

POISON IN THE POLDER

An ethnography of life amidst PFAS exposures in
Dordrecht, The Netherlands



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*To my grandparents, Hans and Margreet Temmink,
for always nurturing my curiosity.*

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Abstract

PFAS are a group of man-made chemicals made from carbon and fluoride. They essentially do not decompose and bioaccumulate in ecosystems and bodies. Hence, they are often referred to as “forever chemicals”. PFAS are toxic, and can lead to cancer, birth deformities and problems with the immune system. Since the 1960s, the company DuPont (which has since transformed into the company Chemours) has produced products with PFAS in Dordrecht. This thesis investigates the question: *How do the communities living in the vicinity of the Chemours factory experience and respond to PFAS toxicity?* The central argument is that one of the most significant impacts of PFAS toxicity is the pervasive experience of not knowing. Theoretically, this thesis builds on anthropological debates on waste, ignorance and uncertainty. Chapter 1 investigates various forms of ignorance among the different communities in Dordrecht, highlighting the imperceptibility of PFAS and the active choice to ignore it. Chapter 2 addresses how governmental secrecy exacerbates mistrust and uncertainty, deepening the communities' sense of insecurity. Chapter 3 explores the temporal aspects of PFAS exposure, emphasizing how shifting scientific and regulatory landscapes contribute to ongoing uncertainty. Overall, this thesis contends that the multifaceted experience of not knowing—stemming from both institutional secrecy and the evolving nature of PFAS science—profoundly shapes the community's response to PFAS toxicity, leading to a pervasive and enduring uncertainty about their health and environment.

Key words: PFAS, toxicity, waste, pollution, chemicals, chemical ethnography, ignorance, uncertainty, Chemours, Dordrecht, The Netherlands

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Introduction

“We never thought about it, because we assumed the government would guarantee the safety of its citizens. They told us there was nothing wrong, so we assumed that was true. So yeah, now we have lost our trust,” says Marga van der Vlies in the documentary *De PFAS-doofpot*¹ by the Dutch program *Zembla* (Bosma 2023a, 5:22). The documentary delves into the controversy surrounding Chemours, a factory that manufactures products like Teflon, for which they use poly- and perfluorinated alkyl substances (PFAS).

PFAS, a group of man-made chemicals invented around the Second World War (Neale 2019), are characterized by their exceptionally strong carbon-fluoride bonds. This chemical structure makes them incredibly stable, rendering them oil- and water-repellant. These properties make PFAS valuable in a range of products including Teflon, Scotchgard (stain-resistant and water-resistant clothing), food packaging, cosmetics, medical devices, and firefighting foam (Neale 2019). Due to their stability and resistance to decomposition, PFAS are often referred to as "forever chemicals" (Renfrew and Pearson 2021; Sys 2022). During and after production, PFAS are released into the environment through air emissions, leaching into water, and deposits in landfills and dumpsites (Renfrew and Pearson 2021). As a result, they have dispersed globally, piling up in ecosystems and living organisms. As they do not break down, PFAS bioaccumulate, passing “from species to species, from mother to child” (Altman 2019).

PFAS are toxic, and even extremely low levels have been linked to a range of serious health issues, including testicular cancer, kidney cancer, ulcerative colitis, thyroid disease, pregnancy-induced hypertension, and hypercholesterolemia. Additionally, they are associated with liver damage, asthma, decreased fertility, reduced antibody response to vaccines, and other health problems (Renfrew and Pearson 2021). According to the Dutch Institute for Public Health and Environment (2024a) all Dutch people have measurable levels of PFAS in their blood.

Starting as early as the 1960s, major PFAS producers 3M and DuPont conducted studies on the toxic effects of these chemicals and found alarming results. However, they withheld this information from the public and environmental regulators, prioritizing their economic interests over the health of their employees and nearby ecosystems and communities (Renfrew and Pearson 2021). Deliberately causing or manufacturing ignorance

¹ Translation: The PFAS coverup

in this way – by withholding evidence or even actively sowing doubt about scientific facts among the public – is not unique to PFAS production but has also been observed in other industries, including the petrochemical and tobacco sectors (Nixon 2013; Kourany and Carrier 2020; Proctor 2008). The scandal that emerged from the discovery of this cover-up in the United States was dramatized in the film *Dark Waters* (Haynes 2019), bringing widespread attention to the issue.

DuPont, the company featured in *Dark Waters*, also established a factory in Dordrecht, the Netherlands, in the 1960s (Bosma 2023a). This factory is still in operation today as a subsidiary of DuPont called Chemours (“About Chemours,” n.d.). In the documentary program *Zembla*, journalist Roelof Bosma (2023a) investigates whether similar cover-ups to those in the United States occurred in Dordrecht. He discovers that DuPont also concealed information from employees, regulators, and the public, resulting in years of undetected PFAS contamination. Consequently, many former DuPont employees and nearby residents now face the repercussions of this pollution and struggle with various illnesses.

In *The Social Life of the “Forever Chemical,”* one of the most prominent ethnographies on PFAS to date, Daniel Renfrew and Thomas W. Pearson (2021) urge social scientists to expand research on “toxic events” (148). Toxic events are moments in which invisible and routine toxicity becomes perceived and acknowledged as unacceptable. Renfrew and Pearson (ibid.) argue that toxic events can drive societal and political change, and that the social sciences can offer a valuable contribution by examining how toxic events come to be, how they are influenced by historical, political, and economic factors, and how people mobilize in response to toxicity.

As a Dutch citizen living in the Netherlands, I am deeply troubled by the fact that Dutch citizens consistently ingest dangerously high levels of PFAS (Sys 2021). I feel even more troubled by the severe impact of this pollution on the populations living near Chemours. With Renfrew and Pearson’s (2021) call in mind, this thesis focusses on the discovery and subsequent response to the PFAS pollution around DuPont/Chemours in the Netherlands. Consequently, the main question this thesis addresses is:

How do the communities living in the vicinity of the Chemours factory experience and respond to PFAS toxicity?

Themes Within Chemical Ethnography

In addressing this question, I build on a tradition within anthropology often called the “chemical turn” or “chemical ethnography” (Shapiro and Kirksey 2017; Neale, Phan, and Addison 2019). Living with and responding to chemical pollution is a complex ordeal. Scholars have addressed this issue from various perspectives and by highlighting various concepts, but in reality, these perspectives are intertwined and cannot be neatly separated. Still, in order to outline the existing scholarship this thesis builds on, I consider the following themes within chemical ethnography: waste, ignorance, and risk and uncertainty.

Waste and Toxicity

As mentioned above, the presence of PFAS in our bodies and environments has become problematic largely because its producers – companies such as DuPont and 3M – have legally and illegally disposed of their waste in landfills, bodies of water, and through air emissions, allowing PFAS to enter the environment. It is through measuring waste that scientists measure the “geological, atmospheric, and biophysical impact of human activity” (Hecht 2018). It is then the task of anthropologists to question how humans “produce, consume, discard, and digest” different materials in our Anthropogenic present (O’Hare 2019, 11), because the way waste is produced and managed shapes our society and planetary processes. As Joshua Reno (2015) writes, waste management’s main task is to “make things disappear” (147); to displace waste so it is out of view. However, “out of view” is not out of existence; the waste is still somewhere. Anthropologists of waste can therefore study the afterlives of waste, what happens to it and the communities that must live with it (Reno 2015).

Within the anthropology of waste, various researchers have focused on issues related to industrial chemicals and toxicity, as “all bodies tested, anywhere in the world, contain industrial chemicals.” (Liboiron, Tironi, and Calvillo 2018, 332). To think about toxic industrial chemicals, Liboiron, Tironi and Calvillo (2018) have defined toxicity as “the contravention of order at one scale and the reproduction of order at another” (335). With this definition, they emphasize that toxicity is not only about – although it certainly includes — the ways industrial chemicals cause harm or disorder to cells and bodies, but also about the societal structures that create and perpetuate this harm. Similarly, Michelle Murphy (2017) writes that we need different ways of studying chemicals, aside from the damage they do in our bodies. Firstly, because that would require us to wait for harm to have occurred to have a way to access these chemicals, which is not a sustainable or ethical practice. Additionally,

looking only at the “side-effects, fallouts, or discards” (Murphy 2017, 496) prevents us from seeing the wider networks in which our bodies, the bodies of others, and our environments are connected and altered by the presence of industrial chemicals. Looking only at the harm does not acknowledge that living with industrial and toxic chemicals is “a condition that is shared, but unevenly so” (497). Hence, Murphy (2017) took the concept of “afterlives” of waste mentioned earlier and calls our condition of living among chemicals “alterlife”. Alterlife is not only about bodies that have been altered by chemicals, but about how our bodies are inextricably entangled with histories of capitalism and colonialism that have led to the production and spread of industrial chemicals. Considering that life is permanently altered by chemicals, “there is no getting out” (Murphy 2017, 500). Our lives will be entangled with industrial chemicals such as PFAS moving forward. With this thesis, my aim is to contribute ethnographic insights into how communities live with PFAS, in order to further our understanding of what it means to live in a permanently toxic world, and how people’s lives are altered by the presence of PFAS in their bodies and surroundings.

Ignorance

Waste, as outlined above, is often displaced, so it is out of view. The communities who then have to live with the afterlives of this waste, often face “slow violence” (Nixon 2013). Generally, violence is considered “immediate in time, explosive and spectacular in space, and as erupting into instant sensational visibility” (ibid., 2). Therefore, when violence is not immediate or spectacular, but dispersed in space and accumulating over time, we often do not perceive it as violence at all. Slow violence, in contrast to this immediate, explosive violence, occurs “gradually and out of sight” (ibid., 2). This is certainly the case for toxicity and chemical pollution, which “is driven inward, somatized into cellular dramas of mutation that – particularly in the bodies of the poor – remain largely unobserved, undiagnosed, and untreated” (ibid., 6). It is often those people and environments considered “disposable” (ibid., 4) that are most affected by slow violence. For instance, waste is often dumped at the fringes of society, in places where people already live in precarious conditions due to intersecting factors of race, class, and gender. The concept “slow violence” sheds light on how certain societal structures enable certain forms of violence to persist, by making this violence hard to see and/or easy to overlook. Here, it is the task of an anthropologist to recognize and specify which structures exactly (for example: spatial divisions, politics, media, to name a few) factor into what is visible or invisible.

Ignorance surrounding slow violence is often purposefully sustained by those who benefit from it. Scholars working on ignorance have extensively outlined how corporate actors “manufacture ignorance”, for instance by actively withholding information on the dangers of their products, what exactly they are emitting, or where they dump their waste (Kourany and Carrier 2020; Nixon 2013; Proctor 2008; Richter, Cordner, and Brown 2021). For instance, Catherine Alexander and Patrick O’Hare (2023) write that “the deliberate withholding of knowledge about toxic wastes and pollution is all too familiar within the military-industrial complex” (435). Nixon (2013) outlines how corporate interest groups fund campaigns that “manufacture doubt”, such as large campaigns to sow doubt around the science of climate change, in order to postpone political action. In this way, those who have an interest in upholding the status quo are literally buying time, ensuring their profits in the present continue, while the repercussions of their pollution will happen in the future, and often to others. Ignorance can be productive, write Alexander and O’Hare (2023), which is why as anthropologists we must ask “to whom, how and why knowledge is revealed or kept hidden” (430). Therefore, this thesis contributes towards debates on ignorance in chemical anthropology by asking in which ways PFAS can be perceived, or on the contrary: the ways in which it is made invisible and why.

Uncertainty

Finally, when thinking about chemical waste and pollution, it is useful to consider scholarship on risk and uncertainty. For instance, when toxic waste such as PFAS is discarded, this creates certain risks (health risks, environmental risks, among others). Therefore, many anthropological accounts of industrial pollution have focused on the concept of “risk”, such as by thinking of our current state as a “risk society” (Beck 2006, 332). A risk society is a society “that is increasingly occupied with debating, preventing and managing risks that it itself has produced” (ibid., 332). “Risk societies” are not limited to questions of pollution, think for instance of financial markets and the risk embedded in them (Burke 2023). However, within this thesis, I will focus mostly on risk in the way it pertains to people’s lives and bodies; the risk in question being whether PFAS pollution in their environment will lead to physical harm, and how this can best be known, calculated, and prevented or managed.

In his later publication “World at Risk”, Beck (2014) highlights the emergence of a novel issue within the risk society, as there are hazards “which nowadays often cannot be overcome by more knowledge but are instead a result of more knowledge” (5). This is certainly relevant in the case of PFAS chemicals, their production and regulation, and

consequent waste management. Overall, risk, uncertainty, and ignorance are closely intertwined. So much so, that Peter Burke (2023) even defined uncertainty as “ignorance of the future” (228). Some scholars argue that risk and uncertainty are directly related, stating that “the greater the uncertainty, the greater the risk and lack of security, and vice versa” (Samimian-Darash and Rabinow 2015, 3). Others, such as Samimian-Darash and Rabinow (2015), argue that scholarly research that focusses on the assessment and management of risks does not suffice in the face of many contemporary problems, as the world is increasingly being populated by forms, practices, and events of uncertainty that cannot be reduced to risk. Risk, they argue, is meant to be understood in terms of probability (Samimian-Darash and Rabinow 2015; Burke 2023). They therefore distinguish uncertainty from risk, arguing that uncertainty arises in situations where the future is too unpredictable, and risks are too incalculable. Hence, they call upon scholars to not only focus on risks as they continue to arise, but to “treat uncertainty itself as a problem” (Samimian-Darash and Rabinow 2015, 1). In their view, using the concept of uncertainty allows us to ask questions that would elude us if we only addressed our research through a framework of risk.

Thinking about uncertainty is relevant in relation to PFAS, as research on PFAS is still mired with uncertainty (Renfrew and Pearson 2021). There is much about these chemicals that we simply do not know yet. For instance, there are PFAS chemicals that we are unable to measure with our current technologies, referred to as “black matter PFAS” (Sys and Luimes 2023), and we do not know why different kinds of PFAS (for instance PFOS and PFOA, both part of the PFAS family) behave differently in different animal tissues (Delhaas 2024). We must thus inquire how these uncertainties are navigated, responded to, and governed (Samimian-Darash and Rabinow 2015). One ethnographic example addressing peoples’ exposure to toxicity and their responses to it, is Adriana Petryna’s (2002) ethnography following the Chernobyl disaster in Ukraine. She outlines how in the aftermath of the Chernobyl meltdown, political responses to the disaster often aggravated the problems they tried to resolve, sometimes even creating “new biological uncertainties” (Petryna 2002, 3), as doctors often gave unclear medical diagnoses and the state withheld information on the disaster. Petryna’s (2002) ethnography illustrates the way societal structures perpetuate the harms of toxicity very well: while citizens tried to acquire more knowledge about their medical conditions and rates of, the state withheld information, which perpetuated uncertainty. With this thesis, I aim to contribute to this debate by adding ethnographic insights that examine experiences of risk and uncertainty, how they relate to each other, and

how they differ, specifically with regards to PFAS pollution in Dordrecht. From my ethnographic work, I specify two distinct *modes* of uncertainty (Samimian-Darash and Rabinow 2015), one affective, outlined in chapter 2, and one temporal, outlined in chapter 3.

The Field

I conducted my fieldwork in Dordrecht, occasionally speaking to inhabitants of surrounding towns and cities, such as Sliedrecht and Zwijndrecht. Dordrecht is a middle-sized city located in the southwest of the Netherlands, in the province Zuid Holland, and has a population of approximately 122,070 (Alle Cijfers, n.d.). The city of Dordrecht is inextricably linked to water, as in 1421, the St. Elisabeth Flood flooded the entire area and turned Dordrecht into an island (Groen Blauw Dordrecht 2024). In the following centuries, the people of Dordrecht built up the city by building dikes, bridges, and draining polders². Ever since, shipping, shipbuilding and dredging have been flourishing industries in Dordrecht (Groen Blauw Dordrecht 2024). Today, the island borders three rivers: the Beneden Merwede, the Oude Maas, and the Noord river, as well as the Biesbosch, a national nature conservation area, and the largest fresh water tidal zone in Europe (“Discover the Park,” n.d.; InDordrecht, n.d.; Het Dordts Patriciërshuis, n.d.).

This close relationship to water, although not the primary focus of my research, is important to note, as almost all interlocutors throughout my research told me that they often swam in the rivers in Dordrecht, or in the Biesbosch, and that this was one of the main instances in which they were made aware of PFAS pollution. When I started my fieldwork, I noticed the all-encompassing presence of water myself too. In my very first fieldnote, I wrote: “There’s water everywhere”³. Considering I have lived in the Netherlands for most of my life, a country in which there is an abundance of water in general, noticing the prominence of water really highlighted its prevalence.

My research question asked how communities living in the vicinity of the Chemours factory experience and respond to PFAS toxicity. Given the phrasing of my research question, my initial focus was not on employees of Chemours, although I was open to meeting them. However, throughout the three months that I carried out research, I did not encounter a single Chemours employee, or former DuPont employee. I tried to contact Chemours’ own neighborhood council (Burenraad Dupont Chemours, n.d.), but my requests were declined on

² Polders are land that has been artificially created in places where there used to be water.

³ Fieldnotes, January 25, 2024

the grounds that the neighborhood council was dissolved as a consequence of the *Zembla* broadcast. Additionally, some of my interlocutors suggested that former employees had signed non-disclosure agreements (NDAs) and could therefore not speak to me about Chemours. However, I have no way to verify this, or to even know this. Additionally, the Chemours workforce is not very large. The company has around 500 employees (Follow the Money, n.d.)⁴. In general, when visiting Dordrecht, I did not notice Chemours or DuPont as a prominent presence in the city at all. Dordrecht's city center is similar to many a Dutch city: an old town, characterized by canals and old wharfs, shopping streets, office buildings. It is only after a twenty minute busride out of the center, towards the outskirts of the city, that Chemours comes into view.

I had never been to Dordrecht before embarking on this research. Throughout my fieldwork I discovered there are different communities who all live in the vicinity of Chemours and experience and respond to PFAS toxicity differently. Therefore, I ended up conducting my fieldwork in three different sites within Dordrecht: with the action group “Gezondheid voor Alles” (Health Before Everything), at ‘t Staartje, a community initiative in the neighborhood de Staart, and by seeking out individual inhabitants of Dordrecht through snowballing methods, trying to get a more diverse sample of people.

Action Group “Gezondheid Vóór Alles”

The action group “Gezondheid Vóór Alles”⁵ was founded in 2016, by Kees van der Hel and Joop Keesmaat (Eelbode 2023). In an interview with the Flemish newspaper *De Tijd*, Van der Hel mentioned that he realized the extent of Chemours' environmental pollution after an incident where 3000 tons of PFAS leaked from the factory. (ibid.). In protest, Van der Hel, Keesmaat, and a few others started dumping a bucket of polluted soil in front of the gates of Chemours every week. For a long time, their action group remained small, until the *Zembla* episode exposing the pollution and cover-up by DuPont aired in June 2023. (Bosma 2023a; Eelbode 2023). Since then, the action group has grown to around 250 members. Additionally, in September 2023, 4200 nearby residents, led by Keesmaat and Van der Hel started litigation against Chemours in September 2023, accusing the company of polluting the surrounding environment and covering this up (*NOS Nieuws* 2023a; Eelbode 2023).

⁴ Considering the total working population in Dordrecht is 61,973, and of this working population, 6,472 people work in industry (Onderzoekscentrum Drechtsteden 2023), 500 is still not a large amount.

⁵ Translation: Health Before Everything

I started my fieldwork with this action group, and I first met Joop and Kees, both of whom wanted to be mentioned by name in this thesis, at one of the Saturday morning protests at the gate of Chemours. Throughout my fieldwork, I regularly attended these Saturday morning protests, had many conversations with the protestors that attended, and as I got to know some better, I conducted in-depth semi-structured interviews with them.

‘t Staartje

The Chemours factory is located on the border of the neighborhood de Staart, so I found it important to spend time there and to look into how the inhabitants of the neighborhood experience and think about PFAS pollution. De Staart is located in the east of Dordrecht, on a separate island. “Staart” in Dutch translates to tail, which I found to be fitting, as especially the industrial area in the east of de Staart, where Chemours is located, is relatively inaccessible and quite isolated from the rest of the city (Groene Gezonde Stad, n.d.).

During my fieldwork, I heard multiple interlocutors refer to de Staart as a “poisoned neighborhood”, because a part of de Staart, a neighborhood known as “Merwepolder Oost”, was built on a chemical waste disposal site (Sijmons 1983). High concentrations of toxic chemicals such as cyanide, chromium, zin, and benzene were found in the soil, which led to the demolition of 106 homes in the early 1980s to carry out soil remediation (*NRC Handelsblad* 1982). Inhabitants of de Staart are still not allowed to dig into the ground, as the poisoned ground was covered up, but is still there under the clean layers of soil (Groenedijk and de Groot 2016).

At the same time, de Staart is the closest neighborhood to the Biesbosch and nature plays a significant role in the municipality’s portrayal of the neighborhood. The Dordrecht municipality, in collaboration with the EU-funded Interreg North Sea Region project Biodiverse Cities, has started a project to improve biodiversity and environmental health in de Staart (Groen Blauw Dordrecht, n.d.). As part of this project, ‘t Staartje was set up: a community center located in a container in the abovementioned neighborhood “Merwepolder Oost”, a ten-minute walk from the gates of Chemours.



Figure 1: The proximity of nature and industry in de Staart, photograph by the author

From the staff at ‘t Staartje, I learned that many consider de Staart a “forgotten neighborhood”, that many services have disappeared, and inhabitants feel left behind. I also heard this from inhabitants themselves, as I spent time at ‘t Staartje and got to know them⁶. Therefore, the goal of the community center is to foster community engagement alongside this Biodiverse Cities project, asking how the greening of the neighborhood can be achieved in a way that works for the residents of the neighborhood. To do this, ‘t Staartje serves coffee every day and organizes different activities, from help with filling out forms, to dinners, to activities for children. As ‘t Staartje had as its goal to reach out into the neighborhood and involve the inhabitants in conversations on nature and environmental health, I considered it a good place to conduct my research, and with permission from the staff and regular visitors, I spent Tuesday afternoons at the container, drinking coffee and chatting with the visitors.

Other Interlocutors

After mentioning to friends, family, and colleagues that I was embarking on this research, several people reached out to me and told me they could put me in contact with friends or acquaintances they have in Dordrecht “who are active around the pollution”. The same occurred through the people I met at the weekly protests: they put me in touch with others, and through this kind of “snowballing”, I met many different interlocutors, with whom I conducted semi-structured interviews. Finally, I also spoke to two employees of the Dordrecht municipality, who heard about the research I was conducting and reached out to

⁶ Fieldnotes, February 20, 2024

me. The meeting I had with them was very formative to this research and will be considered in detail throughout this thesis.

Methodology and Operationalization

Throughout my research, I used different anthropological methods that complemented and enriched each other. My research began with my initial contacts, by attending their events, meetings, and weekly protests at the Chemours factory. From there, I gained a broader insight into the everyday lives of those affected by PFAS toxicity by conducting participant observation, semi-structured interviews, and document analysis.

Participant observation is considered “almost universally as the central and defining method of research in cultural anthropology” (DeWalt and DeWalt 2011, 2). Hence, it was one of the most prominent methods used in this research. Participant observation entails a researcher partaking in “daily activities, rituals, interactions, and events of a group of people” (ibid., 1) to learn the implicit and explicit aspects of their lives. It is used to understand the nature or meaning of social phenomena, helping researchers grasp the fundamental processes of life. I carried out participant observation during the Saturday morning protests, while visiting ‘t Staartje, and during occasional other activities I was invited to, such as a water ritual organized by Extinction Rebellion on World Water Day. The inductive character of participant observation led me to question my assumptions and led to new insights that would perhaps not come out of my initial research questions.

In addition to participant observation, I conducted 10 interviews, with a total of 18 people, as some interviews were conducted in pairs or small groups. In semi-structured interviews, initial questions are normally specified, but there is space for interviewees to elaborate and for the researcher to ask follow-up questions (May and Perry 2022). I found that these interviews were incredibly insightful, and they ended up forming the backbone of this research. Going into this research, I was very concerned with PFAS and had researched them thoroughly, but I was a stranger to Dordrecht, and through these interviews, I really came to understand the experience of living in this city through the eyes of my interlocutors. I started each interview with questions on my interlocutors’ daily lives – how long they had lived in Dordrecht, what kind of work they did, whether they had children, what they did in their spare time – and from there asked whether they had heard about the PFAS pollution in Dordrecht, what they thought about it, and how it impacted their lives. This approach was very helpful in keeping an open approach to my research question, especially as it turned out

that many of my interlocutors were not very preoccupied with PFAS in their daily lives at all. Focusing on the day-to-day experiences of my interlocutors rather than solely on PFAS pollution therefore allowed for me to observe this lack of engagement with PFAS, while still leaving space for the interlocutors who *were* very preoccupied with the pollution to also expand on their experiences.

Finally, throughout my research I noticed the importance of media as a way for my interlocutors to gain information about PFAS. Much of this was shared in the form of reports, newspaper articles, and documentaries on Facebook and through Whatsapp. Therefore, I conducted document analysis, keeping track of all the articles that were shared online, especially when they were referred to in conversations during my participant observation or interviews. I interpreted the term “document” broadly, and considered government reports, notes from meetings and court hearings, and media publications such as newspaper articles and documentaries to fall under this umbrella term. While they are not the center of my research, I found that these documents shaped the experiences of many of my interlocutors, so I found it important to engage with them as well.

Ethics and the Role of the Researcher

In conducting ethnographic research, it is impossible to be objective, as one is always approaching the world from their own perspective (DeWalt and DeWalt 2011). Objectivity was also never my aim; my aim was to remain open and curious towards the variety of experiences I would encounter in my research. However, the experiences I heard about and the interactions I had were inevitably influenced by my person and perspective. Specifically, I am a highly educated, 25-year-old woman, who grew up in a left-wing family in the Hague. And perhaps more importantly: I consider myself an environmentalist, sometimes even an environmental activist, and am *very* concerned about PFAS pollution and its potential hazards. This definitely influenced the tone and attitude with which I entered this research, even though I tried to remain open and nuanced, and to emphasize to my interlocutors that as an outsider to their world, there was so much *I did not know*, and that I was willing to learn, to broaden my perspective.

While I was afraid that I might not gain access to my interlocutors, that perhaps people would be suspicious or closed off, I found that almost all my interlocutors were very open, even the people in de Staart and interlocutors who had personal ties to DuPont or Chemours. What was most challenging was actually the opposite problem: my interlocutors

sometimes being too eager. What I experienced is referred to ethnographic seduction, or “the ways in which interviewees influence the understanding and research results of their interviewers” (Robben 1996, 72). Interviewees, especially victims and perpetrators of violence, often have “high personal and political stakes in legitimizing their interpretation of history” (ibid., 84). In the case of my research, this was very prominently the case, as many interlocutors made comments such as, “I hope we can do something with your research,” or “I hope your research will help us understand X”. I felt quite conflicted about these comments, as I *do* hope my research is enlightening with regards to the PFAS problem in Dordrecht. However, while objectivity is not possible in anthropology, I did want to remain scholarly and balanced in my analysis. In the end it was one of my interlocutors that helped me along in my thinking. We were having a conversation on research bias, during which he said, “Your research question is very neutral. It’s not about whether PFAS are harmful, or really what should be done. It’s just about people’s experiences.” And he was right. Throughout this thesis, my aim was to stay close to my original research question, to write a thesis with an appropriate amount of distance, while still shedding light on the topic in a way that hopefully helps different people address PFAS pollution in their own way.

Reflexivity is one of the most important aspects of ethnography (Madden 2017). Anthropologists should constantly reflect on their research and their role in it (DeWalt and DeWalt 2011). I tried to practice this reflexivity throughout my research, and especially tried to consider the consequences of my presence in the field. Specifically, this made me think about the ethics of researching ignorance. Mainly: how do you ask people about things they do not often think about? And how to do it in a way that does not (unnecessarily) worry them? I had several interviews with people who were very open to speaking with me, but said they were not very preoccupied with PFAS at all. However, many of my questions, despite being “open”, were something like: “Are there things you do or don’t do because of the presence of PFAS pollution?”, or “What information is important to you when making these decisions?” Towards the end of a few interviews, I was concerned that I might have awakened worries in my interlocutors, or feelings of guilt for not being engaged or preoccupied with the issue of PFAS pollution. They all seemed quite firm in their beliefs, along the lines of, “If it is that harmful, the harm is already done, and there is nothing much I can do about it, so why worry.” I navigated this issue by focusing on two practices: informed consent and doing no harm. With informed consent, I mean “people [had] the right to freely choose whether to participate in a research project or not” (DeWalt and DeWalt 2011, 215).

Before each interview, I outlined which topics my questions were on, and emphasized that my interviewee was free to not answer a question or end the interview whenever they wanted. With regards to doing no harm, I made sure to never broach sensitive topics such as illness or death myself, and only addressed these topics when they had already been brought up by my interlocutors.

Finally, with regards to privacy and data safety, all my interlocutors were anonymized, unless they explicitly stated to want to be mentioned by name. I transcribed my interviews using pseudonyms and saved them on my computer and external hard drive, both of which are password protected.

Thesis Outline

The relatively open scope of my research question means that I could have taken a variety of approaches in answering it. I want to emphasize that the story I am telling in this thesis is not the only story that can – and needs to – be told about living with PFAS pollution in Dordrecht. However, throughout my time in the field, there were certain themes that kept arising, certain experiences that my interlocutors seemed to share across the board. My main argument, the story I want to share with this thesis, is that one of the most prominent experiences coming from PFAS toxicity is the experience of *not knowing*. This *not knowing* manifests in different ways.

In chapter 1, I will explore various forms of ignorance present among the communities living near Chemours. First, I will discuss the (im)perceptibility of PFAS, emphasizing how its invisibility makes it easier to ignore. I then complicate this statement by examining the (possible) ways PFAS might be perceived. Next, I consider Loretta Ieng Tak Lou's concept of "the art of unnoticing" (2022), providing additional examples of how pollution was ignored or justified by the communities I studied. Ultimately, this chapter argues that the imperceptibility of PFAS creates uncertainty regarding people's everyday exposure, and that sometimes ignorance is an active response to this uncertainty.

Chapter 2 focusses on the relationship between secrecy, mistrust, and uncertainty. I expand on the uncertainty that many of my interlocutors navigate regarding PFAS and argue that the lack of trust in governmental institutions and their decisions significantly enhances everyday experiences of uncertainty. First, I demonstrate how secrecy from governmental institutions leads to a breach of trust and contributes to the experience of uncertainty among my interlocutors. Then, I argue that PFAS science and regulations add to the feeling of

uncertainty, and I elaborate on how the safety restrictions surrounding PFAS impact the lives of my interlocutors. Finally, I conclude this chapter with reflections and considerations on the relationship between trust, ignorance, and uncertainty, emphasizing the role of governmental bodies and regulatory agencies in this specific controversy.

Finally, chapter 3 explores another kind of *not knowing*. In this chapter, I explore the temporal aspects of the PFAS controversy in Dordrecht. First, I expand on the dispersal of exposures over time, examining how the discovery of PFAS pollution and the potential for future discoveries unsettle both the past and present. Next, I describe how my interlocutors mobilize knowledge and engage in activism to regain their footing amidst this uncertainty. Finally, I delve into anthropological debates on risk and uncertainty. Using ethnographic examples from my time in Dordrecht, I conclude this chapter by highlighting the theoretical distinctions between risk and uncertainty, arguing that this distinction is crucial since, in this case, risk management alone is insufficient to address the ignorance of the future.

Chapter 1. “The plants are still green”: Invisibility, Ignorance, and Physical Experiences of Toxicity

What happens when we are unsighted, when what extends before us - in the space and time that we most deeply inhabit - remains invisible? (Nixon 2013, 15)

It was the first proper day of spring in the Netherlands: predictions of sun and 24 degrees Celsius that I clung to desperately after six long months of almost constant rain. That led me to step off the bus early in the morning at station Sliedrecht Baanhoek, I decided to take the forty-five-minute walk over the river into Dordrecht, rather than take another train and a bus. Besides, walking over the bridge would give me a view of the Chemours factory, which is hidden behind fences and warehouses when you approach it from the street.



Figure 2: Chemours seen from the Baanhoekweg, photograph by the author



Figure 3: Chemours seen from the water, from the Baanhoek bridge, photograph by the author

The further I crossed the bridge, the better Chemours came into view: a colossal factory-terrain, all pipes, silos, containers, and chimneys, spread across the waterfront. Yet, there were no perceivable trails of the chemical giant's emissions. No sounds. No smells. I just heard the birdsong, felt the crisp morning wind softly blowing through my hair. In fact, if I turned the other way, towards the Dordtse Biesbosch, it was as if the factory never existed: green waterfronts, quiet bike-paths, semi-detached houses. And as I walked, I was met by groups of cyclists and runners. "Goeiemorgen!" we all greeted each other happily. But as I passed these groups, I felt a gnawing feeling in the pit of my stomach. Was it safe to run across this bridge, taking deep gulps of air only 500 meters away from a factory known to emit carcinogenic chemicals? Especially since, from their matching t-shirts and the size of their groups, I gathered that this was a regular activity, not an indulgence owed to the beautiful weather. As they ran by, I thought: did they notice the factory? Did they mind it?



Figure 4: Runners on the Baanhoek bridge, photograph by author

I was on my way to the Flower Fest (het Bloemfestijn), an event organized by 't Staartje, a community initiative in de Staart, where I had been doing participant observation for the last few weeks. Increasing biodiversity in the neighborhood is an important part of the mission of 't Staartje and to tie community engagement to biodiversity, 't Staartje organized het Bloemfestijn: a one-day festival during which inhabitants of the neighborhood could pick up a bag of seeds for native flora and scatter them over tree-beds, public fields, or their own gardens. Then, they could hand in the empty bag (a coffee filter decorated by children during

the Wednesday afternoon arts and crafts sessions, also at 't Staartje) at the local snackbar for a free portion of fries and join for drinks at 't Staartje. It was also an experiment for the community center; they had only started three months ago and mentioned to me that they were still working on their outreach into the neighborhood.

As one of the volunteers, I sat behind a table at one of the entrances to the neighborhood, an intersection between two smaller streets leading to the main road and offered all the passers-by a free bag of seeds. As I filled their coffee filters, I got to chatting. One woman, who I also knew from spending afternoons at 't Staartje, told me about the old community center, which was now torn down and used to stand on the fallow field behind me, about her family, about the different places she had lived within the neighborhood. She pointed to the field lying fallow behind me.

“There used to be a community center there,” she told me. “Now there’s nothing, but in the summer it’s a good place to pick blackberries.”

“Blackberries?” I replied, “But I thought you weren’t really supposed to...?” Rereferring to the government’s advice to not eat fruits and vegetables grown close to the Chemours factory, as this could lead to dangerous levels of PFAS exposure.

At this, the woman gave a cynical laugh and gave me the finger. “I’ve been eating them my whole life,” she told me, “And I’m perfectly fine!”

I nodded, I had heard this kind of dismissal of PFAS a lot during my fieldwork, especially in de Staart, usually backed up with statements like this woman’s. We continued chatting, until she announced she was going home.

“Ah, are you going to sit in the garden, enjoy the sun?” I asked her.

“No, I have to keep out of the sun,” she replied. “Because I had cancer.”

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When I started my fieldwork, I thought I would arrive in Dordrecht and be met by a community of enraged and active citizens. Having been immersed in the news coverage of PFAS pollution and its potential harms over the past months, I assumed the lives of the people that were living so close to it would revolve around the pollution, that they would try to mitigate it as much as possible and were fighting the factory and the regulatory bodies in charge of giving out permits. And some people are – they will feature in many parts of this

thesis. However, as the vignette above shows, I also encountered many people who did not seem to be preoccupied with PFAS at all, who barely paid it any attention. In this chapter, I will explore different kinds of ignorance that manifest among the communities living in the vicinity of Chemours.

Questions such as “Where does ignorance occur and why?” can point to important social relations, because ignorance is not merely the absence of knowledge, it does not always *naturally occur* (Proctor 2008). There is always a reason behind it. Often, ignorance requires a concerted effort on behalf of those who sustain it, whether this is the people who actively *ignore* something, or companies like DuPont/Chemours, actively withholding information. The question of ignorance therefore complicates our understanding of “toxic events” (Renfrew and Pearson 2021), as the ways in which toxicity are perceived differ, depend on who you ask, where you look. During my fieldwork, I spoke to people from all over the “toxicity continuum” (Renfrew and Pearson 2021), in which their perception of PFAS toxicity ranged “from invisibility or unacknowledged exposure to different forms of suffering, resignation, and refusal” (148).

In this chapter I will firstly discuss the (im)perceptibility of PFAS, as the fact that it is so hard to see, makes it all the easier to ignore. Yet, I will also complicate this statement, by expanding on the (possible) ways in which PFAS could be perceived. Then, I will return to the above vignette and discuss what is happening, by delving into what Loretta Ieng Tak Lou (2022) refers to as “the art of unnoticed”, as well as by providing more examples of ways in which pollution was ignored or justified among the communities I interacted with.

Invisibility: Perceiving PFAS

At least three of my interlocutors gave me the following example: “If PFAS were pink, it would have been forbidden a long time ago.” Of course, the imperceptibility of this group of chemicals is one of the main reasons why the pollution could fly under the radar for so long, why this “slow violence” (Nixon 2013) could continue. As demonstrated in the vignette above, even while I found myself next to the colossal Chemours complex, I too encountered this imperceptibility of PFAS. If I looked the other way, it was almost as if Chemours was not there. I noticed too, that this invisibility made PFAS pollution much more acceptable to many of the people I spoke to. For instance, Lucas compared the Chemours problem to Tata Steel. He said that in the case of Tata Steel, soot from the steel factory settles on the windowsills in Ijmuiden, and that because of the images he had seen of Tata Steel and its pollution, he would

be much less likely to move to IJmuiden than he was to move to Dordrecht. Before moving to Dordrecht, he had never heard of the PFAS problem, and even though he was concerned about the toxicity, this came from a more ideological place than from his lived experience. With regards to his daily life, he said: “I don’t notice it. It really doesn’t bother me.”⁷

Similarly, Hans, another of my interlocutors, mentioned he often used to go swimming in a lake that was now shown to contain over a thousand times higher levels of PFAS than the European safety norms allow (Bosma 2023b). When I asked him about the feeling of this water, his response was: “It feels clean. I don’t taste it or anything. And everything is green, you know? There’s catfish swimming there, and beavers, and I don’t know what else. It just seems... it all seems healthy.”⁸

However, after a few weeks of fieldwork, I started picking up on more subtle (possible) ways of perceiving PFAS. For instance, I noticed that every time I was in de Staart, whether it was on Saturday mornings to join the protests against Chemours, or I was visiting ‘t Staartje, I had a strange sore throat – a raspy feeling. Now, after having left the field for some time, I realize I have not felt this throat-itch in a while. At the time, I ascribed it to several different causes; I was tired, or had a cold, or had overextended myself a bit that day. Perhaps my throat was irritated from night-time acid reflux. Perhaps I had talked too much during my interviews or drank too little water. But something gnawed at me; I had the feeling there was something in the air.

I noticed that my interlocutors had similar reactions. Firstly, after several interviews, I gathered that there is sometimes “a strange, chemical smell” in Dordrecht and its surroundings. During the interviews, Astrid⁹ attributed this to the waste management facility, Heleen¹⁰ to the oil refinery in Zwijndrecht, and others, among which Sarah, Sophie, and Christine¹¹, attributed it to Chemours. All of them took action in one way or another after perceiving strange smells, whether this was by closing the windows, or calling the DCMR to report the smell. Some of them also mentioned different physical symptoms, which might or might not have been related to PFAS exposure.

⁷ Interview Lucas, February 20, 2024

⁸ Interview Hans, March 4, 2024

⁹ Interview Astrid, February 23, 2024

¹⁰ Interview Heleen, March 5, 2024

¹¹ Group interview, March 15, 2024

This points to the importance of subtle sensations in the body when it comes to perceiving and interacting with invisible chemicals. Shapiro (2015) refers to this process of tracking “small changes to the body” which eventually stir “ethical consideration and political intervention” as “the chemical sublime” (369). In his ethnography of Americans exposed to domestic formaldehyde – which in a similar way to the experiences of my interlocutors, has a scent, but other than that is invisible – found that as bodies can be wounded by chemicals so easily, physical sensations can inform us about toxicity, even if only slightly. He argues that when facing low levels of these invisible, domestic chemicals, we must pay attention to these affective processes, as they can tell us something about our toxic exposures.

However, this “chemical sublime” – attributing meaning and action to small changes in the body that could be caused by chemical exposure – is still mired with uncertainty, and many of my interlocutors expressed doubt or frustration about not being able to pinpoint the cause of their symptoms. For instance, Sophie said: “Since I moved here, I’ve had more migraines. Is it because of that [PFAS]? Because the first year that I lived here, I drank the tap water. And it doesn’t have to be the cause, but that’s the mindfuck: that all of a sudden everything becomes suspicious.”¹² Therefore, as there is no definitive way to know how harmful PFAS are, if it harms people differently, and why, diseases like cancer, diabetes, or arthritis (which were all mentioned by my interlocutors) *could* be linked to PFAS, but there is currently no way to be certain. Where in the examples above, my interlocutors took some kind of action *despite* this uncertainty, the uncertainty on the effects of PFAS, combined with its invisibility, can also lead to *inaction*, which I will elaborate on below.

“Unnoticing” Toxicity

In the vignette at the beginning of this chapter, I observed something different than *invisibility*, namely what Loretta Ieng Tak Lou (2022) refers to as “the art of unnoticing”. During her fieldwork in a similar setting – neighborhoods bordering a petrochemical plant in the Chinese city of Guangzhou – she noticed different ways in which people actively ignored or unnoticed the petrochemical plant. This was especially poignant as, similarly to my experience with the runners on the bridge next to the Chemours complex, “there is a difference between not noticing something as intangible as fine particulate matter [...] and

¹² Group interview, March 15, 2024

not noticing the sight of petro-infrastructures” (Lou 2022, 583). I felt similarly about the runners I mentioned, thinking: do they not notice the factory? Does it not worry them?

With regards to her fieldsite, Lou (2022) outlines three main ways in which people justify this “unnoticing” to themselves: taking their lives and health as evidence that the pollution is not harmful, ascribing the pollution and their exposure to fate, and acknowledging certain trade-offs, such as accepting a certain degree of pollution because rent is cheap. Similar mechanisms are also employed in Dordrecht, as the woman I spoke to at Het Bloemfestijn said, “I am perfectly fine!”. Especially among people living in de Staart, a stone’s throw away from Chemours, these mechanisms of unnoticing were striking to me. Throughout my fieldwork, I heard a variety of justifications for unnoticing PFAS pollution, ranging to dismissals of the risks and harm, to apathy and resignation. Often the pollution was trivialized, and I heard statements such as: “Everything is so green here! If it was that bad, plants wouldn’t grow”. Or, another recurring theme was a kind of resignation to widespread pollution: “There is pollution everywhere. If I go East, there’s the Ruhr-area, if I go North, there’s Tata Steel.” Therefore, if it is equally toxic everywhere, many of my participants reasoned, they might as well stay where they were, where they had built up their lives.

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One afternoon, as we were having coffee, an interviewer from the municipality came by to record a video about the neighborhood for the biodiversity project de Staart is a case study for (Groen Blauw Dordrecht, n.d.). He asked the visitors of ‘t Staartje what they liked and did not like about living in the neighborhood. The inhabitants were overwhelmingly positive; different people said it was very green, quiet, and safe. Especially the access to nature was prominent. “On my mobility scooter, I can be in the Biesbosch in ten minutes!” said Guusje. None of the inhabitants mentioned PFAS or Chemours as a negative aspect of living in de Staart. Instead, they mentioned the lack of services, such as an ATM, a supermarket, a hairdresser, or a general practitioner.



Figure 5 (left): Apartment complex in de Staart, Figure 6 (right): Path by river Wantij, in de Staart, photographs by author

After the man from the municipality left, Joep, one of the volunteers said: “Yeah... it’s a poisoned neighborhood, I know. But where isn’t it poisonous? Take Rotterdam, that’s a disgusting city.” I then asked him if he ever had doubts whether it was worse, or more dangerous, here than in other places, he said: “Yeah, I do think about that. About what kind of shit might be in the water.” Both he and Guusje conceded that they *did* think about it, but not so much. “People are upset about that factory over there,” Guusje said, nodding her head towards Chemours. “But it doesn’t bother me, I have no complaints. My flowers look fantastic. Besides,” Guusje, who was nearing eighty years, continued, “where would I go? I’m rusted in place here.” Therefore, they were not *ignorant* of the presence of PFAS in their environment but had developed different arguments they used to “unnotice” its presence that were sufficient to justify living on de Staart. “Unnoticing” points to how the question of ignorance is more complicated than simply “knowledgeable, concerned, and active vs. ignorant, apathetic, and passive”. For instance, after a day of participant observation in de Staart, I wrote:

A woman told me that when she bought her house, she requested all the information on the toxic waste in the neighborhood from the municipality. She told me that the municipality removed the top 2m of ground and put in place a separation layer, laying clean soil on top of that. [...].

There’s a community garden where she has a little allotment. She farms in crates, filled with clean soil, and the community garden has eight rainwater silos sponsored by Chemours. Supposedly growing vegetables in crates and using rainwater protects the vegetables from the toxicity in the soil and groundwater. She farms to save money, because “everything I grow myself, I don’t need to buy.” She has a pension, and her

*husband is unemployed, but his benefits are cut, because she has an income. So, the two of them share her pension.*¹³

I, myself, had the assumption that as people's knowledge increased, they would become more active against PFAS pollution. This presumption was challenged by the people I met in de Staart. While toxic exposures are universal (Renfrew and Pearson 2021; Liboiron, Tironi, and Calvillo 2018), there are also "geographically dispersed hotspots of contamination" (Renfrew and Pearson 2021, 150). It is often the people who lack resources, whether this be due to race, class, age, or gender, who are the principle casualties of slow violence, both because they often live on the fringes of society, where polluting industrial complexes such as Chemours can be found, and because when they do speak up, we often do not pay attention (Nixon 2013; Renfrew and Pearson 2021). Therefore, I find this question of ignorance and unnoticing especially important. I think it is important to be weary of a kind of "enlightened" saviorism: the researcher, the activist, or the government consultant coming in to the neighborhood to tell people their environment is polluted and they should mobilize against it. They *did* know about it. A sentiment I heard often among my interlocutors, was that because they did not bother thinking much about PFAS, because they had the feeling they could not do anything about it. There was a feeling of resignation behind statements such as "it's toxic everywhere". When I asked Lilian, for example, whether she would want to know how much PFAS there were in her direct environment, she said no. "The harm is already done," she said, "and since there's no way to get rid of it, no pill to take for it, I don't need to know."¹⁴ As Lou (2022) writes, sometimes unnoticing is a way for people to reclaim their agency in the face of exposures they face "just so they can carry on with their lives" (581). Or, as my supervisor said when I told him about the runners on the bridge: "But where else should they run?"

Concluding Remarks

As this chapter has illustrated, the way PFAS toxicity was perceived and engaged with by my interlocutors in Dordrecht varied greatly and manifested along a continuum, from not perceiving it at all, to being actively ignored, to being sensed in the body. By combining ethnographic insights on the (im)perceptibility and "unnoticing" of PFAS in Dordrecht with existing scholarship in chemical anthropology, this chapter has contributed to academic debates on the perception of and mobilization against toxicity.

¹³ Fieldnotes, March 12, 2024

¹⁴ Interview Lilian, April 15, 2024

For instance, the insights provided in this chapter answer Renfrew and Pearson's (2021) call for more research on "toxic events", which they define as "the process through which routinized toxicity comes to be collectively perceived as unacceptable" (148). By looking at these events, we can study how toxicity goes from being invisible to becoming apparent, and how people mobilize against it. The nuances in people's experience of toxicity and their response to it discussed in this chapter show how difficult it is to perceive something invisible like PFAS, while at the same time suggesting other, more embodied, ways of perceiving PFAS, referred to as the "chemical sublime" (Shapiro 2015).

Finally, this chapter has complicated our understanding of mobilization against toxicity, by engaging with scholarship on ignorance and "the art of unnoticing" (Lou 2022). As I have demonstrated, inaction is not necessarily a consequence of apathy, and inaction does not necessarily mean acceptance. Instead, it can be a response to uncertainty, a way to handle living amidst an invisible threat, or an active decision in the face of inescapable toxicity. This is important to consider, as it helps us ask: how do we address slow violence and toxic exposures while taking into account these different experiences? In the next chapters, I will further explore how uncertainty around PFAS manifests in different ways.

Interlude: The Ruben Schilt Case

In 2018, the municipalities Dordrecht, Papendrecht, Sliedrecht, and Molenlanden initiated a liability claim against Chemours, holding them responsible for the damage that the company's PFAS emissions had caused in their municipalities. On the 30th of May 2023, there was a closed council meeting of the municipality Dordrecht about this case. In this meeting, the municipality discussed a proposed settlement: Chemours offered the municipalities "a few million" to settle the case. For this settlement, Chemours set the condition that the municipalities would not be allowed to submit claims for future damage from PFOA or GenX and that no further proceedings may follow. The municipality declined the offer, because it was "too low", and was in the process of discussing a higher offer (Zembla 2023a).

Ruben Schilt, a young member of the Labor Party, was at the council meeting in which this settlement was discussed. He felt that settling this case was unacceptable but was afraid that the council would allow it to happen. This led him to leak the notes from the closed meeting to *Zembla* (Persson 2023).

Consequently, Ruben Schilt is being prosecuted for breaking his oath of secrecy and leaking the information. He faces a year in prison and a fine of €22.500. His reaction to this was: "I'm looking forward to telling my full story in court. That way, the responsibility of politics and the transparency of the council can be tested in front of the judge" (Zembla 2024).

Meanwhile, there has been an interim judgement in the liability case against Chemours: Chemours is responsible for the damage caused by PFOA emissions between 1984 and 1998 (Zembla 2023b).

Chapter 2. “What is safe? What is true?” On Navigating Uncertainty

“My feeling these days is: what is even true? What do they know now? What, what is happening? And what can you trust?” – Astrid, Interview February 23, 2024

For some, the invisibility of PFAS can make the problem easy to unnotice, to ignore. However, for those who are actively concerned with these chemicals, trying to live safely, to make the right decisions in the face of an invisible threat, can be an extremely unnerving and disorienting experience. Where in the previous chapter, I explored different kinds of ignorance, in this chapter, I will delve into a different kind of *not knowing* that is engendered in the vicinity of Chemours: uncertainty. Not knowing what is safe anymore, and not knowing which information to trust. Specifically, this mode of uncertainty is *affective*; it elicits emotional responses such as fear, confusion, stress, mistrust, and anger.

In this chapter, I focus on the feelings of uncertainty that many of my interlocutors must navigate with regards to PFAS and argue that the lack of trust in governmental institutions and their decisions significantly enhances everyday experiences of uncertainty. Firstly, I will demonstrate how secrecy on behalf of governmental institutions led to a breach in trust and contributed to the experience of uncertainty in many of my interlocutors. Then, I will argue that PFAS science and regulation add to the feeling of uncertainty and expand upon how the safety restrictions surrounding PFAS impact the lives of my interlocutors, by basing the safety restrictions on recommendations on PFAS thresholds that shift over time. Finally, I will conclude this chapter with reflections and considerations on the relationship between trust, ignorance and uncertainty – focusing on the role of governmental bodies and regulatory agencies in this specific controversy.

(Manufactured) Ignorance and Uncertainty

A few minutes after nine on a Wednesday morning, I called the number given to me by Caroline, a public servant for the municipality of Dordrecht, who worked on the topic of PFAS and Chemours. She had contacted me a few weeks earlier – she heard about my research and wanted to learn more about it, so asked if we could meet. A bit unnerved, but also excited about this request, I replied that I was happy to meet, but that I was still in the middle of my research and therefore would have no findings to report yet. For that, she would have to wait for the final published result, which would be openly accessible. And, since I was still researching, I told her I would include the meeting and my observations from it in

my research. “Of course, that’s only a good thing!” Caroline replied on Whatsapp. So, the meeting was set.

As Caroline came to meet me in the lobby of the municipal office, scanned her employee card so I could enter, and navigated me through the offices and cubicles to our meeting room, I felt strongly that I was entering a different realm, one that was not accessible to everyone, especially not to many of my interlocutors, who had expressed feeling powerless with regards to politics, feeling like they could not influence the course of events. But as a researcher, I was given this entrance, this access, and, most importantly: this responsibility. I realized how much of an active participant I now was in the PFAS controversy.

We sat down in a large office with our cups of coffee, in front of a computer with Microsoft Teams open on a call with an epidemiologist, Linda, also working for the municipality. The tone throughout the conversation was constructive, open, vulnerable even. Caroline told me how she had started with the Chemours case six months ago, and how overwhelming the experience had been; how much there is to know and how many different actors are involved. “Every day I think, which string shall I pull today?” I nodded fervently, familiar with the feeling of the PFAS problem becoming bigger and more complicated, the more you learn about it. Still, I felt on edge throughout the meeting, even though both Caroline and Linda were incredibly friendly.

It was strange – everyone I had spoken to so far was openly, often harshly critical of government bodies, whether this be national government, regulatory bodies such as the RIVM¹⁵, or the municipality. Now here I was, sitting at their table, and from this perspective, as the specificities of policies and regulations were discussed, the matter seemed much more nuanced. As the meeting progressed, a feeling of inadequacy crept over me. Maybe I had been naïve, I thought, to think that the municipality could easily stand up against Chemours, maybe their hands were also tied, constrained by all the different actors involved in this controversy, and they were doing the best they could. As the doubt crept in, I felt in over my head, trying to keep up with everything being said, and still trying to see this new information I was given critically, to contextualize it with everything else I had learned in the past two months. I felt underprepared, because when Linda and Caroline referred to certain debates having occurred in national government, or to similar developments in Belgium, I didn’t

¹⁵ Rijksinstituut voor Volksgezondheid en Milieu, translation: National Institute for Public Health and the Environment

know what they were referring to. “Check later!!” I added next to these things in my notes, while trying to keep a straight face, trying to seem as professional as possible.

The meeting was long, two full hours, which I also found striking. I was surprised, in a way, that these municipal workers, who were in quite high positions, had taken so long out of their day to talk to me. This also made the fact that I felt critical more difficult – they had been so open to me, and here I was, about to confront them.

“I have one more question,” I said, an hour and a half into the meeting. “It kind of feels like the elephant in the room...” I continued, “But I would like to ask about Ruben Schilt. I know he’s being charged for leaking confidential information, but I think a lot of people I’ve spoken to are very angered about this. Like, Ruben Schilt is getting charged for leaking this information, but meanwhile Chemours leaked all these toxic chemicals and there was talk of a settlement...”

Immediately the atmosphere shifted, and it was very clear now, on which side of the table I sat. “But you understand why Ruben is being charged, right? You understand that there cannot be a legal precedent for council members leaking confidential information left and right?” They asked me. And then: “Do you think it would help if the mayor gave an in-depth interview in which he clearly explains why Ruben is being charged?” As I felt the blood rushing at my temples, I cursed myself internally. How did I get myself into this situation, sitting here with an unfinished master’s thesis, with people with decision-making power asking for my opinion?

“Well, I think it’s clear why he’s being charged.” I carefully said, “but I think the problem is that the meetings are confidential in the first place, that people don’t know what’s happening behind these closed doors.”

“But in those meetings, we’re standing up for the citizens’ interests,” Caroline replied. “And the confidentiality is so that we don’t lose our bargaining position.”

“Right,” I replied. “I understand that. But how can people know that? Given everything that has happened, how can people trust that? It’s not what’s being discussed that’s at issue. It’s the fact that it’s confidential at all.”

•

Above, I mentioned that the more I learned about PFAS, the more overwhelming and complicated the issue appeared. This is a common occurrence: gaining more knowledge often points us to more questions, towards more things that we *don't know*. Therefore, as knowledge increases, so does ignorance (Gross 2007). In *Waste and its disguises: technologies of (un)knowing*, Catherine Alexander and Patrick O'Hare (2023) write that “the deliberate withholding of knowledge about toxic wastes and pollution is all too familiar within the military-industrial complex” (435). Robert Proctor (2008) also demonstrates how industries – he focusses on the tobacco industry – have long withheld information or manufactured doubt to increase their profits. Ignorance can be productive, write Alexander and O'Hare (2023), which is why as anthropologists we must ask “to whom, how and why knowledge is revealed or kept hidden” (430). During my fieldwork, this feeling of ignorance was exacerbated by new developments and discoveries on the topic, whether this be about shifting thresholds or safety recommendations, or more political occurrences, such as the developments in the case against Ruben Schilt. When it comes to day-to-day life, this ignorance can lead to strong feelings of uncertainty.

As I mentioned to Caroline and Linda from the Dordrecht municipality, I encountered much frustration and even anger regarding the case of Ruben Schilt. Of course, I understood that by leaking confidential documents, Ruben Schilt broke his oath and the law, and had to be punished for this. My interlocutors also understood this. However, the problem is not *that* he leaked information, but what that information was, the fact that the municipality withheld it from the public, and what many of my interlocutors consequently experienced as a lack of response on this matter. For instance, speaking about the mayor, Anna said:

I'm not happy with him. Because we didn't hear him. We didn't hear from him when this [PFAS information] came out [...]. And that's supposed to be a “reliable” institution. Screw that. And when Ruben Schilt leaked those documents, *that's* really crossing a line. Leaking secrets was not okay, but leaking PFAS and carcinogenic chemicals, yeah, I guess that just happens.¹⁶

Similarly, in March 2024, when the case against Ruben Schilt appeared in the news again (Zembla 2024), another of my interlocutors, Heleen, forwarded the news to me with this message:

And the paragraph about the lawyer - who said the settlement amount was too low and wanted to negotiate it – I find that downright shocking! And no one says a word

¹⁶ Group Interview, 15 March, 2024

about that. It suggests that they would be willing to negotiate and settle the case for a higher amount.

A large part of the conversation I had with Caroline and Linda revolved around trust: how to increase people's trust in science, and in the municipality. Trust is one of the most important foundations of wider society, especially in the face of uncertainty (Gross 2007). He argues that modernization, which originally had the purpose of mastering the natural world and increasing certainty, has shown us that this mastery of the world is impossible, that we will continue to face uncertainty, for the more we know, the more we know we don't know. Facing these uncertainties, for instance in the case of PFAS, requires trust as "the key to a functioning relationship between wider society and different expert systems" (Gross 2007, 745). This is because it is experts – in this case scientists and regulators – who have most the knowledge and power to (start to) address the issue. For the rest of us, PFAS remain very elusive, hard to grasp, to understand. Similarly, in *Mistrust: An Ethnographic Theory*, Carey (2017) outlines how people are confronted with an infinity of possible futures at all times. It is basically impossible for us to consider all these futures simultaneously. Therefore, trust helps us to navigate this chaos, because we trust the future will go (almost) as we expect (Carey 2017). This helps us narrow down the possibilities, to get a grasp on the future.

However, with regards to the PFAS controversy, the future *did not* go as expected. For years, my interlocutors told me, they believed they lived in a clean environment, only to discover they had been exposed to PFAS for decades. Carey (2017) writes that trust depends on "a certain degree of familiarity with either people, the world, or systemic representations of the world" (6). This familiarity with the world has been disturbed by the discovery of PFAS. Additionally, the government's secrecy on the issue has disturbed the relationship of trust between my interlocutors and the government¹⁷. Where trust is supposed to manage uncertainty, the loss of this trust compounds feelings of uncertainty. For instance, early in my fieldwork, I had asked Joop and Kees which information they trust when it comes to PFAS and Chemours. Kees' response was:

¹⁷ This breach of trust did not occur in a political or historical vacuum. Instead, the information revealed by Ruben Schilt is one instance in a list of many, which my interlocutors cited as reasons for their mistrust in governmental institutions. During almost every conversation I had while doing participant observation, and during many interviews, the childcare benefits scandal, the handling of the earthquake damage in Groningen, the pollution around Tata Steel in IJmuiden, the asylum crisis in Ter Apel, and the nitrogen crisis were mentioned as reasons why my interlocutors had lost trust in governmental institutions.

Well, everything Professor de Boer¹⁸ writes, we trust that. And what *Zembla* brought to light. For us, that's the foundation. We don't have any reason to doubt that. But in terms of the government... At every point, I think: is that true? Even the local government here. I just think: what are they hiding? Why don't they open everything to the public, why don't they want that?¹⁹

“What are they hiding?” Kees asked. This is the crux of manufactured ignorance, also known as “agnogenesis” (Proctor 2008). This kind of ignorance is deliberately engineered, by those who intentionally and actively withhold information (Proctor 2008; Richter, Corder, and Brown 2021). On the receiving end of it, one is at the mercy of those who hold the information, for “they know, and may or may not want you to know that they know, but you are not to be privy to the secret” (Proctor 2008, 9). The consequence is that one never *fully* knows whether there is more to know, whether someone is hiding something. One can only trust. But when information like the documents leaked by Ruben Schilt comes to light, trust becomes compromised, and mistrust increases affective experiences of uncertainty.

Shifting Thresholds

Another prominent way in which uncertainty manifested on the day to day was in relation to the PFAS safety thresholds, for instance recommendations on food products or lifestyle choices. Scholars within chemical anthropology have noted that often safety thresholds shift upwards, as the pervasiveness of industrial and toxic chemicals leads to “a shifting sense of normality” (Shapiro and Kirksey 2017, 484), with a certain level of toxicity becoming normal. As mentioned in the previous chapter, in Dordrecht, I witnessed this normalization of toxicity often, with many of my interlocutors stating, “it's toxic everywhere,” and in this way justifying their choice to stay in Dordrecht. However, when it comes to PFAS safety thresholds, the opposite is happening. Rather than the baseline shifting upwards, as more discoveries are done on the dangers of PFAS, measurement instruments become more precise, and measurements more frequent, the thresholds for PFAS shift downwards, sometimes radically. For instance, the safety thresholds for PFAS levels per kilogram of body weight were lowered significantly in 2020 (European Food and Safety Authority 2020).

These shifting safety thresholds, as well as the government's communication of them, were subject to much debate, dismay, and outrage throughout my fieldwork. During my

¹⁸ Prof. Dr. Jacob de Boer, professor in Environmental Chemistry and Toxicology at the University of Amsterdam.

¹⁹ Interview Joop and Kees, February 7, 2024

research period, many of my interlocutors were concerned about the safety of the water surrounding Dordrecht, both with regards to drinking water, as well as swimming water. For instance, Astrid told me she was confused about the way thresholds and ensuing safety regulations were set, for instance with regards to swimming. One lake, the Merwelanden, located in the Biesbosch, was closed for swimming after dangerously high levels of PFAS were found (*NOS Nieuws* 2023b). On this topic, Astrid said to me:

Astrid: So in the Merwelanden, there's a swimming lake...

Chiara: You mean, like, the one *right next to* Chemours?

Astrid: [laughs] Yeah, that one. Well, first they tell you it's safe to swim there. Or, I mean, yeah, maybe there was some skepticism about it, but yeah... I didn't swim there anyway so... But then what is true or what is correct? Because later, it turns out to be different...²⁰ And they didn't warn about "open water", in which I *do* swim from time to time.

Chiara: You mean the Merwede?²¹

Astrid: No, more like, the Biesbosch is made up of all these streams and creeks. And then you have the Wantij river, and another part, which I don't know the name of... And about these, no one said it was unsafe. But I looked it up later, and it turns out that's because they can't say that about open water. They don't test it for safety levels because it's not "swimming water". Yeah, I think that's a bit strange because a lot of people swim there.²²

For me, an important takeaway from this interaction is how safety thresholds are constructed based on certain technoscientific decisions: what is measured, what is included in certain categories (Masco 2004). Classification is fundamental to setting these safety thresholds. As mentioned above, the classification of a body of water as "recreational" incited measurement, and therefore indicated unsafety, whereas other bodies of water remained unmeasured.

A similar development occurred with the safety thresholds set by the European Food and Safety Authority (EFSA), mentioned above. According to the EFSA, the safety thresholds are tied to a "critical effect", against which PFAS values are measured. First, high cholesterol was taken as a critical effect, and as this problem only appeared at higher PFAS values, the EFSA set higher safety thresholds. However, once it took "decreased response of the immune system to vaccination" (European Food and Safety Authority 2020) as its critical effect, harmful effects were registered at much lower PFAS levels, which therefore lowered

²⁰ Here, Astrid is referring to the closing of the lake for swimming purposes.

²¹ The Merwede River, which runs through Dordrecht.

²² Interview Astrid, February 23, 2024

the safety thresholds. “The act of measurement, as a way of making something known, is heavily freighted morally, economically, technically, politically and socially,” write Catherine Alexander and Patrick O’Hare (2023, 436). The decision on what to measure is therefore a political one disguised as neutral technoscientific facts. Including one thing almost always entails excluding another, which has political consequences. Who is exposed, which exposures are addressed, and which can remain unseen all follow from this decision. Many of my interlocutors were aware of this construction, and therefore were critical of these thresholds:

Louise: We did it [test our blood] because we’ve lived here for so long.

Anna: And what were your results?

Louise: It really wasn’t too bad. We were really under the threshold, which makes me think... [shrugs shoulders, indicating confusion]

Sophie: But what does that *mean*? Is that even *true*?

Vera: Yes, because you had the lake²³ and those kinds of things. There were thresholds for that too. And surface water, there were norms for that too, but those also all went [gestures downwards]. And then you have a totally different story.

Anna: But really, it should just be 0,00.

Christine: And the water takes it everywhere.²⁴

These safety thresholds are politicized and problematized by the statement “it should just be 0,00”. The statement points to the tension between the ideal of a clean living environment and our reality, in which “all bodies tested, anywhere in the world, contain industrial chemicals.” (Liboiron, Tironi, and Calvillo 2018, 332). Writing about the effects of nuclear testing in the American West, Joseph Masco (2004) argues that what is now considered “background” pollution – and therefore the neutral basis for these threshold limits - is partially the consequence of human industrial actions. Therefore, similarly to industrial chemicals, trace effects of the Manhattan Project can be found in people, plants, animals, soil and water across the globe (Masco 2004). With regards to studying the effects of nuclear radiation, Masco (2004) asks: “how does one define the limit or scope of the nuclear laboratory when its trace elements can be found literally anywhere on the planet?” (521). The

²³ Referring to the Merwelanden lake mentioned earlier.

²⁴ Group interview, March 15, 2024

consequence of this, is that the effects of and ensuing safety thresholds for low-level nuclear radiation remain up for debate, uncertain.

Additionally, my interlocutors were critical of safety thresholds in the first place. According to them, when a government sets a certain threshold, this means that they are *approving* a certain level of pollution. Liboiron, Tironi, and Calvillo (2018) write that this is often the case in the regulation of industrial chemicals: they are regulated in such a way that production can continue, through safety thresholds and emission permits. This, in the eyes of many of my interlocutors, was a form of betrayal, a break of their trust. The government, which was supposed to care for them, to guarantee a safe and clean living environment, was instead permitting dangerous pollution to continue. Liboiron, Tironi, and Calvillo (2018) call this “toxic politics”, arguing that our society is structured in a way that allows certain forms of pollution to happen, profiting some, while harming others, and therefore reproducing the power structures that created them and spread them in the first place.

The effects of these “toxic politics” (Liboiron, Tironi, and Calvillo 2018) on the day-to-day lives of my interlocutors, are a combination of mistrust and uncertainty. As mentioned above, many of my interlocutors were aware of the shifting nature of safety thresholds, and critical of the way the government set and communicated them. For instance, some of the safety advice made little sense in the minds of my interlocutors. “Now they’re saying: ‘don’t eat from your vegetable garden, or if you do, only once a week, and get the rest of your vegetables from the supermarket.’” Kees explained to me during an interview early on in my fieldwork. “But,” he continued, “the Jumbo here gets its fruit and vegetables from the farms in Oss, across the river, right across from Chemours! The stuff the farmer delivers to the supermarket is equally contaminated with PFAS. But then it just *feels* safer to get produce at the supermarket, as if that is safe.”²⁵ This statement by Kees became all the more telling when two weeks later, it turned out that Dutch fruits and vegetables are sprayed with pesticides that contain PFAS (NPO Radio 1 Journaal 2024).

Yet the people I spoke to also *need* these thresholds and regulations, as they are one of the main ways in which PFAS are made tangible and actionable to them. In the face of toxic exposures, there is a tension between dependency on government advice and information, and mistrust. “It hinders me every day.” Sophie told me. “With everything you do, you have

²⁵ Interview Kees, February 7, 2024

to think: will this have PFAS? What is this made of? Oh, can I use this? Which way is the wind blowing? Is it blowing our way? Can I open my windows? At least, this is how I think...”²⁶ For Sophie, navigating PFAS exposures in her daily life, as an individual and as a mother, proved to be an incredibly stressful experience, one that the other mothers in the group interview echoed, not in the least, because they said not to fully trust the government that set these regulations in the first place. As Sophie said a bit later in the interview: “That’s the mindfuck of it all. That you just... don’t know. You just can’t trust [anything] anymore.”²⁷

Concluding Remarks

In this chapter, I have laid out different instances from my fieldwork that show how the day-to-day lives of many of my interlocutors are mired with uncertainty. By combining ethnography with anthropological theory on (manufactured) ignorance and mistrust, my aim was to demonstrate how mistrust can compound feelings of uncertainty, especially with regards to toxic exposures.

In their book *Modes of Uncertainty: Anthropological Cases*, Limor Samimian-Darash and Paul Rabinow (2015) write that anthropologists should “treat [uncertainty] itself as a problem and examine the forms of governing and experience that are emerging in relation to it” (1). This chapter attempted to do exactly that and argues that one way in which uncertainty manifests in Dordrecht is affective: situations of ignorance and uncertainty lead to feelings of fear, anger, and stress. This chapter has demonstrated the relationship between (manufactured) ignorance, trust, and uncertainty, and shown that secrecy on behalf of the government has led to a break in confidence, a lack of trust. Throughout my research, I encountered uncertainty as a feeling of losing one’s grip on reality, of losing the stable ground under one’s feet. The feeling of uncertainty was a consequence of situations of *not knowing*. This uncertainty was exacerbated by the government’s policies on confidentiality.

These findings point to the importance of scrutinizing the technoscientific decisions that regulate our lives and societies, because these are not apolitical, and not without consequence. Who makes these decisions, what definitions do they use, and which methods of measurement do they employ? Who stands to gain from the way safety thresholds and chemical regulations are set, and who is most exposed, most vulnerable to these chemicals? Ultimately, this chapter has shown that governing uncertainty, especially in the face of

²⁶ Group interview, March 15, 2024

²⁷ Group interview, March 15, 2024

chemical pollution, is not only about setting thresholds or regulating emissions. The ethnographic research highlighted here has shown the importance of trust and mistrust when it comes to navigating uncertainty, as a lack of trust can enhance everyday experiences of uncertainty.

In the next chapter, I will further expand upon the concept of uncertainty by addressing the temporal aspects of uncertainty – specifically the ways uncertainty about the future also increases uncertainty about the past and the present.

Chapter 3. “We Didn’t Know We Were Emitting This Chemical”: On Temporalities of Uncertainty

“I moved here to get away from Schiphol and thought it was clean here. Then came *Zembla*. Now I’m thinking: what am I doing here?” – Sophie, Interview March 15, 2024

In protest against Chemours’ PFAS emissions, and their perceived lack of action from the government, Joop and Kees, and usually around thirty other demonstrators, gather every Saturday morning at the gates of Chemours, regardless of rain, wind, or sunshine. Throughout my fieldwork, as I got to know many of the demonstrators better and as the weather improved, I came to enjoy these protests a lot. The protests always started off with Joop and Kees playing music – an array of classic rock – while they put up their posters that said “Nul Uit De Pijp!”²⁸ and laid out the buckets of polluted soil that would be scattered at the gates during the demonstration. Joop then kicked off the demonstration by greeting all the “beautiful people”, after which he would hold a brief speech with the week’s updates. On Saturday April 13th, I was chatting to some of the regular protestors I had met over the course of the previous months, when Joop’s familiar “Good morning, beautiful people,” interrupted us and we turned towards him. That day, his speech revolved around the commotion around Chemours’ TFA emissions, ultra-short PFAS compounds of which the harmfulness has not been determined, and which are so small, that they are incredibly difficult to measure (Sys and Luimes 2023). To us, he said:

Last Thursday, I read that Chemours had won its appeal before the so-called ‘South Holland Appeals Committee’ regarding their objections to the illegal discharges of TFA. I swore a little when I read that. The completely absurd reasoning is as follows: according to the Appeals Committee, the TFA discharges were implicitly allowed - it wasn't stated in the permit, but it was allowed - because it was a consequence of another permitted activity. Chemours called TFA an “unwanted byproduct that results from an unwanted reaction in the production process, afterward”. It turns out that this substance has been discharged in large quantities for years - and that's the awful part! And then there's this delightful Chemours lawyer who says that even Chemours didn't know this had been happening for years. And the most childish thing is that what you don't know, you can't include in your permit application [...].

And Chemours, showing no sign of embarrassment, displayed their contempt for the authorities and for us, the locals, just yesterday. With their boundless American audacity, they are now not only applying for a permit to discharge TFA acid directly into the sewer and river, but coincidentally, they have also “discovered” some other previously unnoticed PFAS substances, such as: difluoroacetic acid – never heard of it

²⁸ Translation: Zero Emissions!

– perfluoropropanoic acid, also never heard of it, and tetrafluoropropanoic acid. Apparently, these have also been quietly entering our river for years.

This speech is exemplary of something I saw occur often during my fieldwork: new information coming out, new discoveries being done, that retrospectively point to toxic exposures. Many of my interlocutors mentioned feeling betrayed, as they had assumed their lives were safe, but now information such as the example mentioned above retroactively makes the past unreliable. This in turn makes the present and the future uncertain too – who knows what else will be discovered in the future? Where in the previous chapter, I described an affective mode of uncertainty, in this chapter, I will outline a temporal mode of uncertainty, and consider uncertainty as an *ignorance of the future*.

Firstly, I will expand on the dispersals of exposures over time, on how the discovery of PFAS pollution, and the *potential* future discoveries of more pollution, unsettle the past and present. Then, I will outline how my interlocutors mobilized and used activism to regain their footing in the face of this uncertainty. Finally, using ethnographic examples from my time in Dordrecht, I will conclude this chapter by showing the theoretical distinctions between risk and uncertainty and argue why it is important to make this distinction, as in this case, risk management is not sufficient in addressing this ignorance of the future.

Dispersals in Time

During my fieldwork, I saw that many of my interlocutors were aware that new information might lead to even stricter thresholds in the future, that many more things that were considered “safe” in the moment would potentially be compromised with future information. This made the present freight with uncertainty. As I am writing this in May 2024, posts on the Facebook group “Gezondheid voor Alles: Nul Uit De Pijp!” point to this awareness. Kees, one of my interlocutors, regularly shares news articles on the page. For example, on May 3rd at 15:20, he posted an article titled “124 Spots in the Province Utrecht Potentially Polluted with PFAS” (RTV Utrecht 2024), which he accompanied with the caption:

And *hoppa*²⁹. The next notification has already arrived. Not so long ago you barely read anything about this misery and now it’s prize (a few times) every day, divided over our country from north to south and from east to west... What a tangle this PFAS

²⁹ This is a difficult word to translate. It means something like: “And bam!” or “There we go!”

mess is and and what a mess they've made of it.

Later, at 21:08pm, he shared another article titled “The Country is Full of PFAS, and the Most Polluted Spots are in Brabant” (Janssen 2024), with the caption: “And... the next one and who knows how fast this will be outdated by other news”. Kees, along with many other interlocutors, found himself in a state of anticipating news of PFAS: discoveries of polluted areas, of new kinds of PFAS, or of thus far unknown harms. Anticipation, according to anthropologists Rebecca Bryant and Daniel Knight (2019), is the feeling of the future in the present, for instance *feeling* rain in the air, and hurrying home. In this way, the present and future melt together: while the future has not fully arrived (it has not started raining), the present is already shaped by it (you hurry home). Often, this anticipation is paired with a kind of *expectation*, of having a sense of what the future will look like. Usually, anticipating the future, seeing it come towards us, gives us “a sense of *what we should do*” (Bryant and Knight 2019, 43, emphasis in original).

However, Bryant and Knight (2019) also ask: “what of those instances [...] when the parameters of life have changed so distinctly that the future is no longer imaginable?” (43), as is the case with regards to PFAS in Dordrecht. In *The Sick Building Syndrome*, Michelle Murphy (2006) explains that the ability to perceive chemicals depends on the specific “historical practices and technologies” (9) used. Therefore, as “chemical exposures do not only happen when we know about them” (Murphy 2006, 8), ignorance, in this case ignorance of the future, exacerbates present feelings of uncertainty. There is the possibility that in the future, with new measurement technologies or different approaches, more PFAS exposures will become visible in hindsight (Burke 2023). Even the RIVM recognizes this. “The limit value [for PFAS in one’s blood] may change again as new scientific information becomes available,” they write on their website (2024b). The RIVM recognizes that much is still uncertain in PFAS science, and that they are currently working with estimates and assumptions, and also acknowledges that these might be incorrect (ibid.). Therefore, what happens when one is no longer able to anticipate the future?

Bryant and Knight (2019) describe the condition of not being able to anticipate the future as a “Time of Crisis”, in which people find themselves in “an uncanny present, a present that is unfamiliar” (43). This is because usually, through anticipation, the future shapes our present orientations; in the present, we are constantly making decisions that move us toward a certain future, and these decisions orient us, ground us in the present. However,

in the case of PFAS, these decisions have become compromised by the uncertainty of the future. For example, with regards to swimming, as mentioned in the previous chapter, one could swim in the river Wantij today, thinking it is safe, because the safety recommendations state it is, but perhaps tomorrow, the news will break that the river has been highly polluted for years. The same applies to eating eggs (Rijksoverheid 2024), or buying vegetables (NPO Radio 1 Journaal 2024). The consequence is that the present becomes characterized by great uncertainty, as every decision and orientation might be compromised by future developments. The uncertainty is especially pressing, especially uncanny, especially unsettling, because it pertains to some of the most intimate aspects of life: our bodies, our health, and that of our loved ones³⁰. As Sarah said to me: “You hope it’s not that bad. And then it turns out to be much worse than you had dared to think. And it’s probably worse than that.”³¹

Regaining One’s Footing

In order to address the injustice of having to live with PFAS pollution, of not knowing what the future will bring, and having to live with these uncertainties, Joop Keesmaat and Kees van der Hel started their action group, “Gezondheid voor Alles”, and have been symbolically delivering polluted soil to the gates of Chemours every Saturday morning for over four years, as I described in the vignette at the beginning of this chapter. Joop and Kees were the first people I interviewed for this research, on a crisp, sunny, February afternoon. Kees had very kindly offered to pick me up at the bus stop at Sliedrecht Baanhoek, and together we drove to Joop’s house, where we sat at the dinner table with cups of coffee and tea, discussing their activism against PFAS pollution and the different ways the chemicals had affected their lives. Both men had started their activism out of idealism, just because “that stuff doesn’t belong in the environment”³², but throughout the years the matter had become more personal: Joop’s wife had passed away from ovarian cancer – a type of cancer that later was linked to PFAS exposure.

“Yeah, when I found out about that, I did throw a couple of paintings from the wall.” He said, slowly shaking his head. He had moved houses since then, and we were sitting in his new living room, overlooking the Merwede. Before, he’d lived in a house with a garden that

³⁰ Sigmund Freud (1919) coined the term uncanny in his essay “The Uncanny”. The term refers to when something that should be familiar, is instead unsettled, alien. ‘Uncanny’ is translated from the German *unheimlich*, or unhomey. The translation therefore underlines the core of the issue: how unsettling it is when one’s home is compromised.

³¹ Group interview, March 15, 2024

³² Interview Joop and Kees, February 7, 2024

he shared with his wife, in which they had grown vegetables and kept chicken. In hindsight, these simple acts had become loaded as potential sites of exposure. I got the sense that activism was a way for Joop and Kees to reorient themselves in the present, to reclaim some agency in the face of uncertainty. “It’s really no fun anymore when you’re alone...” He said thoughtfully, looking around the room. A silence fell. “But you know?” Joop continued, referring to his activism, “on the other hand, I also have... it fills my days, and it energizes me because it’s going well.”³³

Throughout the interview, I got the impression that the activism is not only about stopping PFAS emissions, but also about contesting knowledge and information, about Joop and Kees reorienting themselves towards something new, as a way of regaining (a semblance of) certainty. Every week at the Saturday morning protests, Joop read out the news of the week: whether there were new updates on PFAS regulations, whether news had come out about new emissions, and updates on their further activities that week, such as meetings with regulatory bodies or a visit to the European Parliament in Brussels. As a participant in these protests, and as a researcher, I came to really value Joop doing this. It felt like he had done the brunt of labor in following the news that week, in speaking to governmental actors and reading reports, and in this way created some order in the chaos. To me, it felt like these weekly summaries gave me an entryway into what, in Joop’s own words, is “very complicated material”³⁴.

Both Joop and Kees were very informed on the question of PFAS. Half-way through the interview, Joop even walked to another room and returned holding a thick binder, filled with copies of articles, information booklets, government issues reports, and other information. As we pored over its pages together, I asked them whether they had ever conducted blood tests to know their PFAS levels. Both had. When I asked them why they wanted to know this, Kees responded:

Maybe I’ll get sick from [PFAS], who knows? Only when it’s happening, there’s nothing I can do with that information. But still, for myself, I would like to know that I have all this shit in my blood and that it’s because of my neighbors [Chemours]. They did that to me, without me asking for it. It just happens to me. So really, I want to call upon everyone: get your blood tested! Because doctors can do something with that. If so many people with elevated PFAS levels in their blood... All these inexplicable illnesses and symptoms... then they can start building up some kind of expertise. See here, you’re laying the groundwork to be able to make an evaluation

³³ Interview Joop and Kees, February 7, 2024

³⁴ Interview Joop and Kees, February 7, 2024

later: what does PFAS do to the human body?³⁵

The above quote signals a fundamental tension around this issue: that of knowledge, and of agency. Being exposed to PFAS pollution was something that “happened to” Kees, by the fact of living close to a chemical concern that polluted its environment and kept this hidden from the public and regulatory bodies. Wanting to know the levels of PFAS in his blood was partly about regaining control over his own body and what was in it. However, this knowledge was also productive, generative. With it, there would be a clearer perspective on action, clearer information on what is safe and what is not, better ways of anticipating the future again, which could lead to clearer ways of orienting oneself in the present.

A Note on Cancer: On Risk and Uncertainty

At the same time, most of my interlocutors, including Joop and Kees, were aware of the complexity and uncertainty surrounding PFAS science. There is already much knowledge on the adverse effects of PFAS on human health and the environment, for instance thanks to the large epidemiological study conducted in West Virginia after the PFAS discoveries in Parkersburg, the case on which the film *Dark Waters* was based (Richter, Cordner, and Brown 2021). However, this information is most applicable on large scales: for instance, that of an entire population. Unfortunately, it is not the case that a certain level of PFAS will lead to a certain outcome in an individual. Hence, more knowledge will not necessarily lead to clearer risk assessments, to clearer ways of orienting oneself in day-to-day life. For instance, Joop said:

That’s the strange thing about that whole PFAS thing... In comparison to Ted van der Vlies³⁶... You know, my levels were almost twice as high as my wife’s. But still, she got cancer, and I haven’t. And the PFAS levels, they are... mine are six times lower than Ted van der Vlies’. We live in the same village, under the same pollution from the same company... Yeah and Ted’s still here, and my wife isn’t. How can that be? Yeah, that’s complicated stuff...³⁷

Now, let’s return to the meeting I had with Caroline and Linda, mentioned in the previous chapter, who worked at the Dordrecht municipality. During the meeting, I really did get the impression that the municipality was actively looking for solutions to the PFAS problem.

³⁵ Interview Joop and Kees, February 7, 2024

³⁶ Ted van der Vlies, also mentioned in the introduction, prominently appeared in the *Zembla* documentary “De PFAS-doofpot”. He suffered from leukemia and skin cancer and had extraordinarily high levels of PFAS in his blood. He attributed his illnesses to his PFAS exposure.

³⁷ Interview Joop and Kees, February 7, 2024

“I’m lobbying with parliament, with the GGD³⁸, with the RIVM,” Caroline told me. One of the things she was lobbying for, was a larger epidemiological study in the area. She also believed this kind of research could lead to increased certainty in people. “Maybe it turns out you shouldn’t eat bulbs, but you can still eat lettuce, you know?” She said, “and perhaps,” she continued, “the results will show that the risks aren’t all that bad.”³⁹

Here, I believe it is important to consider the difference between risk and uncertainty. After the meeting with Caroline and Linda, I wrote in my fieldnotes: *I think my main conclusion from this meeting is that the municipality is a fundamentally different actor, and really acts from its own position as governmental body.*⁴⁰ By this, I meant that the municipality could afford to think in terms of risk management, to live with a certain degree of risk, because it quantifies risk, measures it out in “degrees of probability” (Burke 2023). This way of handling risk is in line with what Ulrich Beck (2006) refers to as a “risk society”, which he defines as a society “that is increasingly occupied with debating, preventing and managing risks that it itself has produced” (332).

“The essence of risk management,” writes Peter Burke (2023), “lies in maximizing the areas where we have some control” (229), or at least believe we have some control. However, there are also “incalculable” unknowns (Burke 2023, 229). Probability works because of the law of large numbers, but as mentioned above, in the example of Joop and his wife, it is extremely difficult to determine the effects of exposure on an individual body (Burke 2023). In this way, PFAS exposure is interscalar (Hecht 2018): it spreads throughout municipalities and countries, but also, it affects individuals, and manifests in the question of whether one’s body will grow a tumor in reaction to PFAS exposures. Beck (2006) also states that the ability to define risk is unequal, as there are actors who have the power to “maximize risks for ‘others’ and minimize risks for ‘themselves’” (333). If the probability of adverse effects is *low enough*, this then becomes an acceptable risk. But acceptable to whom? Back at the dinner table with Joop and Kees, as we pored over Joop’s thick binder, he said:

We always got into arguments with these people. ‘Yeah, you need to interpret the number in this way,’ they would say, ‘and look at the cancer incidence rates and not the cancer death rates...’ And then they would make predictions, estimations... The GGD would estimate that with such a population, you could expect a certain rate of

³⁸ Gemeentelijke Gezondheidsdienst, translation: Municipal Health Services

³⁹ Interview Caroline and Linda, 3 April, 2024

⁴⁰ Fieldnotes, 3 April, 2024

cancer in the coming year. Expect! What they base that on, I don't know...⁴¹

Finally, these risk assessments are based on the knowledge that is available in that moment, without considering that we are to a certain degree ignorant of the future. As described above, there is always a possibility that, in the future, new discoveries about PFAS “that do not exist for us now maybe come into being for us” (Murphy 2006, 8), revealing risks retrospectively that could not have been predicted.

When Caroline said that perhaps the “risks aren't all that bad,” she was reasoning from a perspective of risk management, acting according to the belief that the future is, to a large degree, predictable. This logic works, because governmental bodies do not experience the consequences of these risks in the same way as my interlocutors do. To governmental institutions like the GGD or the municipality, a percentage of the population getting cancer every year can be “expected” or considered “not that bad”. This is a fundamentally different perspective from my interlocutors' first-hand experiences with cancer diagnoses and deaths. Therefore, “accepting” a certain degree of risk does not remove, and perhaps even exacerbates, day-to-day uncertainties for people like Joop and Kees, who have been and continue to be exposed to PFAS, and don't know how their body will respond.

Concluding Remarks

In this chapter, I have explored the relationships between uncertainty, risk, and time, and established that uncertainty can be considered a form of *ignorance of the future*. Throughout the chapter, I used ethnographic data to better understand the different ways my interlocutors in Dordrecht experienced and responded to this kind of uncertainty. For instance, thinking with Bryant and Knight (2019) and Michelle Murphy's (2006) work, I demonstrated how as knowledge about PFAS increases, this often reveals exposures in hindsight. The unpredictability of future PFAS discoveries then complicates making decisions in the present, as PFAS discoveries (often) cannot be anticipated. Then, I expanded on how Joop and Kees, the leaders of the action group against PFAS pollution in Dordrecht, used their activism to reorient themselves in the face of all this uncertainty. Finally, following from these examples, I outlined the theoretical distinctions between risk and uncertainty and building on the

⁴¹ Interview Joop and Kees, 7 February, 2024

ethnographic examples from this chapter, argued that risk management is not sufficient in addressing uncertainty when it manifests as ignorance of the future.

These insights contribute to our understanding of toxic events (Renfrew and Pearson 2021), showing that toxic events do not have to be a single moment in time. Instead, toxic events can be dispersed. The past seeps into the future, as people currently deal with, and must continue to deal with, past PFAS exposures. And the future seeps into the past, as future discoveries and hindsight might change the way we view present and past events. These findings are important to consider with regards to governing and regulating PFAS exposures, as there will probably (or: certainly) never be a moment in which we have achieved full scientific certainty, in which we have all information. However, I want to stress that this does not mean the scientific enterprise is futile. We might never know *everything*, but we can surely know more than we do now. Studying, governing, and regulating PFAS in a way that is responsible for ourselves, for other communities, and for future generations therefore inherently entails looking for ways to navigate these uncertainties, while trying to understand these chemicals to the best of our ability.

Conclusion

In the Netflix television series *Stranger Things*, there is an alternate dimension that exists parallel to the human world called The Upside Down. The Upside Down is the same as our dimension, almost an exact mirror of it, but darker, dangerous, filled with monsters. I often thought of this image during my fieldwork on PFAS pollution in Dordrecht, because several of my interlocutors phrased their experiences of living with PFAS exactly in these terms: “It’s like the world is upside down!”⁴². The Upside Down in *Stranger Things* really captures the feeling of the uncanny for me, the feeling of your present, your home, your environment, your body, being unsettled, uncertain. This is why *Stranger Things* is such a scary show: the world that should be familiar, safe, and predictable, is not anymore.

Over the course of three months, I spent time in Dordrecht in order to answer the question: *How do the communities living in the vicinity of the Chemours factory experience and respond to PFAS toxicity?* Throughout my time in the field, I encountered many answers to this question, but the theme that stood out to me was that living with PFAS entails a lot of *not knowing*. Not being able to see or otherwise perceive PFAS, not knowing how much of it is in one’s direct environment, not knowing what is safe to eat, or where it is safe to swim, not knowing if something will happen to one’s body as a consequence of exposure, not knowing whether the governmental and regulatory bodies are holding back information, not knowing what information might present itself in the future. And the list goes on.

In this thesis, I situated these experiences of *not knowing* within anthropological debates on waste, ignorance, and uncertainty, using my ethnographic observations to give insight into how waste, ignorance and uncertainty are entangled, and how they manifest in the specific case of PFAS pollution in the Netherlands. With my research, I shed light on how people’s lives are impacted by the presence of PFAS, the different ways in which PFAS can be perceived, the ways in which it is invisible and why. I expanded on different kinds of ignorance, such as manufactured ignorance (Proctor 2008; Nixon 2013; Richter, Corder, and Brown 2021), unnoticing (Lou 2022), and ignorance of the future (Burke 2023; Murphy 2006), and connected these concepts to anthropological debates on risk and uncertainty, by exploring how uncertainties around PFAS manifest, and how they are navigated and governed (Samimian-Darash and Rabinow 2015). Finally, this thesis is a response to Renfrew

⁴² Direct Dutch translations: “De wereld op z’n kop”, meaning “The world on its head,” or “De omgekeerde wereld” meaning “The upside-down world”.

and Pearson's (2021) call for more social science research on "toxic events", or "the process through which routinized toxicity comes to be collectively perceived as unacceptable" (148). With this thesis, I complicate the definition of toxic events, as I have shown that with regards to PFAS pollution in Dordrecht, not everyone perceives this pollution in the same way. In fact, some people choose to actively *not* perceive it. Additionally, considering something unacceptable is not necessarily straightforward, and many people do not (explicitly) do this with PFAS. However, this does not mean that their lives are not affected by PFAS. Finally, I have shown how toxic events can be dispersed through time, as uncertain futures unsettle stable notions of the past and the present.

In chapter 1, I explored the imperceptibility of PFAS and how this influences communities' everyday experiences of toxicity. Through interviews and participant observation, I found that my interlocutors' perception of PFAS toxicity varied greatly and manifested along a continuum. Some did not perceive it at all, some actively ignored it, and others suspected they could feel the effects of PFAS on their bodies, but never knew this for sure. With these ethnographic examples, my aim was to illustrate that a lack of perception, a lack of mobilization, or even actively ignoring pollution, do not necessarily signify a lack of concern. As I wrote in chapter 1, choosing to ignore PFAS can be a way of reclaiming one's agency in the face of inescapable exposures; deciding not to worry, because (one believes) there is nothing one can do about it. These insights are important for thinking how to manage PFAS pollution, how to mobilize against it, and who is responsible for mobilizing. For instance, is the degree to which PFAS pollution is considered unacceptable even a good benchmark through which to address toxicity? And who should be responsible for raising and addressing these concerns? Should citizens take a more active role in monitoring their environment, or is it the role of the government to ensure a safe living environment? In other words: do we have the right to be ignorant, to *assume* a safe living environment? Whose responsibility is that? These are questions that this thesis helps us consider.

This brings me to chapter 2, in which I focused on the relationship between secrecy, mistrust, and uncertainty. Specifically, chapter 2 described how secrecy or manufactured ignorance on behalf of governmental institutions lead to a breach of trust in my interlocutors. As the government sets PFAS thresholds and regulations, the municipality's secrecy contributed to the experience of uncertainty among my interlocutors, for they did not know what was true, and therefore what was safe. This chapter explored the relationship between trust, ignorance, and uncertainty, emphasizing the role of governmental bodies and regulatory

agencies in addressing pollution, and how certain policies such as secrecy and confidentiality, can increase uncertainty instead of curbing or managing it. Governing uncertainty, specifically when it comes to toxicity and waste management, is not only about regulating chemicals and setting safety thresholds. The ethnographic research in this chapter has shown the importance of trust and mistrust when it comes to governing chemical pollution. Trust is important for the relationship between citizens and their government and regulatory bodies. Finally, this chapter also problematized the technoscientific decisions that regulate our lives and societies. Who makes these decisions, what definitions do they use, and which methods of measurement do they employ? Who benefits from the way safety thresholds and chemical regulations are set, and who is most vulnerable as a consequence? This chapter also leads me to ask: to whom are governmental and regulatory institutions accountable? And if the answer is: to its citizens, then how can the decision making and consequent communication on chemical pollution take this into account?

Finally, chapter 3 explored another kind of *not knowing*, which I referred to as ignorance of the future. In this chapter, I explored the temporal aspects of the PFAS controversy in Dordrecht, combining anthropological insights about uncertainty, ignorance, and the anthropology of the future. I outlined how the discovery of PFAS pollution and the potential for future discoveries unsettled both the past and present and described how my interlocutors used activism to regain their footing amidst this uncertainty. I concluded the chapter by delving into anthropological debates on risk and uncertainty and highlighted the theoretical distinctions these two concepts. Thinking in terms of risk leads to framing PFAS pollution in terms of probabilities, for instance: how many cancer diagnoses can be expected in a certain population when there is a certain degree of pollution? However, chapter 3 showed that these frameworks do not suffice when addressing a lot of questions surrounding PFAS pollution. As this chapter has shown, risk calculations cannot tell you if you will become sick as a consequence of PFAS exposure. Additionally, our current risk calculations cannot anticipate future risks that we are currently not aware of. Hence, life amidst PFAS exposures remains mired with uncertainty. With this chapter, and this thesis in general, my aim was to contribute to our understanding of uncertainty as a problem in itself, in order for both scholars and regulators to think of ways to address uncertainty. Understanding uncertainty is not only relevant with regards to chemical pollution, but pertains to much of our reality today, for instance thinking about the COVID-19 pandemic we found ourselves in

suddenly only four years ago, thinking about climate change and its possible effects, or about the way artificial intelligence will develop and impact our lives and societies.

Final notes and recommendations for further research

My hope is that I have brought concrete ethnographic examples through which to better understand waste and toxicity, ignorance, and uncertainty, on which further research can build. However, there are limitations to every research, there is always more to know, more research to be done. The scope of research could be more interscalar (Hecht 2018), tracing waste, ignorance, and uncertainty through different temporal and spatial scales. For instance, in this research, my focus was limited to Dordrecht, but further research could situate Dordrecht more explicitly within the Netherlands and explore how exposures and experiences differ nationally, as well as the relationship between local and national regulators. Within this research, I did not find the space to expand upon the political economy of PFAS, and further research could benefit from tracing economic ties between citizens, governments, and PFAS manufacturers such as Chemours.

Further research could also explore more temporal questions by looking more into the past and the future. As mentioned in the introduction, the neighborhood next to the Chemours complex was historically known as a “poisoned neighborhood”. In this research, I did not find the space to include this historical perspective extensively, but it is certainly relevant how histories of toxic exposure are related to the present. Questions on future exposures are especially relevant for regulation in the present. As this research has shown, we must think about how to regulate chemicals we cannot (yet) perceive, and which we do not (yet) fully understand. Research on PFAS could also be expanded by focusing on industry, as in this research, I did not speak to anyone directly involved with Chemours. Finally, the question of cumulative exposures could be further explored, as the scope of this research was limited to PFAS, but in reality, we are exposed to a vast variety of different pollutants in our daily lives.

As I mentioned earlier, there were many other aspects to PFAS pollution in Dordrecht than I was not able to cover in this research. I chose to focus on ignorance and uncertainty, as these themes stood out to me as urgent during my fieldwork. However, for further social science research into the PFAS controversy in Dordrecht, researchers could also focus on different questions, such as: activism and the role of citizen science in mitigating uncertainty, the social dynamics within activist groups mobilizing against PFAS pollution, spatial, class, and other inequalities in exposure, the interplay between nature and chemical pollution, the

multispecies consequences of PFAS pollution, and the way social relationships are affected by PFAS pollution. This is not an exhaustive list, but a way of illustrating the myriad ways in which social life is impacted by PFAS pollution. My hope is that social scientists will continue to take up these questions, and that in that way, we can contribute to conversations on how to live with chemicals and regulate them in a way that is responsible and ethical. To turn the world “the right side up” again, so to say.

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