fundamental scientific principles and butcher them while trying to refute them.

1. 2. 2. Creationism (or 'Intelligent Design Science')

Within the broad theoretical framework of Creationism (a Creationist being someone who believes that there is some unique intelligent entity that had to be involved in creating the universe, the world, and the complex and varied species inhabiting the world) there are various views that are slightly distinct and vary in their interpretation of and acceptance of science: 1. Young Earth Creationists have a literal understanding of the Genesis tale that the earth was created within a few days; 2. Old Earth Creationists accept that the earth is ancient, but mostly reject Evolution Science; 3. Creationists who believe that the earth's composition with all of its various species and variations as they exist today, including fossils we find, can be explained by some worldwide flood; and 4. Intelligent Design theorists who set aside the question of the age of the universe, but claim that all of the universe and living things are proof of Intelligent Design, i.e., the complexity of the universe, the world, and all living things are proof of Intelligent Design as they are irreducibly complex (Haack, 2007, p. 273). There are some other variations of Creationism, but these are some of the central cases. The fundamental claim in these theories is that some form of the creation tale with the involvement of an intelligent designer *has* to be accurate, and Evolution Science cannot accurately capture the complexities of the natural world and its species (Haack, 2007, p. 273).

What is interesting about Creationism is that there seems to be a far more systematic structuring in their pseudoscientific community than in the Flat Earth Science community. Consider, for example, The Discovery Institute.[29] This website is far more professionally presented than, for example, the Flat Earth Society website.[30] It provides various categories of research (Intelligent Design, Economics, Technology, Education), and when accessing the Intelligent Design page, it presents the centre as having:[31]

> […] 40 affiliated academic Fellows representing disciplines such as physics, astronomy, chemistry, molecular and cellular biology, biochemistry, microbiology, mathematics, history and philosophy of science, law and political science. Our Fellows are scholars who do research, writing, and speaking on topics related to the Center.

[29] See here for The Discovery Institute website: https://www.discovery.org
[30] See here the Flat Earth Society website: https://theflatearthsociety.org/home/
[31] See here the About information on The Discovery Institute: https://www.discovery.org/id/about/.

Everything presented on the Discovery Institute is framed as 'legitimate science' with the expected affiliations. When paying closer attention, one discovers that even though there might be several scientists who have qualifications that are relevant to the domain in question when we talk about Evolution Science—and some of them even have impressive resumes—the majority of the research fellows work in domains that are peripheral or irrelevant to Evolution Science. As the group of real domain-relevant scientists are so small, perhaps they could more appropriately be called a group of fringe scientists.

2. The Failures of Pseudoscience

In this section, I want to consider pseudoscientists, pseudoscientific communities, the claims to epistemic authority, and the accusations of 'scientism' that are leveraged against scientific experts and scientific communities. If pseudoscientists want to be able to claim that they are epistemic authorities on the matters they claim to be authorities on, they would have to have legitimate epistemic authority on those things. What is essential to keep in mind is that the claim of epistemic authority that they make is a certain *kind* of claim: they claim to have epistemic authority on *scientific* matters (such as, for example, being an expert on curing cancer via homoeopathy) or they claim that what they are producing is 'scientific knowledge' and that they are the 'scientific experts' with the requisite epistemic authority on those matters (for example, flat earth 'scientists'). This means they must be a scientific expert *qua* that particular *epistemic authority* to make a legitimate claim.

Certain kinds of requirements are placed on their claims to epistemic authority. It cannot be the kind of epistemic authority that is relevant when I have to testify about the location of my house. Most crucially, this kind of epistemic authority can only come from a certain consensus, where that kind of consensus can only be provided via the mechanisms at work within scientific communities. There is sufficient evidence that scientific communities, as communities with a specific sociological set-up, are good at providing us with things that are mostly right in their relevant domains of scientific questions. There is nothing unreasonable in saying that a pseudoscientific community would have to measure up to the kind of community that a scientific community is to have a legitimate claim to having a similar epistemic status. Their claim is, in effect, that they are just as good—or even *better*—than scientific experts and scientific communities to provide us with what we want from those

kinds of people, namely, scientific truths or scientific knowledge.

In the following discussions, I will consider some of the various pseudoscientific communities, such as Flat Earthers and Creationists.

2. 1. Pseudoscientific Communities

Most crucially, pseudoscience cannot claim to present anything as 'scientific', 'scientific consensus', 'scientific knowledge' or in any other way related to science as it does not occur within the kind of community necessary for producing what we want from science. Remember that the *sociological* characterisation of a scientific community I have sketched is 1. that it is a *diverse* community of individuals (where that diversity includes diversity in thinking, intellectual diversity, as well as many of the other typical kinds of diversity we have in mind, such as race and gender) and 2. that this community has specific mechanisms in place that helps it to be so good at achieving its goals. This is the kind of community that can produce a scientific consensus that is mostly right or is as close to the truth as we can get.

First, I want to talk about diversity. The kinds of communities that develop around pseudoscience are often not diverse in the way we would like a scientific community to be. Some pseudoscientific ideas develop around particular political, ideological, or religious values and beliefs. Consider Creationism (or Intelligent Design Science). In this case, we have a specific group of people who gather due to their ideological or religious views, and these values are essentially the foundation for the pseudoscience they develop. The *starting point* of their pseudoscience is the acceptance of some beliefs about the creation of the world (Haack, 2003, p. 273). The 'science' they do is built on an unquestioningly value-laden belief regarding the matter, and that fundamental belief is mostly unrevisable. This means that what they present as 'science' is value-laden in a way where *religious* values are given precedence over empirical findings and where the empirical findings are often interpreted by first considering how they fit into the idea of Creationism.

Because of this kind of community, where many ideological and religious views are *shared*, and those shared values bring these pseudoscientists together in their 'scientific' pursuits, they cannot keep each other's subjective values in check. Those values are shared and fundamental and, for the most part, very similar or identical to all members involved. Biases, prejudices, and other cognitive defects cannot be effectively eliminated in this community. Scientific communities—even though imperfect— are far better able to identify

the subjective values that are problematic and have a negative influence on science. It is indisputable that significant cases of prejudice and bias influenced scientific inquiry in the past. Still, these biases are identified and eliminated far more quickly as scientific communities become increasingly aware of the need for diversity.[32]

A scientific expert who works within a scientific community would be the person who acknowledges how these kinds of subjective values are not conducive to the scientific community and how they would have to address them. Again, this does *not* mean that scientific experts in scientific communities are immune to being influenced by their subjective values. However, as I have shown, subjective values *can* be good as a diverse community helps identify subjective values detrimental to producing good science. However, a scientific community is the kind of community where subjective values that are impediments to scientific progress are identified and addressed. In Creationism, the subjective values and biases that support the fundamental belief in Creationism are not critically interrogated as those religious and ideological values are, effectively, what brings the community together and what drives the scientific enquiry regardless of the relevance of those values to the empirical issue. Those subjective values that are impediments to *scientific* progress are shared by those involved.

Secondly, I want to discuss the underlying mechanisms necessary for a scientific community to produce what is expected from it. A pseudoscientific community does not have the kind of mechanisms in place that a scientific community has. In most cases of pseudoscience, the community is not structured as formally as a scientific community. There is no *reliable* paper trail of claims and findings (there are no—or very few—formal publications), there is no *reliable* record of empirical research done (again, in the form of formal publications), there is no *reliable* system for self-correcting (as there is no systematic trail of formal publications there is very little to be done to test and correct findings), and this all means that there is no reliable way of keeping individuals accountable.

What is important is to note that I have emphasised the word 'reliable'. Some of these pseudoscientific communities provide some database for their supposed 'research', but what is offered is not research that results from the exact self-regulating mechanisms that we find

[32] Think, for example, about research on contraceptives where women's reports on adverse effects were rejected as 'anecdotal' even when there were millions of women reporting significant side effects (Oreskes, 2019, p. 109). In contrast to this, a clinical trial conducted to test the adverse effects of a contraceptive for men was abandoned after men reported some side effects. The study, however, has only 320 test subjects. There is a history of biases against women and contraceptive medications and the rejection of reports of adverse side effects that cannot be ignored, and the response to the reports of adverse effects experienced by men was insignificant in comparison (Oreskes, 2019, p. 109).

in the research presented by scientific communities. The self-regulation that takes place in scientific communities helps to make it *reliable*. Even when these pseudoscientists, especially the flat earth theorists, 'publish' their findings, they have not gone through the stringent peer-review system and the checks and balances that scientific communities have. What is interesting about flat earth theorists is that there is a significant body of 'empirical experiments' on social media and YouTube.

Searching for experiments that 'disprove the curvature of a globe' or are 'proof that water cannot stick to a ball' is easy. However, these experiments all have fundamental scientific flaws that non-experts can even identify with elementary levels of education. This shows how the lack of reviewing findings allows for fundamental errors to pass into what becomes their 'established scientific claims' and accepted as 'fact' in conducting their empirical research. A straightforward example is Eric Dubay's book *Flat Earth FAQ*, where he often provides mathematical calculations that he claims are scientifically accurate, for example (2023, p. 22):

> If Earth was actually a globe 24, 900 miles in circumference, spherical trigonometry dictates that the center of both the Suez Canal and the Dunyang-Kunshan Bridge would bulge over 1666 feet higher than either end.

When paying closer attention and doing some straightforward calculations, it is easy to see that some of the numbers he uses in his calculations are simply false, or he uses the wrong measurement systems for the incorrect numbers provided (for example, using 'miles' instead of 'kilometres', or vice versa). There is no regulation, systematic evaluation, or rejection of false or misleading claims. When some error like this becomes 'established knowledge' in the community, the errors are reused, and the consequent 'research' is all based on the mistakes. Sometimes, one of the flat earth theorists points out an error in some other theorist's work in these videos and communities. However, there is no systematic way to correct those errors and the corrected 'research' is consequently used for further experiments.

Flat Earth Theorists claim to have a significant body of evidence that supports their beliefs. The Flat Earth Society's website has a 'Flat Earth Society Library' page that lists sources - from books, pamphlets and journals, newspaper and magazine articles, letters,

notes, press releases, and website articles - that are all provided as a part of the 'body of evidence' that supports their claims. Some of the book titles contain phrases that emphasise the irrefutability and 'reliability' of the evidence: *One hundred Irrefutable Proofs that the Earth is Flat* (Jacobs, 2022), *The Comprehensive Proof that the Earth is Flat* (Mike, 2019), *The Ultimate Proof that the Earth is Flat: The Extensive Evidence for the Enlightened Flat Earth Supporters* (Maver, 2019), *200 Proofs the Earth is Not a Spinning Ball* (Dubay, 2019).[33] These texts are littered with so-called 'empirical proofs' presented as reliable bodies of empirical evidence. What is especially tragic in the case of flat earth theory is that Dubay's mathematical calculations are often used as 'established scientific fact' and used as the measure of many consequent experiments that flat earth theorists do.

Often, these communities are gathered in online spaces, such as social media groups, where they echo the same kinds of scientifically ignorant arguments that do not get refuted in the type of settings and communities they are.[34] Suppose some flat earth theorist posts a video that provides some 'empirical evidence' about the existence of the so-called firmament, for example. In that case, there will be many comments, sometimes hundreds, where there will be no precise empirical record to follow to see how their claims are proven or disproven systematically. Often, Globe Defenders will provide perfectly reasonable objections to Flat Earth Science claims and ask Flerfers to address the objections and provide an explanation, after which the Flat Earthers will not respond at all or will respond with direct *ad hominem* insults. Recently, I saw a perfectly legitimate objection where the Globe Defender asked the Flat Earthers why no one has been to the moon if the moon is, indeed, local (far closer to the earth than established science claims) and inside the 'firmament' (the enclosed dome that covers the Flat Earth). When objections are presented, there is no systematic way these objections are addressed or dealt with, and legitimate objections are simply ignored.

Sometimes, these pseudoscientists hold conferences and publications, such as the Flat Earth conferences, and claim that these are proper scientific events. However, these mostly mimic the formal institutions that scientific communities have, with formal conferences and academic papers presented. They do not have the same rigour and self-regulating mechanisms that scientific communities have at these events.[35]

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[33] The Flat Earth Society Library page: https://theflatearthsociety.org/home/index.php/library.

[34] During this project, I joined various Flat Earth Facebook groups to better understand their reasoning (a futile effort, for the most part). Some of these groups are Flat Earth United, Flat Earth Society, Flat Earth Debate Forum, Flat Earth vs. Globe Earth, and the Official Flat Earth Global Discussion Group.

[35] Consider also the following YouTube video, titled 'Meet The Most Confidently Incorrect Man on The Internet', 31 December 2024. This video is presented by Dan, Aka SciManDan, who is simply an informal debunker of flat earth science, specifically. He makes no claims to scientific expertise, but in most of his videos,

2. 2. 'Scientific Consensus'

Flat Earth theorists have a consensus on the claim that 'the earth is flat'. Still, no consensus exists about any detailed empirical evidence *supporting* the theory. At first, the idea that there *is* a consensus claim that 'the earth is flat' could seem similar to a scientific consensus. After all, have I not suggested that the kind of consensus we have from scientific communities, namely the *deliberative acceptance consensus*, is one where there can be partial agreement on the *substance* of the consensus while there is still disagreement amongst the relevant scientific experts on some of the more minor details? This means there is collective agreement and acceptance amongst the relevant scientific experts that some position *p* best represents the current state of the research on a particular matter.[36] For example, there might be a significant consensus on the basic consensus claim that anthropogenic climate change is happening even though there could be considerable disagreement about the more minor details, such as the exact levels of the increases in temperatures or the precise levels of the sea rise, and the timelines involved in these matters.

The crucial difference here is that the central consensus claim a scientific community takes as 'established' is supported by evidence that the relevant community has agreed collectively to support the central consensus claim. The procedural details of reaching that consensus (meaning the deliberation processes and the self-regulating mechanisms in the scientific community) are a part of the defining features of that consensus. In a pseudoscientific community, the evidence for the central claim cannot be well supported in this same way, and the processes to reach a consensus are not the same. For example, climatologists could provide plenty of evidence to support those claims if asked to explain where the evidence is and precisely what the evidence is for the claim that anthropogenic climate change is happening. If Flat Earth theorists were asked to provide evidence for the

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he very accurately points out very simple errors in flat earth science. This video shows a ridiculously simple error in a Flat Earther's mathematical equations in an attempt to debunk the claim that NASA has managed to successfully point and shine a laser that reached the moon. This attempt of the Flat Earther at debunking NASA's findings is a further bit of 'research' towards showing how NASA is a front and the truth about the flat earth is being hidden from us. What this video is further evidence of is how Flat Earthers do not engage in their 'research' in the constructive, rigorous type of environment that a scientific community provides. This example is only one of many others that can be found on SciManDan's YouTube and social media channels. See the video here: https://www.youtube.com/watch?v=ompSH-97qcw .

[36] As a reminder, I used Moore and Beatty to formulate this definition (Moore, 2017; Beatty & Moore, 2010).

central claim that the earth is flat, the majority of that 'evidence' would not be agreed upon or would be inconsistent to the degree that is evidence of fundamental problems in their claims. Furthermore, a scientific community would be able to provide the details of the procedures that have led to the consensus claims. In contrast, the pseudoscientific community's procedures would not have the exact mechanisms as a scientific community's procedures and would not be as reliably documented.

In a scientific community, the evidence that supports the consensus claim would have gone through the scrutiny of the scientific community and, taken collectively, the available relevant evidence will support the consensus position—to the degree stated in the consensus claim. Take, for example, the consensus position on anthropogenic climate change. The claims about the consensus changed over time, reflecting how the consensus increased in strength. A few decades ago, the consensus claims were weaker as the theory was less established. But as the body of evidence grew, they could increase the strength of the claims (as a rough example) by saying there is an '80%' agreement, or later a '90%' agreement, or '97%' agreement, etc.

When considering Flat Earth Science, the essential bits of 'evidence' that support the central claim that the earth is flat are disputed amongst the members of that community. When asked to present evidence, there is no coherence in what is being offered as evidence. Often, there are significant scientific errors or contradictions (see Dubay, 2023, for an extensive example of contradicting and erroneous 'evidence'). Again, note the recent Flat Earth experiment I mentioned earlier: the Flat Earthers made a claim that is, apparently, fundamental to their dominant Flat Earth Science model, namely that there cannot be a 24-hour sun in Antarctica.[37] Now that this 'fundamental' bit of their theory has been disproven, there is chaos in that pseudoscientific community. There is no systematic basis for their consensus claims and no paper trail to follow to identify and correct errors. There does not seem to be any way for them to return to some basic set of claims that they had all already agreed upon as 'well established' in the same way as in a scientific community.

A more accurate explanation of the kind of consensus that is present in a pseudoscientific community is that it is a consensus that was, in a way, already present before pseudoscientists started engaging in whatever 'empirical research' they claim to engage in. Essentially, it is *accidental* that there is a consensus about the fundamental claims in that community. Moore

[37] Please set aside any obvious objections that come to mind to this 'consensus' claim, as they are plentiful. Take this claim that 'there is no 24-hour sun in Antarctica' as an example of a consensus claim they hold for me to analyse some epistemological failures (other than factual failures) in their 'consensus'.

explains a version of this type of consensus as a 'revealed uniformity' or as a kind of 'unforced convergence' of beliefs (2017, p. 120).

The involved pseudoscientists would have independently decided that they hold the belief while there is no strong evidence for those reasons. When we have Creationists who discuss 'Creation Science', for the most part, they are gathered because of the already-held belief that the earth was *created* and the diversity of life on earth is not the result of evolution. Or, when Flat Earth theorists gather, they already believe that the earth is flat and are simply engaging in biased experiments that confirm those beliefs. And when legitimate contrary evidence becomes available in these communities, it is dismissed in a way that it would not have been rejected in a scientific community. What indeed underlies these kinds of consensus is some shared values, be it religious, political, or social, and the consensus is simply a result of those values and the biased influence on the 'scientific findings'.

However, someone could say that some 'established knowledge' kinds of claims in science have a similar unquestioning acceptance like the consensus 'that the earth is flat' in Flat Earth Science. Consider how the theory of gravity is taken as a fact and is no longer questioned. Even if the theory of gravity seems like a claim accepted unquestioningly, there is something different to it than 'the earth is flat'. When we take the theory of gravity as established and do not question it, it is because there is no reason to question it, and it is so well confirmed that we can take it to be true. The consensus that 'the earth is flat' simply does not have a similar epistemic status.

2. 3. The Claim of 'Revolution'

This brings me to the next point. Pseudoscientists often make dramatic claims that their findings are 'revolutionary' and compare themselves to scientific historical figures such as Copernicus or Galileo to make their point. They present themselves as being persecuted or suppressed by the 'scientific establishment' in similar ways as those revolutionary scientists from the past (Gordin, 2021, p. 42). They claim that their sceptical attitude to science is, in fact, in the 'spirit' of scientific inquiry and scientific experts and the 'scientific establishment' are being dogmatic (Oreskes, 2019, p. 67). This is a particularly manipulative and harmful argument as it effectively distorts scientists' healthy sceptical attitude in scientific inquiry—a *strength*—and turns it into a weakness (Oreskes, 2019, p. 67).

I want to briefly discuss Thomas Kuhn's theory of scientific revolution and progress, his

definitions of ‘normal’ and ‘revolutionary’ science, and the necessary tension between the two (2012). Although Kuhn’s account of scientific progress has problems, I believe it helps to understand some of the core ideas of his normal and revolutionary science within the sociological framework I have sketched.[38]

Kuhn’s theory on the development of science explains that we have alternating phases in scientific development, one being ‘normal’ science and the other being ‘revolutionary’ (or ‘extraordinary’) science (Kuhn, 2012). ’Normal’ science refers to scientific research based on established scientific achievements of the past that currently provide the basis for scientific practices (Kuhn, 2012, p. 10). What characterises this kind of ‘normal’ science and provides the framework for what Kuhn called a scientific ‘paradigm’ is 1. that the achievements that the current scientific practices are based on are ‘sufficiently unprecedented’ that a significant group of scientists had decided to adopt the practices that underlie the achievement, and 2. that the achievement and its resulting practices offer an open-ended spectrum of problems that the scientists who follow the new practices can pursue to resolve (2012, pp. 10-11).

Kuhn’s ‘normal’ science, with its established scientific achievements and established practices, results from the kind of scientific community I have described. It is, effectively, the scientific consensus achieved through the workings of a scientific community where that scientific consensus is about the questions they engage in and the methodologies involved. The established ‘normal’ science is based on those things that have become *collective knowledge* of the kind I have explained. Scientists work in this range of ‘normal’ science that offers new areas of investigation, new problems to solve, and has an accepted methodological approach, all of which fits within the framework, i.e. they attempt to address and clarify issues that are dominant within the paradigm (Kuhn, 2012, p. 24).

One of the significant reasons why scientists, during the ‘normal’ period, focus on problems which fit within the paradigm (and not focus on any ’big’ novelties outside of the paradigm) is that the paradigm is explored to test its precision, the details, its accuracy in predicting the results of research (Kuhn, 2012, p. 36). The paradigm is considered *the most successful* at dealing with problems that scientists have to deal with within the field of inquiry, which is why it is preferred to competing paradigms (Kuhn, 2012, p. 24). This means that an established consensus has been reached regarding the traditions, methods, and ways the questions within the domain are to be addressed. This further means there is a consensus

[38] For some criticisms of Kuhn, see Stephen Toulmin’s suggestions that a more accurate picture is that there are more minor, revisionary changes in science rather than giant revolutions (1970), for objections related to Kuhn’s incommensurability thesis see Scheffler (1967), Kripke (1980), and Putnam (1975b) amongst others.

about what falls outside the working paradigm and what things have been rejected.

During this period, 'normal' science is 'puzzle-solving' (Kuhn, 2012, p. 36). Comparing the scientific research in these 'normal' times as puzzles to be solved is meant to show that the scientific expert, like a puzzle-solver, considers the scientific problems to be of such a nature that they have a reasonable chance of solving the relevant problems, as the problems have a degree of familiarity and the methodologies used are also familiar (Kuhn, 2012, p. 40). Solving *familiar* scientific problems in this way means that the progress to accumulating many solutions to problems is quick as the territory is well chartered and the scientific expert is familiar with the paradigm's methodologies and commitments (Kuhn, 2012, p. 37). By working on demanding puzzles within a paradigm and those that have proven challenging to resolve, a scientific expert will demonstrate their skills if they can resolve the puzzle (Kuhn, 2012, p. 38). Scientific progress only occurs within 'normal science' (Kuhn, 2012, p. 162). Scientific paradigms are where scientific puzzles are resolved, and in solving these puzzles, we have progressed (Kuhn, 2012, p. 165).

What 'normal' science does is test hypotheses and phenomena to bring the theory and reality in agreement, and this activity can be seen as "a search for confirmation or falsification" (Kuhn, 2012, p. 80). In this sense, 'normal' science *could* be considered a kind of dogmatism: "[n]o part of the aim of normal science is to call forth new sorts of phenomena; indeed those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are often intolerant of those invented by others" (Kuhn, 2012, p. 24).

At first glance, this intolerance could be seen as some epistemic sin. However, the key to this kind of pursuit within the paradigm - and 'normal' science - is that *novelties become apparent from work within the paradigm* (Kuhn, 2012, p. 53). 'Normal' science has the necessary mechanisms to relax the rules and restrictions of the paradigm when it is right for it to do so, i.e. when the paradigm becomes dysfunctional (Kuhn, 2012, p. 25). When scientists are familiar with the paradigm, the expectations of results within that paradigm, and what an anomaly would look like, they can identify anomalies that are of significance and worthy of further investigation (Kuhn 2012, p. 53). If the anomaly deserves more investigation, the scientist will pursue it to interrogate it and see what the meaning of the anomaly is and if the current paradigm needs to be adjusted to allow for the anomaly or if the anomaly could be dismissed as insignificant (Kuhn, 2012, p. 53).

Scientific discovery is a process; it involves a deep understanding of currently accepted paradigms to identify something as being *new* and to identify *what* exactly it is (Kuhn, 2012,

pp. 55-6). As per my definition of scientific expertise, a scientific expert must be someone who has been initiated into the traditions of the relevant domain. An existing paradigm's limitations are necessary for discovery: by limiting the phenomenological field of enquiry, precision and accuracy are increased, inquiry results are predicted with more precision, and the field of enquiry is better understood (Kuhn, 2012, p. 57). When discoveries are made and anomalies are considered, some previously held beliefs and commitments are rejected to assimilate the anomaly (Kuhn, 2012, p. 66). Often, when an anomaly is assimilated, the paradigm can address previous questions better, allowing for a fuller understanding of the field (Kuhn, 2012, p. 66).

However, we have to account for those scientific discoveries that have led to entire paradigm shifts - or even the total abandonment of paradigms that had previously been accepted and followed. Think, for example, about Galileo and Copernicus. This is precisely the kind of analogies that pseudoscientists draw when they talk about their science being 'revolutionary'—they refer to those cases of scientific discovery that dramatically reinvented the scientific landscape. Kuhn's account of scientific development explains this dramatic change - or 'revolution' - in science.

Sometimes, an anomaly cannot be assimilated, and sometimes, the anomalies increase in number, and a crisis emerges in the paradigm. Take, for example, the Ptolemaic system of astronomy. Before the Copernican revolution, the Ptolemaic system offered many accurate predictions of events, and it was the best fitting theory for the observations made (Kuhn, 2012, p. 68). However, as astronomy evolved, there were eventually many problems in the 'normal' science, or paradigm, of the Ptolemaic system that could not be resolved (Kuhn, 2012, p. 68). The increase in discrepancies made it clear that the Ptolemaic system had a fundamental flaw (Kuhn, 2012, p. 69). One of the fundamental problems for astronomers, of antiquity and Rennaissance "was to account for the seemingly irregular motions of the planets among the stars, especially the so-called retrograde motion, in which a planet appears temporarily to reverse its eastward motion against the background stars as seen from Earth" (Lightman & Owen, 1992). Increasingly, astronomers acknowledged that the system was failing due to an increase in anomalies, and the acknowledgement of the failing system allowed Copernicus to reject the system and work on a new theory (Kuhn, 2012, p. 69).[39]

This is an example of when a scientific paradigm is in a crisis, and there is a need to discover something to resolve the crisis. An anomaly becomes more than an anomaly when

[39] This description ignores some political and religious factors that complicated the task before Copernicus.

the anomaly becomes a predicted outcome in certain situations. Eventually, the solution and articulation of the problem of the anomaly becomes a significant focus within the field (Kuhn, 2012, p. 83). The proposed partial solutions to the anomaly are divergent, and in attempting to resolve the anomaly, the fundamental commitments and rules within the paradigm come under question, and the rules become blurred (Kuhn, 2012, p. 83). When a new paradigm emerges, those anomalies that seem to become significant problems are addressed within the latest theory, and they are no longer a problem in the same way as they were within the former paradigm (Kuhn, 2012, p. 78).

There is often resistance to change at first; the scientists working within the paradigm have become rigid and restricted within the framework of accepted methodologies and expected results (Kuhn, 2012, p. 64). When a paradigm seems to be failing, new theories are invented to offer explanations that could better capture the phenomena under question; they develop in response to a crisis in science (Kuhn, 2012, p. 75). Scientists do not immediately reject the current paradigm unless a new, better theory has garnered acceptance and conversion to a new paradigm is a complex matter that I will not discuss in too much detail (Kuhn, 2012, pp. 78, 152-154). However, there is a period in which competing paradigms exist, and the paradigm best suited to deal with the dominant scientific issues that had become crucial in the field becomes the victor (Kuhn, 2012, p. 171).

What pseudoscientists do not understand is this understanding of the role that 'normal' science plays in scientific pursuits and its relation to 'revolutionary' science or the complete rejection of a current paradigm. Scientific paradigms and their 'normal' science are crucial for scientific revolutions. Kuhn explains the necessary tension between 'normal' and 'revolutionary' science: there is a necessity for conservativeness in science, on the one hand, and the desire and pursuit for innovativeness, on the other (Kuhn, 2012). According to Kuhn, Revolutions are sought only when necessary, i.e., when the paradigm is in a crisis, such as the example of the Ptolemaic system before the Copernican revolution.

When considering the Flat Earth Theory, for example, it is clear that the current paradigms in scientific research that work on the very well-established claim that the earth is a sphere are in any way in trouble. All scientific communities work with this spherical-shaped earth model; there is no evidence that it presents any problems, and a revolution of any kind is necessary. As mentioned earlier, pseudoscientists often pursue ideas and methods that have already been wholly rejected and pushed to the fringes or ideas that have no empirical support in any way (Gordin, 2021, p. 16). These ideas, then, had been rejected as irrelevant ideas or anomalies within existing scientific paradigms or had no merit to be

investigated. These ideas did not survive in the scientific community, probably for good reason. Flat Earth Theory has long ago been rejected as irrelevant as it is established that the earth is not flat. Kuhn would consider these rejected ideas and theories as no longer competing paradigms, i.e., they are no longer regarded with seriousness and as a possible answer to the problems they attempt to address. They are simply untrue.

I want to consider what a 'crisis' in the context of a pseudoscientific community looks like. I believe the recent example of the Flat Earth community is apt. This crisis is still playing out, but the initial reactions are very revealing. Upon discovery that one of their fundamental claims of the dominant flat earth model is wrong, namely, the claim that there is *no 24-hour sun in Antarctica*, the whole community has been thrown into chaos. This is quite possibly an indication that this 'established fact' from their consensus is, in fact, wrong. The problem is that they do not, like in science, reject this claim that they work from but keep using it to try and explain further things even though they have no grasp on that fundamental claim and the reasons for holding it. There is a consensus and a basic assumption from which they work, but it is simply not well established and supported, and consequently, research fails. Furthermore, the empirical experiments they do to support this basic assumption are deeply flawed, with elementary mistakes that are easy to identify, as shown before.

Flerfers claim to provide empirical evidence. However, Flat Earth Science is not a competing programme; it is entirely off the scientific radar. Flat Earth Science has been considered nonsense for centuries. Mainstream science does not even engage with the 'scientific' questions that Flerfers claim to engage with, such as how gravity works on a flat earth model (some Flerfers deny that there is such a thing as gravity and explain it by saying that more dense objects will naturally be on the earth's surface, which fails to explain why denser object would then rest *on the earth* rather than simply floating out into the (less dense) air, for example), the moon and sun cycles and daylight, seasons and weather, how thunder works within a dome (called the 'firmament'), amongst many other questions that have accepted mainstream scientific theories, within the context of a spherical earth.

This highlights another failure in pseudoscientific communities: They cannot produce the kind of collective knowledge that a scientific community can produce. Knowledge produced in a scientific community is, appropriately called, a form of *collective knowledge* that is often expressed in a consensus claim. When a community of scientific experts work through the processes of that community—essentially the underlying mechanisms—it effectively produces the consensus we wish to have from a scientific community. As a pseudoscientific community does not work through these processes that a scientific community has, it cannot

produce anything that is collective knowledge.

3. How to Fake Scientific Epistemic Authority

As I have shown thus far, pseudoscientific communities cannot produce a scientific consensus or scientific knowledge, i.e., *collective knowledge*. This means they do not have any claim to the epistemic authority that scientific experts and scientific communities have. However, they claim to possess scientific expert epistemic authority on some issues (that are scientifically related) and effectively *fake* it. But remember, they do not consider themselves *pseudoscientists* and often believe they are proper scientists and what they do is 'scientific'. In faking scientific epistemic authority, they could think they are genuinely scientific.

It is helpful to consider some empirical studies to determine how convincing indicators of 'scientificness' are to non-experts. Thomm and Bromme did an empirical study to test non-experts' perceptions of the 'scientificness' and 'credibility' of texts they read about science-related topics (2012). In talking about the perception of 'scientificness' or 'credibility', they refer to those features of scientific texts that provide us with the idea that the text has scientific merit, such as references, credentialed authors, using proper referencing techniques, use of technical terminology, etc. (Thomm & Bromme, 2012). Although the study had some limitations, it provided a baseline for understanding how improving and increasing the features that make the reader interpret the text as 'more scientific' leads to a more substantial acceptance of the information. The study revealed that by increasing those indicators of 'scientificness' and 'credibility', readers were more likely to adjust their beliefs to accept the information.

Zaboski and Therriault conducted a similar study to determine how similar markers of 'scientificness' and 'credibility' would affect a non-expert's interpretation of a pseudoscientific text (2020). The study's results aligned with the findings of Thomm and Bromme's studies: when references, credentialed authors, referencing techniques, and technical terminology are used, even a pseudoscientific text is more likely to convince a reader that it is 'scientific' and 'credible' (Zaboski & Therriault, 2012, p. 831). I take away from these studies that it is possible to fake scientific epistemic authority very convincingly.

Crucially, faking scientific epistemic authority amounts to faking those activities and products of science that make it epistemically praiseworthy and provide the honorific status that 'science' and its cognates provide. Some of those features, as mentioned earlier, include

providing ‘research’ that contains references, credentialed authors, and technical terminology. Other features that make science epistemically praiseworthy are those that come along with *being the kind of community that a scientific community is*. Some features that could be faked that indicate a scientific community could be conferences, journals, and the presentation of an ‘organisation’ (such as the Flat Earth Society).

When pseudoscientists claim scientific epistemic authority, they fake those features of scientific communities and science that would be ‘evidence’ of that epistemic status. They believe that exhibiting these features gives their claim to scientific epistemic authority some legitimacy, as non-experts tend to take these things as indicators of something being ‘scientific’. Sometimes, some pseudoscientists genuinely believe that what they are doing is good science. This means that perhaps they are not faking these features in any attempt to be deceptive in a morally bad way.

When we say that something is ‘scientific’, we tend to believe that those things that make science good were involved in what we have labelled ‘scientific’. ‘Scientific’ as a label attached to something essentially becomes an honorific label. Gieryn explains, “If ‘science’ says so, we are more often than not inclined to believe it or act on it—and prefer it over claims lacking this epistemic seal of approval” (1999, p. 1). References to science seem to provide us with “systematic markers of truth”, and this is often considered to be a powerful way to “lend credibility to the claim one is making” (Harambam, 2020, p. 104). As pseudoscientists understand the power of using these honorific labels of ‘science’, they often employ them.

The word ‘scientific’ is used as an honorific label even when certain products are marketed to the public. Think, for example, of something as simple as a toothpaste TV ad. Actors dress up as dentists, walking around in their ‘laboratories’ and doing ‘experiments’ on the ‘patients’, their sparkling teeth so bright you want to close your eyes or change the channel. These ads are loaded with phrases such as ‘clinically tested’, ‘clinically proven’, ’99% of dentists agree’, ‘scientifically proven’, or other such phrases; we tend to judge that the product has some higher value than a toothpaste advertisement that lacks these phrases and the sparkling teeth of the actors. We judge this product to provide specific guarantees from the praiseworthy scientific endeavours supporting the brand’s quality.

It is these honorific labels that we intuitively attach to so many things in our everyday lives that pseudoscientists attempt to attach to their theories. When we say something is ‘scientific’, it provides a quality label. It says something about the quality of the knowledge connected to the label and claims the quality of the information provided (Blancke, Boudry,

Pigliucci, 2017, p. 85; Haack, 2007, p. 18). Similarly, when we call someone a 'scientific expert', it gives this quality label. In these cases, the word 'science' is used *honorifically*: attaching this quality label to something often leads to people being more accepting of the information, knowledge, products, or 'scientific experts' who are connected to the label. In other words, it makes us less epistemically vigilant. Pseudoscientists often say that their claims are 'scientific', and by saying this, they are exploiting the guarantees of quality associated with it and the fact that people are more readily accepting of whatever is claimed in the name of being 'scientific' (Haack, 2007, p. 18).

When a claim is made that something is 'scientific' or 'scientifically proven', we have in mind the collective knowledge produced in scientific communities that is guaranteed to be associated with good scientific empirical studies and evidence. Flat Earthers often claim that their findings are scientific as they have 'empirical evidence' of the truth of their claims. Suppose someone is not well enough educated to see that their 'scientific' claims are false. In that case, they might look at a book that provides 'established facts' that are 'scientific', and on the surface of it, as the texts are filled with nonsense maths and other 'scientific facts', someone could mistakenly believe it has this quality label that science provides. Flat Earthers also often claim that they are more scientific than the scientists who claim that the earth is round. They use the quality labels of 'scientific' and 'scientist' in an epistemically misleading way. Some Flat Earthers even go so far as to call it 'Flat Earth *Science*'.

Creationism is another example of the misuse of labels in this way. By calling the Creationist class of beliefs 'Creation *Science*' or 'Intelligent Design *Science*', it gives the false impression that the associated beliefs and claims carry the same weight as scientific theories with their strong evidential support. It is presented *as* scientific as other sciences, but 'Creation Science' deviates significantly from science. As already mentioned, many of the assumptions in Creationism are based on religious beliefs and values. They make 'empirical observations' from that starting point to explain their essentially *religious* theory. For example, according to a simplistic version of an argument some propose, the belief that the earth was created means that there must be some intelligent designer is fundamental and inherent to their theories, and the world and all its species cannot solely be the product of evolution. Then, they claim that we cannot observe evolution, so Intelligent Design Science and its claims must be true.

What else does science have that makes us believe that it has the status of being epistemically authoritative? Established scientific theories and truths can be considered 'reliable bodies of knowledge' (Boudry, 2022, p. 89). These 'reliable bodies of knowledge'

are considered reliable as the relevant theories and knowledge have been corroborated to such a degree that it is unlikely—and often even impossible—for the theories to be disproven or, consequently, for the knowledge we have gained from the theories to suddenly be false. This comes back to the idea of scientific consensus and how pseudoscientists cannot provide the kind of consensus that can come from a scientific community. Pseudoscientists often claim that what they give is the same kind of 'established knowledge' that scientific communities present and that what they provide is reliable knowledge. Pseudoscientists usually claim that they use reliable and trustworthy scientific methods to produce knowledge (Boudry, 2022, p. 89; Derksen, 1993, p. 21). If pressed on this, they will generally attempt to provide empirical evidence to support their claims.

Consider the example of Eric Dubay's book *Flat Earth FAQ*, where he provides things that the flat earth community claims to be 'established scientific truths' (2023). Also, consider again the 'Flat Earth Society Library' page on the Flat Earth Society website, as mentioned before. These are all presented as evidence and support for the 'established scientific facts' that their 'research' has produced. As mentioned earlier, another way in which pseudoscientists fake scientific epistemic authority is through the use of scientific terminology or jargon, which the pseudoscientists often do not even understand themselves, never mind the resultant public misunderstanding of that terminology (Dunlap & Jacques, 2013, p. 699). Consider, for example, when flat earth theorists make claims about the 'level' of the Earth and the implications for a spherical earth versus a flat earth. Dubay defines the 'level' as "a flat, horizontal plane with no deviation in elevation along its surface" (2023, p. 13). To the non-expert, this terminology might sound perfectly reasonable. The conclusion drawn from this supposed definition is that as water is always 'level', i.e. flat and along a horizontal plane, the Earth cannot be curved. He then claims that Globers have redefined the term 'level' to fit their agenda and that his definition is accurate. However, when discussing something being 'level' in science, the gravitational field is essential, as gravity dictates what is 'level' at any specific point. What is 'level' at one position on Earth is not parallel to, or at the same 'level' as, what is considered 'level' at another. So whenever we talk about something being 'level', it is with the knowledge that 'level' is in relation to the spherical Earth and gravity.

As mentioned, scientific epistemic authority is also faked by providing in-text citations and credentialed authors or 'experts' (Zaboski & Therriault, 2020, p. 823). An example is Eric Dubay, who claims that the basic construction of bridges worldwide proves that the earth is not a curve, as engineers do not adjust designs to allow for curvature. He quotes engineer

W. Winckler as stating (2023, p. 22):

> As an engineer of many years standing, I saw that this absurd allowance is only permitted in school books. No engineer would dream of allowing anything of the kind. I have projected many miles of railways and many more canals and the allowance has not even been thought of, much less allowed for.

By quoting an engineer, he provides a 'credentialed' expert to support his claims.

Consider, as well, the case of anti-vaxxers. Anti-vaxxers are quick to call their beliefs 'scientific' by saying that it is backed by 'science'. They often refer to the research paper by Dr Andrew Wakefield that was eventually retracted (1998). In this paper, Dr Wakefield presented 'research' that proved a connection between autism and vaccines. In this case, the audience might be less epistemically vigilant the moment the anti-vaxxer mentions the research paper and the credentialed author (and even if the audience does a rapid Google search, they might be convinced that the claim is correct if they see that there was such research, but fail to notice that the paper had been retracted). The audience will be more accepting of anything else that looks even remotely 'scientific' and is further offered in support.

The Flat Earth International Conference is one of the events of the Flat Earth community that takes the form of a scientific conference. When reading about the keynote speakers from the 2019 conference, their biographies contain claims about the 'superiority' of their empirical research over other sciences and that they are 'following the evidence' of their senses.[40] Flat Earth Science's claim that people must 'open their eyes' and 'trust their senses' is very prominent. This narrative of 'trusting your senses' can be traced back to Samuel Rowbotham's 1865 book that encouraged people not to try to determine the shape of the earth by considering the stars, planets, and constellations but that you can find the truth by simply looking at the earth. This is one of the fundamental empirical claims that makes people believe it is a 'legitimate' science. Science is, after all, supposed to be empirical, with evidence that can be seen and analysed. In the claims made by Flat Earthers, and in this fundamental text, it is claimed that people who believe in a spherical-shaped earth are not

[40] Remember the Flat Earth Society website I mentioned earlier that lists sources that provide empirical evidence: https://theflatearthsociety.org/home/index.php/library.

looking into the truth by trusting their senses and 'doing their research'.

So, what does this have to do with the 'faking epistemic authority' bit of the argument in this section? Flat Earth Scientists claim that they have a strong community of researchers who all work towards providing empirical evidence that anyone can test. You do not need any special equipment; you do not even have to look at the stars or other planets, as the truth can be determined by simply looking at the horizon. The conferences and events they hold are where they present their 'empirical research', their 'models' of the flat earth, and their 'theories' on how the moon and sun would work on a flat earth model. The speakers selected are the Flat Earthers, who have the most dominant presence in the media and on social media platforms and have the most significant following. As many present their findings through YouTube videos with experiments that non-experts can 'reproduce', the 'empirical evidence' and 'scientificness' seem apparent for people who might not know any better.

Remember that when scientific epistemic authority is faked, the speaker fakes, providing reasons for beliefs that have their source in scientific epistemic authority. They present themselves as epistemic authorities who provide preemptive reasons for belief. We believe they can tell us what to believe or accept as accurate.

4. Conclusion

In this chapter, I discussed one of the ways in which the relationship between scientific experts and non-experts can go wrong. With pseudoscience, there is an illegitimate claim to epistemic authority and the rejection of the epistemic authority of scientific experts and scientific communities. Pseudoscientists primarily defend themselves against the claims that they are not legitimate scientific epistemic authorities. When this happens, they reject the epistemic authority of scientific experts and claim to have the same epistemic authority. They often claim to be as good at science—or even *better*—than scientific communities and their members. They claim to produce the kind of knowledge we expect from scientific communities.

In this chapter, I have shown that pseudoscientific communities cannot provide us with the knowledge we expect from science. I have also explained how they effectively 'fake' possessing the epistemic authority that scientific experts have. In the next chapter, I will discuss another of these pathological relationships, namely that of science denialism. In science denialism, there is a rejection of the epistemic authority of scientific experts, and the

main difference with pseudoscience is its intentional nature. In science denialism, there is a deliberate attempt to erode the epistemic authority of scientific communities and their members. I will discuss some other similarities and differences once I reach the end of the following chapter before discussing the epistemic harms to scientific experts and communities and defining the unique kind of epistemic injustice.

Chapter 4

Another Species of Zombie: Science Denialism and the Rhetorical Strategy to Erode Epistemic Authority

Doubt is our product.

Brown & Williamson Tobacco Company, internal memo, 1969

In the first two chapters, I sketched the ideal relationship between a scientific expert and a non-expert to show what scientific expert testimony *does*, what it *is*, and how scientific communities can produce the knowledge we want from them. i.e., *collective knowledge*. When a scientific expert testifies, they provide preemptive reasons for belief, whereas those kinds of reasons for belief can only be provided because of their epistemic *authority*. Scientific experts *qua* epistemic authorities are people who 1. accurately articulate the scientific consensus on questions related to that specialised domain and 2. are people who have been initiated into the traditions of that specialised domain. The epistemic authority of scientific experts comes from the scientific consensus, which is essentially collective knowledge.

In the previous chapter, I provided an analysis of one of the epistemic pathologies that can develop in this kind of relationship, namely when a non-expert claims to be an epistemic authority about specific questions, essentially claiming to provide preemptive reasons for belief about that particular question. What this further means is that these non-experts fake having epistemic authority. As epistemic authority comes from a scientific consensus, which results from mechanisms within a certain kind of community, namely a scientific community,

they claim that their community of pseudoscientists is similar to scientific communities. They are as good or even *better* than scientific communities at producing scientific truths.

In this chapter, I will analyse another pathological relationship between scientific experts and non-experts that is often slightly more malicious. Science denialism uses rhetorical strategies to exploit a non-scientist's ignorance of scientific matters, a kind of epistemic 'blind spot' towards some goal. Here, we have a case where ignorance should not be understood as something simple, like the omission of information and a gap in our knowledge, but instead that there is an active *production* of ignorance (Proctor & Schiebinger, 2008, p. 4). This active production of ignorance—where the rhetorical strategy towards this end is an *exploitation* of the non-expert's existing scientific ignorance—causes great concern with science denialism. Often, it is industries such as the tobacco industry or fossil fuel industry that actively apply manipulative rhetorical strategies to defend themselves against scientific evidence that could harm them. For example, the science that became increasingly well-established in proving the causal connection between smoking and lung cancer posed a significant threat to the tobacco industry. Similarly, the increasing strength of the consensus on anthropogenic climate change posed a giant threat to the fossil fuel industry. In these cases, the industries involved have a vested interest in denying the science and manipulating non-experts into disbelieving or rejecting the science.

The rhetorical strategies employed usually, if not always, involve direct attacks on scientific communities and experts. These strategies exploit the scientific ignorance of non-experts to erode scientific experts' epistemic authority. These rhetorical strategies essentially disestablish scientific facts: when non-experts no longer accept the testimony of scientific experts as epistemic authorities and providers of preemptive reasons for belief, they reject scientific consensus and the collective knowledge that results from the workings of scientific communities.

These rhetorical strategies are implemented through various argumentative tropes where there is the exploitation of scientific ignorance coupled with the appeal to values, such as 1. conflating science and politics, 2. conflating science and morality, 3. unreasonably high evidential standards, 4. science provides us with 'just a theory', and 5—announcing a controversy with an appeal to democratic values. What results from these rhetorical strategies that employ various argumentative tropes is a kind of 'zombie argument', where a zombie argument is simply an argument that keeps returning no matter how many times it has been refuted formally (Weart, 2011, p. 48). An example of a zombie argument is, for example, the argument that 'climate change is a recurring phenomenon as can be seen over many

centuries, and the current climate change is simply a natural occurrence'. What is added to this argument is, for example, a claim that 'climate change is a natural occurrence, meaning that implementing policies to reduce carbon dioxide emissions will significantly harm the economy and the overall well-being of people'. On the one hand, there is an exploitation of the non-expert's ignorance about Climate Change Science. On the other hand, there is an appeal to specific political values and ideals, namely that of free markets and economies.

This example of a zombie argument illustrates why a sociological approach to understanding these epistemic pathologies is most beneficial. There are social and moral failings that allow for these sorts of arguments to recur. These arguments keep returning because of the *combination* of the exploitation of scientific ignorance and the appeal to values. As non-experts do not understand the processes within scientific communities, they are more prone to falling for the arguments that exploit their scientific ignorance. It is important to note further that I believe that when a group of scientists fall into the traps of working for the science denialists (whether they are willingly corrupted or not), they can no longer be called 'scientific experts' or 'scientific communities'.

In this chapter, I will discuss the basic mechanisms of science denialism by considering various rhetorical strategies and the argumentative tropes used by science denialists. I will then provide some specific zombie arguments to illustrate these rhetorical strategies. Finally, I will compare science denialism and pseudoscience to discuss their similarities and differences.

1. What is Science Denialism?

Science denialism could be defined as "the refusal to believe in well-warranted scientific theories even when the evidence is overwhelming" (McIntyre, 2020, p. 150).[41] This definition only captures an intuitive understanding of science denialism as something performed in some act: someone actively rejects some scientific idea or theory *t*, where it can be anyone who does the denial. In this definition, we can include 'true believers' cases, such as those who genuinely believe there is no such thing as anthropogenic climate change, where their

[41] The words 'denier' and 'denialist' are often used interchangeably to refer to a person who does the denying of X. However, I will use the word 'denialist' as I believe it helps to differentiate this problematic kind of denialism from other forms of denial that are not as problematic. It is essential to have a term that specifically points out the type of denial we have in mind when discussing science denialism.

beliefs can be epistemically blameless.

However, science denialism is a far more complex phenomenon. I am particularly interested in those cases where there is a deliberate strategy to exploit scientific ignorance and an active process of manufacturing science denialism. When discussing science denialism, I specifically discuss these intentional rather than non-intentional cases. In these intentional cases, we have those who challenge scientific consensus by deliberately implementing rhetorical strategies to exploit scientific ignorance and erode scientific expertise and the epistemic authority that comes with scientific expertise. These cases can also be called 'science denialism', but it certainly has a different ring.

Think, for example, of the fossil fuel industry and the attempts to defend it against climate science and the claims that fossil fuels are a significant contributor to anthropogenic climate change. Or think about the tobacco industry and the attempts to defend it against research findings that drew a clear causal connection between smoking and lung cancer. Those who deliberately attempt to 'disestablish' the well-established consensus often fund campaigns and research in support of the industry involved, meaning that there is an agenda in science denialism (McIntyre, 2020, p. 149). This manipulation of a scientific consensus through funding alternative research and campaigns has been called the 'manufacture of doubt', as phrased by Naomi Oreskes and Eric Conway (2010). This is a very apt description of this kind of science denialism.

This deliberate attempt to disestablish the accepted scientific consensus by exploiting scientific ignorance can be described using *agnogenesis*, which describes how ignorance is effectively "made, maintained, and manipulated" (Proctor & Schiebinger, 2008, pp. 3). Non-experts have limited scientific knowledge, and their ability to assess reasons for belief regarding science can be unstable and easily manipulated. This epistemic vulnerability is precisely what is targeted and exploited.

This strategic exploitation of scientific ignorance further erodes the epistemic authority that scientific experts and scientific communities have. What is effectively manufactured is a systematic way to cast doubt on scientific experts and scientific communities *qua* epistemic authorities. In the next section, I will explain the rhetorical strategy that employs this exploitation of scientific ignorance.

2. Rhetorical Strategy and Argumentative Tropes

In this section, I will consider the rhetorical strategies implemented via certain argumentative tropes, where the argumentative tropes are simply devices to execute the rhetorical strategies. The rhetorical strategy is to engineer and exploit the non-expert's ignorance of, amongst other things, scientific processes, procedures, the non-expert's understanding of highly scientific details, and other features of the scientific community that they cannot understand and then appeal to values that are important to non-experts. The science denialist effectively casts doubt on the epistemic authority of the relevant scientific experts, and the appeal to values outside of science, broadly speaking, such as politics, ideology, religion, and freedom of speech, seems like a far more important consideration to the non-expert.

As briefly mentioned in the previous section, *agnogenesis* is the term used to describe this deliberate strategy to engineer and exploit ignorance (basically, disestablishing established scientific consensus), and it is "made, maintained, and manipulated" (Proctor, 2008, pp. 3, 8-9, 14). When scientific ignorance is exploited, and the science denialists employ argumentative tropes that effectively distract from the science, it is very effective. They essentially make claims about various scientific features, including scientific evidence and processes within scientific communities, that seem legitimate to a non-expert as they exploit their scientific ignorance. Then, they couple that with an appeal to values that have nothing to do with science and distract the non-expert.

I firmly believe that even though values outside of science are essential considerations concerning scientific matters, there is a substantial distinction to be drawn between the scientific enquiry that takes place within the scientific community and discussions that take place once we have the best idea about the scientific consensus on the matter. As I have shown in earlier chapters, scientific communities are not immune to subjective values and their influence. Still, they are equipped to address those subjective values within the relevant scientific community.

As mentioned, the rhetorical strategy is to exploit and manufacture the non-expert's ignorance of scientific matters and then appeal to values beyond science that are important to non-experts. Science denialists often know precisely which values to appeal to in these rhetorical strategies, as they know their non-expert audiences very well, as I will show. The science denialist's rhetorical strategy is implemented through the use of various argumentative tropes, such as 1. conflating science and politics, 2. conflating science and morality, 3. accusing scientists of dogmatism and/or scientism, 4. appealing to democratic values such as 'giving both sides of the story equal weight' along with the announcement of

scientific controversy. The various argumentative tropes exploit scientific ignorance, on the one hand, and appeal to multiple values that are important to non-experts, on the other hand.

2. 1. Conflating Science and Politics

One of the central argumentative tropes that science denialists use is to present an argument that conflates science with politics. In doing this, they appeal to non-experts' political ideals and values. If the non-expert's scientific ignorance is sufficient for this to work, the appeal to political values seems far more substantial and more important than the scientific claims might seem.

This is especially prevalent in climate change denialism (mostly, the denial of *anthropogenic* climate change, in particular). Consider the following. Within the narrative of climate change denialism, we often see appeals to free market values, which are considered necessary for the development of the economy and are frequently associated with more conservative political views.[42] Appealing to these values overrides scientific claims when science is misrepresented and scientific ignorance is exploited. What these science denialists often claim is that stricter regulations around production, manufacturing, and (by extension) restrictions on the growth of the economy would mean that regulations like these are "the slippery slope to Socialism, a form of creeping Communism" (Oreskes & Conway, 2010, p. 249).

Once it became increasingly clear that capitalism was a problem for the environment insofar as free markets have produced many of the environmental threats faced, the science denialists vigorously started fighting the emerging scientific consensus regarding global warming. The strategies used in defending free markets relied on appealing to other values by claiming that the values of free markets were directly connected to "free speech, free religion, and free assembly" (Oreskes & Conway, 2010, p. 249). The millionaire investor George Soros has labelled this perspective "free market fundamentalism" (Soros, 1997; Oreskes & Conway, 2010, p. 249). The crucial appeal to value is that an economy of free markets is "the only way that will not ultimately destroy our other freedoms" (Oreskes & Conway, 2010, p. 249).

What is crucial in this argumentative trope is that the appeal is made to some essential

[42] See Oreskes and Conway for a detailed discussion (2010, pp. 248-255).

political values that are fundamental to the political identity of the target audience. This means that the science denialist often knows their audience very well. These kinds of political appeals, especially in the case of climate change denialism, are frequently seen in cases where the denialism comes from more conservative camps. In the tobacco industry's battles against science, one of the significant appeals was also to this apparent threat to freedom: if smoking is strongly regulated, "there is essentially no limit to how much government can ultimately control our lives" (Singer & Jeffreys, 1994 in Oreskes & Conway, 2010, p. 249).

Another way science denialists conflate science and politics is by conflating scientific and political *uncertainties* (Oreskes, 2007, p. 76). Political and scientific uncertainties are two different things. The science denialist does not refute the science directly but conflates the issues of scientific evidence and political problems, such as freedom of choice. Another example of political uncertainty is, for example, the uncertainty in how we should *respond* to anthropogenic climate change in terms of governance and politics, where there can be very legitimate contending views on how this response should be (Oreskes, 2015, p. 76). Scientific uncertainty has to do with the uncertainties we have *in science*, i.e. those things that scientists do not have much knowledge about, those things in science where there is still a lot of uncertainty or even that margin of uncertainty that is unavoidable even in something that is a consensus view and treated as established knowledge. So, for example, we could have many uncertainties regarding the exact rise in sea levels due to the warming climate, but this does not negate the consensus on anthropogenic climate change happening.

How does the difference between these kinds of uncertainties help the denialist? When denialists conflate political and scientific uncertainties, they use the fears that non-experts have about *other* issues to influence their beliefs about science further. This strategy can work effectively if scientific ignorance is exploited and the appeal to other concerns is strong. Consider the example of an opinion piece published on The Heartland Institute website, dated 21 December 2018.[43] I quote the following summary of text in the Non-Governmental Panel of Climate Change's report, titled *Climate Change Reconsidered II: Fossil Fuels* (own italics):

> The more than *700-page report* consists of eight chapters, the first two providing a *foundation in environmental economics and climate science* that serves to inform the remaining chapters. These chapters detail *how the use of fossil fuels has contributed to human prosperity,*

[43] Burnett, 2018: https://heartland.org/opinion/fossil-fuels-critical-to-prosperity-nipcc-report-shows/

> *improved human health and welfare, and even benefited the environment*.
>
> […]
>
> Citing *thousands of studies and using hundreds of graphics*, "fossil fuels deliver affordable, plentiful, and reliable energy that is closely associated with key measures of human development and human welfare," says the report. "There is a strong positive relationship between *low energy prices* and economic prosperity. *Economic prosperity in turn is crucial to human health and welfare*."
>
> The *evidence* human fossil fuel use is causing dangerous warming is "tenuous" at best, CCRIIFF shows. By comparison, *the benefits from the use of fossil fuels are evident*. As a result, *it would be dangerous for governments to force the world to dramatically decrease the use of fossil fuels*.

Here, the opinion piece cites hundreds of articles and reports, claiming 1. that it provides evidence against the claims of anthropogenic climate change, 2. that fossil fuels are necessary for human prosperity, 3. that fossil fuels are necessary for human health (as a direct result of the low energy prices), 4. that it would be dangerous to decrease the use of fossil fuels, 5. that the evidence that fossil fuels are causing dangerous warming is simply 'tenuous'. The authors provide criticism highlighting the *political* uncertainties of whether governments would take action against anthropogenic climate change by limiting emissions. The authors have turned the non-expert's attention away from a strong scientific consensus view to draw their attention to concerns about their welfare, a political manoeuvre.

Also, naturally, there would be research that shows how the use of fossil fuels has improved the general prosperity of humans. This is an undeniable fact. However, what the denialists do in how they phrase the issue is to draw another false dichotomy: if we use fossil fuels, we will have human prosperity, and if we do *not* use fossil fuels, we will *not* have human prosperity. The situation is far more complex than what is stated here. Even though it is the case that the reduction of the use of fossil fuels will have a significant effect on global economies, the authors here neglect to give a balanced view. There has been considerable research into how alternative energy solutions could eventually be as good as fossil fuels. Even though the matter is undeniably complex, the authors are insincere in painting it in such a strong false dichotomy of fossil fuel use being good or bad and not having any other possibilities.

In the United Nations Climate Change Conference in 2018 (UN COP24) 'Climate Science and Policy' briefing by a speaker from the Heartland Institute,[44] it is very revealing how climate scientists, Climate Change Science research organisations such as the IPCC, and any policymakers are described as: 'the world's global collectivists', 'the climate totalitarians', 'the global ruling class elites', saying that "what they want to tell us is that humans are creating a global warming crisis that necessitates people sacrificing affordable energy, people sacrificing abundant energy, and people sacrificing their individual and national rights to turn over to the global climate bureaucracy".[45] In phrasing it this way, they make it sound like people's freedom and fundamental human rights are at stake. They emphasise the idea of political uncertainty and a loss of freedom. When this is alongside their claims that science is unreliable, uncertain, riddled with errors, or even completely fabricated, the conclusion is simply that we cannot rely on science and must protect our freedom.

The president of the Heartland Institute, James Taylor, uses the location of the COP24, namely Katowice, Poland, as a further manipulative tool in their casting of doubt by reminding the audience that Katowice is a coal mining area where economic restrictions on fossil fuels and affordable energy will be very harsh—in a sense harsher than in many other places. He then reminds the audience of the history of Poland in the 1970s and 1980s when the solidarity labour union "took on the evil corrupt communist totalitarians and ultimately prevailed". He then says that the same solidarity union is now trying to make people aware of the impacts climate policy from the UN and elsewhere will have on people. In all of this, the speaker is evidently drawing attention to previous economic problems that had harmed the people and comparing them to actions that could *now* be made to address anthropogenic climate change—calling climate change action a form of 'climate change totalitarianism' and those involved 'climate totalitarians'. This strategy is clever. It immediately connects his appeal to problems that the audience can understand. Some people in the area could even recall, and some can still feel the effects of those past economic problems. He puts the Climate Change Science issue in a frame where the audience will feel that their immediate well-being and security are threatened.

[44] The Heartland Institute is a conservative think tank with a history of attacking climate science. It persistently questions the science, presents and promotes its own "experts" (scientists who have done nearly no peer-reviewed research on the topic), and sponsored a conference in New York in 2008 where it alleged that the scientific community has faked all of the work on climate science (Oreskes, 2010, p. 233).

[45] Full briefing here: https://www.youtube.com/watch?v=sC1N1-Okm1c.

2. 2. Conflating Science and Morality

I want to consider an example of science denialism in Intelligent Design Science. In the previous chapter, I categorised Intelligent Design Science as pseudoscience; however, in this specific case in this interview, the speaker uses science denialism argumentative tropes, and there is very little in theory creation or promotion, which is prominent in pseudoscience. What happens is that the speaker is simply attempting to cast denial on Evolution Science without providing any support for her claims that intelligence design is a science. She mainly supports her argument using the zombie argument that we must 'teach the controversy' and hear both sides. The interview is between Richard Dawkins and the Women for America organisation's president, Wendy Wright.[46]

When pressed on why Evolution Science is so problematic, the speaker keeps saying that a society built on the principles of evolution would be evil (broadly talking about politics, morality, and some other vague 'bad' things that she does not always explicitly explain). Dawkins agrees with this point and makes that clear (from my transcription; see *Addendum* for full transcript):[47]

> **Dawkins:** I I liked one phrase you used there, you talked about the *sort of society in which we wish to live*, and I will I'll tell you quite freely that a society based upon Darwinian principles is exactly the sort of society I do not wish to live in. It would be a terrible society. It would be a sort of, um, um, George Bush kind of society, if I can put it like that, or or Margaret Thatcher kind of society. *I do not wish to live in a Darwinian world.* I do, however, respect facts. And I do recognise that, uh, the facts of science show that we that the world of nature is a *Darwinian world. It's a very unpleasant world, it's a thoroughly unpleasant world, not the kind of world we wish to live in.* So let us understand it, so that we can construct the kind of society in which we with to live which will be a non-Darwinian society, with a sort of society which is which departs from Darwinian principles, a society that was based on Darwinian principles would be a ruthless, free market economy, in which the rich trample the poor, uh, in which, um, it would be sort of opposite of a liberal socialist society, in fact. In a way I am rather surprised, uh, if if we're talking politics, that the rightwing in America is so hostile to Darwin. If we're going to be naive about applying science to politics, you ought to be in favour of Darwin. I'm I'm against where politics concerned, but you cannot argue with

[46] See the website for Concerned Women for America: https://concernedwomen.org.
[47] Full interview here (and full transcript in Addendum): https://www.youtube.com/watch?v=Vno1lAydv-8.

scientific facts.

Wendy: You actually help to make my case quite well. And that is that a philosophy that is drawn out of Darwinism would be extremely, uh, brutal, and in fact has been, uh, that has been the experience.

Dawkins: I I've just said that *I've agreed with that*…

The speaker keeps pressing the idea that accepting evolution is, in some way, utterly incoherent with a good kind of society and good moral values and dives into discussions of communism, deaths resulting from communism, etc. An audience who listens to this kind of reasoning might think that these kinds of moral problems that could be the result of science should be avoided—and they leap to the conclusion that science should also be rejected (if they accept her unfounded claims about the lack of evidence for evolution). Whenever she gets trapped in a discussion about science, she starts appealing to political and moral issues and diverts from the central problem of science.

2. 3. Unreasonably High Evidential Standards

Lee McIntyre claims that science denialists have hijacked the word 'scepticism', and I strongly agree with this (2020, p. 163). Those who oppose the current consensus on anthropogenic climate change call themselves 'climate sceptics', dismissing the word 'denier'. Calling yourself a 'sceptic' sounds better than calling yourself a 'denier', as the word 'sceptical' is often considered as some epistemic virtue, furthermore implying the upholding of scientific values (McIntyre, 2020, pp. 156, 163). The underlying issue at work seems to be that when one is a 'sceptic', one is not dogmatic. When one is a 'denialist', one is not sceptical but utterly unresponsive to any evidence, meaning that one is, in fact, dogmatic, which would be an epistemic vice (Goldsby & Koolage, 2015, p. 224). The assumption in claiming to be a 'sceptic' rather than a denialist is that deniers are unreasonable while sceptics are reasonable (Goldsby & Koolage, 2015, p. 224).[48]

[48] This assumption, even though at times correct, is not categorically correct. There will be cases where scepticism would be unwarranted and other times when dogmatism is warranted. Simple, but straightforward, examples given by Goldsby and Koolage (2015, p. 224) are: 1. when it is clear that something is a contradiction, it would be unwarranted to be sceptical about the matter, and 2. suspending judgment on the existence of the

It is essential to note the difference between philosophical scepticism (a radical scepticism emerging from Descartes' *Meditations*: for anything to be knowledge, it requires certainty, and therefore, we have reason to reject *everything*, McIntyre, 2020, p. 156) and that of a healthy *scientific scepticism*, which is not the belief that we cannot attain any knowledge whatsoever, but rather that belief in a particular scientific theory or idea must be withheld until it has been tested and that scientists have to anticipate what might be problematic or failings in their methodologies (McIntyre, 2020, p. 157). Scientists withhold their belief in a theory or idea until it meets a specific high evidential standard that justifies its uptake (McIntyre, 2020, p. 158).

Returning to the science denialists and their hijacking of the word 'scepticism,' consider the following bit in the interview with (at the time) Senator Ted Cruz (McIntyre, 2020, p. 161, own italics):

> **Inskeep:** Do you question the science on other widely accepted issues—for example, evolution?. …
>
> **Cruz:** *Any good scientist questions all science. If you show me a scientist that stops questioning science, I'll show you someone who isn't a scientist*. And I'll tell you, Steve. And I'll tell you why this has shifted. Look in the world of global warming. What is the language they use? *They call anyone who questions the science*—who even points to the satellite data—*they call you a, quote, "denier". Denier is not the language of science. Denier is the language of religion. It is heretic. You are a blasphemer. It's treated as a theology*. […]

Here, we see precisely how science denialists reject the word 'denier' and claim that they have a healthy - questioning - attitude towards science, i.e., that is *praiseworthy* scientific scepticism. Cruz frames the problem in a way that makes it seem that science denialists have the healthy and appropriate scientific attitude to 'question' everything (McIntyre, 2020, p. 163). Cruz misunderstands or deliberately misrepresents the open relationship of sceptical inquiry in science. Furthermore, Cruz is guilty of misrepresenting open and scientific scepticism in scientific inquiry and decides to doubt *selectively*. Science denialists do this routinely—they are sceptical of those findings that they do not want to believe (for whatever

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United States of America because of some doubt over its existence would seem epistemically irrational. However, if we were to deny a claim that 2 + 2 = 5, it would not seem irrational.

reasons), and they are willing to accept certain bits of information that suit their case for the specific science denialism they currently engage in (McIntyre, 2020, p. 158).[49] These are all relevant to cognitive bias when considering the evidence, and I will return to that shortly. However, first, let's consider an example of selective scepticism.

The following example illustrates many features of science denialism and this specific form of selective scepticism, found in an example discussed by Stephen Gardiner in *A Perfect Moral Storm* (2011). Gardiner discusses the author Michael Crichton's (the author of works such as *Jurassic Park*) author's notes in the novel *State of Fear* (2004). (It is important to note that these notes are his *personal views* and not a part of the fiction.) I quote Gardiner, who presents Crichton (Gardiner, 2011, p. 457-458; Crichton, 2004, pp. 569-573):

> • *Nobody knows* how much of the present warming trend might be a natural phenomenon.
>
> • *Nobody knows* how much of the present warming trend might be man-made.
>
> • *Nobody knows* how much warming will occur in the next century. 2 . . . But *if I had to guess*—the only thing anyone is doing, really—I would guess the increase will be 0.812436 degrees C. There is *no evidence that my guess* about the state of the world one hundred years from now *is any better or worse than anyone else's*. (We can't "*assess*" the future, nor can we "*predict*" it. These are *euphemisms*. We can *only guess*. An *informed guess is just a guess*.)

Crichton's claims cast epistemic doubt, plain and simple. The use of phrases such as "nobody knows", "no evidence", "if I had to guess", "no evidence that my guess […] is any better or worse than anyone else's", "can't "assess" […] nor can we "predict" […] These are euphemisms", "we can only guess", "an informed guess is just a guess" illustrates how doubt is produced: the author casts doubt on the epistemic authority of scientists and scientific bodies, such as the IPCC, and their claims, mainly about evidence for manmade global warming, the ability to predict specific outcomes about global warming, what knowledge scientists have or do not have, what certainty we have. The author claims his guess is as good as anyone else's due to a lack of evidence. This is false, as the basic science of the

[49] As McIntyre notes, this kind of quick, uncritical acceptance of evidence that supports their position is very similar to how conspiracy theorists are quick to accept anything that supports their theories (2020, p. 158). The same can be said about pseudoscience. Pseudoscientists are 'sceptical' of those things that are evidence against their pseudoscientific claims, but they are quick to accept anything that supports their claims.

greenhouse effect is proven across the board of scientific research and bodies, with these projections remaining consistent (Gardiner, 2011, p. 458). Crichton later proposes a sufficiency condition that has not been met, making claims about how much evidence we need and how many predictions need to be proven to be accurate before we can reasonably use these predictions to direct policy decisions in the future (Gardiner, 2011, p. 459). This is one of the key strategies denialists use: they propose a standard of certainty that will never be met, meaning that it will be impossible to take action. The other problem is that when the bar is set so high, it would probably be too late to take action when the requirement is met (Gardiner, 2011, p. 459).

When Crichton makes the claims about predictions being 'guessing' and that anyone's guess is as good as another person's guess, he is playing the same denialist card as I will discuss later: we either have facts and certainty, or we have 'just a theory' that is a guess, and as good as anyone else's guess (Gardiner, 2011, p. 460). We are left with radical scepticism, which comes from Descartes: we must reject everything we cannot know with certainty. The problem is that we claim to know various things (Gardiner, 2011, p. 461). This push towards radical scepticism just intuitively seems wrong and problematic. Also, the denialist misses that if there is an epistemological issue with climate science here, it is not unique to climate science (Gardiner, 2011, p. 462).

Crichton further invokes the problem of induction through his claims that we cannot "'assess' […] nor can we 'predict' the future" and that using these words is simply a euphemism. Hume's induction problem led him to conclude that "all of empirical knowledge relies on a much less robust foundation than we pre-theoretically believe" (Gardiner, 2011, p. 462). The problem with Crichton's argument is, as with his radical scepticism, that he is selectively invoking the problem of induction, implying that climate science is unique in some sense, meaning that there is, again, an epistemic corruption (and moral) in some way (Gardiner, 2011, p. 462). We make all sorts of predictions about things that could, in this sense, be explained away as being 'guesses', but the thing is that we usually do make predictions and claim to know things, which makes Crichton's claim misleading (Gardiner, 2011, p. 462).

What is often further used in support of the claims that there is not enough evidence is that the science denialist cherry-picks and manipulates existing data, making it seem like there is a lack of evidence. Oreskes mentions the case of physicist Willie Soon (Harvard-Smithsonian Center for Astrophysics), who published a paper titled "Modeling Climatic Effects of Anthropogenic Carbon Dioxide Emissions: Unknowns and Uncertainties" with

some colleagues, and how this paper has consequently been misused in various climate change denialist narratives (Oreskes, 2007, p. 75; Soon et al., 2001). The fact that it keeps being used in many climate change denialist narratives, regardless of how many times the errors in its use are pointed out, means that it has become a zombie argument in the climate change denialist's arsenal. The paper considers the issue of how good models are at predicting the future (tempo and mode). The authors clarify in their paper that they are not refuting or disproving anthropogenic climate change but are attempting to identify deficiencies in existing models used for predictions (Soon et. al., 2001, p. 259). Denialists have since used this paper as a legitimate and vital example of dissenting findings (Oreskes, 2015, p. 75). Even if the paper made a case that predictive models on anthropogenic climate change should be dismissed, the claims regarding anthropogenic climate change has more than enough other evidence that the overall consensus position on climate change would remain firmly. There are so many unique bodies of scientific evidence—from a variety of scientific disciplines that are legitimately related to questions regarding anthropogenic climate change—that support the consensus (Oreskes, 2007, p. 76).

Consider also the following example from the interview between Richard Dawkins and Wendy Wright:

> **Dawkins:** When I asked you about evidence, you said there are no fossil intermediates. And when I told you about fossil intermediates, you change the subject, I mean…
>
> **Wendy:** No, I don't change the subject, what I say is that if there were, uh, if, uh, if there had been evolution, from slime to human beings, that there'd be a massive amount of evolution, of, of, sorry, if there was, uh, evidence of going from slime to human beings, there'd be a massive amount of evidence, uh, showing, uh, interspecies from one macro species to another and that's where I I find the concept of evolution lacking and so the burden is really on the evolutionists. Oftentimes it's been thrown back at us that we just need to look at the information but no, but let me throw it back on you all, to say, look, this is what you what's needed to convince us. So you need to come up with, uh, with, um a large amount of evidence to back up this claim that there's been a large progression of macro evolutions throughout the years.

The argument invokes a kind of selective scepticism. The denialist emphasises the (supposed) lack of evidence and demands more evidence. However, she demands more

evidence for evolution (an impossibly high evidential standard) here. In contrast, in other parts of the interview, she accepts the science of DNA with very little scepticism. Even more crucially, she accepts Intelligent Design with very little evidence.

It is essential to note the role of bias in how we consider evidence. Lord et al. emphasise how we are all prone to cognitive and confirmation biases when it comes to issues we have to deal with (1979, p. 2098). We all tend to respond to situations by rejecting evidence that disconfirms our preferred beliefs and instead seek evidence in support of our already-held beliefs. We apply an asymmetrical evidential standard. However, there is a case to be made that sometimes these kinds of biases are no longer mere confirmation bias but something stronger. Instead, tentatively, it could be called a kind of confirmation *prejudice*. In this sense, a hearer is not simply biased in their consideration of evidence and *seeks* evidence that confirms their beliefs, but they are *prejudiced* regarding any evidence that might be contrary to their view. It is something more pathological than a mere bias. When Wendy Wright is presented with evidence *against* her already-held beliefs, there is something more happening in her response to that evidence than simply displaying a confirmation bias. When science denialists set unreasonably high evidential standards, they exploit the scientific ignorance of non-experts by also exploiting their biases and, in a sense, we could make the case that they turn the bias into a prejudice via their manipulations. If you know your audience and know that they are predominantly conservative, you would know what kinds of confirmation biases would be convincing and could even be a prejudice.

2. 4. Science Provides Us with 'Just a Theory'

Most science will be open-ended due to uncertainties, where uncertainty is integral to science. No scientist could tell us exactly what would happen, especially concerning questions that have still not been answered fully, but they could make predictions that would either be proven or disproven. This is the case with many questions in science that are still open questions that need further testing and investigation—appropriately called those 'puzzles' in science that are actively worked on in the scientific community. Furthermore, failure in science is inevitable and necessary, often in these areas where many puzzles still need to be resolved. But failures are essential to drive progress.

However, science can also provide us with things considered as 'established knowledge' and 'fact' as it has been proven repeatedly and becomes unlikely—if not *impossible*—to ever

be disproven. These are things such as the earth's shape, gravity, and the earth's rotations and movements around the sun, amongst many other things that we now take for granted. I will not jump out of a building and expect to start levitating and drifting out to space. The theory of gravity is established—*fact*— and there is good reason for its acceptance. Most people would agree that even though it is technically a '*theory* of gravity', gravity and the precise details about how it works, etc., are well-established and taken as fact.[50] When we say 'the theory of gravity' or 'the theory of anthropogenic climate change', it differs significantly from 'the theory of extra-terrestrial intelligence', even though scientific communities and scientific experts are working on the open questions within both these areas. Within scientific communities and the usual discourse regarding scientific matters, we no longer even talk about the 'theory' of gravity as it is taken as fact that the theory is correct.

The non-expert quickly believes they have good reason to reject scientific findings when they believe the science is uncertain and the word 'theory' is used, and so often used when it is no longer relevant. What they believe is that when something is labelled a 'scientific theory', *it is just a theory*, i.e., there are no good reasons to believe what science presents in theories because a theory is as good as any other theory, regardless of who presents the theory, for as long as the theory had not been proven with certainty (McIntyre, 2020, p. 29). People who do not understand science quickly believe they have good reason to reject a scientific theory when it has not been proven as sure. By claiming that Evolution Science is 'just a theory' in the same way as Intelligent Design Science is, there is an exploitation of the false dichotomy between certainty and uncertainty in science. Consider the following bit of dialogue between Wendy Wright and Richard Dawkins:

> **Wendy:** So, what is your, what is your cause in life? It, it, I would think that if your cause was to convince others that evolution is correct—not just a theory, but a fact—uh, then you'd be devoting yourself to finding this information and making it readily available. What I find is that you're spending a lot of time arguing with me, trying to convince me, instead of instead of showing the evidence or spending your time producing evidence.

It is the little details of certainties and uncertainties, failures in science, and the use of the word 'theory' that science denialists often exploit to drive their denialism. Science denialists

[50] Note that most Flat Earthers deny the existence of 'gravity' and attempt to explain the phenomenon by discussing object density.

often exploit the non-expert's misunderstanding of the differences between 'theories', 'hypotheses', 'established truths', 'consensus', and 'facts'. They draw a false dichotomy between certainty and uncertainty that allows all sorts of epistemic pathologies to emerge. When something in science is called 'uncertain', non-experts with this misunderstanding falsely equate that uncertainty with a 'lack of evidence'. Furthermore, as non-experts misunderstand the word 'theory' in science, they equate its use with the false dichotomy between 'certainty' and 'uncertainty'. Effectively, they believe that if something is called a 'theory, there is 'uncertainty', i.e., a lack of evidence.

The false dichotomy of certainty versus uncertainty in science is the result of a myth about science that has the underlying belief that "science inevitably leads to truth because it uses empirical evidence to prove a theory [and] science has no bearing whatsoever on what we should believe because everything it proposes is 'just a theory'" (McIntyre, 2020, p. 29). When considered within this framework, science is all or nothing: something is either proven, and we *know* something, or it just proposes some theory that is *as good as any other theory*. These two myths go hand in hand in the science denialism narrative - and are simultaneously exploited. Once non-experts know of any uncertainty about some science, they are prone to believe it is 'just a theory' and can be doubted. When a scientific claim falls short of being true, proven, or verified, it is 'just a theory' to the non-expert and warrants rejection (McIntrye, 2020, p. 34). By extension, the scientific theory, which is 'just a theory', is then considered to have the same epistemic status as *any other theories on the matter*, including those by non-experts (McIntyre, 2020, p. 34). When the theory of gravity has the same epistemic status as a theory about 'density and buoyancy' as the explanation for why we stay on the ground and do not float into the sky, the non-experts believe that their theory has the same epistemic merit.

What non-experts tend to misunderstand here is the difference between a hypothesis and a theory, where a hypothesis is epistemically closer to what they take a theory to be but where it is still far more informed than '*just* a theory' in the general sense, as they phrase it. When a scientific expert makes a hypothesis, it is an 'informed guess' of a scientific issue, backed by years of research by others in the relevant scientific community, and the guess has far more weight than any other guess (McIntyre, 2020, p. 35). A difference between a scientific expert's 'guesses' about the shape of the earth and a Flat Earther's 'guesses' about the shape of the earth is that the scientific expert's guesses are supported by evidence that had been tested, can be tested again, and more than mere guesses back up the theory as those guesses had been corroborated until it eventually became an accepted mainstream theory (McIntyre,

2020, p. 164). Flat Earth Science is a collection of guesses with plenty of empirical errors. In fact, a scientific expert's 'guesses' about the earth's shape cannot be called 'guesses' as its epistemic status is entirely different from that of a Flat Earther's—and that is the crucial difference.

I want to briefly return to a case of pseudoscience to explain this difference more clearly. Compare the example of the difference between UFOlogy (a case of pseudoscience) and SETI (the Search for Extra-Terrestrial Intelligence, a borderland science). Both of these groups of people present 'theories' about the existence of extraterrestrial intelligence. However, when we talk about research in the SETI Institute where it is a proper scientific community, even though we would call their theories far more 'uncertain' than, say, the theory of anthropogenic climate change, the theories researchers present in the SETI Institute has a far different status to those made by UFOlogists. Simply put, the theories presented by SETI Institute researchers are backed by well-informed 'guesses', forming a part of the progress in the scientific community. Crucially, we might even go so far as to say that when scientific experts make 'guesses', they very often cannot even be called a 'guess'.

2. 5. Announcing a Controversy: Appeals to Democratic Values

This difference between a scientific theory, where the initial guessing is backed by evidence, ties in with another strategy that denialists use. When two theories are positioned as having the same epistemic status, i.e. having the same claim to credibility and scientific integrity as they are 'both *just* a theory' in this misunderstood sense of 'theory', the denialists can quickly push an agenda in the media: an accepted standard in journalism is to give "both sides of the story equal weight" (Prothero & Shermer, 2013, p. 44). This idea of considering 'both sides of the story' is a narrative technique that often goes along with the claim of 'other causes' to some controversial scientific issue (Prothero & Shermer, 2013, p. 44). When the denialist claims that a phenomenon potentially has 'other causes' in an attempt to draw the attention *away* from the thing they are attempting to deny, they often attempt to substantiate a claim of 'other causes' by an appeal to 'journalistic fairness', i.e., the journalistic fairness idea that all of the sides of a story should be reported on (Prothero & Shermer, 2013, p. 45). The denialists portray the issue as 'controversial' and it is 'only fair' to give equal weight to all sides. Denialists often draw attention away from the *consensus* cause of something by saying there could be 'other causes' (Prothero & Shermer, 2013, p. 44). Sometimes it is true

that a phenomenon's causes are multiple and it is complex to isolate the causes (such as with autism); however in the case of smoking and lung cancer, the connection is, indeed, overwhelming, and denialists direct attention away by pointing the finger at 'other causes' (Prothero & Shermer, 2013, p. 44). The smoking industry denial campaigns were mainly driven at casting doubt on the causal link between smoking and cancer (Oreskes & Conway, 2010, p. 5).

Sometimes, yes, the approach to give 'both sides of the issue' an equal voice is fair. However, the approach is only fair when an issue is truly unsettled. Denialists warp the narrative by creating the illusion that there is controversy. Consider the case of flat earth science. Journalists rarely provide the same kind of platform for Flat Earthers to present their case in the same way as they would for most established sciences, simply because the evidence is conclusive and overwhelmingly in favour of heliocentrism and the push to create a false 'scientific controversy' is largely a failure (Prothero & Shermer, 2013, p. 45). What goes wrong when a denialist gets a platform to speak, 'to give equal weight to the story', is usually that the denialist is given the same (or even higher level of) credibility as a scientist, as they have created the narrative that the issue is controversial and their argument carries equal weight to that of the scientist's argument (Prothero & Shermer, 2013, p. 45).

I want to briefly return to the example of the interview between Richard Dawkins and Wendy Wright, the Intelligent Design proponent. Consider the following:

> **Wendy:** … and the position we've taken is *teach the controversy*, *teach all the information, not just selected information that promotes one viewpoint which, most of the time, that's evolution*, but let's teach all the information so the school children can *learn how to think for themselves* and come up to their own come to their own conclusions.
>
> **Dawkins:** Nobody could possibly object to teaching children to think for themselves.
>
> **Wendy:** I wish I wish that were the case that people would not object to teaching *all the information* or teaching children in a manner so they can think for themselves. But sadly, there's been a very heavy-handed effort in the United States to clamp down, not allow any teaching that is contrary to evolution, even to the point of court orders.
>
> **Dawkins:** When you say 'teach the controversy'—it would be nice, I mean, of course scientists teach controversies all the time, there's a lot of controversies in science. *There's evidence on one side, there's evidence on the other side. In this case, however, we have a very*

large amount of evidence in favour of evolution. But the evidence on the other side is not evidence in favour of anything else. It's actually *looking for little gaps, looking for little, um, things that, allegedly, evolution can't explain*: 'look, we found something they can't explain! That must mean God did it' - um, it's not—that's not—doesn't sound like science, does it? It sounds like looking for gaps.

Wendy: *If it's evidence, then those, then scientists should be in favour of teaching evidence* even if they may discount the evidence, even if they think it's inconsequential. As a scientist, a scientist should be committed to teaching truth.

Dawkins: Yes, but I think you didn't understand what I said. I said, on the one side there is *evidence, on the other side there is a looking for apparent lack of evidence.* There is no [inaudible—interrupted].

Wendy: But that is what scientists, science is about. *Science is taking a theory and challenging it to see if it can stand up …*

Dawkins: That's right.

Wendy: … and so, while people may not like, uh, when the evidence doesn't stand up to, uh, further testing, that, but that's what science is about.

Dawkins: Yes, well that is what science is about, but there there are no cases known to me at least where science [talking, specifically, about evolution], where where it doesn't stand up. I mean, there are cases where work needs to be done, and of course, science flourishes on finding places where more work needs to be done—that's how science advances.

Wendy: What we have argued when we say 'teach the controversy', is teach the controversies in evolution, um, and to *teach the evidence that shows Intelligent Design*. Uh, I'm not aware of people arguing that they ought to do that in public schools it ought to be taught the, um, biblical accounts of creation, so, uh, what we, what we, um, uh uh, when we say teach the controversy, we mean to *teach all the evidence,* uh, including the, um, *evidence that goes against evolution, teach the evidence for Intelligent Design.*

Here, we have an example of the 'teach the controversy' argumentative trope, where the science denialist claims that there is a controversy, when there is no controversy ("*teach the controversy*, *teach all the information, not just selected information that promotes one viewpoint which, most of the time, that's evolution*"). What is fascinating and revealing in this

interview, is how the speaker keeps to her guns, rejecting any kinds of claims that Dawkins might make that there is significant evidence that supports Evolution Science (even to the point where she claims that the evolutionists only have drawings, rejecting the fossil records, in some fairly incoherent manner).

3. Zombie Arguments in Science Denialism

I have now reached the point where I want to list a few examples of the recurring zombie arguments that have the rhetorical strategies with the argumentative tropes I have described.

> 1. There is research by Dr. Andrew Wakefield that showed that the MMR vaccines cause autism. We must look at the science ourselves and be critical of what governments tell us. [He is a martyr and a 'fighter for the truth' and was silenced by other scientists and nefarious actors.]
>
> 2. Average temperatures have not increased significantly for 18 years, disproving claims that we are experiencing exceptional increases. The far left is trying to make society socialist by changing our free markets.
>
> 3. Anthropogenic climate change is an event that naturally recurs, and we have no proof that anthropogenic activities drive current temperature increases and fluctuations.
>
> 4. There are many potential causes of lung cancer, so we cannot exclusively blame smoking. They cannot restrict our freedoms by limiting smoking.
>
> 5. Intelligent Design Science theorists are right to claim that 'we should teach the controversy' to allow people to be critical thinkers and look at the evidence themselves. We should do this by teaching Intelligent Design Science alongside Evolution Science.
>
> 6. Evolution Science provides 'just a theory' in the same way as Intelligent Design Science provides 'just a theory', meaning that both must be given equal weight and consideration.
>
> 7. Fossil fuels are necessary for human prosperity and, by extension, human health. Reducing fossil fuel use will have harmful consequences, resulting in a loss of human prosperity that far outweighs the benefits.
>
> 8. There is a significant body of research that shows that vaccines cause harm, and it is my body and my choice.

9. If you accept what the climate scientists tell you (that anthropogenic climate change is happening), you are unquestioningly accepting it and being brainwashed.

10. The vaccine scientists are lying to us, and you must be sceptical and question the science.

11. There is insufficient evidence to support the theory of evolution, and we need to demand more proof. A world that accepts Evolution Science blindly will be morally terrible.

12. There is insufficient evidence linking climate change to human activity, and we must demand more. Reducing carbon dioxide emissions will cause suffering.

We can see the various argumentative tropes employed by science denialists in all these zombie arguments. In these arguments, you have the exploitation of scientific ignorance and the accompanying appeals to social and cultural values. In many of these examples, there is a demand for more evidence (3, 11, and 12 explicitly). In many examples, there is the appeal to non-experts applying their own 'sceptical attitude' in questioning the science, which is related to the unrealistic evidential standards, as well as the misunderstanding of what a healthy 'scepticism' in science would look like (1, 5, 9, 10). In some examples, there is the conflation of moral values and science (1, 5, 7, 10, 11, 12). In other examples, politics and science are conflated (2, 4, 5, 6, 8). There is a lot of overlap between the argumentative tropes. Sometimes, talking about politics immediately involves other complex questions about morality and vice versa. It is often a combination of these values and tropes that are used in combination.

4. When it is No Longer a Scientific Community

It is crucial to consider the status of scientists who do research funded, for example, by the tobacco or fossil fuel industries. In other words, could they be called 'scientific experts' or 'scientific communities'? It is a complex question, but I do not generally believe so.

When a group of scientists produces research whose findings are manipulated to support the funder's position, the research is epistemically compromised. The scientists involved can no longer trust that the mechanisms within that group will work towards providing what we want from a scientific community. This means that the scientists are no longer 'scientific experts' and can no longer be called a 'scientific community'.

However, there are cases where these scientists engage in conferences and publish in proper peer-reviewed journals, indicating that they want their research to go through the mechanisms of a scientific community (Oreskes, 2019, pp. 66-67). In some of these cases, the contributions by those scientists can be considered valuable. However, suppose it is known that the relevant scientists are working for a specific industry. In that case, it is apt to be cautious and ensure that the research they produce makes its way through the processes of the relevant scientific communities.

I found an interesting analysis of research done by scientists who worked for pharmaceutical companies that could successfully pass peer review, as there is no apparent fraud or fiddling with results. However, the research is so strongly in favour of the pharmaceutical companies because it is funded to answer *very specific kinds of questions* (the following is a list of standard methodologies in the 'biased' research, as provided by Dr Richard Smith, a former editor of the *British Medical Journal*) (Michaels, 2008, pp. 98-99):

> Conduct a trial of your drug against a treatment known to be inferior.
>
> Trial your drugs against too low a dose of a competitor drug.
>
> Conduct a trial of your drug against too high a dose of a competitor drug (making your drug seem less toxic).
>
> Conduct trials that are too small to show differences from competitor drugs.
>
> Use multiple endpoints in the trial and select for publication those that give favourable results.
>
> Do multicentre trials and select for publication results from centres that are favourable.
>
> Conduct subgroup analyses and select for publication those that are favourable.
>
> Present results that are most likely to impress—for example, reduction in relative rather than absolute risk.

What became clear to Smith was that the results were not the products of flawed research or that the study was even aimed at producing a specific result (even though that was also often the case) and that sometimes it was even the case that these industry-funded studies were better than others (Michaels, 2008, p. 98). However, the methods behind the studies

would, most probably, cast the pharmaceutical company's products in a better light than they should and increase sales, but not truly provide physicians with information that would help them to make the best decisions for their patients (Michaels, 2008, pp. 98-99). Essentially, these studies are epistemically compromised even though they were able to pass through the mechanisms in scientific communities.

There is a load of evidence that shows how research funding can affect research outcomes, which is usually to the benefit of the funder.[51] Furthermore, when there are private funding bodies involved, they can restrict the publication of findings from the research: often, they have the right to limit the publication of findings from the studies they fund, meaning that they can suppress findings that are disadvantageous (Michaels, 2008, p. 102). This is why a privately funded scientist should be treated with suspicion, and the reviewing practices at scientific journals should certainly be stringent on disclosing conflicting interests. Scientists should not see this as a problem but as another mechanism that helps science produce the knowledge we want.

This is fundamental to understanding some misperceptions that develop and cause problems in the relationships between scientific experts and non-experts. Just because a scientist is working alongside other scientists and it seems like a scientific community does not *make* it a scientific community that produces us with things that are primarily right or any form of scientific consensus. Furthermore, the research findings of a small group of scientists do not represent a scientific *consensus*.

This means there is a crucial distinction between scientific communities and groups of scientists who present themselves as such or where they are presented by a private funder, regardless of the formal qualifications of the individual scientists in that group or community. This comes back to the sociological explanation of a scientific community that is good at providing things that are primarily right: specific underlying mechanisms in such a community make it a scientific community, and when those mechanisms are missing (such as in the cases of funding from particular industries) it cannot be called a scientific community. Dr. Richard Smith's analysis of the published research methodologies is proof of the self-

[51] See: Flaco, M. E., Manzoli, L., Bocia, S., et. al., "Head-to-head randomized trials are mostly industry sponsored and almost always favor the industry sponsor" (2015); Stamatkis, E., Weiler, R., Ioannidis, J.P.A., "Undue industry influences that distort healthcare research, strategy, expenditure and practice: a review", (2013); Ioannidis, J.P.A, "Evidence-based medicine has been hijacked: a report to David Sackett", (2016); Fabbri, A., Lai, A., Grundy, Q., Bero, L.A., "The influence of industry sponsorship on the research agenda: a scoping review" (2018); Lundh, A., Lexchin, J., Mintzes, B., et. al., "Industry sponsorship and research outcome" (2017); Rasmussen, K., Bero, L., Redberg, R., et. al., "Collaboration between academics and industry in clinical trials: cross sectional study of publications and survey of lead academic authors" (2018).

correction and self-regulating mechanisms in scientific communities. Even though the findings of his analysis are concerning, it is proof that those mechanisms work. A problem has been identified, and there is undoubtedly a significant improvement in disclosure policies in scientific journals.

5. Science Denialism and Pseudoscience: A Comparison

I want to compare science denialism and pseudoscience before continuing with the definition of the unique epistemic injustice I have in mind. This is important if I want to be able to claim that there is some epistemic wrong to scientific experts and scientific communities—a wrong that is similar in nature and is present in *both* of these kinds of pathologies—that constitutes an epistemic injustice, as I will proceed to do in the following chapters. I will consider a few aspects in these pathologies, namely how the pathologies deal with epistemic authority, the accusations of scientism (or other 'dogmatism '- related accusations), accusations of corruption, zombie arguments, and conspiracy theories.

The main thing these pathologies have in common, which runs through many of the similar and different features of the pathologies, is that they lead to the *erosion of the epistemic authority of scientific experts and scientific communities*. When this erosion occurs, there is a rejection of or lack of acknowledgement of the scientific experts and scientific communities *qua* epistemic authorities. When this rejection or lack of acknowledgement occurs, it is the rejection of the preemptive reasons for belief that a scientific expert's testimony provides.

5. 1. The Accusation of Scientism (or Dogmatism)

In both pseudoscience and science denialism, there are accusations of dogmatism—or, often in the context of science, called *scientism*. In pseudoscience, these accusations can result from the pseudoscientist genuinely believing that the scientific expert is guilty of being dogmatic, and the accusation is often an attempt to defend their claims of having epistemic authority of the kind scientific experts have. Remember that when a pseudoscientist claims that they are being 'scientific' and their work is 'revolutionary', it often goes along with the accusation that scientific experts are 'dogmatic' and a part of the 'scientific establishment'

that is, in effect, persecuting them (the pseudoscientist).

In the case of science denialism, the accusations of dogmatism are often part of a far more deliberate strategy to attack scientific experts and scientific communities, as discussed earlier in this chapter. These accusations align with the rhetorical strategies employed to cast doubt on scientific experts. These accusations of 'scientism' effectively erode the epistemic authority of scientific experts and scientific communities: they make non-experts doubt the legitimacy of the claims to epistemic authority that scientific experts make.

When the accusation of 'scientism' is leveraged at scientific communities and scientific experts, it is a way of blaming scientists for an unquestioning belief in science and its findings, implying that science is a 'dogmatic' and unquestioning establishment (Boudry & Pigliucci, 2017, pp. 4-6). An accusation of 'scientism' would, effectively, mean that the scientific expert or scientific community who is the recipient of the accusation no longer adheres to so many of the values that we believe scientific experts would adhere to.

Boudry and Pigliucci define this normative understanding of 'scientism', which is pejorative and an accusation of some sort, as (2017, p. 2):

> (1) an excessive deference towards the deliverances of science and anything to which the honorific label *scientific* is attached; (2) brazen confidence in the future successes of scientific investigation, for example in arriving at a Theory of Everything, or in solving every interesting question about reality; (3) the conviction that the methods of science are the only worthwhile modes of inquiry, and will eventually supplant all others; (4) the thesis that other disciplines should be either subsumed under science or rejected as worthless; (5) the thesis that all ways of acquiring knowledge and understanding are (or should be) scientific in nature, and hence there is no interesting difference between science and other forms of inquiry.

Originally, 'scientism' denoted "a scientific habit of thinking, or the worldview of a scientist", which had no negative connotations (Boudry & Pigliucci, 2017, p. 3). With the shift in the use of the term, it is often used as an accusation; a negative normative judgment has become integral to the term with the resulting implication that scientists are guilty of committing an epistemic sin. It is true that, sometimes, scientists are guilty of committing this sin. Susan Haack identifies 'six signs of scientism' that are indicators of the epistemic sin, in the pejorative sense, as when it is leveraged as an accusation towards scientists (2012, pp. 77-

78):

> 1. Using the words “science,” “scientific,” “scientifically,” “scientist,” etc., honorifically, as generic terms of epistemic praise. 2. Adopting the manners, the trappings, the technical terminology, etc., of the sciences, irrespective of their real usefulness. 3. A preoccupation with demarcation, i.e., with drawing a sharp line between genuine science, the real thing, and “pseudo-scientific” imposters. 4. A corresponding preoccupation with identifying the “scientific method,” presumed to explain how the sciences have been so successful. 5. Looking to the sciences for answers to questions beyond their scope. 6. Denying or denigrating the legitimacy or the worth of other kinds of inquiry besides the scientific, or the value of human activities other than inquiry, such as poetry or art.”

According to this usage, scientism is a dogmatic, institutionalised blindness to any understanding or interpretation of the world outside the ‘dogmatism’ of scientific inquiry. Even though this accusation is often legitimate, Boudry and Pigliucci point out that pseudoscientists have largely exploited this use of the word ‘scientism’ to hide anti-science (2017, pp. 4-5). I believe that this exploitation of the term ‘scientism’ is not only in pseudoscience but also in science denialism.

Accusing scientific communities and their members of ‘scientism’ further rejects epistemic authority. If a scientific expert is ‘scientistic,’ we would intuitively question their expertise. The accusation implies the target no longer adheres to some required epistemic standards.

5. 2. Accusations of Corruption

In both pseudoscience and science denialism, we often deal with accusations of corruption. These accusations can come in many forms, be it that the scientific community is, in a sense, epistemically corrupted (such as in an allegation of ‘scientism’ or ‘dogmatism’: where the accusation is that if a scientific community or a scientific expert is dogmatic, they are no longer adhering to some of the epistemic standards of scientific enquiry) or if it is an accusation of moral corruption (for example, scientists being ‘bought’ by specific companies or governments).

5. 3. Zombie Arguments

As I have shown in this chapter, *zombie arguments* in science denialism contain rhetorical strategies that work towards exploiting the non-expert's ignorance of scientific matters and appealing to values outside of science that are important to them. Various argumentative tropes are employed within these arguments that help it to execute the rhetorical strategy, such as when the science and political values are conflated. The zombie arguments are the recurring arguments that take this form that just 'don't seem to die'. An example is: '*climate change is a naturally recurring phenomenon and we have no proof that anthropogenic activities is a driver of the current increases in temperature and the use of fossil fuels is crucial for human prosperity'*.

I believe a similar 'zombie argument' phenomenon exists in pseudoscience. However, it is probably just recurring expressions of scientific ignorance that are used in defense of the pseudoscientific claims that pseudoscientists make. It can, sometimes, be more intentional and strategic, in a similar sense as it is used in science denialism, although I believe that is less often the case. An example of the kind of zombie arguments used in pseudoscience is '*I cannot see the curvature of the earth, and therefore the earth is flat*'. The fundamental detail in this argument is scientific ignorance. What pseudoscientists then add to this argument is that *they* are the ones who are more 'scientific' in their empirical research than scientists who might make contrary claims (Boudry, 2022, p. 89; Derksen, 1993, p. 21). As non-experts are scientifically ignorant of the details of science and the methods used, this argument can, intuitively, be convincing. Zombie arguments in pseudoscience work well and recur as they contain specific fundamental scientific ideas that non-experts do not understand. Crucially, I believe zombie arguments in pseudoscience are primarily defensive, whereas zombie arguments in science denialism are offensive.

5. 4. Conspiracy Theories

And then, finally, conspiracy theories. Conspiracy theories, broadly defined, are theories that attempt to explain significant political and social events and circumstances by referring to conspiratorial activities amongst agents, usually agents in positions with considerable

power (Douglas et al., 2019, p. 4; Coady, 2006b, p. 2; Keeley, 2006, p. 51).[52] A conspiracy theory usually explains events in a way that opposes the official account, maintaining that authorities attempt to keep the truth from the public (Coady, 2006b, pp. 2-3). By extension, conspiratorial theorising includes any form of reasoning that helps formulate these theories and informs such reasoning processes.

We often find pseudoscience and science denialism in specific conspiracy theories. It is crucial to keep these kinds of conspiracy theories in mind when discussing cases where the ideal relationship between a scientific expert and a non-expert goes wrong. In conspiracy theories with pseudoscientific claims, we also have a case where a non-expert presents themselves as a scientific expert. In the case of science denialism, we also have a case where non-experts use rhetorical strategies to erode the epistemic authority of scientific experts and scientific communities. However, not all conspiracy theories involve pseudoscience and/or science denialism. And not all conspiracy theories that involve science are the kind of conspiracy theories I have in mind.

I want to focus on two kinds of conspiracy theories that are relevant in discussing pathological relationships between scientific experts and non-experts. These are 1. pseudoscientific conspiracy theories and 2. science denialist conspiracy theories. Consider the following four conspiracy theories:

> 1. The Royal Family murdered Princess Diana, and the car accident was a cover for the murder by some powerful actor/s, such as the Royal Family.
>
> 2. Elvis Presley never died, and the Illuminati faked his death. One of the proofs for this theory is that his DNA was found in a car, where he was seen decades after his death, with DNA from the car testing as a positive match.
>
> 3. Vaccines cause autism; there is scientific proof for the fact (and it is provided, in some form or another), and the governments and Big Pharma are hiding this fact from us for economic reasons.

[52] Many definitions of conspiracy theories include the idea that the secret plot of the conspiracy is usually towards some nefarious goal. However, I agree with philosophers such as Pigden (1995, p. 5), Dentith (2014, p. 45), Bale (2007, p. 54), Coady (2006b, p. 1) and others who do not believe this is always central to a conspiracy. A conspiracy can be either good or bad. We could very easily imagine that a man plans a surprise birthday event for his wife, and he is working with other family members to plan the party. This is clearly a conspiracy insofar as there are various agents who are conspiring to make some kind of event take place. However, there is also clearly no ill intentions in this conspiracy.

> 4. There is plenty of evidence that the earth is flat. However, governments are hiding the truth because there is plenty of land beyond the ice wall, and they want to control us.

What is crucial to note is that there are significant differences in how these theories deal with scientific issues. Consider the following differences. The conspiracy theory about Princess Diana is not a conspiracy theory that deals with any apparent scientific matters. The topic of the conspiracy theory is not science-related, and there is no pseudoscience or denial of science involved in trying to prove the theory. The second theory about Elvis Presley is also not a pseudoscientific or science denialist conspiracy theory. The topic of the theory is not science-related, and even though the evidence claimed to support the theory is science-related, no pseudoscientific or science denialist claims are involved. The third conspiracy theory is a science denialist conspiracy theory. There is a claim that attempts to erode the epistemic authority of scientists, while there is a conspiratorial claim that goes along with the science denialism. The last conspiracy theory is what I would call a pseudoscientific conspiracy theory: the topic of the theory is pseudoscientific, and there is a conspiratorial claim. I will now explain this in more detail.

It is important to note, again, that the distinctions between science denialism, pseudoscience and the related conspiracy theories are not always clear cut. As I have mentioned before, there are times when the distinctions become less clear. However, it is helpful to attempt to draw distinctions as it is easier to identify many differences in the relevant epistemic pathologies. Science denialist conspiracy theories are the kinds of conspiracy theories where 1. it concerns specific scientific issues that are the target of science denialist rhetoric (the topic), and 2. the science denialist rhetoric is used in support of the conspiratorial claim, or vice versa. Consider again the example theory provided earlier:

> Vaccines cause autism; there is scientific proof for the fact (and it is provided, in some form or another), and the governments and Big Pharma are hiding this fact from us for economic reasons.

In vaccine science denialist conspiracy theories, the targeted established science is that of vaccines. This is the topic of the conspiracy theory. Secondly, in this example, the science denialist rhetoric is often meant to *support* the conspiratorial claims. However, it is possible

that there are cases where the science denialism is the primary claim, and a conspiracy theory is used in support of the science denialism. Consider again the example of the Ted Cruz interview discussed earlier. Although Ted Cruz is mainly interested in denying the science regarding anthropogenic climate change, he makes some reference to conspiracy theories in support of his claims:

> **Cruz:** But no, they don't. You can go and look at the data. And by the way, this hearing—we have a number of scientists who are testifying about the data. But here's the key point. *Climate change is the perfect pseudoscientific theory for a big government politician who wants more power. Why? Because it is a theory that can never be disproven.*

With pseudoscientific conspiracy theories, we have a similar structure to conspiracy theories with science denialist conspiracy theories: 1. they concern something claimed to be 'scientific', and 2. pseudoscience is used to support conspiratorial claims, or vice versa. Consider again the example provided earlier:

> The earth is flat, and there is plenty of evidence for this. The governments are hiding the truth from us because there is plenty of land beyond the ice wall, and they want to control us and keep us indoctrinated.

Here, the topic of the theory is 'Flat Earth Science', and pseudoscientific claims are offered to support the conspiracy theory. However, it could also go the other way around where the pseudoscientific claims are fundamental and the conspiracy theory is in support of the pseudoscience.

As mentioned before, it is not always perfectly clear which is more fundamental to the person making the claims, but these combinations are often found in these kinds of narratives.

6. Conclusion

In this chapter, I discussed the second of the epistemic pathologies I have in mind in constructing a definition of a unique kind of epistemic injustice towards scientific

communities and its members. In science denialism, the epistemic authority of scientific communities and its members are intentionally rejected. The rejection is done via rhetorical strategies that exploit the non-expert's scientific ignorance. These rhetorical strategies are implemented through various argumentative tropes where the scientific ignorance of non-experts is exploited, coupled with the appeal to cultural and social values. What results from these kinds of argumentative tropes are 'zombie arguments', meaning it is the kind of argument that keeps returning no matter how many times it has been refuted.

In the next chapter, I will explain some epistemic harms to scientific communities and scientific experts. As I will show, the epistemic pathologies I have discussed chiefly produce epistemically detrimental dissent that creates the conditions where there is a rejection or lack of acknowledgement of the epistemic authority of scientific communities and their members. This rejection produces many distinctly epistemic harms.

Chapter 5

Harming the Flock of Dodos: *Epistemically Detrimental Dissent* and Epistemic Harms to Scientific Communities and their Members

In the first chapters, I showed how scientific experts provide preemptive reasons for belief when they testify due to their *epistemic authority*. A scientific expert is someone who 1. accurately articulates the scientific consensus on a matter, and 2. has been initiated into the relevant scientific community and its traditions. The scientific consensus is the *source* of epistemic authority, where a scientific consensus is produced by a particular community with certain sociological features necessary to provide answers (that are primarily accurate) to scientific questions—i.e., they have a good *track record*. This specific kind of community is a *scientific community*. Note, again, that this definition takes into consideration the social nature of the scientific community as well as the scientific community and its members' relationship with non-experts as providers of scientific knowledge. Scientific communities and their members are crucial in providing the knowledge we need.

What is produced in a scientific community can be called *collective knowledge,* as the scientific community is uniquely set up to work through the processes that help to produce collective knowledge and consensus claims relevant to the specialised domain. The product is collective knowledge as it is not just the aggregate of the community's findings but rather the product of a deliberative process that considers all relevant research. The testimony of a collective of scientific experts is stronger than that of an individual scientific expert as it has the added level of a *communicative consensus*, where this kind of consensus means that the non-expert's margin of error in their judgment of the legitimacy of the claim to scientific

expertise is reduced.

In the third and fourth chapters, I provided analyses of some epistemic pathologies between scientific experts and antagonistic non-experts, where 1. pseudoscientists claim to possess the kind of epistemic authority that only scientific experts have, and 2. science denialists exploit the scientific ignorance of non-experts to erode the epistemic authority of scientific experts, which is the rejection of the epistemic authority of scientific communities and their members. What is fundamental to these kinds of pathologies, and the key to the epistemic injustice I will define in the final chapter, is that they produce *epistemically detrimental dissent*, i.e. the kind of dissent that can impede knowledge production, amongst other activities such as the dissemination and communication of knowledge, in science (Biddle & Leuschner, 2015, p. 262). Epistemically detrimental dissent effectively makes the relevant scientific experts epistemically worse off than they would have otherwise been by impeding their *epistemic agency* in various ways.

In talking about *epistemic agency,* I use Dunne and Kotsonis's definition and refer to the scientific expert's ability to engage in epistemic practices such as producing knowledge, considering and accessing evidence and information, and sharing knowledge, i.e., it is an impediment of their epistemic agency to engage in the epistemic practices that are necessary in a scientific community (2014, p. 8). However, I extend this understanding of epistemic agency to include the scientific expert's agency to communicate knowledge to non-experts. The definition of a scientific expert I have provided accounts for this crucial aspect of a scientific expert's role. This definition of 'epistemic agency' is helpful to consider alongside the sociological characterisation of the scientific community I have used, as these social epistemic practices are a fundamental and necessary part of the workings of scientific communities.

Not only does epistemically detrimental dissent impede the scientific expert's epistemic agency, but it also erodes the epistemic authority of scientific communities and scientific experts, i.e., it produces the *rejection* or lack of *acknowledgement* of their epistemic authority in non-experts. When their scientific expertise *qua* epistemic authority is rejected, it is the rejection of the *preemptive reasons for belief* they provide. When this rejection of their epistemic authority takes place, it impedes their epistemic agency as someone who can share knowledge via testimony and provide specific kinds of reasons for belief, namely, preemptive reasons for belief. However, it impedes their epistemic agency as producers and disseminators of knowledge within the scientific community.

In this chapter, I want to focus on the epistemic harms to scientific communities and their

members that result from the epistemically detrimental dissent produced via the epistemic pathologies I have analysed. The epistemic harms to scientific experts will be fundamental to the epistemic injustice I define in Chapter 6. As I will show, the harms resulting from epistemically detrimental dissent harm the scientific community and its members on the individual level. Essentially, the epistemic harms towards scientific communities and their members resulting from these kinds of pathologies come from *epistemically detrimental dissent* as a product of the epistemic pathologies I presented.

Epistemically detrimental dissent, i.e., dissent that impedes knowledge production rather than being conducive, provides the conditions where there can be many types of distinctly *epistemic* harms to scientific communities and the members of those communities (Biddle & Leuschner, 2015, p. 262). I will show that there are intrinsic *primary epistemic harms* to scientific experts and *secondary epistemic harms* to scientific communities and their members that result from this kind of dissent. I will focus on the *epistemic* aspect of this problem, i.e., how this kind of dissent can cause epistemic harm to scientific communities and their members rather than some consequent delays in policy-making and other factors beyond the scientific community. However, this is not to say that those consequent problems are not significant; it is crucial to remember them and understand the extent of the harms as they are not exclusive to the scientific community and its members.

In § 1, I will discuss the notion of epistemic *harm* (primary and secondary) and the difference to an epistemic *wrong*. In § 2, I will analyse *epistemically detrimental dissent* and how it provides the conditions for rejecting or not acknowledging the epistemic authority of scientific experts and scientific communities. In § 3, I will consider how epistemically detrimental dissent and the resultant rejection of epistemic authority harm scientific communities and their members. As individual members of scientific communities, scientific experts have an increased vulnerability to the epistemic harms resulting from epistemically detrimental dissent. This is often because it is easier to target individuals.

In Chapter 6, I will use the epistemic harms that result from epistemically detrimental dissent, as discussed in this chapter, to define a *scientific expert epistemic injustice*.

1. Epistemic Agency, Epistemic Harms, and Epistemic Wrongs

For me to claim that there is an *epistemic* injustice towards scientific experts, I would have to say how there are distinctly *epistemic* harms to scientific experts and how the

epistemic harms I am interested in amount to epistemic *wrongs*. A necessary condition for something to be called an epistemic injustice is that there must be some epistemic wrong to someone, not only harm (Fricker, 2007). *Wronging* someone is distinct from harming someone, as wronging implies a violation of some duty, which results in an injustice, although both could result in responsibility for the harm caused (Dunne & Kotsonis, 2014, p. 4). Not only that, but for something to be an epistemic injustice, the distinct harm has to be primary and intrinsic, which is definitive of an epistemic injustice (Fricker, 2007, p. 46). I will also focus on the distinctions between primary and secondary epistemic harms before launching into more detailed analyses of the harms in the following sections. However, I will not discuss epistemic injustice here, but only the distinctions between epistemic harms and wrongs and primary and secondary epistemic harms. The following chapter will provide a detailed discussion of epistemic injustice, where I define a unique kind.

Several distinctions need to be considered when discussing harms and wrongs. There could be no culpability for harm for a variety of reasons. Consider that I sent my friend an e-mail to tell her about the location of our Epistemology exam. The e-mail was not delivered to her because of a glitch with the e-mail system, and she missed the exam and failed the course. She is harmed, but I am not culpable if I had fulfilled my responsibility and had no reason to believe the e-mail had not reached her. Although I would feel terrible, I have not violated a duty to her.

On the other hand, it is essential to remember that even *wrongs* can, much like harms, be intentional or unintentional, out of choice or a perceived necessity, knowingly or unknowingly, amongst many other kinds of relevant distinctions (Dunne & Kotsonis, 2014, p. 4). These are just some of the distinctions between wrongful harm, blameless harm, culpable harm, and non-culpable harm. These distinctions are important because I would have to say why the harms involved are *wrongful* for me to claim, in the next chapter, that there is an epistemic injustice to scientific communities and scientific experts.

As mentioned, it is crucial also to remember the distinction between primary and secondary epistemic harms. For me to eventually define an epistemic injustice, the related epistemic harms would have to be *primary* and *intrinsic*. For there to be primary harms to scientific experts, there would have to be *intrinsic* harms, i.e., a harm that makes them epistemically worse-off as their *epistemic agency* is somehow impeded (Fricker, 2007, p. 44). The *capacity* to exercise epistemic agency would have to be hindered in some way or another, and that would make it intrinsic and primary (Fricker, 2007, p. 44). You could exercise your epistemic agency properly if you could communicate freely when the need to

do so arose. If, for example, I am not allowed to raise my concerns about a particular issue in a meeting about grading student essays, I have been restricted from exercising my epistemic agency as someone who can communicate and/or enquire.

If, for example, scientific experts are obstructed from effectively participating in knowledge production and *dissemination* activities, their *epistemic agency* has been impeded in some way. That distinct harm—the *obstruction of the exercise of epistemic agency*—is primary and intrinsic. It means they have been made epistemically worse off than they would have otherwise been. At the same time, there are 'knock-on' epistemic harms that are secondary: when someone is systematically the recipient of primary epistemic harms—where their capacity to exercise their epistemic agency is continuously obstructed—it might lead to some other epistemic harms that are *secondary*. These secondary epistemic harms are the *follow-on* disadvantages and are *extrinsic* to the primary harm, i.e., they are not a proper part of it (Fricker, 2007, p. 46).

General examples of these secondary epistemic harms are, for example, when someone loses "confidence in her general intellectual abilities to such an extent that she is genuinely hindered in her educational or other intellectual development" (Fricker, 2007, pp. 47-48). Consider again the example of me trying to raise my concerns about grading student essays in a meeting. If I am constantly harmed because I am not allowed to raise my concerns in multiple meetings of this kind, a knock-on secondary epistemic harm could be that I become less assertive in trying to communicate my thoughts and knowledge on the topic or less assertive in my attempts to enquire about relevant matters.

The distinct *intrinsic* epistemic harm I identify in the relevant cases is that scientific experts are harmed *qua* knower, where they are harmed in their *epistemic agency*. As epistemic *agents*, they are epistemically worse off than they otherwise would have been (Dunne & Kotsonis, 2014, p. 9). When I talk about the *epistemic agency* of scientific experts, I use the phrase in a similar way as Dunne & Kotsonis (2014, p. 8):

> [epistemic] agency [is] exercised in terms of our uncompromised zetetic or epistemic practices. These include, but are not limited to, practices such as acquiring, auditing, and disseminating knowledge, but also marshalling evidence, generating shared meanings or understandings, and procuring justifications for beliefs. Epistemic agency should not be understood in terms of cognitive islands. We are epistemic co-dependents; our epistemic agency in a community of inquirers is directly affected through our attitudinal perspectives,

attentional resources, and interpersonal relationships. Some of these factors and associated interactions will enhance our agency, while others compromise it.

This definition is apt in the *sociological* setup of scientific communities. If a scientific expert's epistemic agency is impeded, it impedes their capacity to engage in those social epistemic practices within a scientific community that are necessary for it to produce what we want from it. This means that, in the case of the epistemic agency of scientific experts, it is a specific *kind* of epistemic agency, namely that as a producer and disseminator of the type of knowledge that scientific experts *qua* epistemic authorities can produce and provide, which, more importantly, includes the provision of preemptive reasons for belief when they testify.

If I want to say how the epistemic agency of scientific experts is harmed by the epistemic pathologies I have analysed, I would have to show how those pathologies produce conditions that could harm the epistemic agency of scientific experts *qua* epistemic authorities. As I will show, the *source* of the epistemic harm is the rejection or the lack of acknowledgement of their status as scientific experts *qua* epistemic authorities. The rejection results from epistemically detrimental dissent produced via the epistemic pathologies I have analysed. And it is the rejection of their agential epistemic authority that makes the harm a *wrong*. As a reminder, in this chapter, I will focus on the *harms* before moving to considerations of *wronging* in the following chapter when I define the epistemic injustice.

When the scientific community and its members suffer secondary epistemic harm, it harms the internal processes that make the community effective at producing the knowledge we want from it and providing non-experts with that knowledge. Thus, the scientific community and its members are worse off epistemically than before. One way we might witness the secondary epistemic harm to scientific experts is when they have trouble effectively engaging in epistemic practices within the relevant scientific communities.

However, my claim is that when we can identify *epistemically detrimental dissent* due to the epistemic pathologies I have analysed, we can more easily connect the secondary and primary harms. There might be cases where there are obstructions to the production and dissemination of scientific knowledge that is entirely unrelated to the kind of epistemic harms I have in mind. For example, a scientific community might not receive the *funding* they need to do research in cancer treatments, but that does not mean it is the result of a primary epistemic harm of the kind that results from epistemically detrimental dissent. Consider the

financial cuts that Donald Trump has recently made in biomedical research.[53] There are many harms insofar as there are impediments to the production of scientific knowledge. Still, the source of the barriers differs from those created via epistemically detrimental dissent, and the harm to epistemic agency is also different.

Epistemically detrimental dissent is unique in how it impedes a scientific expert's epistemic agency: it is a rejection or lack of acknowledgement of their epistemic authority. When funding for research is cut, for example, it does not mean there is a rejection or a lack of acknowledgement of the scientific community or its members' epistemic authority. However, consider that the funding for cancer research is cut because of political actors who claim that there is no need to research as homeopathic remedies offer better solutions to cancer. In this case, there is something different to the harm, as I will discuss in more detail in this chapter.

In the next section, I will discuss epistemically detrimental dissent and the primary and secondary harms that result to scientific communities and experts.

2. The Production of Epistemically Detrimental Dissent

In this section, I want to establish an understanding of *epistemically detrimental dissent*. As I will show in the following section, *epistemically detrimental dissent* impedes the exercise of the epistemic agency of scientific experts in various ways. I remind the reader that when scientific experts can effectively exercise their epistemic agency, we can see it in their effective engagement in the epistemic practices within their scientific communities: they can produce, share, disseminate, consider and interrogate evidence and successfully testify to non-experts about the knowledge in their domains. Furthermore, they can exercise their epistemic agency when they can successfully testify, providing us with distinct kinds of reasons for belief, namely *preemptive reasons* for belief. Their epistemic agency is a particular kind that comes from their epistemic authority as scientific experts.

Biddle and Leuschner distinguish between epistemically beneficial dissent and epistemically *detrimental* dissent in science, defining *dissent* as "the act of objecting to a particular conclusion, especially one that is widely held" and epistemically *detrimental* dissent as the kind of dissent that *impedes* scientific knowledge production (2015, pp. 261-

[53] See a *Financial Times* article here: https://www.ft.com/content/028b2df3-2120-490c-a6a4-8af571305507.

262). Epistemically detrimental dissent often results from science denialists who want to delay policy-making that would negatively impact them—financially, economically, or otherwise (Oreskes & Conway, 2010). When epistemically detrimental dissent is produced, it can cause impediments to knowledge production and effective dissemination of knowledge to those outside the scientific community who need the knowledge for effective policy-making.

Biddle and Leuschner mainly focus on epistemically detrimental dissent in science denialism and, more specifically, climate change denialism (2015). I believe that it is a very apt example to show how science denialism is an area where this kind of dissent is especially prominent as it is employed, as mentioned earlier, specifically to help delay policy-making further along the line (Biddle & Leuschner, 2015, p. 262). However, this framework has to allow for epistemically detrimental dissent of other kinds, such as in pseudoscience and science-related conspiracy theories.

Firstly, what is *epistemically detrimental dissent*? Most theories on science and scientific progress agree that dissent is crucial within science (Biddle & Leuschner, 2015, p. 262). The characterisation of the scientific community I have described captures this intuition, as I believe the scientific community I have described acknowledges the central role of dissent. It even shows how dissent is a *necessary* part of what makes a scientific community good at producing scientific knowledge. The internal processes and mechanisms in scientific communities make it the kind of community where dissent is good, as it can be used to work towards better and more accurate consensus claims and collective knowledge. Furthermore, this kind of community is meant to deal with dissent, which helps it work through scientific problems and questions within that domain. Even consensus claims show how dissent is dealt with and a part of the process: a *deliberative acceptance consensus*, the kind of consensus we want from science, allows for disagreement on some of the details involved in the consensus question.

For example, even though the consensus on anthropogenic climate change is overwhelming, strictly speaking, the consensus allows for the acknowledgement that there is some disagreement in the relevant scientific community regarding some of the more minor details, such as the exact increases in sea level rise or the timeline for the precise increases in the average temperatures. Another example is that of Evolution Science. Evolution is well established; there is a consensus on the basic theory of evolution, which is taken as accurate. However, there is disagreement among the relevant scientific experts about some minor scientific details about evolution, and the relevant scientific communities are actively working towards producing answers to those open questions.

The distinction Biddle and Leuschner draw between epistemically beneficial and detrimental dissent is intuitive and crucial: some kinds of dissent can be epistemically beneficial in scientific communities, i.e., those kinds of dissent in science that contribute to knowledge production within the scientific community, but other kinds of dissent are epistemically detrimental, i.e., those cases where dissent *impedes* the necessary knowledge production in science (2015, p. 262). After all, when we think about dissent in science, it should be epistemically beneficial as it will help guide us closer to the truths and knowledge we are pursuing. A valuable and descriptive phrase that Martini and Andreoletti use to describe the bad kind of dissent is 'bogus disagreement' (2021, p. 2).

I believe that epistemically detrimental dissent is apparent in cases of science denialism, where the rhetorical strategy is to directly attack scientific communities and scientific experts by exploiting the scientific ignorance of non-experts and confusing them about the details of science. The goal is *to disrupt* the mainstream scientific consensus by employing rhetorical strategies and certain argumentative tropes that cast doubt on the established scientific consensus. Even though it is true that science denialism often has the goal of disrupting policy-making, as Biddle and Leuschner's account of epistemically detrimental dissent points out, I do not believe that is the crucial part of what makes the dissent epistemically detrimental (2015). What *makes* it epistemically detrimental dissent is that it produces *epistemic* harms within the scientific community that delay scientific progress.

In the case of pseudoscience, the epistemically detrimental dissent does not always directly target the established science to delay eventual policy-making (as is mostly the case in science denialism), as the pseudoscientist aims to present themselves as legitimate scientific experts. However, these pathologies can also produce epistemically detrimental dissent that causes significant harm to scientific progress and the production and dissemination of scientific findings. Consider, for example, pseudoscientists in alternative medicines—such as the 'qualified' healers at the School of Natural Medicine'.[54] Here, we have an organisation that presents itself as a legitimate 'school' that provides courses and qualifications in alternative medicines with courses in 'iridology', 'quantum botanicals' (my favourite, I have to say …), and 'naturopathy', amongst others. The school even provides a list of organisations that have 'accredited' the school.[55] However, when looking into these 'accreditation' organisations, it is just another group that presents itself as having scientific

{$NOTE_LABEL} https://schoolofnaturalmedicine.com. (Accessed: 10 January 2025).
{$NOTE_LABEL} https://schoolofnaturalmedicine.com/accreditation. (Accessed: 10 January 2025).

expertise on medical matters, where there are *some* signs of formal qualifications, but the community members who have those qualifications are very few.[56] It is a regressive process when digging deeper to see if they have legitimate scientific expertise. There is no scientific community of the kind I have described where the epistemic authority can come from the type of knowledge produced in that community.

When non-experts accept these bodies as legitimate scientific communities with epistemic authority (often, these organisations are mispresented as epistemic authorities in the media), it can cause significant harm. These sorts of 'alternative' therapies can usually be taken as replacements for vaccines or even cancer treatments, for example, reinforcing a general anti-vaccine narrative as well as causing severe adverse effects for people using the treatments.[57] The acceptance of 'alternative bodies' and their support for the use of homeopathic remedies as alternatives for vaccines could, in turn, reinforce anti-vaccine conspiracy theories. These sorts of schools and organisations often also mention popular media outlets that have mentioned them (such as glamour magazines, etc.), and this can be very misleading to non-experts. These organisations present accreditations, media mentions, and other public exposures as some 'badge of honour' to establish their epistemic authority.

So, how do I compare the epistemically detrimental dissent produced in the epistemic pathologies I have in mind? Science denialism is a direct response to mainstream science, where the intention is to disrupt mainstream science. In contrast, pseudoscience is presented as 'better' science with the relevant claims to having legitimate epistemic authority, implicitly positioning itself in opposition to the scientific consensus (admittedly, as mentioned before, there are some grey areas and there often is some overlap between pseudoscience and science denialism). I take a broader approach in considering epistemically detrimental dissent than Biddle and Leuschner do. Biddle and Leuschner's account considers *inductive* risks by considering the risks to the public and the industries involved and how these kinds of dissent can also impact policymaking further along the line (2015, p. 273).

However, when discussing pseudoscience, considering these risks is not always apt or necessary to understand the notion of 'epistemically detrimental dissent'. Sometimes, there are no industries involved that must deal with potential financial harm (such as when we talk about the tobacco industry and science denialism). To me, the *source* of the dissent is

[56] Some of the accreditation bodies are the American Association of Drugless Practitioners (https://aadp.net) and the British Association for Holistic Medicine and Healthcare (https://bhma.org), amongst others.

[57] See Posadzki et al. for a presentation of a review study of 35 reports that considers the findings of adverse effects of homeopathic medicine use (2012).

essential. It comes from *antagonistic non-experts* (who sometimes have credentialed scientists backing them), where this dissent effectively 'downgrades' the epistemic authority of the relevant scientific experts when it results in a rejection or lack of acknowledgement of their epistemic authority.

It might at first seem that there are no 'relevant scientific experts' when I talk about alternative medicines. And, if there are no 'relevant scientific experts', how can I say there is epistemically detrimental dissent which causes obstructions to the production of scientific knowledge? When alternative drugs and therapies start impacting people's decisions on vaccine use, the extent of the impact and the affected scientific communities become clearer. Alternative medicines and therapies then become a topic that needs to be addressed. Consider, for example, the spread of the 'alternative' treatments for COVID-19 during the pandemic, where the most prominent case that comes to mind is that of Ivermectin. The following chapter will discuss the Ivermectin and COVID-19 cases in more detail. Still, it is crucial to note that the Ivermectin controversy produced significant epistemically detrimental dissent during the pandemic.[58] Ivermectin was not only used as a tool by science denialists, but it also became something that many pseudoscientists latched onto. My approach in focusing on the *source* of the epistemically detrimental dissent works for the pathologies I have in mind.

Think, again, of alternative medicine proponents. They pursue their 'science' and claim it *is* scientific, but they are not all involved in creating a narrative of dissent to oppose mainstream science. Mostly, they claim to *possess* epistemic authority and to *be* scientific experts. However, even though pseudoscience does not position itself as a direct attack on mainstream science in the same way as science denialism, I believe that a consequence can be the production of epistemically detrimental dissent. When someone *claims* to have epistemic authority on a scientific matter which they do not, they make an implicit (or sometimes explicit) claim that their ideas should be considered with equal—or even *more*—respect as the claims from mainstream science. Here, they create the impression that their ideas and theories should be deemed to have the same epistemic authority and legitimacy as the claims from scientific communities. A non-expert, who might be trying to find the best treatment for their cancer, could be fooled into thinking that a homoeopath's and oncologist's suggested treatments come from a place of equivalent epistemic authority.

[58] Some discussions of the consequences (which will be discussed in more detail in the following chapter): Garegnagi et al. (2022), Caly et al. (2020), Schraer & Goodman (2021).

In other cases of pseudoscience where the issue is highly politically or ideologically charged, such as Intelligent Design Science and Evolution Science, an especially harmful kind of epistemically detrimental dissent can result. As discussed before, epistemically detrimental dissent often means that scientific experts are drawn into court battles and cases where valuable time and resources are wasted.[59] In the next section, I will show how wasting time and resources is also epistemically harmful as a secondary harm.

When we compare the epistemically detrimental dissent in science denialism and pseudoscience, it becomes clear that the difference is in *how* exactly the dissent is produced because of the claims the antagonistic non-experts make. With pseudoscience, epistemically detrimental dissent comes from antagonistic non-experts and their claims to *possess* epistemic authority. In contrast, with science denialism, the epistemically detrimental dissent comes from the arguments against scientific expertise and the *denial* of scientific expertise. The problem with pseudoscience is when its claims to have scientific expertise gain enough support that scientific experts are forced to address them, such as Intelligent Design Science and Evolution Science or Ivermectin as a cure for COVID-19. Pseudoscientists who falsely claim to possess epistemic authority are elevated to the same level of epistemic authority as scientific experts by the public, and scientific experts must address the resulting problems.

There are a few methods of dissent productions that I can identify (although there are many more—especially in the rhetorical strategies of science denialism): 1. when scientists outside of the scientific community create dissent through the production of research that supports dissenting claims (for example a. when the tobacco industry-funded research to show that smoking is not harmful, and b. when the petroleum and other similar industries worked towards casting doubt on the connections between the fossil fuel industry and anthropogenic climate change), 2. when the dissent is created by scientists who cannot properly be called scientific experts, who have dissenting views, and who are appealed to comment on the scientific issue at hand (see for example physicist Frederick Seitz who contradicts Climate Change Science, but is now retired and not engaged in any new research, Oreskes, 2007, p. 75), 3. when dissent is created outside of the scientific community by politicians, (for example, an interview with politician Ted Cruz that I will discuss in more

[59] Think, again, about some of the American court cases regarding Evolution and Creationism/Intelligent Design Science, some of the major ones being *Epperson v. Arkansas* in 1968, *Segraves v. State of California* in 1981, *McLean* v. *Arkansas Board of Education* in 1982, *Edward v. Aguillard* in 1987, *Webster v. New Lenox School District* in 1990, *Peloza v. Capistrano School District* in 1994, *Freiler v. Tangipahoa Parish Board of Education* in 1997, *Rodney LeVake v. Independent School District 656, et. al.* in 2000, *Selman et. al. v. Cobb Country School District et. al.* in 2005, and *Kitzmiller et. al. v. Dover* in 2005).

detail in the following chapter), 4. when the dissent is created via false claims to being a scientific expert *qua* epistemic authority (claims from Intelligent Design theorists, or claims from vets that say that Ivermectin is suitable for treating Covid-19, for example) and sometimes 5. when there are accusations of corruption (where these kinds of allegations can come from any of the epistemic pathologies I have discussed).

Intuitively, not all of these kinds of epistemically detrimental dissent appear to be epistemically harmful to scientific experts and scientific communities. For example, when politicians create dissent, would the harms not be restricted to non-experts? Epistemically detrimental dissent can also be *epistemically* harmful to scientific experts and scientific communities, and the harms are not restricted to non-experts, as will be discussed in the next section.

Another important note is that empirical research has provided some evidence that there is a greater acceptance of scientific consensus amongst non-experts who see climate science as 'the search for truth'. In contrast, those who see science as a 'debate' of some kind are more likely to reject a consensus (Bertoldo et al., 2019, p. 778). Furthermore, there are also empirical studies that show how a perceived consensus increases the acceptance of science. When non-experts are made aware of a strong consensus on a particular scientific issue, they are more likely to adjust their beliefs (Lewandowsky et al., 2013, p. 402). The more epistemically detrimental dissent is created, the more the idea of science as a 'debate' is reinforced. The more the idea is created that there is no firm consensus on particular scientific issues, the less likely non-experts are to accept scientific claims. The more the idea of science being a 'debate' with no consensus is reinforced, the more scientific experts are forced to spend their time and resources to address problems and the more the relevant scientific communities and members of those communities will experience the kinds of epistemic harms I will discuss in the next section.

When there is epistemically detrimental dissent *and* the epistemic harms I identify, it helps indicate that scientific experts face impediments to exercising their epistemic agency. As will be shown, some secondary epistemic harms indicate obstruction to this agency. There are impediments to their epistemic agency in producing knowledge and engaging in knowledge production in epistemically virtuous ways. The following section will discuss various primary and secondary epistemic harms.

3. Epistemic Harms to Scientific Communities and their Members

How are these forms of dissent *epistemically* harmful to scientific experts and scientific communities? The primary epistemic harm is in the obstruction of exercising the scientific expert's *epistemic agency*. When there is a rejection or lack of acknowledgement of the epistemic authority of scientific experts, their epistemic agency is obstructed. This is the *primary* epistemic harm. And remember, as mentioned in § 1, when we talk about the epistemic agency of *scientific experts*, it is a particular kind of epistemic agency as a producer and disseminator of scientific knowledge and the provider of *preemptive reasons for belief* when they testify. The primary epistemic harm is in the obstruction to their epistemic agency as a provider of preemptive reasons for belief.

Scientific experts *qua* epistemic authorities are epistemic agents who can engage in certain epistemic practices within scientific communities, where those practices help produce and share scientific knowledge. Their epistemic authority as scientific experts gives them the epistemic agency to not only engage in these practices within their scientific communities but also to provide preemptive reasons for belief when they testify to non-experts. When my friend wants to tell me about something she read about the state of climate change (and we have a relatively similar level of knowledge on the topic) and I obstruct her from telling me about it, I am harming her epistemic agency as a giver of knowledge. However, in this case, we are epistemic peers, and I do not reject the unique *kinds* of reasons provided when a scientific expert testifies. Something about the epistemic harm is different when I reject the testimony of a scientific expert versus the rejection of my epistemic peer's testimony. When I reject the scientific expert's epistemic authority and the preemptive reasons for belief they provide, I downgrade their epistemic authority. When I reject my friend's testimony in the above scenario, I am not downgrading her epistemic authority as the kind of epistemic agent that a scientific expert is, as she does not possess that kind of epistemic authority. I am not saying that rejecting my friend's testimony is less *bad* in some other ways. Perhaps, if I had been a white male and my reasons for rejection had been because of a gender prejudice, it could be equally bad or even worse. I am, for now, only making a case about a difference in the kind of *epistemic agency* and *epistemic authority* that is being obstructed.

In terms of the *secondary epistemic harms* to scientific experts, many knock-on harms are identifiable and, *alongside* the presence of epistemically detrimental dissent, they provide evidence of the primary epistemic harm that takes place. Biddle and Leuschner have done a

lot of work identifying some of the secondary epistemic harms that result from epistemically detrimental dissent, as I will discuss in this section (2015). However, their analysis misses a crucial part of the question. They accurately identify that epistemically detrimental dissent causes many obstructions to producing and disseminating scientific knowledge. There is a more fundamental question to be asked: *Why* does epistemically detrimental dissent obstruct the production and dissemination of scientific knowledge in the scientific community in the way it does? This is the answer I provide: when there is epistemically detrimental dissent, the *epistemic authority* of scientific experts is rejected or not acknowledged as there is a downgrading of their epistemic authority. What happens is that there is an obstruction to their exercising of their *epistemic agency* not only as producers and disseminators of scientific knowledge within the scientific community but as an epistemic agent whose testimony provides preemptive reasons for belief.

In this section, I will discuss many knock-on secondary epistemic harms in more detail. As mentioned, I take evidence of the secondary epistemic harms *along with* evidence of epistemically detrimental dissent as an indication that there might be a primary epistemic harm that takes place prior to the secondary harm. When we have proof that scientific experts do not engage in production and dissemination, and we can see that it results from epistemically detrimental dissent and a rejection of their epistemic authority, it is fair to say that there is an impediment to their epistemic agency.

When scientific experts are less actively engaged in the production and dissemination of scientific knowledge and more hesitant to engage in the relevant epistemic practices, something has happened to obstruct them in effectively engaging in these sorts of activities would be evidence of a healthy exercising of epistemic agency. The epistemic agency of scientific experts *qua* epistemic authorities is very closely tied to their *epistemic agency* within the scientific community: their engagement in certain kinds of practices within scientific communities, such as the producing, sharing, disseminating, considering and interrogation of evidence, etc., that are all a part of the workings of a scientific community and the processes of coordination and competition. However, remember that I mentioned that a reduction in engagement in these activities *in itself* is not evidence of the primary epistemic harm. There could be other reasons for these obstructions, such as the loss of financial support. What is crucial is the presence of epistemically detrimental dissent.

There might be many more secondary epistemic harms than I can identify in this space, so I will only focus on some of the most apparent harms. Biddle and Leuschner identify three distinct ways in which epistemically detrimental dissent can inhibit knowledge production,

sharing, and retention (in their case, specifically in instances of science denialism): 1. how research is *conducted* can be largely influenced by financial factors, such as the industry that pays for specific research to be done and often imposes limits on the kinds of experiments that can be done, 2. how research is *disseminated* is also directly influenced by the industry, as the industries can impose restrictions on what results can be disclosed to the public, or published in journals, and 3. scientists can avoid following certain *areas of research* as a result of how rewards and incentives influence industry-friendly research areas (2015, p. 274). Kempner did an empirical study that investigated the degree to which scientific experts and scientific communities can self-censor in applying for funding when there are areas of enquiry that receive a lot of opposition from funders, or how they even avoid certain areas of enquiry altogether when the circumstances are antagonistic (2008). Kempner's empirical research supports Biddle and Leuschner's analysis of how epistemically detrimental dissent can inhibit knowledge production, sharing, and retention (2008).

In concrete terms, when there are cases of epistemically detrimental dissent, they can cause impediments to the production and dissemination of scientific research insofar as they divert cognitive and financial resources from the inquiry itself, which is where the focus should be (Martini & Andreoletti, 2021, p. 4). When scientific experts are forced to respond to the demands and objections of those outside of science, it can use up valuable time and other resources that could have been used more effectively in doing new research, etc. (Biddle, Kidd, Leuschner, 2017, p. 168). This is a specifically *epistemic* harm as it is an obstacle to knowledge acquisition, sharing, and possibly retention. Further, imagine the damage that can be caused during a time-sensitive crisis, such as COVID-19. The harms can be significant when scientific experts are forced to respond to outside attacks when there is a time-sensitive crisis and a need to produce answers to scientific questions.[60] In a survey done to investigate some of the negative impacts some scientific experts experienced when they reported on the pandemic in the media, 15% of 321 reported that they received death threats (Nogrady, 2021). Some of the other negative impacts were due to attacks on their credibility, physical attacks, threats of physical or sexual violence, and emotional and psychological distress (Nogrady, 2021).

Further to these ways of impeding knowledge production, scientists employed by the antagonistic non-experts produce fraudulent, erroneous, or misleading findings, adding to the

[60] For an article that reports on some of the attacks and threats leveraged at scientific experts during the pandemic, see here (Nogrady, 2021): https://www.nature.com/articles/d41586-021-02741-x.

epistemically detrimental dissent and consequences thereof. Scientific communities are good at identifying research outputs that could be corrupting (such as with fraud, errors, or misleading research). However, it is still the case that their time and resources could have been used far more effectively. Instead of engaging in productive work, they must address research that could be perceived as misleading to policy-makers or other parties outside the scientific community.

For example, consider again the opinion piece published on *The Heartland Institute* website, dated 21 December 2018.[61] Again, I quote the summary of text in the Non-Governmental International Panel of Climate Change's report, titled *Climate Change Reconsidered II: Fossil Fuels* (own italics):[62]

> The more than *700-page report* consists of eight chapters, the first two providing a *foundation in environmental economics and climate science* that serves to inform the remaining chapters. These chapters detail *how the use of fossil fuels has contributed to human prosperity, improved human health and welfare, and even benefited the environment*.
>
> […]
>
> Citing *thousands of studies and using hundreds of graphics*, "fossil fuels deliver affordable, plentiful, and reliable energy that is closely associated with key measures of human development and human welfare," says the report. "There is a strong positive relationship between *low energy prices* and economic prosperity. *Economic prosperity in turn is crucial to human health and welfare*."
>
> The *evidence* human fossil fuel use is causing dangerous warming is "tenuous" at best, CCRIIFF shows. By comparison, *the benefits from the use of fossil fuels are evident*. As a result, *it would be dangerous for governments to force the world to dramatically decrease the use of fossil fuels*.

Some of the research presented in the reports is legitimate. As mentioned in Chapter 4, there could be research that shows how the use of fossil fuels has improved the general prosperity of humans. It is undeniable, and I doubt any reasonable scientific expert could

[61] Burnett, 2018: https://heartland.org/opinion/fossil-fuels-critical-to-prosperity-nipcc-report-shows/

[62] The original report was edited by Bast and Bast (2018). This quotation is from a summary presented in the opinion piece by Burnett (2018).

deny it. But what happens is that scientific experts often must address this kind of research and spend their time and resources contextualising the findings to non-experts and relevant parties. One way non-experts could misinterpret these claims is by taking these findings as evidence that the use of fossil fuels presents far more positive consequences than the threats of anthropogenic climate change.

This is one example of how antagonistic non-experts can impede the active engagement of scientific experts and communities in the production of knowledge. There are various other examples of these kinds of obstructions. When Creationists claim that Intelligent Design Science is a legitimate science and they push it so far as to make legal cases for its inclusion in school science classes, it requires the involvement of scientific experts to refute these claims, meaning that scientists who could be engaged in other epistemically advantageous work are now sidelined to engage with dissent that is simply bogus. Another example is that of Climate Change Science. With the Climategate leak, scientists who were involved with crucial research were sidelined and forced to engage with attacks on their scientific research, its legitimacy, and even their moral and epistemic characters (Biddle, Kid, Leuschner, 2017, p. 168). It could halt scientific progress even further by reducing the intakes of new students in certain areas of research as they are aware of the environment of dissent and backlash, and some scientific experts have mentioned reductions in student intakes (Biddle, Kidd, Leuschner, 2017, p. 168). Effectively, progress in the scientific domain is negatively affected, and the effects of the epistemically detrimental dissent can, potentially, extend well into the future, such as when potential students avoid certain areas of research and we have fewer scientific experts in those fields in a few years (Biddle, Kidd, Leuschner, 2017).

Another way in which epistemically detrimental dissent can epistemically harm scientific progress is that it can cause *funding* to be directed towards research that does not provide an accurate account of the current significant questions within the relevant scientific domain. For example, consider the earlier case of focusing on the positive impacts of fossil fuel usage. Even though the research is legitimate, it does not accurately account for the current relevant questions within climate science. The research is presented as relevant to the ongoing research in climatology, even though it does not engage in the critical pressing questions, such as the degree of temperature increases, sea rise levels, or other critical open questions. Furthermore, the research on the positive effects of fossil fuel usage is presented as studies relevant to the specifics of anthropogenic climate change, even though the study itself has nothing to do with the intricate details of anthropogenic climate change.

The harms produced via epistemically detrimental dissent and the resultant rejection of epistemic authority function at the individual level (the scientific expert) and the community level (the scientific community). On the one hand, there are harms to the scientific community as a whole (which are secondary harms). On the other hand, there are harms to individual scientific experts (primary and secondary). To better explain some of the secondary epistemic harms to the scientific community, I will first consider the secondary epistemic harms to individual scientific experts as the individuals are more vulnerable than the scientific community. Crucially, the scientific community has a greater capacity to deal with the harms as its sociological setup protects it to a significant degree and makes it robust.

However, when considering the potential epistemic harms, it is crucial to keep in mind the scale of scientific communities, as I discussed in Chapter 2. When I talk about the 'scientific community' and its mechanisms, it is a scientific community that includes many scientific experts working in smaller groups on specific questions. Think of the different groups of scientists working on cancer research, for example, across many individual universities, research centres, and organisations worldwide. This is why a scientific community is so robust: the research that we eventually consider as the product, i.e., collective knowledge and consensus claims, is most likely exclusively not the product of one of these smaller groups of scientists. It is the product of scientific experts who work independently across the many smaller groups. This means that even when bias could find its way into a specific smaller group's work, the larger community can still effectively help to identify and eliminate bias.

This is why a scientific community is robust, and individuals are more vulnerable: individuals and smaller groups of scientific experts can more easily be isolated and manipulated. Furthermore, this is why it is the case that the larger the scientific community is, the more robust it will be.

3. 1. Individuals and their Increased Vulnerability

When there is the persistent—and antagonistic—presence of epistemically detrimental dissent along with the rejection or the lack of acknowledgement of the epistemic authority of scientific experts and scientific communities, the vulnerability of individual scientific experts is increased in various ways. Firstly, the rejection of their epistemic authority is the primary epistemic harm—there is an obstruction to exercising their epistemic agency as a scientific

expert *qua* epistemic authority. The scientific community *as a community* cannot be harmed in this same intrinsic epistemic way. Still, the knock-on secondary epistemic harms can harm the community and its members.

However, the individual scientific expert is far more vulnerable to secondary epistemic harm than the community, as they can be isolated, targeted, and exploited. When individual scientific experts repeatedly get harmed via the primary harm, their vulnerability to the secondary epistemic harms increases. I will now discuss some of the secondary epistemic harms.

3. 1. 1. Robbing Scientific Experts of their Status as 'Scientific Expert *qua* Epistemic Authority'

One way scientific experts can experience secondary epistemic harm is when they are robbed of their status as scientific experts. This can, potentially, happen without their awareness, such as when they unknowingly become involved in research that has hidden agendas—think of the tobacco industry. As it is possible that the research agenda and how the research findings will be implemented outside of science is not immediately transparent to the scientific experts involved, they might believe that they are engaging in research in a healthy scientific community where there is a sincere engagement in producing results that will be accurately communicated to relevant parties. If they are involved in the work of a group of scientists that becomes a part of these manipulations, they will, however, lose their status as a *scientific expert* as they are no longer a part of the broader scientific community that reliably produces what we want from it.

I remind the reader that when a group of scientists work in this way and they are corrupted, they are not a *scientific community*. This is a case of a smaller group of scientists who have probably been isolated from the broader scientific community as they have been provided funding and work in a more isolated environment. In itself, there is nothing wrong with a group of scientists working in this way, as I have mentioned before. However, they risk losing their status as a scientific expert when unaware of how their findings will be manipulated and used.

In some of these cases, it is plausible to argue that scientists who worked to produce research for the tobacco industry were not immediately aware of the underlying manipulative strategies of the tobacco industry. However, I believe that it is apt to say that, at some point,

scientists who work within such a corrupted environment *should* become aware of the corruption and that there is a firm responsibility for them to correct what is going on—even if they are only able to fix their behaviour by leaving the corrupted environment.

This kind of responsibility could be, what Cassam calls, *revision responsibility*; i.e., there is a responsibility to *revise* the specific way of thinking and behaviour if they become aware of the vicious nature, even though they might not have been responsible for *acquiring* the vicious thinking (or behaviours) (2019, pp. 18-19). This leads to the next section where I will talk more about epistemic vice. When we talk about individual scientists who were aware of the epistemic corruption in the scientific activities of the involved scientists, such as with fraud, I believe the discussion is instead about the moral corruption of the scientists involved. There was a knowing and willing participation in the relevant corrupted practices.

3. 1. 2. Turning Epistemic Virtue into Epistemic Vice

When scientists constantly face the kind of antagonism that comes via epistemically detrimental dissent, they are more susceptible to their values and norms being corrupted, meaning that there is an increased vulnerability of them becoming epistemically vicious (Biddle, Kidd, Leuschner, 2017, p. 179). When the scientific community loses its outside support—such as political support and, sometimes, connected financial support—it can weaken scientists and make them more susceptible to other epistemic vices, such as epistemic timidity (Biddle, Kidd, Leuschner, 2017, p. 179).

What the epistemically detrimental dissent and consequent lack of acknowledgement or rejection of the epistemic authority of scientific experts further does, is to produce the kind of environment where epistemic vice can flourish: this is the kind of *epistemically corrupting conditions* that Biddle, Kidd, and Leuschner identify that means that the epistemic agents (scientific experts and scientific communities) are epistemically harmed insofar as their epistemic environment becomes conducive to the development of epistemic vice rather than epistemic virtue (2017, p. 166). This is one way the scientific experts are more vulnerable and epistemically worse-off than they would have otherwise been.

An analysis of epistemically detrimental dissent reveals an intuitive connection with the idea of epistemic vice, as per Cassam's definition, which I adopt: an epistemic vice obstructs the *gaining, sharing, and retaining of knowledge* (2019, p. 6). Cassam's obstructivist account of epistemic vice emphasises the *consequences* of epistemic vices on our knowledge

(acquisition, sharing, and retention of knowledge) rather than on the *motives* of the vices (2019, p. 5). This is useful when discussing how scientific experts can become epistemically vicious due to corrupting influences. I want to talk about the epistemic corruptibility or corruption of otherwise epistemically virtuous scientists and the *consequences* of that epistemic corruptibility or corruption. When individual scientific experts become corrupted or more vulnerable to corruption, it does not necessarily mean they were willingly corrupted. It can simply mean that the environment has become conducive to becoming epistemically vicious. Talking about the *consequences of epistemic vice* makes the most sense, at least within the context of the scientific community and the individual scientific experts *within that community.*

What epistemic vices can potentially become manifest? Cassam's distinction between character vices (understood as *epistemic* character vices) and thinking vices helps to identify exactly what kind of epistemic vices we talk about in this sociological context (2019, p. 57). When scientific experts become vulnerable to the development of epistemic vice, I believe that we talk about the potential epistemic corruption of scientists on a more superficial level than their epistemic *characters* being corrupted or corruptible. The difference between a character vice and a thinking vice is a matter of the difference between traits and actions: a character vice is a trait that a person possesses that systematically affects them epistemically, whereas a thinking vice has something to do with the action of a specific agent, perhaps in an isolated case (Cassam, 2019, p. 57).

As an example, I will consider closed-mindedness, as it is often considered a paradigmatic example of epistemic vice due to it being directly related to those activities that we consider epistemic, such as thinking, reasoning, and responding to new information (Cassam, 2019, p. 33). When we say that a person has the epistemic vice of closed-mindedness—i.e., we are saying that they *are* closed-minded—we are saying something about the *consistency* of displaying that epistemic vice. It says something about an epistemic trait that they *possess*. In a situation where that person could be open-minded or closed-minded, I would expect that person to be closed-minded as I believe that it is a trait they *possess* and are most likely to display in a situation where they could be either open-minded or closed-minded. We are saying that they have some consistent trait of being resistant to receiving information that opposes their existing beliefs.

When we talk about someone who is closed-minded *in their thinking* about a particular situation, we might be talking about someone whose actions in this case are closed-minded, but they might be behaving out of their epistemic character as they are usually open-minded

(Cassam, 2019, p. 56-57). Something about the particular *context* causes them to behave out of character. I might be surprised when someone is closed-minded in their thinking when I consider them to be open-minded *characteristically*. In the case of closed-mindedness as a character trait, we say someone *is* closed-minded, whereas in the case of a thinking vice, we believe someone's way of *thinking* is closed-minded (Cassam, 2019, p. 56).

This difference between *character* and *thinking* epistemic vices helps make sense of scientific experts' potential epistemic corruptibility. The kinds of epistemic virtues that a scientific community helps to foster are mostly *thinking virtues*: in some cases, the individual scientists might possess a specific thinking virtue that, coincidentally, is also a *character virtue* for the particular individual*,* i.e., they *possess* that epistemic virtue as a character trait that we expect from them consistently across many different situations. However, this distinction between character and thinking virtues helps to show how scientists can become epistemically corrupted in their *thinking* rather than their characters becoming corrupted (although it is, naturally, possible that one's epistemic character also becomes corrupted). In their private social engagements, a scientific expert might be epistemically closed-minded regarding other issues, such as their political views. We might say that their closed-mindedness is domain-specific (Battaly, 2018, p. 26). But for the sake of science, we hope that they will think virtuously, be open-minded, and work within the domain of their scientific endeavours and not be negatively influenced by epistemic vices that could potentially cause them to be biased in their work.

Again, the kind of community that a scientific community *is* effectively protects the individual scientific experts from developing thinking epistemic vices. If the mechanisms of praise and blame or reward and punishment are so strongly built into this kind of community, and if there are specific values that we hope direct scientific enquiry within scientific communities, epistemic virtue and vice is a natural way to talk about epistemic activities within the community. After all, when we talk about a scientific expert, it is someone who has been initiated into a particular tradition, which implies the presence of specific ways of thinking and doing that are epistemically (as well as morally) praiseworthy.

A scientific community has mechanisms that reward or punish scientific experts if they behave epistemically virtuously (producing research in ways that are evidence of epistemic virtue) or, on the contrary, epistemically viciously (producing research that is evidence of epistemically vicious behaviour).[63] When engaging in scientific activities, certain things are

[63] I do not rule out the idea that epistemic vice could potentially produce something that a scientific expert

valued in science, and we hope that underlies the work scientists do (broadly speaking, things such as objectivity, impartiality, consistency, etc.). When a group of scientists are a scientific community in the sense I have defined such a community, the mechanisms we expect to work in such a community help create a scientific community that fosters the kind of epistemic virtues we want. I partly agree with Biddle, Kidd, and Leuschner that "if an inquiry is to go well, one thing it needs are inquirers with various appropriate *epistemic virtues, dispositions, or character traits*" (2017, p. 174, my italics). However, I believe it is more apt to talk about '*thinking* virtues' rather than '*character* traits', as Biddle et al. explain (2017, p. 174).

This means that we have a community where the individuals either possess epistemic virtues that help achieve this, or the underlying workings of that community pushes them to behave in an epistemically virtuous way, even if they do not individually possess those virtues as character traits. I believe that it is because of the kind of community that the scientific community is that individual scientists accomplish the possession of various epistemic virtues that are required of them: the sociological set up of the scientific community as diverse, with self-regulating and self-policing mechanisms (and punishment and reward), helps to guide the scientific community to being epistemically virtuous.

When a scientific expert becomes epistemically corrupted, using Cassam's account of *epistemic vice*, it would mean that the manifested epistemic vices obstruct knowledge gaining, sharing, and retention (2019, p. 6).[64] Consider the example where the tobacco industry funded research that had the goal to cast doubt on the causal connection between smoking and lung cancer. Through financing research that only focused on outcomes that favour the involved industry, the internal processes of the group of scientists were manipulated: the kinds of experiments that were created would be designed in a way where a specific result would be favoured above another result. A financial incentive was implemented to push scientists to confirm that outcome. As it was a whole group of scientists who would work on research that would focus on producing specific results, the 'consensus' that would come from this kind of group of scientists would not be representative of a scientific consensus. Partly, because a smaller group of scientists do not represent the scientific community, and secondly, the usual mechanisms at work in a scientific community

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could be rewarded for, but I doubt that that will be in the majority of cases.

[64] This is why certain personal motivations that scientists might have is not necessarily a bad thing. I remind the reader that I have previously shown that the goal of acquiring status, which is highly personal, is not necessarily a vice that a scientist has. It only becomes a vice once those personal motivations become impediments to their engagement in the scientific community in the successful pursuit of collective knowledge through all of its mechanisms.

would not be present as specific outcomes would be rewarded in that smaller community rather than research that comes from the epistemically virtuous behaviour that a scientific community fosters.

When scientists are funded for a specific project, the research might not immediately raise any red flags. Plenty of particular projects that are not de facto wrong or bad in any way are funded. As an isolated case, funded research that is aimed at proving some *other* cause for lung cancer than smoking is not bad, especially in the earlier years when the science was not as well established. When scientists do their work, we hope that they will consider alternative approaches and questions in their research, such as trying to find other causes for lung cancer than smoking, as a broader approach could provide far better and more accurate knowledge than if the research is narrowly focused on one specific approach to the question.

And that is precisely what goes wrong when these industries fund research that tries to protect themselves: the funding is not towards an honest investigation of the question, but only to emphasise those results that will work in the favour of the particular industry. There is plenty of evidence to show how research funding can affect the outcomes insofar as it is inclined to be positively biased towards the funding bodies.[65] Fortunately, there is an increasing emphasis and increasingly stricter regulations regarding the disclosure of funding and other conflicting interests. In the specific case of scientists who work for the tobacco industry, closed-mindedness is epistemically vicious: the involved scientists are closing themselves off to information that might be relevant to what they are researching, and the scientist is closed-minded about *relevant* alternatives to their intellectual inquiry (Battaly, 2018, p. 27).

An epistemic sin in these kinds of decisions is that there are violations of those standards in science that would be relevant here (making sure that the data used or tossed would be standard practice, etc). (Biddle & Leuschner, 2015, p. 272). A violation of those accepted standards in science is a violation of the epistemic virtues that help a scientific community achieve its goal of producing knowledge.

I will now consider some epistemic vices that scientific experts can develop due to

[65] See: Flaco, M. E., Manzoli, L., Bocia, S., et. al., "Head-to-head randomized trials are mostly industry sponsored and almost always favor the industry sponsor" (2015); Stamatkis, E., Weiler, R., Ioannidis, J.P.A., "Undue industry influences that distort healthcare research, strategy, expenditure and practice: a review", (2013); Ioannidis, J.P.A, "Evidence-based medicine has been hijacked: a report to David Sackett", (2016); Fabbri, A., Lai, A., Grundy, Q., Bero, L.A., "The influence of industry sponsorship on the research agenda: a scoping review" (2018); Lundh, A., Lexchin, J., Mintzes, B., et. al., "Industry sponsorship and research outcome" (2017); Rasmussen, K., Bero, L., Redberg, R., et. al., "Collaboration between academics and industry in clinical trials: cross sectional study of publications and survey of lead academic authors" (2018).

epistemically detrimental dissent.

a. Epistemic Timidity

One of the epistemic vices that scientific experts can develop is *epistemic timidity*. I agree with using the phrase 'epistemic timidity' rather than 'epistemic cowardice' in the discussion of epistemically detrimental dissent, as a large part of epistemically detrimental dissent and its harms is the result of an active intimidation and attack on scientists (Biddle, Kidd, Leuschner, 2017, p. 175). How Biddle, Kidd, and Leuschner define this epistemic vice is also good within the context, although I will make one suggestion (2017, p. 176):

> A person with the vice of epistemic timidity characteristically fails to persist in or with an intellectually appropriate but threatening state or course of action, because an aversion to, or desire to avoid, risk of harm has an unwarranted precedence in their motivational structure over a concern for epistemic goods such as truth.

Again, although I largely agree with Biddle et al.'s definition, I believe that, in this case, it is necessary to talk about epistemic timidity as a *thinking* vice rather than saying that it is a vice that someone *characteristically* possesses. This is because, as I have shown, epistemic virtues in science are the kinds of virtues that could more appropriately be called *thinking virtues* due to it being epistemic virtues, *as a way of thinking,* that are fostered in a scientific community. This kind of epistemic timidity might only reveal itself in certain situations rather than being a characteristic vice that scientific experts possess.

Various studies have shown that the IPCC reports err on the side of caution, being conservative in their published predictions and findings (Biddle & Leuschner, 2015, p. 269). One of the possible explanations for this is that they 'tone down' their results to avoid backlash and epistemically detrimental dissent (Biddle & Leuschner, 2015, p. 270). Oreskes and Conway also refer to cases of scientists explicitly acknowledging their fears of backlash when they make strong claims (2010, p. 270). Scientists moderate their claims more than before due to their fear of backlash (Biddle, Kidd, Leuschner, 2017, p. 168). What Biddle, Kidd, and Leuschner emphasise is that when this kind of epistemic timidity becomes manifest, it is not simply a case of scientists "failing to 'stand up for themselves'" but that the

social conditions have been manipulated in such a way where certain epistemic behaviours become "psychologically and professionally reasonable ways to act" (2017, p. 177). When epistemic timidity becomes prevalent, it also impacts the epistemic virtue of truthfulness or intellectual honesty. If a scientific expert becomes epistemically timid and understates findings, they might not be as truthful as they would have otherwise been.

Although this might seem like a case where the relevant scientific experts *and* scientific community had been epistemically corrupted, I do not believe it is the case. Here, it is the *communicative consensus* that has been moderated to a degree where the consensus communicated via the IPCC reports still communicates the overall consensus honestly: the consensus claim regarding the current state of Climate Change Science (i.e., the established consensus that climate change is happening and it is due to anthropogenic activity) is accurately presented and it might be a good idea and strategic to understate some details about the consensus when there is such a significant backlash against the scientific claims. However, it becomes a problem when the scientific experts become epistemically timid in a far more fundamental sense, when it affects their research, the questions they ask and address, the limitations they impose, or how they present these findings to other scientific experts in the relevant community. It becomes problematic when it affects their research on this far more fundamental level.

b. Dogmatism and Scientism

One of the epistemic vices scientists might develop is an unhealthy scientistic—or dogmatic—adherence to science. Lewandowsky, Oreskes, et al. did an interesting study on how dissent in public discourse 'seeps' back into the relevant scientific communities, causing scientific experts to over-emphasise scientific uncertainties, and they often end up playing into the discourses that reinforce the epistemically detrimental dissent (2015, p. 1). It can strengthen the epistemically detrimental dissent as science denialists can use this over-emphasis of the claims scientific experts make as 'evidence' that scientific experts are being dogmatic.

Usually, dogmatism is considered a species of the epistemic vice of closed-mindedness. Closed-mindedness is generally considered an epistemic vice as it implies an unwillingness to consider any new information that might be relevant to some issue (Battaly, 2018, p. 24; Cassam, 2019, p. 29). I believe that, as Cassam, Battaly and others show, it would again be

necessary to consider what the *impact* of closed-mindedness is on the acquisition, retention, and sharing of information, as an epistemic vice is understood in these terms (at least, in terms of the definition I adopt, where there is a consideration of the *consequences* of epistemic vice). If closed-mindedness has a negative impact insofar as it obstructs these epistemic activities, it could aptly be considered an epistemic vice.

We could consider closed-mindedness as an epistemic vice if it means that someone is or thinks in a way that is not open to new information relevant to a particular situation, which is a general understanding of closed-mindedness (Cassam, 2019, p. 35). In this case, there is a problem in the acquisition of knowledge. Secondly, we can see that closed-mindedness is an epistemic vice if it leads to someone not sharing knowledge. However, something else might be at play when we think about knowledge *retention*. Sometimes, closed-mindedness could *benefit* knowledge retention, making it an epistemic virtue in the particular case. Proctor calls this a case of 'virtuous ignorance', which I think is a better way of describing the idea of a closed-mindedness that is epistemically good in some way or another (2008, p. 20).

Suppose I know *p* and am justified in my belief. In that case, it might be okay to reject any new information concerning *p*. A silly example could be something as simple as knowing that I was in Johannesburg on my 21st birthday. When someone says something contrary, I reject it as I believe I am perfectly justified in holding my belief. Regarding this particular case, I am an epistemic authority on the matter. We could argue that due to scientific experts having epistemic authority in their specialised domains, they have good reason for rejecting some cases of new information if they have justification for their beliefs about *p*. In these cases, the rejection is that of *irrelevant* (or misguided) new information, and the scientific expert is protecting their knowledge.

However, in the case of epistemically detrimental dissent that weakens the epistemically virtuous community, and potentially the scientific experts within the community, we might end up in situations where scientific experts are too quick to reject novel information relevant to the particular situation. In this case, we end up with closed-mindedness (or dogmatism) as a distinct epistemic vice. As mentioned earlier, this harmful kind of closed-mindedness can sometimes be seen when scientists have to defend their claims in a public setting where there is a strong rejection of their claims, and they over-emphasise certainties to protect themselves.

3. 2. Scientific Communities: Robust but Vulnerable

When there is epistemically detrimental dissent and scientific experts become vulnerable to the various epistemic harms I have discussed, the scientific community can also become more vulnerable to all sorts of harms. Besides the impediments to effective research production and dissemination, one of the other problems is that it can make the scientific community more *corruptible*. However, keep in mind that when I say the scientific community becomes vulnerable to corruption—more *corruptible*—I am not claiming that the scientific community *is* corrupt. In fact, my understanding of what constitutes a scientific community means that it is very robust, and it would be challenging to corrupt it. The scale of corruption would have to be tremendous, especially in scientific domains that are 'hot topics' and where there is a lot of activity and ongoing research, such as in Climate Change Science.

My claim is rather that because of the increased vulnerability of individual scientific experts, the scientific community is more vulnerable to epistemic harms resulting from the activities of corrupted members. The individuals in the scientific community are *corruptible* and can be corrupted. When there is significant *epistemically detrimental dissent* i.e., dissent that impedes knowledge production, about a particular scientific issue such as Climate Change Science, I believe that it opens the door that scientific communities, where enquiry into that scientific domain that had gone right thus far, can become *corruptible*—both epistemically as well as morally. *Moral* corruptibility is when the members of scientific communities become susceptible to manipulative financial influences, for example. Epistemic corruptibility would be when the corruption of individual scientific experts could weaken the inner workings of the scientific community. However, it is unlikely to completely lose its ability to reliably produce what we expect from a scientific community.

There is an essential distinction between corruption and *corruptibility*: epistemic corruption is when conditions are created that are conducive to corrupting the epistemic agents *and they do become corrupted*, whereas *corruptibility* is "the vulnerability of an agent or community to efforts by others at corruption" (Biddle, Kidd, Leuschner, 2017, p. 179). More specifically, "*p* is corruptible if the values, norms, practices, and other features that would enable it to resist external strategies of corruption are absent, diluted, or otherwise ineffective" (Biddle, Kidd, Leuschner, 2017, p. 179). In the case of corruptibility, it does not mean that the relevant agents *are* corrupted but simply that they are more vulnerable. As mentioned before, contrary to Biddle et al., I believe that a scientific community cannot be

corrupted; only individual scientific experts or smaller groups of scientists within the larger scientific community can be corrupted.

An apt way of describing the notion of corruptibility in science is that scientific experts are weakened, which makes them more susceptible to corruption (Biddle, Kidd, Leuschner, 2017, p. 179). This often affects some 'weaker' members within the scientific community, such as the more junior researchers, who will be more easily corrupted and drawn into the dissenting group's corner (Biddle, Kidd, Leuschner, 2017, p. 179). I believe that more senior researchers could, naturally, also be corrupted. However, my interpretation of the kind of vulnerability Biddle et al. have in mind when talking about junior researchers is that junior researchers are not as well established and 'protected' in the sociological setup of the scientific community as more senior researchers might be (2017, p. 179).

Consider other examples of how corruptibility could be increased when, for example, scientific communities continually face backlash against their claims regarding the science and consensus. Ways in which this could happen is "to attack and drain its resources—time, money, morale—either by cutting them off at the source or forcing them to be wasted […] or by attacking the community's wider public and political support" (Biddle, Kidd, Leuschner, 2017, p. 179). When a scientific community loses its outside support—political, financial, etc.—the scientific community will be more easily corruptible. When external influences affect scientific communities insofar as they increase epistemic corruptibility, there is distinct epistemic harm. When the individual members of the scientific community are more vulnerable to harm—and become corrupted, for example—it can mean that the scientific community has more corrupting influences and other impediments to deal with. This can slow down scientific progress.

However, the kind of community I have described, a *scientific community*, is robust: diversity and other underlying mechanisms help the scientific community keep on track and work through the processes to produce reliable collective knowledge and consensus claims when necessary. When we have corrupting influences that attempt to push scientific experts to produce biased findings, the diversity of scientific communities will play a crucial role. The more extensive and diverse the community, the better it will be able to eliminate these biased influences. It is precisely because of the sociological setup of a scientific community that it will be able to eliminate corrupting biases, for example. When scientists work in isolation, they are far more easily corruptible. However, when they work in a community, they can keep each other in check and identify corrupting biases.

Furthermore, scientific communities have coordination and competition processes that

help to avoid corruption. When scientific experts work in the scientific community, they are involved in the processes of coordination and competition that will help them to achieve the status they want, which comes from the acknowledgement of other scientific experts in that community (Hull, 2001, p. 344). They will not get the status they want if they do not participate in these processes. When scientific experts are within this community, they are effectively forced to a significant degree to partake in honest research practices, meaning they are less likely to be corrupted. This also means that when individuals are corrupt, they will be identified and eliminated because of this robust process of self-regulation at work in the scientific community.

What is further crucial to this understanding of the scientific community as robust is that it 'self-corrects', as mentioned before: when a mistake of some kind is found, it is possible to trace back to the origin of the error and to determine what went wrong. This also means that any subsequent research could be checked to see if it was based on a mistake. Even if a single corruption case slipped through the cracks, the chances of it being discovered and corrected are pretty strong. Furthermore, when the scientific community faces problems of epistemically detrimental dissent in the form of research from dissenters, they will be better able to identify those research cases as malevolent and treat them with greater caution. As there is a community of scientists and more than one scientist who could engage with the corrupted/corrupting research and review the findings, the mechanisms of the scientific community will help to be able to deal with the problem. The IPCC, for example, not only compiles reports that include all research on climate change, but they also identify research that might contain errors, biases, and other problems that should instead be excluded. However, as mentioned before, when scientific experts deal with dissent, many resources could be lost, eventually increasing corruptibility.

It is helpful to briefly return to an objection mentioned in the third chapter of this thesis to consider other claims of corruption: Jon A. Krosnik presented an argument that claims that the motivations of individual scientific experts can become corrupted and will no longer align with the pursuit of finding knowledge and publishing the truth (in Oreskes, 2019, p. 208). The kinds of things that could corrupt them, as he mentions, are prestige, money, status, and all sorts of other things, where these things could trump their motivations to pursue and publish the truth (Oreskes, 2019, p. 208). Further, he claimed that this problem is relevant in *all domains of contemporary science* "because of the incentive structure that rewards rapid publication at the expense of care and diligence" (Oreskes, 2019, p. 229).

As I have already refuted this argument with Oreskes' support in chapter three, I will only

briefly consider this example again: the *kinds* of examples that Krosnik presented in support of this objection are cases of individual scientists being corrupted (such as ESP, the 'replication crisis', an example of outright fraud, etc.) (in Oreskes, 2019, pp. 228, 229, 203, 231). Contrary to Krosnik's claims, these examples have proven how a scientific community is *good* at eliminating these problems. These cases did not represent a *scientific consensus* that had been reached in the scientific communities relevant to his examples. The relevant scientific communities had effectively identified, addressed, and sorted these problems out. However, these examples show the *corruptibility*: individual scientific experts are more vulnerable to corruption, whatever the reasons for corruption might be. This again emphasises the *need* of the scientific community. An individual scientific expert does not create a scientific consensus, and the processes of the scientific community are necessary to present anything as a 'scientific consensus' as this kind of knowledge is, crucially, *collective knowledge*.

4. Conclusion

I have now explained how, when there is *epistemically detrimental dissent* due to epistemic pathologies such as pseudoscience and science denialism, there are epistemic harms to scientific experts and scientific communities. There is primary epistemic harm to scientific experts when there is a rejection or lack of acknowledgement of their epistemic authority and their epistemic agency is impeded. The rejection or lack of acknowledgement is a rejection of the specific kinds of reasons for belief they provide when they testify, namely preemptive reasons for belief. Secondary epistemic harms to scientific communities and their members result from the primary harms. When there is evidence of the secondary epistemic harms, where there are impediments to knowledge production and dissemination in scientific communities, and we are also able to identify epistemically detrimental dissent from antagonistic non-experts, it is most likely the case that there are some primary epistemic harms towards the scientific experts. These harms are *epistemic*, as they make the scientific experts, as epistemic authorities, worse off by impeding their epistemic agency.

In the next chapter, I will show how these primary epistemic harms to scientific experts and secondary epistemic harms to scientific communities and their members are wrongful. When epistemically detrimental dissent produces these harms, the epistemic authority of scientific experts is downgraded. This downgrading is key to understanding the epistemic

injustice I define.

Chapter 6

Wronging the Dodos: A *Scientific Expert Epistemic Injustice*

In this chapter, I will define the epistemic injustice I have in mind. To do so, I will have to show how the primary and secondary epistemic harms resulting from epistemically detrimental dissent are not only harmful but also *wrongful*. Essentially, a *scientific expert epistemic injustice* occurs when scientific experts are epistemically harmed due to the wrongful downgrading of their epistemic authority when they testify about matters relevant to their scientific expertise.[66] It is important to note that the particular epistemic injustice I have in mind occurs in the moment when scientific experts testify. When prior epistemically detrimental dissent occurs, for example in an interview with a prominent science denialist such as Ted Cruz, it produces an environment where the downgrading of the epistemic authority of scientific experts can take place. Considering various moments where precise epistemic injustice occurs will allow for the identification of other kinds of epistemic injustices within the pathological relationships between scientific experts and non-experts, such as an epistemic injustice of some kind that occurs at the time of the epistemically detrimental dissent—in an interview with a science denialist such as Ted Cruz, for example. Considering Kristie Dotson's account of epistemic oppression could provide a useful basis for an analysis of such a kind of epistemic injustice (2012).

Within a variety of potential variations of epistemic injustices towards scientific experts and communities, a crucial feature that will connect them is *likely* to be the downgrading of their epistemic authority. Broadening the scope to create a framework for a variety of epistemic injustices towards scientific experts is outside of the scope of this thesis as it will

[66] In my use of the term 'downgrade', I consider it to be a species of Fricker's account of how a credibility deficit is applied to a speaker (see Fricker, 2007, p. 17 for a detailed discussion of the notion of 'credibility deficit', although this will be discussed in more detail later). The word 'downgrade' reads easier than the phrase 'applying a credibility deficit', and so this is mostly a stylistic decision.

be a large project. For now, I wish to focus on the specific case where an epistemic injustice occurs when a scientific expert testifies. This is, furthermore, why the framework Miranda Fricker provides in discussing testimonial injustices is particularly useful in defining the kind of epistemic injustice I have in mind. When there is a rejection—or a lack of acknowledgement—of the epistemic authority of scientific experts when they testify, they are *downgraded* as a certain kind of knower with a particular type of epistemic authority. The downgrading of their epistemic authority is *wrongful*, and this is where the harm is an injustice. When there is a downgrading of their epistemic authority, it is harmful to their *epistemic agency*—it obstructs them from exercising their epistemic agency, as I have shown in the previous chapter. The downgrading of their epistemic authority and resulting impediment to their epistemic agency as providers of certain kinds of reasons for belief is an intrinsic, primary epistemic harm.

The secondary epistemic harms I identified in the previous chapter result from the epistemic injustice and the primary epistemic harms. These are all also ways we can see that their epistemic agency had been impeded. They are obstructed from producing knowledge, engaging in knowledge production in epistemically virtuous ways, and sharing knowledge within the scientific community. These knock-on harms from the primary harm and injustice can take many forms. These are more *concrete* ways in which there are obstructions to exercising their epistemic agency in producing and disseminating scientific knowledge.

In § 1, I will consider the most typical account of epistemic injustices, focusing on Miranda Fricker's definition of an epistemic injustice as those kinds of injustices that are distinctly *epistemic,* meaning that it is those cases where an epistemic agent is wronged *qua* epistemic agent (Fricker, 2007, p. 1). In the account of epistemic injustices that I define, the harms are not a result of the usual kinds of historical identity injustices, such as race and sex, that are fundamental to Fricker's kind (2007, p. 27). However, the harms to the relevant scientific communities and their members are not superficial. It corresponds with the structural notion of Fricker's account. In Fricker's typical cases, the involved injustice is not just a one-off case of an injustice, but it has a structural social significance due to its connection with the intricate unjust historical social power related to identity (Fricker, 2007, p. 27). Furthermore, it corresponds to Fricker's notion of an epistemic agent being "degraded *qua* knower" (2007, p. 44). The downgrading of scientific experts is a specific kind of downgrading where their epistemic authority as scientific experts is downgraded.

In § 2, I will define the unique epistemic injustice and explain how epistemically detrimental dissent causes the downgrading of the epistemic status of scientific experts and

the resultant primary and secondary epistemic harms. In § 3, I will provide some paradigm cases showing the epistemic injustice. In § 4, I will discuss some *practical* harms to scientific experts. In §5, I will consider some of the resulting harms to non-experts, where they can be epistemic or practical. I believe it is crucial to consider these, as the harms to non-experts can be significant.

1. The Typical Account: Miranda Fricker, Testimonial and Hermeneutical Injustices

In the previous chapter, I explained the difference between epistemic harms and epistemic wrongs. This section will explain how certain kinds of epistemic wrongs are epistemic *injustices*. Although my account is different from the usual kinds, I will discuss Miranda Fricker's account as a foundation for considering epistemic injustices in my account.

Epistemic injustices are, broadly speaking, distinctly *epistemic*, i.e., those related to *epistemic* features of particular social situations where an epistemic agent is wronged *qua* epistemic agent (Fricker, 2007, p. 1). An epistemic injustice is when it "wrongs someone in their capacity as a subject of knowledge" (Fricker, 2007, p. 5). Fricker claims that the primary harm incurred in this injustice is an *intrinsic epistemic harm*, where the knower is harmed insofar as they are "degraded *qua* knower", which harms their *epistemic agency* (2007, p. 44). I will explain Fricker's notion of 'epistemic agency' more clearly in explaining testimonial injustices.

What is crucial in this fundamental account of epistemic injustices is that the source of the injustice is in the unjust relations of historical *social power* that 1. affects the ability to communicate and convey knowledge, as well as/or 2. it affects the knowledge that is available to make sense of specific social experiences (Fricker, 2007, pp. 1, 3, 4). The relevant relations of social power in epistemic injustices are *historical*, being related to the politics of identity, where the identity prejudices at the core of epistemic injustices are often inherited prejudicial stereotypes, such as racial and sexist prejudices (Fricker, 2007, pp. 1, 3, 4, 11). The social context and how the social world functions are crucial to understanding the powers involved, where "shared institutions, shared meanings, shared experiences" are necessary and depend on the coordination of social agents for those powers to work (Fricker, 2007, pp. 11-12). The involved social agents must have "shared conceptions of social identity", which are crucial for the powers to work (Fricker, 2007, p. 14). When there are

these shared ideas of identity and social power, the practical, socially situated capacity to control others can be exercised by an agent, or it can operate structurally.

Fricker identifies two epistemic injustices that she considers as central types of epistemic injustices related to historical social power: (1) testimonial injustice and (2) hermeneutical injustice. A *testimonial injustice* is when prejudice against a particular speaker leads the hearer to consider the speaker as having a decreased credibility (Fricker, 2007, pp. 1, 17). Some agents have more credibility than others due to the identity prejudices and social powers at work (Fricker, 2007, p. 1). For example, a man's testimony might be considered to have higher credibility than a woman's testimony. In this case, the central harm that degrades the knower *qua* knower is that their *epistemic agency* is obstructed: they are obstructed from communicating and sharing knowledge. Communicating and sharing knowledge is an essential capacity "as a giver of knowledge" (Fricker, 2007, p. 44).

A *hermeneutical injustice* occurs earlier in a communicative process when there is a gap in collective epistemic resources. This gap causes a particular person or group of people not to be able to interpret their social experiences accurately, i.e., there is a disadvantage in how they can make sense of some of their experiences due to their identity and the historical relations of social power (Fricker, 2007, p. 1). This kind of injustice comes from specific structural features in a community, which affect the collective hermeneutical resources and, consequently, the epistemic interactions (Fricker, 2007, p. 1). In both typical kinds of epistemic injustice, there is the idea of historical social power, where one agent can be controlled by another agent or structural features of the social situation.

What is important to note is that in the typical cases, the involved injustice is not just a one-off case of an injustice, but it is something that has a structural social significance due to its connection with the intricate unjust historical social power related to identity (Fricker, 2007, p. 27). This is why, in the typical kind, something cannot be called a testimonial injustice if there is just an instance of prejudice against the speaker at a particular time. There has to be a more considerable social significance to the prejudice against the speaker, where the prejudice can be tracked across many different social interactions (for example, an instance of the epistemic injustice occurs in an educational social setting, but it can also happen in political, religious, professional, legal, and other areas of social interactions) (Fricker, 2007, p. 27).

Similarly, in the typical account, hermeneutical injustices are systemic, not simply a once-off. In hermeneutical injustices, there is a structural identity prejudice that affects the collective hermeneutical resources of those targeted, and the specific identity makes the

social group vulnerable to injustices across a broad spectrum of social interactions (Fricker, 2007, pp. 155-156). The collective hermeneutical resources that produce the gap that impedes understanding of social experiences 'traces' them across the various social interactions in the same way testimonial injustice does. What connects these two kinds of epistemic injustices (testimonial and hermeneutical), is that the "subject suffers from one or another sort of prejudice against them qua social type" and in both cases the prejudice tracks them across a variety of social interactions obstructing their epistemic agency, degrading them *qua* knower (Fricker, 2007, pp. 1, 5, 155).

When the epistemic agent who is being epistemically wronged is only fleetingly marginalised in a particular and isolated *instance*, it means that it is not systemic and reoccurring in various other social contexts (2007, p. 156). *Incidental injustices*, which are also about certain kinds of epistemic wrongs, do not have the same status as the systemic kinds, meaning that the systemic nature of the type Fricker calls 'epistemic injustices' is a crucial feature of what makes it that kind of injustice. Fricker provides a further example of an injustice we might want to call an 'epistemic injustice' as the wrong certainly is epistemic, but it does not qualify as an epistemic injustice of the kind she defines.

Even though Fricker does not consider a *credibility excess* as a case of an epistemic injustice, I want to use an example she applied to explain something about *cumulative* epistemic harms, i.e., harms that can *build up* to eventually be significant taken collectively (2007, p. 21).[67] Consider a white male who consistently receives a credibility *excess* when he testifies about all sorts of matters, and eventually, this has "malformed his epistemic character" in a way that amounts to some injustice (Fricker, 2007, pp. 20-21). Here, Fricker emphasises the *cumulative* nature of the harm: there are individual moments where he receives credibility excesses, and *cumulatively*, that builds up to some epistemic harm (2007, p. 21). But Fricker rejects the idea that individual cases of credibility excesses and potential harms are instances of epistemic injustice, since "none of them wrongs him sufficiently *in itself*" (2007, p. 21, own italics). In this specific case, it is only *if* all of those instances of harm somehow coincide in a sequence of events over a period that it builds up to being a more significant harm (Fricker, 2007, p. 21).[68]

The following example (roughly adjusted from Fricker) can explain both testimonial and

[67] It is important to note that Fricker does not deny the fact that cumulative kinds of wrongs can eventually be very harmful and very unjust, but she simply does not consider these cases as the typical of the cases she has in mind (2007, p. 29).

[68] Fricker also discusses the notion of a credibility excess causing epistemic injustices, and rejects the idea (2007, p. 20). I will not engage with this idea as it is irrelevant to the present argument.

hermeneutical injustices (consider the scenario taking place a few decades ago): a woman's testimony in a case of sexual harassment is not taken seriously due to her identity as a woman, the hearer being a man, and the hearer reducing the credibility of her testimony (Fricker, 2007, p. 1). Secondly, a hermeneutical injustice takes place insofar as a woman suffers sexual harassment, but the culture or particular society still lacks the critical concept of "sexual harassment", which is a gap in the collective hermeneutical resources (Fricker, 2007, pp. 1, 150-152). In both cases, the woman is tracked throughout all social interactions due to her identity, where there are underlying historical unjust power relations. These examples show how that same identity prejudice could lead to a testimonial and hermeneutical injustice.

A crucial part of the intrinsic epistemic harm is not only the epistemic harm of being degraded *qua* knower, but that there is another layer to the harm that has symbolic power (but becomes a part of the epistemic insult), where the speaker (specifically in a case of testimonial injustice) is also degraded *qua* human. This degradation becomes central to the epistemic wrong (Fricker, 2007, pp. 44-45). This kind of degradation *qua* human goes along with negative identity-prejudicial stereotypes, such as that "black people are inferior humans to white people", "the working classes are the moral inferiors of the upper classes", "women are irrational", etc. (Fricker, 2007, p. 23). A negative identity-prejudicial stereotype is (Fricker, 2007, p. 35):

> A widely held disparaging association between a social group and one or more attributes, where this association embodies a generalization that displays some (typically, epistemically culpable) resistance to counter-evidence owing to an ethically bad affective investment.

In these cases where a negative identity-prejudicial stereotype is applied, this kind of degradation of knower qua knower, which is simultaneously a degradation *qua* human, is particularly dehumanising (Fricker, 2007, p. 44).

Fricker further identifies secondary harms, which can be practical or epistemic (2007, p. 46). Practical secondary harms are those sorts of harms that result from the primary intrinsic harm but are more concrete. Consider how someone who is the victim of a testimonial injustice in court might wrongly end up going to prison for a long time (Fricker, 2007, p. 46). Other examples Fricker mentions are those where someone might be in a disadvantaged

position professionally and not receive a promotion as they are not perceived as authoritative due to prejudicial stereotypes (2007, p. 46). An example of an epistemic secondary harm is where someone who is systematically the recipient of a testimonial injustice will lose confidence in their beliefs and views, and even in their intellectual abilities, causing them not to pursue specific opportunities in education or other scholarly pursuits (Fricker, 3007, p. 47).

What is crucial to these typical accounts of epistemic injustices is that it explains how these injustices can further perpetuate and reinforce the existing negative identity-prejudicial stereotypes and social power dynamics involved (Duakas, 2019, p. 329). This reinforcement effect further contributes to the systemic nature of these kinds of injustices: as the social power relations are reinforced and perpetuated, the systemic oppression is reinforced. What is important to note is that this is not only to the disadvantage of the oppressed but also to the dominantly situated as the broader community's shared epistemic resources and access to a better understanding of particular social experiences and social relations are obstructed (Duakas, 2019, p. 329).[69]

Fricker's account allows for something to be called an epistemic injustice even when blame is not appropriate, as in her own words, "for something to be an injustice, it must be harmful but also wrongful, whether because discriminatory or because otherwise unfair" (2007, p. 151). This makes perfect sense within the context of structural harms in the way she describes. Even though we cannot immediately blame anyone for the harms that result from hermeneutical injustices, for example, it does not mean that they are not injustices and *wrongful*.

2. Defining the *Scientific Expert Epistemic Injustice*

In this section, I will define the epistemic injustice I have in mind. I will show how the primary epistemic harm to scientific experts discussed in the previous chapter is wrongful and constitutes this unique kind of epistemic injustice. Throughout the discussion, I will also consider some secondary epistemic harms that results from the injustice. I will first provide my definition and then discuss its various features. In the following section, I will provide examples.

Firstly, the definition:

[69] This idea will be crucial in considering the extended harms to non-experts when there are epistemic injustices towards scientific experts.

> a *scientific expert epistemic injustice* occurs when scientific experts are epistemically harmed due to the *wrongful* downgrading of their epistemic authority when they testify about matters relevant to their scientific expertise..

There is a unique epistemic injustice when scientific communities and their members testify about matters relevant to their domain in an environment where epistemically detrimental dissent has led to the erosion of their epistemic authority. This epistemic injustice occurs when the epistemic authority of scientific experts are *wrongfully downgraded* and their testimony about relevant matters is rejected or not acknowledged. When this happens, it is a distinct *epistemic* and intrinsic harm as the involved epistemic agents are wronged insofar as their *epistemic agency* is impeded. The *source* of this epistemic injustice is the downgrading of their epistemic authority. They are hindered in exercising their epistemic agency as providers of preemptive reasons for belief as their epistemic authority is downgraded. Furthermore, they are impeded in exercising their epistemic agency in partaking in the epistemic practices within the scientific community, amongst other epistemic harms, such as being obstructed from exercising epistemic virtue. These are secondary epistemic harms that are the consequence of the epistemic injustice.

The kind of epistemic injustice I define has features similar to those of Fricker's account, although I will not go into those details at length. Firstly, Fricker's epistemic injustice is epistemic in nature as it is a wrong done to someone "specifically in their capacity as a knower" and harms the agent's *epistemic agency* (2007, p. 1). Naturally, the kind of injustice I am defining is also a wrong done to someone in their capacity *as a knower,* and the harm is to their *epistemic agency*. Fricker's notion of 'epistemic agency' largely coincides with my account thereof as the capacity to communicate and share knowledge (2007, p. 44). When the scientific expert's epistemic authority is downgraded, it causes impediments to their *epistemic agency* to produce and share knowledge.

Secondly, there are some similarities with her testimonial injustice. Remember that when there is a testimonial injustice, prejudice against a speaker leads to the hearer applying a *credibility deficit* when the speaker testifies (Fricker, 2007, p. 1). Here, the testifier's epistemic agency *qua* epistemic agent who can communicate and share knowledge is impeded. The similarity is in the idea that the *credibility* of the speaker is downgraded, which

results in impediments to communicating effectively, where I talk about the *epistemic authority* of scientific experts as a particular kind of epistemic agent—scientific experts *qua* epistemic authorities—that is downgraded. Fricker's notion of 'credibility' has problems, such as determining how much credibility a speaker should be afforded.[70] I will not discuss this problem in detail, but I only want to suggest that the account I offer provides a clearer understanding of what the downgrading of the epistemic authority of scientific experts would look like when compared to Fricker's account of the downgrading the credibility of a speaker. Understanding *what* scientific expertise is and *why* it is epistemically authoritative helps to understand what 'downgrading' would look like. There has been a 'downgrading' when there is a rejection or lack of acknowledgement of legitimate epistemic authority. There might be some practical difficulties in determining when someone possesses epistemic authority, but once that is determined, we can see when there is a downgrading.[71]

When we speak about the epistemic authority of a scientific expert being downgraded, it is about a particular kind *qua* scientific expert. However, in the account of an epistemic injustice I provide, there is no *prejudicial* dysfunction in the same way as in Fricker's testimonial injustice. Although prejudice might play a role in the rejection or lack of acknowledgement of the epistemic authority of scientific experts, I am concerned with the particular cases where antagonistic non-experts produce epistemically detrimental dissent that provides the environment for the downgrading to take place. Prejudice could play a role somewhere within the framework, but it is not fundamental or crucial.

I want to go into more detail on my account and discuss how the epistemic agency of scientific experts is impeded and how their epistemic authority is downgraded. When scientific experts testify and their epistemic authority has been downgraded, their testimony is rejected, and the preemptive reasons for belief they provide are also rejected. Their epistemic agency as an epistemic agent who can communicate and share knowledge and provide *preemptive reasons for belief* is impeded. The cases of the downgrading of epistemic authority that I have in mind where there would be an epistemic injustice to scientific experts are those cases where they would be *systemically* epistemically worse-off due to epistemically detrimental dissent and the wrongful downgrading of their epistemic authority.

[70] A significant body of literature engages with Fricker's notion of 'credibility deficit' and other features of epistemic injustice to attempt to clarify how the kinds of 'degradation' of knowers could be measured or better understood. I will list only a handful of sources here that I see as relevant to this debate: Auerback (2021), Boncompagni (2024), Carter and Meehan (2023), Giladi (2018), and McGlynn (2021).

[71] I remind the reader that I am not concerned with these kinds of practical difficulties in my project, as I believe that is an altogether different, complex, big project.

The downgrading of epistemic authority is *systemic* as it targets and affects a specific *scientific community*. Because of the systemic nature of the harms, the harms would not be restricted to an isolated case of a non-expert rejecting what a scientific expert says, but the harms will instead go beyond that.

This brings me to another similarity—and difference—with Fricker's account. Consider again the example of a white male who consistently receives a credibility *excess* when he testifies about all sorts of matters, and eventually, this has "malformed his epistemic character" in a way that amounts to some kind of testimonial injustice (Fricker, 2007, pp. 20-21). Fricker emphasises the *cumulative* nature of the harm: there are individual moments where he receives credibility excesses, and cumulatively, that builds up to some kind of epistemic harm (2007, p. 21). But Fricker rejects the idea that individual cases of credibility excesses or harms such as these are instances of epistemic injustice, since "none of them wrongs him sufficiently *in itself*" (2007, p. 21, own italics). For Fricker, it would only be when the speaker is *systemically* harmed—across many social situations—that this could be the kind of epistemic injustice she has in mind.

The reason I mention this example again, is that the kind of epistemic injustice I have in mind could easily be dismissed as such a 'cumulative' kind, where many instances of harm do not build up to a more considerable harm, which results in the conclusion that it is not the 'token' kind of epistemic harm that Fricker focuses on (2007, p. 21). Even though my kind of epistemic injustice is not the 'token' kind, I believe that it corresponds with Fricker's account of a systemic injustice. When there is the kind of systematic erosion of the epistemic authority of scientific experts that I have in mind, it is no longer incidental. I believe it is structural and more fundamental. It is a downgrading of epistemic authority *across the relevant scientific community* and not simply the downgrading of an individual's epistemic authority in one instance.

As I have shown, when scientific communities and their members constantly face epistemically detrimental dissent, the individual scientific experts within the community become especially vulnerable to the primary epistemic harm (and resulting secondary harms). They are weakened significantly—and more so than the scientific community as a whole. What furthermore happens is that there is a kind of 'reinforcement effect'[72] where the epistemically detrimental dissent and downgrading of the epistemic authority of individual

[72] Nancy Duakas speaks of this 'reinforcement effect' in terms of negative identity-prejudicial stereotypes and how these have a reinforcing effect by further perpetuating the injustice more broadly and systemically (2019, p. 329).

scientific experts end up affecting the other members of the scientific community, the harmful effects to individuals harm the community and its processes, and so forth. Duakas speaks of this 'reinforcement effect' in terms of negative identity-prejudicial stereotypes and how these have a reinforcing effect by further perpetuating the injustice more broadly and systemically (2019, p. 329). Essentially, there is a cycle of reinforcement where the harm to the members of the community further perpetuates the harm to the other individuals, and the harm to the individuals further perpetuates systemic harms to the community. However, as individual scientific experts are more vulnerable to harm, the cycle is more damaging to them.

When we talk about a harm that is cumulative in the sense of a white male's testimony constantly receiving a credibility excess, we are talking about the cumulative effect of instances of harm on him as an *individual*. It also does not have this kind of 'reinforcement effect' where it harms some group he belongs to in the same way as proper epistemic injustices do. Admittedly, the credibility excess the white male receives results from having a particular identity, but these specific cases of credibility excesses are isolated—and specific—to him. The harms towards scientific experts affect them individually insofar as there is an interpersonal kind of epistemic harm (they are downgraded *qua* a particular type of epistemic agent). Still, it is *systemic* insofar as the downgrading of epistemic authority affects the entire scientific community by making it more vulnerable to epistemic harms and the injustice is no longer isolated and restricted to any individual scientific expert.

The epistemic injustice is systemic insofar as it tracks the relevant scientific experts across various activities within and beyond the scientific community and their engagements with antagonistic non-experts and other non-experts. When non-experts believe the antagonistic non-experts, the epistemic authority of scientific experts and scientific communities are downgraded systemically. Non-experts are primed to reject the epistemic authority of scientific communities and their members.

It is important to note that there are cases of epistemic wrongs to individual scientific experts that do not amount to the kind of epistemic injustice I have in mind. Consider the following example: I listen to a white, male specialist on quantum physics (let's pretend, for the sake of argument, that I can understand some of what he says), and I decide that he is talking absolute nonsense and, as a consequence, reject his testimony. In a sense, I am wronging the quantum physicist as a giver of knowledge. I seem to downgrade his epistemic authority and thereby reject the preemptive reasons for belief provided. This instance of an epistemic wrong is isolated and has no broader impact on the scientific community or beyond

the scientific community. The quantum physicist will probably continue his projects as if nothing had happened. The cases relevant to the particular epistemic injustice are when the kind of downgrading of epistemic authority is systemic insofar as it targets a relevant community and its members. There is a structural *social* significance to the epistemic injustice I have in mind. It is about a particular scientific community and its members and their epistemic agency to communicate being impeded *qua* members of that specific community.

I believe that understanding it as 'systemic' rather than *instances* of injustice that are *cumulatively* bad is crucial to understanding the seriousness of the injustice and the degree of its harm. The instances of harm to individual scientific experts can be significant, but the extent of the harm can only be fully understood when it is seen as systemic. Because of its systemic nature, the injustice can occur even without individual scientific experts being present at an occasion where it takes place. Consider, for example, the interview with Ted Cruz that I discussed in Chapter 4. When there is a systematic denialism of the consensus claims on anthropogenic climate change, it is not only the downgrading of a particular scientific expert's epistemic authority in an instance and the harms associated with the individual, but it is the downgrading of the epistemic authority of the *whole* scientific community and its members. Epistemically detrimental dissent does not necessarily only erode the individual scientific experts, but often it targets the products of the scientific community—the collective knowledge. The ability to communicate as scientific experts *qua* epistemic authorities as members of the particular scientific community has been rejected. That is, furthermore, a rejection of the individual scientific experts and their community and its epistemic practices and the knowledge it produces.

Another science-relevant example of an epistemic wrong that does not amount to the epistemic injustice I have in mind is that of a science journal that prefers publications of certain kinds due to the dogmatic adherence to specific methods and the rejection of other methods (Fricker, 2007, p. 27). In this case, there is a wrong towards the scientists who submit their research to journals where legitimate methods are dogmatically rejected, but the wrong is highly localised, and the prejudice that produces that wrong does not make those scientists vulnerable to other injustices (Fricker, 2007, p. 27). This case of a wrong might be so narrow and localised that it only negatively impacts the relevant scientists in the context of that specific journal and no others. These cases show how it is essential to consider which cases of epistemic wrongs to scientific experts amount to the kind of injustice I have in mind.

The kinds of relevant epistemic wrongs are those where epistemic authority is

downgraded due to the scientific expert belonging to a particular scientific community. The types of scientific communities (and members) that are the victims of these injustices are those with a very immediate connection between science and non-experts, which has to do with values and ideologies. As mentioned, scientific communities such as climatologists, scientists involved in lung cancer research, scientists engaged in epidemiology, evolutionists who stand up to Intelligent Design Science court cases, etc.

However, it is essential to remember cases of injustice of the kind I have described, but it is unintentional. When we talk about science denialists—the antagonistic non-experts—who exploit the scientific ignorance of non-experts, for example, the involved non-experts who believe the science denialists could unknowingly become an 'accessory', so to speak, to the epistemic injustice done towards the relevant scientific communities. There is a case to be made that these exploited non-experts unknowingly participate in the wrongs to the relevant scientific communities.

Consider, for example, that I have a very gullible friend. She watches some YouTube videos on climate change that misrepresent the state of Climate Change Science. Eventually, she believes that the current changes in climate are normal and not produced by anthropogenic activities. Consequently, she tells her family this. They eventually disregard what scientific experts say, vote for political parties who claim there is no anthropogenic climate change, and along the line, her acceptance of the denialism can harm many people and potentially influence other people's decisions. In the YouTube video she watched, there was an exploitation of her scientific ignorance and the use of other rhetorical strategies and argumentative tropes, as explained in chapter five, which makes her susceptible, and she accepts what she hears. Essentially, she participates in the broader structural harm to scientific communities and experts, but her actions are, arguably, unknowing. Perhaps there is no blame in this case, but there is still an injustice.

When thinking of the epistemic agency of a scientific expert and how there can be secondary epistemic harms to their epistemic agency, there are many ways in which their agency can be impeded. I have identified most of these in the previous chapter of my discussion of secondary epistemic harms. Their epistemic agency can be hindered in the production and dissemination of knowledge, their epistemic agency as specific kinds of testifiers with epistemic authority whose testimony provides certain types of reasons for belief (or acceptance of testimony), and their epistemic agency as knowers who can exercise epistemic virtue.

These secondary epistemic harms are the consequence of the injustice and, along with the

presence of epistemically detrimental dissent, can be evidence of an epistemic injustice. When scientific experts are forced to respond to objections and demands from people outside of the scientific community—often the antagonistic non-experts and scientists employed by them—it uses up valuable time and other resources that could have been used to do research (as explained by Biddle, Kidd, & Leuschner, 2017, p. 168). When their valuable time and resources are wasted in this way, their epistemic agency is impeded. Furthermore, scientific communities and experts can also be forced to address dissenting research produced by scientists who are working with the antagonistic non-experts, and this can further use up time and other resources, causing an impediment to their epistemic agency.

Consider also how their epistemic agency can be impeded when the environment becomes conducive to developing epistemic vice, as discussed in the previous chapter. Again, Cassam's definition of epistemic vice helps show the connection between it and how it can impede *epistemic agency* (2019). An epistemic vice obstructs knowledge gaining, sharing, and retention (Cassam, 2019, p. 6). When the epistemic environment becomes conducive to the development of epistemic vice rather than virtue, the epistemic agency of the scientific experts is impeded: they are obstructed from producing, accessing, sharing, and retaining knowledge. Epistemic virtue seems crucial to humans' epistemic lives for the production or receiving of knowledge and their retention and sharing of knowledge. When scientific experts become vulnerable to developing epistemic vice, they are vulnerable to developing those kinds of epistemic vices, such as epistemic timidity or closed-mindedness, that impede proper epistemic inquiry. These epistemic vices could hinder the type of scientific enquiry we hope a scientific expert will do well. Again, epistemic timidity could mean that scientific experts avoid certain areas of investigation and dogmatism or closed-mindedness could make them miss valuable epistemic contributions.

In the next section, I will provide examples of moments where the *scientific expert epistemic injustice* occurs.

3. The Injustice and Its Wrongs: Case Studies

In this section, I will consider several paradigm cases of the *scientific expert epistemic injustice,* which, I remind the reader, occurs when scientific experts are epistemically harmed due to the *wrongful* downgrading of their epistemic authority when they testify about matters

relevant to their scientific expertise. When their epistemic authority is wrongfully downgraded, it impedes the exercising of their epistemic agency as providers of preemptive reasons for belief (the intrinsic, primary harm), and it further impedes their epistemic agency in effectively engaging in the epistemic practices within the relevant communities (the secondary epistemic harms).

Again, I remind the reader that the cases I am interested in is when there is the downgrading of the testimony of scientific experts *qua* epistemic authorities due to the epistemically detrimental dissent via antagonistic non-experts. Consider again the following science denialism example in the interview with Ted Cruz (in McIntyre, 2020, pp. 160-161, own italics):

> **Steve Inskeep, Host:** What do you think about what is seen as a broad *scientific consensus* that there is man-caused climate change?
>
> **Ted Cruz:** Well, *I believe that public policy should follow the science and follow the data*. I am the son of two mathematicians and computer programmers and scientists. In the debate over global warming, far too often politicians in Washington—and for that matter, a number of scientists receiving large government grants—*disregard the science and data and instead push political ideology*. You and I are both old enough to remember 30, 40 years ago, when, at the time, *we were being told by liberal politicians and some scientists that the problem was global cooling*.
>
> […]
>
> **Cruz:** *So let me ask you a question, Steve. Is there global warming, yes or no?*
>
> **Inskeep:** *According to the scientists, absolutely.*
>
> **Cruz:** *I'm asking you.*
>
> **Inskeep:** Sure.
>
> **Cruz:** OK, you are incorrect, actually. *The scientific evidence doesn't support global warming. For the last 18 years, the satellite data—we have satellites that monitor the atmosphere. The satellites that actually measure the temperature showed no significant warming whatsoever.*
>
> **Inskeep:** I'll just note that NASA analyzes that same data differently. But we can go on.

> **Cruz:** But no, they don't. You can go and look at the data. And by the way, this hearing—we have a number of scientists who are testifying about the data. But here's the key point. *Climate change is the perfect pseudoscientific theory for a big government politician who wants more power. Why? Because it is a theory that can never be disproven.*
>
> **Inskeep:** Do you question the science on other widely accepted issues—for example, evolution?. …
>
> **Cruz:** *Any good scientist questions all science. If you show me a scientist that stops questioning science, I'll show you someone who isn't a scientist.* And I'll tell you, Steve. And I'll tell you why this has shifted. Look in the world of global warming. What is the language they use? *They call anyone who questions the science*—who even points to the satellite data—*they call you a, quote, "denier". Denier is not the language of science. Denier is the language of religion. It is heretic. You are a blasphemer. It's treated as a theology*. […]

This serves as an example of the epistemically detrimental dissent that could cause someone to reject the epistemic authority of a scientific expert when they testify. If, for example, I listen to Ted Cruz and I believe what he claims and as a result reject the testimony of a scientific expert when they testify on the matter, I am guilty of committing the epistemic injustice I have in mind. I have effectively downgraded the epistemic authority of the relevant scientific expert and rejected their testimony. And as a result of believing what Ted Cruz has told me, I am likely to not only reject this particular scientific expert's testimony on the matter, but also the testimony of other relevant scientific experts.

Consider, also, a case of pseudoscience. I want to focus on the claims made during the COVID-19 pandemic that Ivermectin was an effective treatment for the virus. The claim that Ivermectin effectively treated COVID-19 spread like wildfire over social media and in the press during the pandemic. Ivermectin is an antiparasitic drug that had mainly been used off-label for some viral diseases, as it has a wide range of severe adverse effects for humans (Garegnani et al., 2022). During the pandemic, laboratory work was done to determine its use to treat COVID-19, and there were some initial indicators that it could be an effective treatment (Caly et al., 2020). The results showed, however, that the doses necessary to treat the virus *effectively* would have to be far higher than could be safely approved for human use (Garegnani et al., 2022). However, some smaller groups of scientists produced fraudulent research on Ivermectin and its uses for the treatment of COVID-19, *supporting* the claims that it worked (note that I say 'groups of scientists' and not a 'scientific community')

(Schraer & Goodman, 2021).[73] Some antagonistic non-experts picked up this whole drama, and when scientific experts attempted to contextualise these early fraudulent and erroneous studies, the antagonistic non-experts used it as evidence that the science was 'rigged'. Due to the highly politically and emotionally charged situation during the pandemic, this produced the kind of storm where the types of pathologies I have so far analysed flourished and quickly escalated.

When the initial findings that Ivermectin was effective against COVID-19 got out and started spreading, people even started using the supplies meant for animals. There were many people—and especially some of the antagonistic non-experts—who grabbed onto the claims that Ivermectin worked and used it to promote their pseudoscience or alternative therapies. Dodgy news sources and social media platforms, including Robert F. Kennedy Jr's Children's Health Defense, promoted anecdotal 'evidence' for its effectiveness.[74] In the case of Ivermectin during the pandemic, I think it can be said that a wide range of antagonistic non-experts became involved in producing the epistemically detrimental dissent around promoting Ivermectin. There were cases of science denialism, pseudoscience, and multiple conspiracy theories that resulted from this chaos. One of the conspiracy theories was that ivermectin had been proven to be a successful treatment for the virus and that drug companies wanted to cash in. Therefore, they were "depriving the public of a cheap cure" (Reardon, 2021).

This example shows a substantial similarity to MMRI anti-vaccine narratives that contain pseudoscientific claims, such as that there are alternative ways of preventing viral diseases. When Dr Andrew Wakefield published the fraudulent study that claimed to show a causal connection between MMRI vaccines and autism, it spread like wildfire, and the scientific community was swift to interrogate the findings and uncover the fraud. However, because the topic was very politically laden—values of freedom and choice over your body and what you can do to it—the fraudulent findings spread like wildfire and still have such a firm grip on so many people, even today.

In the case of Ivermectin, the social environment was primed for the fraudulent findings being spread widely *before* it could make its way through the usual self-regulating mechanisms within scientific communities and a proper consensus to form. When the

[73] The fraudulent study was done by Elgazzar et al. (2020).

[74] For Ivermectin coverage by the Children's Health Defense organisation, see the search results on their website for 'Ivermectin': https://childrenshealthdefense.org/search/?search=ivermectin. (Accessed: 13 February, 2025).

scientific community had reached a consensus on the matter—that the necessary dose to treat COVID-19 effectively was too high for human use—the damage had already been done, and the pseudoscience, science denialism, and conspiracy theories regarding the issue had already run their course. The crucial thing to keep in mind is that the initial findings had shown fundamental flaws. Some consequent meta-analyses on the effectiveness of its use included the fraudulent study, and these meta-analytic studies will still show the decrease in deaths that was found in the fraudulent study, even though that individual paper had been removed and confirmed as fraudulent (Reardon, 2021). This shows the terrible consequences of such a fraudulent study in a crisis period where the media often focuses on finding these kinds of reviews that provide an overarching view on the topic of the study. Even though, much like with the studies of the MMRI-vaccine and its causal connections to autism, the study was proven as fraudulent and consequent research and communications of the consensus considered this, antagonistic non-experts only conveniently focused on this earlier study rather than listening to what scientific communities testified about the matter.

So, epistemically speaking, what happened here? I want to analyse this example specifically from the perspective of *pseudoscience* and set aside those cases where ivermectin was used in the rhetorical strategies of science denialists. So, more clearly put, I want to consider how the theory that Ivermectin would cure COVID-19 was first considered a *possibility* in some mainstream science, it was then rejected as the evidence was inconclusive, and then it was taken up by pseudoscientists and others who claimed that they had the epistemic authority on the matter—they were *scientific experts*—and could confidently claim that it worked.

Remember that in pseudoscience, we often have theories that were initially mainstream scientific ideas that got discarded and then picked up again by pseudoscientists (Gordin, 2021, p. 100). In the case of Ivermectin as a treatment for COVID-19, the scientific community emphasised that the evidence for its effective use was inconclusive and that it should not be used as a treatment. Even though this was not an absolute rejection, there was a fair consensus against its use until, at least, more studies had been done. However, consequent studies provided significant evidence that more risks were involved in its use, and the findings were too inconclusive. Pseudoscientists picked up on the rejected theory regarding the uses of Ivermectin. As the claims that it worked were taken so seriously by non-experts (who were particularly vulnerable to being misled during the pandemic), it resulted in a significant uptake by non-experts. The CDC reported a substantial increase in reported calls to poison control centres because of the use of ivermectin (CDC, 2021).

Because of the disastrous consequences of promoting Ivermectin use to treat COVID-19, scientific communities were forced to become involved and do further studies to provide evidence of it not working—on a large scale. However, the resulting studies that prove that it is dangerous to use ivermectin as a cure have not been received well. As a consequence, and especially during the height of the pandemic, many scientific experts who publicly tried to refute the damaging claims of ivermectin's effectiveness in treating COVID-19 even received death threats. Two of these scientific experts are Dr Andrew Hill, a senior research fellow at Liverpool University, and Dr Gideon Meyerowitz-Katz, an epidemiologist (Nogrady, 2021).

From this example of pseudoscience, there can be many cases of the rejection of the epistemic authority of scientific experts when they testify about the relevant matter. In the moment of the rejection, the particular epistemic injustice occurs. This downgrading of their epistemic authority obstructs their epistemic agency as a provider of certain *kinds* of reasons for belief. Some of the terrible consequences of the injustice and its harms (the secondary epistemic harms) are also obvious: scientific experts had to proactively engage with the problem to debunk the claims regarding Ivermectin use, and it used up valuable resources in a crisis.

I wish to discuss one more case of the scientific expert epistemic injustice in an example of the interview of Dawkins with Wright. Consider the following dialogue:

> **Dawkins:** You said that there was no evidence of intermediates, and I told you about five fossils … [inaudible]
>
> **Wendy:** And what I say if that were the case and those were valid there would be tons of evidence because there are so many different species, that there ought to be tons of evidence, even, let's say, for 1% of the macro evolution that's taken place, there should be evidence but there's not even 1%, let alone 10 or 50 or 70%.
>
> **Dawkins:** There is a massive amount of evidence, you just need to go into the books, and go into the museums, and look at it. It's there, you're believing people …[interrupted]
>
> **Wendy:** Yes, and we, and we… and we have been
>
> **Dawkins:** … who are telling you there is… [interrupted]

> **Wendy:** Oh… and again I go back to, it's, um, very demeaning to say that, uh, we only believe what we believe because we've been told that, and yet, we have evolutionary scientists who want to be the ones to tell all of society what is fact and what is not fact and to censor out information that is inconvenient.
>
> **Dawkins:** I'm asking you to go and look at the facts, I don't want you to believe me, just go and look at the facts …

In this example, we have a clear rejection of the epistemic authority that Richard Dawkins has on the relevant scientific matter by a science denialist. In the rejection of Dawkins' epistemic authority, there is a rejection of the preemptive reasons for belief that Dawkins is uniquely able to provide due to his epistemic authority. There is an epistemic injustice in this case.

These three examples show the primary epistemic harm, where the downgrading of the epistemic authority of scientific experts causes obstructions to their exercise of epistemic agency and the secondary epistemic harms resulting from it. The downgrading of the epistemic authority of the relevant scientific experts is an epistemic injustice, more specifically, a *scientific expert epistemic injustice*.

4. Practical Harms to Scientific Experts

Fricker explains secondary practical harms from epistemic injustices (2007, p. 46). Similar to secondary epistemic harms, these harms are the consequences of the primary epistemic harm caused by the epistemic injustice. As these are secondary practical harms, they are not intrinsic, such as the primary epistemic harms that downgrade the knower. Instead, they result from the primary harm and can be described as "follow-on disadvantages" (Fricker, 2007, p. 46).

Some practical harms to scientific communities and their members resulting from the epistemic injustice are significant. My focus in this project is on the epistemic injustice, but it is crucial to keep in mind the practical knock-on harms. These can be especially harmful when we deal with the scientific domains I have in mind that become the targets of the antagonistic non-experts, such as Climate Change Science, anti-vaccine narratives, Intelligent Design Science proponents, and COVID-19-related pseudosciences and science denialism.

There are close ties between some secondary practical and epistemic harms, which are often connected. This helps to show how the practical harms are related to the epistemic injustice. Consider how, for example, reducing funding towards vaccine research would not only be a practical impediment but also an epistemic impediment as it obstructs knowledge production. Some of the other practical harms are, for example, when fewer positions are available for scientific experts in specific fields as funding for those areas is reduced, when scientific experts find themselves intimidated and decide to pursue research in a particular domain no longer, when their time is wasted because they have to respond to antagonistic non-experts, etc.

A further, often-overlooked practical harm is when scientific experts face problems in their personal lives due to the ongoing intimidation. An example is that of Ben Santer who followed the appropriate procedures and addressed reviewer comments on his research (and the compiling of findings for a chapter of the Second Assessment Report issued by the IPCC) after which some physicists who were connected with a think tank accused him of 'scientific cleansing' (in this case used to explain the process of "expunging the views of those who did not agree") (Oreskes & Conway, 2010, p. 3). In brief, as a consequence, he had to spend significant time and effort defending himself and his scientific integrity and reputation, where relevant public publications misrepresented his position by only publishing parts of his responses to the allegations (Oreskes & Conway, 2010, pp. 304). Eventually, the whole affair and associated stress resulted in him being unable to hold his marriage together (Oreskes & Conway, 2010, p. 5). Again, as I mentioned in the previous section, consider the terrible negative impacts scientific experts experienced when they reported on COVID-19 and Ivermectin use in the media, such as death threats, threats of physical or sexual violence, attacks on their credibility, etc. (Nogrady, 2021).

These are only a few examples of the personal impact that could result from epistemically detrimental dissent, the resultant downgrading of the epistemic authority of scientific experts, and scientific experts having to defend themselves and deal with other practical obstacles. If I were a scientific expert and I was working on COVID-19-related research during the pandemic, I would undoubtedly feel intimidated if I received death threats. Even worse, I might reconsider my research activities entirely if I had a family and children and had concerns about their well-being. Again, I believe it is an example of a 'reinforcement effect' I mentioned earlier. The harms experienced in their position as scientific experts affect their personal lives, and those personal harms, in turn, affect their lives as scientific experts. These combined harms make the scientific experts even more vulnerable to primary and secondary

epistemic harms.

5. Harms to Non-Experts

Even though the knock-on effect harms to non-experts is not fundamental to the definition of this kind of epistemic injustice, it is worth mentioning some of these harms. Sometimes, these harms can be a part of the reinforcement effect I have discussed at various points. Non-experts might further harm the relevant scientific communities and experts when they are harmed in specific ways. Consider how, for example, someone could be in the audience and listening to the Ted Cruz interview. After attending this interview, the person tells another non-expert about the interview and the rejection of the consensus on anthropogenic climate change. This rejection spreads, and eventually, there is an increase in people who reject the consensus. Eventually, someone who might have to decide on the allocation of funding research will allocate less to Climate Change Science. The scenario I paint here can play out with the new Trump administration, where Robert F. Kennedy is likely to have a lot of influence in allocating funding for scientific research in medicine. In this case, he is the science denialist who spreads denialism, but it all ends up going in a reinforcement cycle. The fact that he has found his way into such a dominant position in governance seems to be evidence of how people (voters) who reject established science can have quite a strong reinforcing influence on future research. There may be room for defining another kind of epistemic injustice towards non-experts that results from these knock-on harms. When thinking about harms to non-experts, there are a few apparent harms, and then there are some other harms that can be extremely serious.

Firstly, some apparent harms: I will briefly discuss some of the epistemic harms to non-experts that result from epistemically detrimental dissent, although I will not focus on this too much. When we have epistemically detrimental dissent, it is intuitive to say that there can be a kind of pollution of the hermeneutical resources available to non-experts. Han Edgoose uses the term hermeneutical sabotage to describe a form of epistemic injustice that is relevant here (2024). Hermeneutical sabotage occurs "when dominantly situated knowers actively maintain or worsen the dominant hermeneutical resources for understanding the experiences or identities of marginalised groups" (Edgoose, 2024, p. 879). Naturally, the kind of 'sabotage' of hermeneutical resources I have in mind is somewhat different. Via the epistemically detrimental dissent that is produced via the epistemic pathologies I have in mind, it is the

shared *scientific* hermeneutical resources that non-experts have that are sabotaged. This means that it is their basic understanding of science, their beliefs as to who has epistemic authority, what is genuinely scientific knowledge, what is reliable knowledge, who can be trusted, whether science as a process can be trusted, etc. The mechanism through which this happens is similar to what Edgoose describes, where there is an active *distortion* of the hermeneutical resources available (2024, p. 879). When there is epistemically detrimental dissent, it can be intentional or unintentional, but the available scientific hermeneutical resources are distorted. A better understanding of the exact harms and mechanisms would require a far more detailed discussion than I can offer here, as there are significant differences between Edgoose's account and what I propose here, but this serves as an initial note of a kind of injustice to non-experts that could be formulated.

One of the main ways the sabotage of the shared hermeneutical resources could occur is by exploiting the non-expert's scientific ignorance that I discussed in the science denialist's rhetorics (Chapter 5). The science denialists exploit the scientific ignorance of non-experts and couple that with appeals to values outside of science. When they exploit and manipulate these bits of scientific ignorance, they effectively sabotage the non-expert's understanding of those scientific matters. Where a non-expert already had a very tentative knowledge of the scientific use of the word 'theory', for example, their understanding is further corrupted when the science denialist exploits their misunderstanding and effectively makes them believe that it has an alternative meaning. What further happens when the non-expert's hermeneutical resources is sabotaged in this way, is the so-often mentioned reinforcement effect: the non-expert misunderstands the science because they have been sabotaged, they doubt the epistemic authority of scientific experts, they downgrade the scientific expert's epistemic authority, and the whole terrible cycle of harms start all over.

When we consider the epistemic harms to non-experts, I have to pause and discuss a specific case of epistemic harm to non-experts that can, potentially, be *extra* serious. That is the case of marginalised non-experts, specifically, who are in groups where there is a history of the usual kinds of epistemic injustices such as testimonial and hermeneutical injustices (according to Fricker's accounts, and especially Heidi Grasswick's epistemic trust injustice, as will be discussed briefly) (Fricker, 2007; Grasswick, 2018). The reason that these groups of people are vulnerable to an extra serious harm from the epistemic injustice to scientific experts, is that in the case of historically marginalised non-experts, it is very likely the case that there could be some other kinds of epistemic harms and injustices that are already at work amongst those groups and that the compounded effect of added epistemic sabotage and

epistemic harms to their trust in epistemic authorities would make a significant contribution to further distrust.

If, for example, I am a woman and I already have significant distrust in scientific experts because of previous testimonial or hermeneutical injustices, I might be primed to far more easily reject the epistemic authority of other scientific experts when they testify about a matter. Consider the case of contraceptive medications that I discussed in Chapter 3 (Oreskes, 2019, p. 109). Imagine I visit a male doctor, and he is dismissive of my report of side effects due to a contraceptive medication. The doctor dismisses the matter very quickly. This situation has caused me to have less trust in him as a doctor. On top of this, I visit a male psychiatrist as I am suffering from depression. The psychiatrist prescribes me an anti-depressant and it causes me to have severe side effects that he immediately rejects upon me telling him about them. Now, consider that there is a pandemic and another male doctor suggests that I get a vaccine for the relevant virus. I ask the doctor about the potential side effects; he dismisses my question. I am not very well informed about scientific matters and must decide based on my trust in doctors. I have a history of bad experiences with male doctors where I have suffered several epistemic injustices. These epistemic injustices have now led me to have severe distrust in male doctors.

Heidi Grasswick defines an *epistemic trust injustice* as the kind of epistemic injustice "when potentially powerful forms of knowing such as scientific understandings are generated in isolation from them [marginalised knowers], and when the social conditions required for a *responsibly-placed trust* to be formed relative to the relevant epistemic institutions fail to transpire" (2018, p. 69). Essentially, it is where "a history of social conditions suggest the epistemic untrustworthiness of an expert community towards a marginalized group, thereby significantly diminishing opportunities for group members to gain important knowledge through a responsibly-formed trust" (Grasswick, 2018, p. 87). Now, imagine the scenario of my distrust in the male doctor again. I have, unfortunately, been exposed to significant science denialism narratives during the time of the pandemic outbreak, and due to my scientific ignorance, I have fallen victim to these narratives and now believe them. Consequently, I reject the doctor's offer of a vaccine, but not only that, I respond to the whole situation by telling others of some of the science denialist narratives, etc. When epistemically detrimental dissent produces conditions where there is a downgrading of the epistemic authority of scientific communities and their members, and we have the resulting epistemic harms to non-experts, it can be compounded when there are *pre-existing strained relationships* between scientific experts and non-experts. An already fragile relationship of

trust becomes even more challenging to maneuver where the epistemically detrimental dissent that affects non-experts could affect already vulnerable communities even more.

Conclusion

The Plight of the Dodos: No Easy Way Forward

In this thesis, I presented an argument for a unique epistemic injustice: a *scientific expert epistemic injustice*. This epistemic injustice occurs when scientific experts are epistemically harmed due to the *wrongful* downgrading of their epistemic authority when they testify about matters relevant to their scientific expertise. This kind of epistemic injustice results from epistemic pathologies that develop between scientific experts and non-experts (such as pseudoscience and science denialism), where the resultant epistemically detrimental dissent produced via these pathologies leads to the rejection or lack of acknowledgement of the epistemic authority of scientific experts. This rejection or lack of acknowledgement of the epistemic authority of scientific experts downgrades their epistemic authority, where downgrading also means that there are impediments to the exercising of their epistemic authority and a rejection of the preemptive reasons for belief provided when they testify.

I presented a characterisation of the ideal relationship between scientific experts and non-experts where the testimony of a scientific expert provides preemptive reasons for belief to non-experts. Preemptive reasons for belief can only be provided when there is epistemic authority, and preemptive reasons are those kinds of reasons that replace my reasons. In pseudoscience, the downgrading of scientific expertise *qua* epistemic authority occurs via the epistemically detrimental dissent produced by pseudoscience. Pseudoscientists claim to possess the same type of epistemic authority as scientific communities and scientific experts. In science denialism, the epistemic authority of scientific experts is eroded via the rhetorical strategies employed to cast doubt on scientific expertise. Science denialists reject the epistemic authority and preemptive reasons provided by scientific experts.

I believe there is space to identify some other kinds of epistemic injustices towards scientific experts. As a tentative idea, perhaps there is room to say that there is an epistemic injustice of some kind to scientific experts when funding of certain kinds is reduced.

However, the exact mechanisms behind such an epistemic injustice would be different as it is not necessarily a rejection or lack of their epistemic authority. The wrong might be located in a distributive type of injustice, although it is open for debate whether a *distributive injustice* could be called truly 'epistemic'. A question for future consideration would be whether the lack of funding to do necessary research could be called the same kind of 'epistemic good' as access to education and information? I believe there is potentially a case to be made that there are some differences.

How bleak is the picture, really? It can seem pretty dark considering the many resulting harms to scientific communities and their members and the significant knock-on harms to non-experts. What I have done is provide an analysis of the epistemic pathologies and the epistemic injustices that can result from those pathologies. I have also offered a glimpse into the broader harms that can result from these pathologies. I have not provided any suggestions for addressing these problems or explained what the road forward could look like. Social media, the media, and the increasingly strange turn of international politics seem to push us further into accepting half-baked truths, fake news, and other forms of 'post-truths' that can paint a harrowing picture.

Furthermore, some people believe the wrong things for *fairly* good reasons. This makes me a bit more empathetic towards people who may fall for the rhetorical traps set by some science denialists and the pseudoscience presented by some pseudoscientists. As a South African, I can understand how South Africans are far more likely to believe specific conspiracy theories and misinformation. After all, our current president was caught with roughly £3.3m stashed inside his couch at his Phala Phala game farm near Bela-Bela in Limpopo.[75] (*Yes. You read correctly.*) Even *I* was jumping to conclusions that involved all sorts of conspiracy theories, even some pretty bizarre ones. Furthermore, even though he may appear to be corrupt, he might be our best bet for leadership in the current situation. Context plays a fundamental role in understanding beliefs. I have found many empirical studies on measuring conspiratorial beliefs that are pretty ignorant of contextual factors that might contribute to the beliefs people form.[76] In South Africa, some beliefs would be perfectly reasonable, whereas others would be very unreasonable in the UK. One conspiracy theory currently doing the round is that our government accepted a bribe to put forward the charges

[75] Muia, 2024: https://www.bbc.co.uk/news/articles/cd6qpqx24yyo

[76] For some only a few examples of empirical studies, see Brotherton et al. (2013), Clifford et al. (2019), Imhoff et al. (2022), Wagner-Egger et al. (2023), and Enders et al. (2021). Even though Imhoff et al. attempt to do a measurement of conspiracy beliefs across 26 countries, I am not convinced by how measurements across countries could be compared in the way it is done in the study.

of genocide against Netanyahu and Israel in the International Court of Justice. It would be an unfortunate turn of events if this is true, but it is, dishearteningly, possible. Corruption is rife in South Africa.

Back to science. There is an important ongoing debate about the way established science should be *communicated* to the public, whether or not there should be transparency in such communication, what the responsibility of scientific communities and scientific experts are in these kinds of communication, how non-experts are to identify scientific experts, amongst many other questions. All of these questions are important, and the answers are necessary. The intuition is, after all, that if there is better communication, it could eliminate some of these terrible epistemic pathologies I have analysed. However, complete transparency is *not* the answer to solving the problem of communicating scientific findings to the public and eliminating many of these epistemic pathologies. I agree with C. Thi Nguyen that forcing transparency in presenting scientific findings to the public can, counter-intuitively, lead scientific experts to increase their attempts at hiding certain things about science from the public (2022, p. 331).

Consider it this way: if a scientific expert on quantum physics were to present some highly technical bit of their research to a non-expert audience, how would she go about it? There will be so much highly specialised content involved in her research that she would have to find a way to present it to a non-expert audience in a far less technical format. Even though it might sound just about right that an attempt should be made to simplify it—and it is even *reasonable*—it misses something crucial. The very nature of scientific knowledge is that it is often so intricate and highly specialised that it is, simply put, inaccessible to non-experts. I can count many conferences I attended where I could not understand most of the presenters' papers merely because they work in entirely different fields within philosophy than I do.

I have a far higher level of education than many audiences that want to understand Climate Change Science, epidemiology, and Evolution Science 'to make up their own minds' about the science. Still, I have only learnt some fundamental skills that will help me better understand the bigger picture of the anthropogenic climate change problem to write something coherent about the epistemological and ethical issues: statistics, interpreting graphs that show trends, and reading the IPCC reports with the ability to understand some of the overarching conclusions about the state of affairs. It would be impossible for me to learn enough to understand intricate details in all relevant areas within climate science. And, as many scholars know, even climatologists do not understand every detail of every specialised, intricate detail in their discipline. Admittedly, some bits of climate science are more

accessible to non-experts than quantum physics could be. Still, the overall problem of anthropogenic climate change is so big and complex that it cannot be reduced to a degree where it can be made accessible to non-experts in the way many wish.

Even more troubling, Nguyen argues that transparency could "change what experts do, pressuring experts to only act in ways which readily admit of justification in non-expert terms" (2022, p. 333). This seems highly problematic. We want *answers* to scientific questions from scientific communities, where those answers are *correct* or as close to the truth as possible. If scientific experts adjust their projects, their answers to questions, and, more generally, how they go about 'doing science' to enable a better understanding for non-experts, it will undermine the processes within the scientific community that *work*; the underlying mechanisms I have described at length that make a scientific community good at its job and gives it a good track record. The reports offered by the IPCC represent something that seems like a 'middle ground' between, on the one hand, complete transparency and, on the other hand, no transparency. The IPCC reports are compiled in a way that can be useful in policymaking for governments and other relevant actors. However, even though these reports are written to make some essential scientific consensus claims regarding the status of anthropogenic climate change accessible, they are still not accepted and trusted as much as we would hope for. Even when trying to make scientific findings more accessible, communication still has problems. I want to make a guess and say that a 'lack of transparency' is not the primary problem, or at least not the *only* major problem. The *inaccessibility* of highly specialised scientific knowledge is, perhaps, the biggest problem, and I doubt there is a solution to make everyone happy.

Stephen John discusses the Climategate leak incident at the Climate Research Unit of the University of East Anglia as a "massive experiment in transparency", using it to argue that transparency in science communication would *reduce* trust in scientific communities and scientific experts (2018, p. 75). When the e-mails of the scientific community were leaked, the information gave an insight into the internal processes of scientific communities, their communications, and the rest of the inner workings of the scientific community. Non-experts did not understand these e-mails in the context of how scientific communities work, how reviewing processes work, what legitimate 'omissions' of scientific findings would look like, and all sorts of other details within the normal range of scientific progress and enquiry. More crucially, antagonistic non-experts exploited scientific ignorance by using the leaked information as 'evidence' that science was 'broken' (John, 2018, p. 75).

Is opposition to complete transparency challenging our democratic values of freedom of

speech, access to information, and others? I do not believe so. Perhaps the work within scientific communities could be explained to non-experts as a *type* of democratic process that functions alongside our other democratic and social values. When a parliament or congress or other forms of democratic government have deliberations about matters that affect us, we understand those deliberative processes as a kind of democratic process. If there is some way to frame what a scientific community does in this way—as a type of *democratic* process—to make it more understandable to non-experts, it could help them to better understand what happens in scientific communities. It is not a perfect comparison, but making an attempt to highlight some deliberative features that have a similar nature could provide a way to better explain the scientific processes that take place within scientific communities to non-experts.

I do not claim to address the issue of transparency here entirely, but some lack of transparency would be preferable. I think what is needed is a way to make non-experts understand what science does—as a *process* to finding the truth—and how science goes about it when things go right. There is a significant role to be played in education at far lower levels than universities or colleges. At the most fundamental levels of education, children should learn about Evolution Science and, *almost* more importantly, *why* it is the most accurate theory and is considered to provide a reliable body of knowledge that is used as a foundation for other scientific endeavours. They should not only learn about the shape of the earth, but they should understand *why* we believe that, *how* prior theories were disproven, *how* science corrects itself, and, when it makes mistakes, we should understand those mistakes as *progress*, amongst many other things. Not only that, children have to be educated better to understand the red flags in narratives about science as they are presented in the media. They must learn to identify when there is a conflation of science and other important social and cultural values and when their scientific ignorance is being exploited. Essentially, they have to learn to ask the *right* questions whilst accepting their scientific ignorance about highly specialised scientific questions. Perhaps they should understand what 'intellectual humility' is.

Even though this all seems terribly bleak, I honestly believe these problems can be addressed. Consider again The Final Experiment (TFE) in Antarctica. Jeran Campanella was one of *the* most prominent Flat Earth theorists until his participation in The Final Experiment. To give an idea of his influence, he currently (I last checked on the 15th of February 2025) still has 164k subscribers on his YouTube Channel, he has merchandise that he sells online, and he offers consultations of up to three hours at a rate of up to $350 per five hours (I am unsure about the nature of the consultations, and I believe that this service might no longer be

available).[77] He is clearly someone who would have a real interest in keeping the Flat Earth model strong and alive as he is benefitting from the sustained belief therein.

Since his participation in TFE, he has publicly acknowledged his mistaken beliefs: he critically considered the evidence available to him when he was in Antarctica, and instead of grasping at straws, he rationally analysed the available evidence, realised that he had made giant mistakes, and has now stepped back from the Flat Earth community. He is an example of a *true* pseudoscientist. Previously, when theorising about the earth's shape, he had a sincere belief that his evidence told him that the earth was flat. However, after being presented with contrary evidence, he changed his beliefs accordingly. He responded to the evidence available to him. I quote him from a recent Facebook post (sic):[78]

> First, I have taken no money, no deals, signed nothing or agreed to nothing and the following is based purely on my own actions, observations and experience. Please just listen. […] The very simple and easy to understand fact is this. I saw the sun in Antarctica. It was the sun and not the devil in a ball like Dean Odle says. It spins above your head. It was at a high of 35º and a low of 15º. If I wanted, I could have walked to the South Pole with no compass and no gps. I'd know when i was there when the sun was at the same height all day. The sun would be moving right to left and at that pole would be able the horizon 6 months. The same happens in the north but that sun goes left to right and it happens 6 months later. […] As of now and in my opinion for the future, no flat earth map can explain that. I don't want to believe it either but the world appears to be a ball. Nothing else explains it but I'm open and hopeful someone can figure it out because I have watched them lie to you and you all believe it. I've watched them butcher their investigations into my very real trip.

This turn of events seems optimistic and gives hope. It shows that some pseudoscientists and science denialists who are sincere believers might be open to convincing if the evidence presented is strong. However, what he further says in the same post is enlightening (sic):

> The messages I received this morning are more evidence of a deep seated hate and confusion

[77] For Jeran's YouTube channel, see https://www.youtube.com/c/jeranism. For Jeran's merchandise: https://shop.jeranism.com/?fbclid=IwY2xjawIQUBtleHRuA2FlbQIxMAABHeYVD198KM9UaBH-2PmtP3VHBGA7E1Q7qSALxEi7wBfpHff-vHeopuuIQw_aem_OUuY6CoAiIL8fygJZkJy5Q.

[78] Campanella, 2025: https://www.facebook.com/jeranism.

> inside the minds of flat earthers. I'm not your enemy. To call me names and tell me im stupid or I'm a sell out is evidence of exactly what i am saying. I don't think you want the truth. You want me to tell you that you're right. You don't even care if I tell lies just as long as I tell you that your beliefs are right. […] Because I build my beliefs based on reality and the current evidence. My evidence basket has changed. If yours hasn't. Remain a flat earther I don't care. But to attack me simply shows what I have said. It appears more like a cult than an open minded group of truthers. just facts.

The degree of hatred Jeran has received since The Final Experiment has been alarming, to say the least. Some of the most prominent Globe Defenders have even contacted him with support and kindness. I certainly applaud his public acknowledgement of his errors and would be interested in having a conversation with him. He has shown courage, intellectual honesty, integrity, and humility. What is very revealing is how he calls the Flat Earthers acting out against him a 'cult'. Since The Final Experiment and the resulting fallout, the word 'cult' has been floating around in my mind. I believe that there is a distinction to be drawn between some Flat Earthers, like Jeran, who are sincerely trying to find the truth and acting out of scientific ignorance, versus those whose behaviour aligns more with cult-like beliefs. When starting this project, I realised that there is a distinction to be drawn between the psychology and epistemology of the epistemic pathologies I have analysed in this thesis. When considering the cult-like aspects of the Flat Earther communities, I believe a study that is more focused on the *psychology* of these believers and their belief systems would be apt.

As I say, I am more positive than negative. If we do not have faith in our fellow travellers on this blueish-greenish Globe (and perhaps, someday, intelligent beings beyond our galaxy), we are in trouble, and it is preferable to show optimism. I recently read an essay by Eric Schwitzgebel on *Aeon* that considers the value of philosophy and its place alongside science, amongst a few other Big Questions (2025).[79] One of his main points is that humans are valuable as we are curious and *can* ask 'why?'. If we imagine another kind of intelligent species but they do not have this same ability to ask 'why?' about the world and everything else, we might not consider them to have the same kind of value as we do. It is our speculative abilities and questioning abilities that make us unique. Essentially, it is *philosophy*.

[79] To read Schwitzgebel's enlightening essay, go here: https://aeon.co/essays/if-you-ask-why-youre-a-philosopher-and-youre-awesome?fbclid=IwZXh0bgNhZW0CMTEAAR3w5A-xQ_BlslRk7i2EZImfoRpOqkPSVynYxAAJ08yeB_T_QLkqRyc-2Qs_aem_4xwXiT-yZkFYhb7zdNT0sA .

This is also why science is meaningful: It is meaningful because we can reflect on its answers and see how they transform our understanding of the world and our place in a galaxy with so many secrets (Schwitzgebel, 2025). What value does science add to my life? What does science say about my place in the world? Why are complex scientific questions and answers important? Why are some scientific answers troubling to us as humans? What do scientific answers say about my values? What do scientific answers say about *our* values? What about this microscopic, greenish and beautiful, bacteria called a *baccilus subtilis* is so fascinating for us, as humans?[80]

Our scientific Dodos are valuable and a species to protect. Today, we need more people to realise and understand their value. We shouldn't find a way to fight and destroy the Zombies. But perhaps we should make a bigger effort to find out *why* they have become Zombies and what we can do about it without ostracising them.

[80] For some images of exquisite bacteria, see this gallery here: https://ideas.ted.com/gallery-the-most-beautiful-bacteria-youll-ever-see/ .

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