DRIFTING POLLEN GEOGRAPHIES

An amateur's engagement with palynological practice and a drifting self

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Abstract

This thesis aims to explore how pollen science may be used as a tool to understand myself in the world through its history and practices of said history. The thesis uses palynology to explore the relationships between the material and temporal and seeks to unpack the role 'science' and 'art' play in constructing these relations. I situate the thesis within a growing literature of plant geography with an underlying foundation in the idea of a shimmering relationality being key to unveiling a myriad of assemblages which carry with them temporal and material relationships. This is done through my own personal experiences with researching palynology and participating in palynological field and lab work, as well as my own encounters with more creative expressions and investigations including poetry, photography and a foray into more 'experimental' ways of engaging with plants. Moreover, the thesis takes seriously the implications of how a colonial past has shaped my understanding of self and science, and how pollen, much like my own body, becomes a story because of its temporal and material assemblages.

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Chapter 1: Introducing an amateur endeavour

This thesis began as a wish to engage with the more-than-human, rather than merely the human. Initially I found myself drawn towards plants and aspects of plant-life, and especially the minutia of pollen, the 'stuff' through which plants reproduce themselves.[1] As I read and thought more about pollen, its properties, lifecycle, and potential to co-create life, I became excited and aware of the possibilities which lay within the scope of pollen-research. I was particularly drawn to how pollen 'drifts', or at least that pollen which is released into the air and caught by the wind or perhaps moved by animals of all kinds, notably birds, mammals, and insects, and hence to the more-than-human worlds (which might be thought imaginatively, phenomenologically, as well as scientifically) create new landscapes that swim into view. I was also intrigued by what it means as a human geographer to be studying the extremely small, the 'microscopic', where in most ordinary ways of conceiving things, the human is not present. I wonder about what kinds of landscapes might be inhabited or constituted by pollen, to consider 'pollen landscapes' across different spatial scales and temporal horizons. I envisaged a project that would push a long way into the realm of what is normally reserved for science, in this case particularly palynology as the science of pollen analysis, often set in the context of long-term environmental studies, yet retaining a human geographical sensibility.

Learning about palynology quickly complicated this vision, however, and the further I reached into the process of research the clearer it became to me, that humans were unavoidable. Mine was still going to be a thesis full of humans. I quickly realised, that not only could I not escape the fact that I am human, it became increasingly obvious to me how much inhabiting a human body and positionality shapes everything I do, every choice I

[1] A detailed account of what pollen is and how it operates will be given in chapter 2.

make. In a sense that realisation is obvious, as too is the claim that much of the knowledge I have gained about plants and pollen has been created and curated by certain humans in certain contexts and circumstances. Nonetheless, the 'cross-pollination', if I can call it that, between humans, pollens and plants increasingly became my focus, the entry-point for my thesis and arguably too its exit-point. While I initially wanted to make this human part of the thesis almost an afterthought, acknowledging it but not taking the focus from the more-than-human, it felt wrong to go about matters that way. It became more and more clear to me that I am writing to humans, as I have learned from humans about the more-than-human, and that, in order to write in the most 'fair' way possible,[2] it indeed became increasingly important for me to take seriously how the knowledges of plants I encountered and practised with had been formulated and where their roots lay. Furthermore, my own role as a researcher and person participating in the research and practices of others brought forth questions of my own 'place' within the research, what biases was I bringing to the project and how had they been shaped? Throughout the thesis I have striven to hold these questions at the forefront of my mind, and not shied away from admitting and expressing doubts, disappointments and failure. I have also ended up finding it necessary to adopt a more critical, maybe political, angle on questions about what pollen discloses – about, for instance, questions of plant diffusions or 'invasions', plantations, colonisation, settlements and more – but also on how such an angle rebounds upon my own personal attributes, history and drift.

In order to explore pollen, I had a strong wish to engage with and deploy more 'creative' methods which fit into the geo-humanities space, in order to orient myself within pollen landscapes across spaces and timescales. I initially hoped that this would disclose an

[2] Fair is perhaps not the right word, but what I want to suggest is a responsibility to the more-than-human that I have chosen to be in conversation with, to represent them in a way which is informed by more than just one way of understanding their being.

enchantment or a ‘shimmer’ of pollen and it’s broader world. However, as I began this search, the realities of my own humanity and body became more present and helped me realise that removing myself and my messy humanity from the shimmer and magic I sought was impossible. Moreover, the experimental approach I had to learning about pollen left me wanting more, which led me to take seriously the possibilities of working with pollen through a scientific lens, embracing the field of paleo-palynology as a means of engaging with people, time, place, and pollen. My amateur approaches to both science and the more creative methods, has opened me up to noticing a relationality between myself and the things I have searched for, and in this case, allowed me to drift into a shimmer because of a willingness to see beyond a strict division of arts and science, while embracing the realities of my own and pollen's materiality.

The thesis is split into 7 chapters (including this one). I have outlined each of them here to give a sense of what the thesis contains and give a sense of its progression. While chapters 2 and 3 (the literature review and the methods chapter) stand alone with their titled purposes, I have tried to order the three empirical chapters in a structure that starts with an larger, systematic approach to questions of how humans attempt to know the more-than-human, moving into how that knowledge practically is obtained through practices of investigation, and lastly to how my own personal body and identity creates parameters for my own connection with pollen. The final chapter, 7, is the conclusion to the thesis which seeks to bring together the chapters and asks what the thesis might have been and how it may pertain to larger discussions in human geography and the geo-humanities.

Writing this thesis has not been as straightforward as I had assumed it would be. I began without a clearly formulated ‘question’ to be answered or hypothesis to be proven, just a sense of wishing to engage differently with the lure of more-than-human phenomena. I

wanted to be-with a non-human[3] idea of pollen, which I imagined would encompass things like the areal movement of pollen, the relationships between pollen and pollinators, the process of fertilisation and the chemical makeup of the pollen grain itself. As I explore later in the thesis, the focus on natural science held me back from taking this route, and led me down a different path as I was introduced to – and sought to navigate a route around – the science of palynology (see chapter 2). Part of taking a detour from the 'scientific' approach was also spurred by a wish for the thesis to have an element of experiment, and to push the language and format of the thesis itself. With this in mind, I found my self writing in a voice that I hoped was more 'accessible' to a non-academic reader, weaving in scholarly footnotes, rather than leaving these discussions in the main body of the text. This approach was taken in part because an element of this project is an attempt to invite the reader into the enchantments of the shimmers that are made up by exploring outside the art/science binary, and in part because I believe that the experiment also lies in pushing myself out of my own niche both in research and writing.

It will hence become clear that this thesis is one of experiment, trial, and lots of error. Many of the things I set myself up to do, both research-wise and also in the crafting of the thesis itself, did not go as I had hoped or planned for. This circumstance forced me to change my direction and ambition many times (adjusting or cancelling activities in the lab and field, developing new chapter structures and themes as a growing awareness of my own racialised position became evident through my exploration of pollen history), but more importantly, and generatively it helped me to develop a deeper understanding of what I was trying to do and why it felt so frustrating when it did not work out as planned,

[3]I want to arrive at an idea that goes beyond what humans conventionally conceive pollen pollen to be. This is admittedly an idealistic ambition, but nonetheless what I wanted at the outset of the project.

but led me into an 'amateur sensibility (see chapter 3) which has carried thought out my fieldwork.

Chapter 2 Relations, plants, and pollen: here I situate myself within the discipline of geography, human geography specifically, and attempt to bring out the key concepts and contexts which overarch the thesis. Firstly, this is done through thinking with a form of 'process philosophy', wherein my thesis very much builds on a sense of the assembled 'shimmers', a interconnected and always-in-motion process in which things 'become' through inter- and intra actions that generate newness. Secondly, the chapter explores the history of plant geographies in order to locate my thesis, which is concerned with plants and those who work with them, in a broader sense of a geographical discipline. Moreover, the thesis spans into the geo-humanities and, by mixing a more traditional historical geography of plants and their place in human practices with the more experimental practices and concerns of the geo-humanities, I hope to bring a new relationality into play. Lastly, as the science of palynology plays a big role throughout the thesis, I have dedicated space in the literature review to explain what this science is, what it investigates, how it is conducted, and a brief introduction to its history.

Chapter 3 A drifting pollen methodology: here I try to bring together some of the logistics of the fieldwork that I have undertaken throughout my project, presented chiefly in an overall table to help the reader orientate themselves in time and place, as well as offering a more traditional evaluation of my practices as a researcher. The other half of the chapter gives a perspective on how I have approached the research on a more ontological level: asking what something like the concept of an intra-active shimmering relation means to me as I carry out my fieldwork, alongside how I have seen myself as an amateur throughout most of the research process, peering into fields and disciplines I have only

observed from afar.

Chapter 4 Enchanting the mundane: this is the first of my empirical chapters and concerns itself with how my expectations going into the thesis were shaken once I began to read and started to undertake my fieldwork. This chapter introduces the tensions that I found between the 'natural science', noting the historical and traditional practices shaping my own understanding of 'science' and initially making me weary of embracing it fully, and exploring more alternative, supposedly more creative and speculative, approaches to connecting with plants and pollen more specifically. During these experience I have gained an understanding of the nuances in both approaches and have come to grapple with the idea of enchantment and how the things that I originally thought mundane held more shimmer and enchantment than anticipated, whereas those which promised magic turned out to be frustratingly disenchanting. I have developed this thinking through a a brief study of the 'herbarium', my introduction to palynology as a science and practice, and my participation in a so-called Plant Initiation Ceremony. This chapter also addresses the underlying theme of settler science and appropriation as both of these critical concepts have been helpful to rethink how and why certain things become alluring to me and serve as a reminder to check my own concepts of what knowledge is important.

Chapter 5 Searching and noticing: this chapter is concerned with how that knowledge is gathered. I participated in a 'scouting search' for suitable pollen-study sites in the spring of 2019 which is the fieldwork with which this chapter mainly concerns itself. This chapter leans into the distinctions between searching and noticing, paying attention to how the intention behind these two activities bring out different outcomes. Moreover, the chapter addresses how the physicality of embodied fieldwork bringing out new shimmering assemblages that illuminate new possibilities for understanding and being-with place and

its more-than-human inhabitants. This chapter also contains some of the more experimental work I have undertaken, including a series of photographs, a narrative poem, and an exercise in observation mediated through short text and illustration. These more experimental expressions have helped me to understand my place and develop a security in the ambiguity of being an amateur of both science and 'arts', as well as a researcher. I also carry on the theme of understanding 'science' and the distinction between theory and practice, and how this disparity became clear to me while working in the field.

Chapter 6 Drifting towards a rooted diaspora: this chapter stays with the body, my body, and looks at how identities and belonging shift with their context. Firstly, I look at my own identity as person of mixed Danish and African American heritage, and how that has placed me as someone exploring the paleo-ecological sciences in an American context. Here questions of diaspora, rootedness and belonging are explored through my own personal experiences with feeling out of place and being assumed to belong to certain contexts, prompting a look at how genealogy may act to place people into contexts based on their genes, and leading to thinking through how we may look at pollen and other more-than-human critters and matter in similar ways. The magic and trauma which is passed through generations and found in the pollen archive, telling the story of a flora on a generational/historical, began to suggest a rather different slant on my thesis subject-matter. Moreover, taking the temporalities of, for instance, a specific tree, the body itself also tells a story and is a shimmering and a live archive in constant flux. Lastly, this chapter ponders how these shimmers might be made more visible and bring together unanticipated assemblages and kin.

Chapter 7 An instructive failure to fertilise: This closing chapter binds together the thesis and evaluates how it has morphed and changed throughout the process from conception to

completion, and how I have grown comfortable with the places in which I have encountered failure and disappointment in my work. It also leaves spaces for directions that the thesis might have taken, holds space for considerations on how this work might be taken further and explore the temporalities of a planetary ecology of which both humans and pollen have and continue to be intra-acting parts.

Chapter 2: Relations, plants, and pollen

This chapter cuts into three bodies of literature in order to frame the following chapters, and to place them within the context of wider geographical and cognate inquiry. Broadly speaking, I begin in the first section with an account of what might be labelled the 'sensibilities' of my project, the overall orientations and its 'situated-ness' as a project which deals with materiality, embodiment and relation. The second and third sections get closer to the object of pollen itself, first through exploring how an understanding of plants in geography has changed and is expanding, and then by answering some of the more technical questions of how pollen and pollination works, thereby more directly preparing the reader for the rest of the thesis as well as going into some of the more technical aspects of what palynology comprise. Lastly, I have tried the synthesise what these things mean for my thesis as it draws from these three threads of thoughts. A simple preliminary point is an obvious one: to emphasise that plants and pollen are inextricably inter-related – intra-acting, to use a concept that I prefer – which is why much of this literature review, indeed much of my thesis, majors on plants, the pollen-producers, as much as on pollen *per se*.

Early in the exploration of the thematics of my thesis, I spoke with my father. "So, what are you working on?" I hesitate before answering the dreaded question, I am not yet able to explain it to myself, and not sure I will be able to explain it to my father. "Eh, I think I'm supposed to be writing a paper on process philosophy or materiality, or something like that." There is silence on the other end of the phone. "You've lost me," he laughs and I laugh with him. "Don't worry I say," worrying immensely myself, "I've lost me too." This is not completely true, as I do think I understand it, my project, but only in 'shimmers'. Shimmer is always in motion, it is the wavering reflections of light that sparkle with no predictable pattern, and as a geographical phenomenon, The continuously varying

distortion of objects seen at low levels caused by variations ‘ in surface atmospheric properties, as over strongly heated ground’[4]. To me, shimmers are the moments when you can stand back and see the big pictures which connects everything; shimmers make the whole world come into focus and brings it alive through its assemblages.

The concept of shimmer has evolved for me as I have written my thesis. In many ways it has begun as something which I was attracted to initially, but was unable to quite explain, and since come into a sharper focus. I see shimmer as spheres which intersect beyond the laws of geometry, something which is alive and ever-changing. I imagine my discovery of it like the 3D books my grandmother had in her house. The ones where you need to hold the picture far away from your face and slowly bring it closer until the 3D image pops, or the optical illusions that are a duck and a rabbit depending on how you look at it. It doesn’t make sense until all of a sudden it does. Shimmer is always becoming (the first cut explores this constant process and becoming) and its constant refraction creates a lively and pulsing reality which allows for both the cyclical nature of seasons (and pollen) as well as being open to the random changes, and even the more linear ways of thinking about time. Time and the temporal natures of plants as they differ from humans has found itself as an undercurrent throughout the thesis, and is in many ways encapsulated in my concept of shimmer. Shimmer works with a time dimension as well, meaning that the becoming and refraction happens within the context of time as well as space. I explore this when thinking about Lennart von Post’s motto ‘think horizontally, act vertically’ later in this chapter.

Since my work, if not my life, has now become plant-centric, it would be remiss not at least to bookend my narrative with them. Seeing plants shimmer is not hard; they are after all alive, breathing, growing, affective beings, even if they are not terribly mobile. Their inter-

[4] Oxford Reference, Shimmer

and intra-actions with the world(s) around them are hard to look past, partly because of their rootedness; with this comes a relationship with the soil they live in, the water and minerals taken up through intricate root systems, and partly as well as the plant's above ground relations with wind, the twisting of leaves and flowers towards the sun, and the dispersion of genetic material to the wind or other pollen-bearing vectors. What follows on from here is not all, or even mostly, plant-oriented, but does try to get at the shimmer.

Shimmer has woven its way into the thesis, and in turn the thesis has been woven by it. Every time I have been introduced to something new (to me) and the thesis has been shifted and adjusted, new shimmering refractions have emerged which have in turn opened new avenues of inquiry, creating new shimmers. I see the thesis then, as one of these spheres which has more tendrils and intersections than I can count, and as something which changes every time I engage with it, as I change in the world.

Cut I: A survey of the object, its relations, and its temporalities

There is a fine line between absolute realism and absolute social constructivism (Whatmore, 2002). This is to say that things in their thing-ness are real without humans relating to them, but is also to acknowledge that they are influenced by their potential human relations and that we, as humans, attach past experience and bias on to the relations we have with non-humans and non-living things. When a tree falls in a forest it makes a sound, but what that sound means to an individual, human, as well, as to a bumble bee or an elephant, is shaped by the intimate textures, routines and requirements of their life. This claim feeds into a bigger point made by Barad (2003; Kerr, 2016), namely, that it is foolish to prioritise humans and think that humans are not part of the world, simply observing it. This would be to encourage human exceptionalism and strip non-humans and/or the non-living, be they/it animal, vegetal, plastic or other, of their

own life-worlds and render that which is not anthropogenic void (Bastian et al, 2017). Rather, we (here referring specifically to humans) are all part of the world, which is why we are able to understand any of it at all. Furthermore, this separation between humans and nature/the world is a Western notion, as is the idea that humans influence the world and not the other way around. I do not argue that humans fail to act in ways which both effect and affect the world(s) around us, but urge humans to recognise that it is a two-way street and that the things being influenced by humans are influencing humans right back (Jackson, 2000; Bennett, 2010; Kohn, 2013; Lorimer, 2012; Reason, 2005). While these affectations might not always be evenly or equally distributed (Bastian et al, 2017), they are still in play, and for some the need to distance humans from non-humans is shrinking (Haraway, 1991).

What follows is my attempt to 'go form an entity', tied to its relations and finally to the temporalities of the relations. It is hard to know where to begin, as everything in this piece of writing is interconnected by its very nature. This is just one way of ordering that which by nature cannot be ordered, as it is always in flux. I hope, however, to give some insights into the newer movements in materialist as well as process-oriented geography and philosophy. I have generally not gone to the root texts, the older foundations of thinking in this mode, although this move might be fitting for another time, but have instead tried to look more into what is happening and what has been written more recently. While some of the writing is focused on materiality itself and what matter might be, a lot of the material discussed is more interested in 'live matter', in how it lives and what it does. As I am working with live matter, this angle is what is of most interest to me and is therefore featured a little more prominently.

Knowing an object

I am not the first to ask what it is like to know something different to what I am. Thomas Nagel (1974) famously asked what it is like to be a bat and concluded that he could never quite know. This however, does not mean that the things and material existences which humans cannot understand fully are unimportant, nor does it mean that nothing can be learned from trying to engage with and to understand that which is unlike the self. Nagel acknowledges that his imagination can only take him so far in understanding bat-ness because he lacks many of things that make bats bats, precisely because he has the things that make humans human. He considers that, while having the physical characteristics of a bat might bring him closer to them, part of what makes Nagel who he is resides precisely in the fact that he is not a bat. The differences in their physical forms, from their toes to their brains, means that a bat can never know exactly what it is to be Thomas Nagel, just as Thomas Nagel can never know what it is to be a bat (Nagel, 1974). But perhaps this is not the right place to being to think about thing-ness.

I want this section to think about what objects/matter/things are, how they come to be and what boundaries are drawn to specify an object. I might not be able fully to understand an object, or to know what its life-world might look like, and even defining what an object is can of course be really hard. Where to begin if not with bats? Or should I begin with something closer to myself and my own experience? Am I an object? If so, are my gut bacteria part of what makes me, me? Is it because they live inside my body, even if our genetic makeup is completely different and we (in theory) could exist separately? Thing-entanglements can be extrapolated to a point where the object is still connected, but somehow lost (Ingold, 2014). If this complication is set aside, and if it is accepted that an object can be defined as a tree, a mug, a bird or pollen, the discussion can be had about those identified things, which is what I aim to do going forward, saving relations and

entanglements for the next section, where I lean into the promise of how interactions of things prompt tricky self-reflection (Kohn, 2013).

A prominent body of theory which advocates the importance of an object focus is Object-Oriented Ontology (OOO). It thinks about human, non-human and non-live entities as equally important and affective objects. Ones which all have meaningful private lives (Kerr, 2016). An object here, then, is a "weird entity withdrawn from access, yet somehow manifest" (Morton, in Bennet, 2012) in a manner that is affectual (Bennet 2012). This affords the objects what Morton calls a 'shimmer' (McIntyre and Medoro, 2016). This shimmer is not exactly the same as meant by Tsing et al (2017), since it refers to the objects themselves rather than to the in-between relations. Another take on this 'shimmer' is what Jane Bennett (2010) calls thing-power or vibrant matter. Thing-power is afforded to all things, regardless of whether they are biologically alive or not, which horizontalises them, and breaks with the traditional hierarchy which features humans on top, affording less importance to things which are not human-like (Bennet, 2010; Hetherington and Munro, 1997). Likewise, vibrant matter affords agency and vitality to material, elevating it from simply matter into matter which matters. Barad (2003) argues that the phrase 'matter matters' has been overused, but if one ignores the overuse of the phrase and can put its pun and cliché away, it is still effective in illustrating that materiality has value in and of itself without a human interpretation or value judgement put over it. I should, however, be careful of putting Bennet so close to Morton, as she argues that his obsession with objects has been taken too far in an attempt to destroy the 'golden calf' of relational theory, and is therefore sceptical about awarding so much importance to matter outwith relation (Bennett, 2012).

I do agree that matter 'matters', but do not wish to write off discourse – human talking and writing about the world, about matter – completely. Neither does Barad, who argues:

> A Bohrian ontology does not entail some fixed notion of being that is prior to signification (as the classical realist assumes), but neither is being completely of language (as in linguistic monism) – what is being described is our participation within nature, what I term 'agential reality'. (Barad, 2007, page 176)

By Bohrian, she is referring to the Danish Physicist, Niels Bohr, whose ideas she develops into what she calls agential realism. This allows Barad to afford objects agency, but also to acknowledge that human intra-actions with them are shaped by human discourse (Barad, 2003). Moreover, she notes that nature (as an example which I think can be extrapolated upon) has agency, but, as it does not speak in a way which is easy for humans to hear, we often do not notice or acknowledge. Furthermore, it is not a blank slate waiting for human inscription. It does therefore not do any of us (human or not) well to privilege either materiality or discourse, as this is to forget the entanglements of phenomena (Barad, 2003). This agential intra-action Barad describes, is useful to further the understanding of shimmer as spheres. Rather than simply intersecting, they change merge and create the sparkling shimmer which in turn changes each sphere of shimmer through the intra-action.

Although materiality and engagement with objects can bridge the material and mental gaps in studying geography, there must be caution not to become too descriptive. There is a danger, then, that material geography can become 'surface geography'. Surface geographies are those which narrate and describe a depiction without engaging with the underlying theories and politics which are ever-present, ever-pertinent. We must therefore acknowledge that the material world is alive and vibrant. We must also acknowledge that

'things' are more than just actors in a stationary world, only important because of their connectedness in networks, and move onto understanding the politics, grammars, productive powers and names of matter (Tolia-Kelly, 2011). A movement which has also tried to bridge this gap is eco-feminism, but this stance has been heavily criticised for universalism, sunk in essentialist assumptions about womanhood in the word, thereby allowing the matter they wish to engage with to become meaningless, thus taking the 'matter' out of matter (Bastian et al, 2017).

As alluded to in earlier, there must be a balance between extreme realism, which is what is engaged with in OOO, and complete social constructivism, holding that reality is nothing but a mental-discursive projection of and from the human. One of the critiques met by OOO is that it is foolish of humans not to realise that we, humans, do have disproportionate power over how the world is shaped and should use this power to make it better[5] (Kerr, 2016). So, taking discourse into account helps humans to learn from objects (human objects included), even if we cannot ever be *an*other, as in Nagel's bat problem, but we can still learn from different ways of being objects; and perhaps this learning can prompt a better way of being human, not just for humankind, but for all the life-kinds of our planet and the life-worlds we – a big collective 'we' – all share.

While thinking about what objects are is important, thinking about how they relate to other objects might be even more so because nothing exists in a vacuum; everything is in touch with and effected and affected by other materialities, which is what the next section will explore.

5 Though this raises the questions 'better for who?'.

Networks, relations, and hybridity

So, if looking at cut-off and bounded objects is not the best way to understand the matter in the world, what is? The thing about objects is, they never stand alone but rather are always in engagement and relation with others (Ingold, 2014). The shimmer continues in this section. Here, however, it is what happens when connections come into focus and become clear to us (Tsing et al., 2017). In this part, assemblages, associations, networks, relations, hybridities, and intra-actions are all explored for their similarities and differences, asking what they bring to the aforementioned objects and things, before moving into objects, their relations and temporalities, which adds a crucial layer to an ontology of things.

Nothing is perhaps more intimate than our bodies. A human body is human, and cannot be a bat as previously explored, but the question becomes whether it actually is as human as it appears at first glance. Only 10% of cells in the human body carry the human genome, while the remaining 90% are made up of bacteria, fungi, and other 'stuff' (Haraway, 2008). The bacteria are important for our health and wellbeing, but it can still be a hard pill to swallow; are the bacteria part of me? Am I less me because of them? In his novel 'Turtles All the Way Down' John Green explores this question, which is a huge source of stress for his protagonist Aza Holmes who lives with Obsessive Compulsive Disorder (OCD) (Green, 2017) and for the author himself (Floods, 2017). Both Aza and Green grapple with what it means to be you, your own entity, when so little of what you consider to be your body actually carries your specific and unique DNA. When Aza gets upset about kissing a boy, it is because she feels threatened by the idea of new bacteria entering into her body, bacteria which is even more foreign than the bacteria which already inhabits her gut. This opens up for discussion what exactly constitutes a self, a singular, bounded self, and to what extent the self bleeds into the 'other' in an unavoidable relation (Green, 2017). Sticking with the

human biome for just a little longer, I want to present another example of how humans living-together with our gut bacteria is more complicated than I first anticipated[6].

A historian, Kate Brown, held a talk about a village in a former plutonium mining district. Everyone living in this particular village suffered from unexplained pain and fatigue. Doctors were unable to determine what was wrong with them as all tests came back normal, indicating that there was nothing wrong with the villagers who were sure the plutonium was to blame. A microbiologist, Margaret McFall-Ngai, who sat in on the talk recognised all of the symptoms and thought they could be explained by a mutation in gut bacteria, which was her own field of research. Apart from illustrating why it is important to embrace stronger relations and cross-disciplinary research, this recognition helped to understand why these people were getting sick. The humans involved were in fact not sick, but the bacteria living inside of them was, and thus the overall balance of the collective – human and bacteria – was 'off' and the suffering of a non-human suddenly became a very human problem (Tsing et al, 2017). Furthermore, research is now being done to see whether sick human biomes can be treated by healthy non-human biomes, which further blurs the boundaries of who is sick and who is being treated, since the treatment of the biome greatly affects the wellbeing of its human carrier (Lorimer, 2017).

This example is perhaps easy to get on board with: humans are connected to the things that live inside our bodies. That makes sense, but what about things that are not 'alive'? Is it possible for them to be in relation (with 'us' humans) in a meaningful way, does pollen, which interactions with (some) humans cause strong allergic reactions count as meaningful encounters? Examples of such relationality can be found in networks of

6 Pollen intra-acts with the human body too; while it does not become a hybrid with the human body, it does in some cases illicit strong reactions for those who suffer pollen allergies.

commerce like those described by, for example, Tsing (2015) or Cook (2006), both writing about food and how it travels, thus connecting different other material things, humans and non-humans. Different materials in the vast variety of possible specific constellations become connected, not only to each other but also to places in a convergence, becoming an entity – a particular quality of entity-through-relation – in the process; they become relational spaces as they are geographical and material (Anderson, 2012).

As a physicist, Barad sets forth the concept of intra-actions to explain how these connections and assemblages are established. Intra-actions are not the same as inter-actions. Where speaking of inter-actions describes two things meeting and leaving that meeting without having changed, intra-action leaves both parties affected from the inside (Barad, 2007). A bond is thus formed, creating a connection and relation between the two things which bring them into relation. Barad again draws on Bohr and his description of assemblage as phenomenon. To Bohr, no object can be ascribed an independent reality in the ordinary physical sense because it is always in relation, including its linguistic implication, since Bohr (and Barad) always see the phenomenon under scrutiny as a fusion of the cultural and material. An object or a phenomenon is thus more than the sum of its parts, and it is impossible to divorce the material from the cultural. Thus, phenomena are where matter and meaning meet (Barad, 2007).

There are various ways of articulating this intra-action, one popular way being to think about it terms of hybridity (Lulka, 2009). Hybridity is not as straightforward as the mixing of two things to produce a third mix of the first two, but rather suggests the impact of impact occurring between forms of matter (Whatmore, 2002). As set out in Whatmore's 2002 book *Hybrid Geographies: Natures, Cultures, Spaces*, heavily influenced by Latour's

actor-network thinking about modernity, hybridity involves the enfolding of humans with nature. But, as Whatmore and Latour repeatedly underscore, while hybridity can be conceived as being human-made, it is not necessarily so, but can happen with and without (human) ken and purpose. The bridging of 'nature and culture' is an important aspect of hybridity (Whatmore, 2002; Lorimer, 2017), but to some this bridging is not enough: indeed, it is seen as a 'thin' accounting of what hybridity can potentially hybridise. Lulka (2009) encourages instead a stronger and deeper version of hybridity to bring together science and humanities to create a 'thick' hybridity that forces us as humans to face, and to deal with, environmental uncertainty. Moreover, our everyday human engagements and encounters with other kinds of creatures can open up new ways of relating to and understanding that which is not familiar and self (Haraway, 2008).

For those who think of assemblages more as entities-in-relation rather than bleeding, Deleuze and Guattari offer explanations as well (Nail, 2017). They say that elements in an assemblage are not puzzle pieces, but should be thought of more as a drystone wall, only held together along the diverging lines. Each new mixture produces a new kind of assemblage which is always free to recombine again and change its nature (Nail, 2017). They are *ad hoc* groupings of heterogeneous elements, living and functioning despite energies which confound them from within (Bennett, 2010).

Assemblages can be small and intimate, as in the case of a child playing with fabric. Drawing on Bennett's (2010) work on matter, and how it becomes vibrant when in relation, Thiel works with children and how they make new realities from themselves and fabric. She follows three boys as they use fabric scraps to make themselves into superheroes by letting the fabric be transformed into capes (Thiel, 2015). While this might

be less tangible and obvious than the example of the human biome where several live things come together, in Theil's argument the coming together of child and fabric brings a life to both which could not exist independently; the fabric could not be a cape without the boys, and the boys cannot make this particular superhero identity without the fabric. Moreover, she brings out Barad (2007), who reminds us that there is not a world out there waiting to be discovered; rather, the world becomes alive through our intra-actions with it, and the in-between spaces which are constituted by our relations are what become alive, not the things themselves. This is why Thiel's work with children becomes interesting. The boys she works with are able to create a new assemblage with each other and bring a different world to life, one in which they are superheroes, not regular children, and one in which their capes have meaning beyond just their material fabric-ness (Thiel, 2015). But what happens when there are too many things to count in one assemblage and it becomes so big that it is impossible to oversee? Morton calls these 'hyperobjects' and they refer to a theorising of mega-entities or mega-networks which are playing an increasing role in the 21st century (Laist, 2017). These hyperobjects are things like climate change, nature, or the internet, which cannot be touched as a whole or fully accounted for. This does not mean that they are not real entities, but that it is impossible to 'overskue'[7] them fully, not just because of their size or (in some cases) lack of tangibility, but significantly also because they operate on timescales which are out of proportion to those experienced by humans (Morton, 2013). It could be argued that pollen itself can become such a hyperobject. The sheer masses of wind borne pollen may move as once 'being' or object as it is released from trees and blown about in such quantities it makes it hard to distinguish any sense of individuality for the human eye. I am a little sceptical of this classification as it *is* in fact possible to discern a single pollen grain and it's 'being' a pollen grain is not reliant on other pollen. The next section will explore time in greater detail, thinking about what different

7 Overskue is a Danish words which directly means to overlook/oversee, but encompasses the ability to hold and understand a big and/or complex thing or idea in your mind

temporalities of materials means to the ways in which their inter- and intra-actions unfold, and asking if there may be things to be learned from trying to look at matter from its 'own' perspective.

Decay and deposition

There is another way to engage with what matter is; while entanglements and relations are all happening, time passes. Time implicates all relationships in process, and nothing is therefore a finished product but always in process, becoming itself or other (Ingold, 2014; Nail, 2017). This is the 'process philosophy' I was thinking of when speaking to my father. The connections between matters are always in process, their assembled constellations are always being slightly changed by time and their continued change within their own composition. Perhaps these ever-changing temporalities are not what shimmers, but the light that allows us to see matter and what matters?

Memento mori – an object to remember mortality. All biological things (objects) will at some point die. But instead of thinking about death as the end, can we think about it as a biological matter entering a new state, able to form new relations and integrating into a new position in the constellation that is its assemblage? In this thinking, matter cannot be destroyed, only transformed into something new; this means that matter is always in process, and that the process is driven by time elapsing (Davies, 2011). We can see these changes through new life springing up where the old has given way to new (Tsing, 2015), but also in the ghostly absence of what has been (Tsing et al, 2017; Lorimer, 2017). Some things, however, do not become ghostly presences which haunt our imaginations and give way for renewal; some things do not decay, do not change on a time-scale which can be intra-acted with by other matter.

An important example of this is plastic. There is a tension between biological life and plastic which stems very much from the latter's inability to decay at the same rate as it is being produced (Jackson, 2012). Plastic is made and used by humans, who dispose of it when its preordained purpose has been fulfilled, but, just because humans have deemed its life-mission fulfilled, it does not mean that it ceases to exist. Indeed, instead it takes on a new mode of being like everything else (Davies, 2011). What makes plastic different from biological material is that, instead of quite swiftly decaying, plastic is deposited in the ground or some other 'waste place' after its human use has been fulfilled and, because it takes so long for it to decompose, it basically just stays there. As Jackson (2012) explores in his paper with a long title that is nevertheless worth writing out in full, 'Plastic islands and processual grounds: Ethics, ontology, and the matter of decay', plastic produced from fossil fuel is causing serious distress to the environment. Focusing on the 'island' of discarded plastic forming in the Pacific Ocean, Jackson notes that the rates of producing plastic things, using and discarding them does not add up with their rate of decomposition. The accumulation of plastics in the ocean in turn has consequences for other matter (including the ocean itself, which of course can be broken into smaller chemical components is only the ocean because of it's interconnected vastness.) and life in the water, be that the deformity of sea life or harmful, polluting substances. Perhaps this would not be the same problem if plastic decayed at a comparable rate to other things in the sea. While dead biological material is broken down comparatively quickly, it too leaves a trace; however, because it takes so long for plastic particles to break down, it exposes the friction between its temporalities and, in particular, human ones. Similarly, on a geological time scale, a human life is a speck of dust, yet the materials that have taken millions of years to form (like fossil fuels) are being taken from their deposits and put back into the world at a rate which is completely off kilter from when they were taken out of it.

The tale of human activity does not have to be as bleak as in the case of plastic in our oceans; although human activity may have greatly altered an assemblage, this does not necessarily have to make it a complete wasteland (Kirksey, 2015). As is evidenced by Tsing's writings about the matsutake mushroom, places which might look void of relations can still harbour potential for new assemblages to come into being (Tsing, 2015). Tsing explores the wide-reaching networks facilitated by the matsutake. The mushroom is widely sought after in its native Japan and is found in areas which have previously been forested and later cleared by human activity (Tsing, 2015). This up-crop of mushrooms then signals a change in the assemblage of a given Japanese landscape; as the matsutake is a reminder of what has been, it acts as a haunting. Ghosts haunt landscapes, as noted previously, by reminding us that there has been a different configuration of that landscape and that it is constant change to become, once again, a new arrangement (Tsing et al, 2017).

Temporalities are hard to wrap our heads around. It is impossible to see things from places we do not inhabit (Nagel, 1974) and, I would argue, times we do not inhabit. The intra-acting of these temporalities are complicated because of the different modes and paces they exist at (Lorimer, 2017). This is perhaps why something like Deep Time is so hard for me to overskue. It is so big, and so far out of my possible experience that it in a sense becomes one of Morton's hyperobjects which exists without being definable in a way that makes it tangible. On the flipside, I can plant a sunflower seed, watch it sprout and grow taller than my own body within a fraction of a normal human life time: that seems highly tangible. Our different temporalities, the different ways we experience the passing of time are part of how we define what we are; we are our process of becoming (Ingold, 2014).

Discussion and conclusions

I have tried to move from the singular entity, to its affective and affected relations, and into its tension filled temporalities. Ironically, this has been difficult not in spite of, but because, objects always sit amidst entangled relations which make it hard to separate one concept from another, especially when the concepts have been so closely related, tangential, and above all trying to get at the same things from slightly different angles. I hope to have made it clear that there is not just one way of looking at life or matter and its place and time in the world, nor its entanglements with others. In this last concluding portion of Cut I, I want to return to my own musings on plants, their worlds, and how I see them in all of this.

A thread which cropped up in the more environmentally-oriented readings was the Anthropocene as a supposedly current 'geological phase' of peculiarly inter-acting human culture and environing nature, one in which the former is actually leaving an imprint in the geological-stratal record (Davies, 2011; Ingold, 2014; Irigaray and Marder, 2016; Jackson, 2012; Kirksey, 2015; Kohn, 2013; Lorimer, 2012, 2015, 2017; McIntyre and Medoro, 2016; Morton, 2013, Tsing, 2015; Tsing et al, 2017). Human entanglements with non-humans can generate new modes of being (Tsing, 2015; Harraway, 2008; Kirksey, 2015) for a variety of species, creating new ways of intra-acting and living. However, it is important also to look at the 'dark side' of these entanglements. Morton does this in his book *Dark Ecology: For a Logic of Future Consequence* (Harris, 2016). He reminds us that all actions (and inactions) are part of multiple larger assemblages or hyperobjects which bleed into one another, with or without the performers' knowledge or intention. It would be beneficial for humans to acknowledge the things which are shared with non-humans, not only in terms of what is in our respective best interests, but to gain a deeper knowledge of what our intra-actions mean to both parties in order to loosen the tensions between objects

– and more specifically between species – which often leads to the problems, notably those associated with the Anthropocene (as in humanly-created climate change and environmental challenge). This outcome is exactly what Jackson (2012) is getting at when thinking about human-plastic relations.

I hope to have communicated that everything is intertwined and that actions have butterfly-effects, both immediately and in the hauntings of past actions. What really spoke to me in my readings for Cut I was the importance of temporalities. They hinder understanding and cooperation between humans and non-humans, as well as between non-humans. Bringing my thoughts round to plants and their wildly varying temporalities, elaborated in Cut II, I find that this gives me a new way to look at my inter- and intra-actions with them. Personally, I am not sure I buy into the conceptual horizontalisation of living and non-living matter, Latour's 'symmetrical' treatments of culture and nature (Latour, 1991): I will be honest, in that I think giving agency to my computer keyboard is pushing it[8]. I see how it can affect me, but I do not think that it has as much to do with the plastic keys as it does with my typing hands. In contrast, I believe non-human animals or plants *do* – massively – have the capacity to affect and have agency to enforce that affect, but what I believe is often misunderstood with regards to plants is the temporal scales which this capacity operates on. Plants' actions are much slower than humans', which means that we, humans, might easily overlook a reaction to external stimuli.

In her work with Marder, Irigaray writes of how she comes to understand that she needs the vegetal world, and that, in order to have it, she must consider its needs as well as her

[8] This does not mean I cannot see out *connection* as shimmering and 'alive'. From the fossil fuels which have made the keyboard to the words I type making a statement about the keyboard, I am entangled with it in order to express myself, and because of that need (mine or whichever human may be using that specific keyboard), there is a relation. This discussion about tools is carried on in chapter 5.

own. She becomes a vegetarian and stops driving her car because she knows that these are things which will impact plants, and she would rather have plants than meat and cars (Irigaray & Marder, 2016). As my world becomes increasingly entangled with a vegetal one, by bringing plants into my home, by spending time outside with them in theirs, and sharpening my attention to their beings, I see what Irigaray means; I want them to stay too. Thinking about plants as being more like me, turning towards sunlight and needing just the right amount of attention, but also very much unlike me, rooted and green just to start, lets me care for the ones close to me better, even seeing them as individuals with individual needs (Bastian et al, 2017). Moreover, knowing the plants I have brought home allows me to think about where they have travelled before me, what their varying temporalities are and how my actions impact their life-worlds. This ultimately leads me to think time and temporality into my own work. I cannot expect plants to work to the same schedule as myself, and must be prepared to accept their temporalities and agencies in order to produce work with the plants instead of merely on them. In sum, the object – a plant perhaps or even a pollen grain – is always caught in, but also freed by, its immediate (and sometimes time-space stretched) relations with all manner of others, to an extent is only made as what it is through those relations, myself – the human, and here a researching-writing-feeling human – unavoidably included.

Cut II: Plant geography

For the original working paper that now forms Cut II here, I set myself the following challenge: *Describe and evaluate how the study of plant life by geographers and other cognate disciplines has changed since the early-20th century.*

Nature, and by extension the things that, so to speak, dwell in it, have a real, but perhaps spectral presence in the geographic discipline (Castree, 2005). Plants are part of (and are

sometimes said to live in) nature, but importantly also hold their own distinct identities. They have been configured as something which has gone missing from the geographical literature, but is being gradually brought back in (Head and Atchison, 2009). It is undeniable that humans have significantly influenced plant life (Mackey, 2008), which is the point from which this review will begin. Entanglement of humans and plants, and the assemblages which such entanglements form, will be explored, as well as notions of where and how humans have placed plants within their own life-worlds, asking too how we can begin to think of plant-lives and worlds as something to take seriously and to learn from. This will be done by describing and evaluating how plant-worlds are and have been presented in geography and its cognates literatures throughout the 20th century and up until today.

The review will begin by touching on the concept of nature, as plants are often configured within it. Nature is something which has a long been debated, and while there is not scope in this review fully to elaborate what nature is, nor how human relations contribute to its formation, there is room for a brief discussion which assumes plants to be part of a wider nature assemblage. Secondly, the section titled 'Putting Plants in their Place' deals with the spaces which humans have decided plants should and should not occupy. These spaces are both material and imagined, and help to give the reader a sense of both how plants have relations amongst themselves and the roles they have played in the making of human place. In asking 'Resource or stakeholder?', the next subsection considers the levels of agency we have afforded plants through our agricultural practices and conservation effort. Moreover, it also touches upon what people gain from their intimate relations to individual plants in their gardening practices and spending time in nature as a resource beyond creating food. This move plays into larger conversations which beg the question of whether plants deserve 'a voice' and are in fact stakeholders in the future of the planet. In 'Toward

Plant Identity', there is a chance to think about the assemblages that plants operate in, and how their worlds, both in said assemblages but also as individuals, have been perceived and how we can continue to expand our thinking about plants and what it means to be one. Here I also draw from critical animal geography to see if some of it may be mapped onto plants to start a more critical plant geography. Lastly, I want to evaluate the literature described and consider to what extent plant geography has changed, followed finally by reflections on where I would like to see plant geography go, and what I might suggest be done in order to open up a new and more critical plant geography.

What are we living in?

Before taking this literature review completely into the realm of plants and their conceptualisation with academic geography, it is prudent to touch on the role the geographical understanding of nature plays, as plants are commonly placed 'inside' nature, as part of its assemblage rather than being studied in their own right (Szerszynski, Heim, and Waterton, 2003).While labouring under no illusion that this literature review has the task of unpacking fully the concept of nature, as it is a whole field of study on its own, I do want to think about what we count as nature, and how we have configured its' workings.

Firstly, there is the question of what nature is. While I did not really find a definitive answer to this question, Castree (2005) notes that, broadly speaking and echoing distinctions made in Cut I, geographers have thought of nature in one of two ways: social or realist. Unsurprisingly, he finds that today's human geographers typically view nature as something constructed and inherently social (or cultural) and not necessarily something easy to define, whereas physical geographers have tended to focus on the materiality and the 'realism' in nature in order to define what belongs and what does not. Others,

(Whatmore, 2002), have rejected the binary of social/realist and take in various understandings of what nature is in order to 'build it'. The idea of narratives surrounding nature being parts of what shapes it can be taken further, to a place of embodied enactment, where the actions performed in it are part of what shapes it (Lorimer and Lund, 2003; Palmer, 2006). Palmer (2006) furthermore suggests that the understanding of nature has moved from a 19th-century positivist doctrine of the nation-state which excludes alternative understandings and practices, to the 20th century's value-based and multi-scalar politics which invites us to think about nature as something that can challenge notions about a state's governance and sovereignty, especially in as it relates to environmental issues. Moreover, such a shift of perspective gives spaces to alternative narratives and voices of, for instance, indigenous peoples (Kohn, 2013).

While a traditional view of human-nature relations quickly arrives at the term 'stewardship', which has let humans justify their manipulations of nature (Sauer, 1952), the consequences of that manipulation are starting to become ever more noticeable. As noted previously, Lulka (2009) wishes to bring the concept of hybridity into the conversation, and to lean into the uncertainty surrounding the current environmental state to create possibilities for a 'thicker' hybridity. He takes up the critiques of Donna Haraway and Bruno Latour, and calls for a larger integration of the biological sciences and cultural inquiries to create this thicker hybridity, itself suggesting (and advocating for) a closer relationship between humans and the nature we, humans, live with (Lulka 2009). Ultimately what nature is, and how it should be used, is founded in where we come from, what that origin has taught us (Olwig, 2005; Palmer, 2006; Kohn, 2013), and how our everyday interactions and experiences with the non-human have shaped our understandings of our own status (Szerszynski, Heim and Waterton, 2003; Olwig, 2005; Haraway, 2010). Moreover, as plants have gained more designated attention from

scholars, more nuances around what nature is, and who and how it is seen have sprung up, scaling attention both down to the individual and up to the wider assemblages each plant is a part of . If we consider plants to be embedded and encapsulated in that nature, many of the broader statements made about nature are also valid for plants. And as nature is something humans live with, so are plants.

The notion of living-with is how I want to close this subsection. Regardless of the binaries set up between nature and culture, Head (2010) argues that we live *with* nature. She rejoices that we have moved beyond the notion that nature has a climax, a point in which it stops changing and being in process; rather, this ongoing process involves and enrols everything and everyone a plant interacts with, and is part of forming the networks a plant inescapably lives within.

Putting plants in their place

As we have established in the previous subsection, nature is something with which humans are unavoidably enmeshed in, both in our conscious and unconscious doings. This next subsection of the review works with the assumption that plants are part of what authors have described as nature, but tries to pick out what has been said specifically about plants as well. Plants, like all other things, have a physical and imagined place in the material world, and thus humans have had various ways of thinking about and categorising them. As noted, there has been a split in the way human and physical geographers have thought about nature (Castree, 2005) and this translates not only into different versions of the subject, different disciplines almost, but also into differing approaches to time.

What might be considered a 'traditional plant geography' – cleaving towards physical geography – is concerned with the multivariate links between flora (and fauna) and their geographical distribution as it relates to the likes of soil types, geomorphology, weather and climate patterns. Such a focus was evidenced by Scottish 'biogeographer' Marion Newbigin (1936), who used plants and their distributions to track environmental changes across geological time. She was also concerned with ecological associations, the latter, , according to Newbigin, being linked with 'plant climaxes' which represent – or describe – the state of an ecosystem that has reached a 'plateau', a seeming natural end-state, in which not much changes. She made these observations in 1936, but already by 1952 influential North American cultural geographer Carl Sauer had called this idea into question. He argued that it is problematic to assume that an ecosystem can reach a climax and 'be done'. He evoked the idea of 'man' [*sic*] as an agent of change in the 'natural' world, referencing agriculture and husbandry as significant drivers of change, commonly intervening in ecosystems so as to throw into question any natural reaching of plant climax communities. Sauer saw this process occurring not only at small scales or in specific landscapes, but noted that humans have carried plants much further than they might otherwise have spread, while still realising that there are certain arrangements (or by the more recent terminology 'assemblages') of plants which are helpful to their and our (human) flourishing (the example he gives is of the 'Three Sisters', beans, maize and squash, which help each other grow in what Newbigin might call an association). What Sauer does not comment on is that this recognition might help us to think about the human-plant assemblages that we discern through human-plant co-living. Lesley Head underlines that there has been a move away from thinking about nature as something which reaches a climax or an 'ideal' state, that self regulates or returns into one fixed way of being, but rather thinking about it as something more akin to a complex assemblage which contains multiple (and sometimes opposing) forces and aspects (Head, 2010).

In terms of plants belonging, and us, humans, placing them in the world, our doing so might be influenced by where we expect to see them, or part of them. If we think about food, this is certainly the case. A lot of food is grown in one place before the edible parts are harvested and processed for sale somewhere like a supermarket (Cook et al, 2006). This system creates both an assemblage and a dis-assemblage as part of the plant becomes entangled in a whole new set of networks and connections, those of food production, distribution and consumption. Analytical food-systems work has been done on tomatoes (Brandt, 2002), broccoli (Fischer and Benson, 2006), hot peppers (Harrison et al, 2006), French beans (Freidberg, 2005) and papaya (Cook, 2004), showing how plants connect people across multiple locations (Cook, 2004), placing the plants in globe-spanning networks, as well as in a locales spread widely across the globe, connecting people, places as well as other non-humans which might not have been in contact had it not been for increasing globalisation. While contemporary human geographers may not be interested in plant associations and their distributions and migrations over time in the same manner as was Newbigin, they do find many things to unpack in the relations that link plants with culture. Thinking about plants as food-stuff, Tsing's *The Mushroom at the End of the World* (2015) deals with the matsutake mushroom, showing how it can be used to explore the worlds which surround it and the identities and networks which all come into contact with a specific plant species. Her book shows that plants can hold strong ties to place, thinking about their origin as well as destination as something which makes and defines a place (Bell and Valentine, 1997).

While this is a way to begin to think about plants and their relation to humans, it also makes it hard for geographers, among others, who wish to study plants because they, the

plants, are always put into other *a priori* categories, whether that be nature, food or production (Head and Atchison, 2009), rather than being treated in, and of, themselves. Moreover, there is the concern that the study of these plants ends up being about everything that surrounds them (production, consumption, economics and culture), rather than the actual plants. Kohn's work with indigenous communities in Ecuador's Upper Amazon is a plea for researchers (in this case specifically anthropologists) to consider the more-than- human surroundings and the importance of listening to voices outside of the human ones we are accustomed to. Here we hear, not only the more-than-human voices, but also the cosmologies of indigenous peoples. Their voices present an alternative to the prevalent and more settler-oriented understandings of 'nature' as an external domain to be managed and/or preserved' (Palmer, 2006:33). Moreover, Kohn's work is about the larger scale ecosystems and assemblages, and all that are in them, refusing to prioritise human life over all other forms (Kohn, 2013). Instead of thinking of plants as something existing in a different world to us, it may be time to think about the relationships we have to plants across larger assemblages of relations.

Placing plants on a more practical and material level, plants are culturally conceived of as existing in one of a trinity of places (which all overlap and become hard to define): a 'wilderness', in cultivated fields, and in our own gardens. Wilderness, or nature, has been covered, but what about the plants which humans place? Agriculture has for a long time – ever since humans began tending plants to eat or otherwise use – necessarily attended to the physical conditions of soil/weather, but as it has increasingly been subsumed into the human/economic realm, so the lens through which it has been studied has arguably lost touch with the plants and their places (Grigg, 1995). Our gardens are places which are easy to take-for-granted (Head and Atchison, 2009) as they become extensions of our homes, and are ordered in ways which create meaning for their owners (Head and Muir 2007).

The next section will cover the importance of both agriculture and gardening in more depth, but it is important to keep these two places in mind, when thinking of where we as humans most often come into contact with plants.

Resource or stakeholder?

Now that we have charted differing cultural understandings of where to find plants and begun to contemplate what the places where we find them might tell us about them, just as much as about ourselves, it is opportune to think about what they are (ontologically speaking), how they are used and misused, and whether it is conceivable to think about plants (and perhaps a wider nature) as something with a stake and a 'say' in how we – all of 'us' on this earth – should and can co-live.

While there has been a move towards thinking animals as stakeholders with 'rights' (Wolch, 2016), plants have not yet been treated comparably, or studied as deeply, perhaps because they are conceived of as silent and stationary, and therefore less likely to catch our, human, attention in the same way (Moyle, 2017). Seeing plants as little more than a resource – a human projection of their utility for 'us', humans – is dangerous because it does not afford the plants sufficient agency, and therefore leads our actions and attitudes towards them to be less concerned with the plants in question, and much more focused on the implications they hold for our own lives. This focus on 'us', the human, is also what shapes our relationships with different plants, designating them as resource or pest – foodstuff, flower or weed - and thus the 'usefulness' of a plant is not to do with how efficient it is in reproducing or growing, as itself, but with what it contributes to the human world (Tsing, 2015).

The most obvious way we, humans, use plants as resources is in agriculture. Whether it is the direct intake of a farmed plant, or its use to feed animals to eat or its use in other products, we cannot escape plants in our everyday lives. Farming is also immensely important to the economic state of a country, and thus has value beyond its immediate materiality and on larger scales, and increasingly this is creating stress and competition for plant resources – and for land on which to grow these resources, sometimes prompting capitalistic 'land grabs' – as well as environmental degradation, worsened by climate change (Xiong et al., 2009). This climate change, with all its adverse effects, might be what is needed to bring together and strengthen the relationships between humans and nature (Liverman, 2009), something which may also be done by that 'thickening' of our concept of hybridity mentioned earlier, which can – and, in relation to plants, must – go beyond its anthropocentric focus which it retains, even arguably in the work of Haraway and Latour (Lulka, 2009). Lulka even invites the uncertainty which comes with a less stable climate to be a guide to thickening the hybridity which he sees in borrowing from botanical sciences.

Another 'use' of plants in more indirect ways is expressed in the literature around performance and political ecology (Szerszynski, Heim, and Waterton, 2003). How humans spend time with plants/nature, i.e. what performances are undertaken, plays into building a relationship for the humans actually engaged in the performance, as well as other humans observing it. Performing leisure activities in nature is one way in which people engage with and build up real and imagined relationships with nature and what is in it (e.g. plants or mountains) (Lorimer and Lund, 2003), and can be a way for humans to become part of the larger scaled ecology of a place shared by all its inhabitants (Kohn, 2013), thus engaging in the assemblages plants are part of. Human representations of plant – encounters in the form of prose and poetry (e.g. Magrane and Cokinos, 2016) – is a way of representing this relationship, and is a way to engage in and pay attention to the everyday

relationships we, as humans, have with plants in order to learn about new types of relationships which can blossom from these encounters (Haraway, 2010). Again, nature-writing touches on these types of leisurely or even therapeutic (Mabey, 2005) qualities which present nature and plants as something with which humans can have important and fulfilling relationships. Arguably, though, even here the utility of plants *for* humans remains core: the possibilities for some other kind of human perspective on plant lives and places, to one side, concerned and caring for *them* not for the human 'us', still await further elaboration (which is, I might add, a prompt for what my own project attempts, however imperfectly, to provide).

Intimate relationships between plants and humans are illustrated in the practice of gardening. The small-scale hands-on nature of gardening operations and the intimacy of relation required allows for hands-on, embodied engagements with plants. Several studies using a variety of methods (Hitchings, 2003; Robbins and Sharp, 2003; Christie ,2004; Power, 2005; Graham and Connell, 2006; Head and Muir, 2007) have found that humans do have relationships with plants, whether they be aesthetically pleasing, evoke memories or create an emotion connected to what they represent. Moving out from the private space of the garden, revitalisation projects in cities aim to bring more plants into urban areas, which – while complicated for a host of reasons outside the purview of this particular piece – is also beneficial to residents and has shown to increase the amount of time people spend outside of their homes (Wolch, 2016).

Towards plant identity

Plants have previously been afforded the same levels of agency as animals, as they were both situated as an 'other' with similar roles and relationships to humans (Moyle, 2017). While there is a pervasive tendency to separate animals and plants as fundamentally

different organisms or forms of life, thinking about the things they have in common can be informative and provocative, and the methods used to study one group (animals) might be helpful to envisage the further development of a critical plant geography which recognises plant liveliness, needs, agency and even individuality in the same way that such work is being called for and done in animal geography (e.g. Bear, 2011). Consequently, this subsection first considers how the developments of new animal geography might inspire a comparable plant geography, before considering some of the ways in which geographers, and others, have worked with plants as active actants ascribed agency and individuality as well as beings within complex assemblages.

The emergence of a 'new' critical animal geography takes animals from being resources for human activity and/or a landscape backdrop into being agents with subjectivity and lives which stretch *beyond* their entanglements with human activity (Emel and Wolch ,1998; Philo and Wilbur, 2000). Ethically-driven questions concerned with how humans treat animals have been posed, drawing from feminism and environmental geography, as part of a larger 'moral turn' (Buller, 2016). This move aligns itself with an ethical turn which, furthermore, has laid out a critique of anthropocentrism and seeks to frame humans and non-humans in ethically-charged relations and assembled networks (Cloke and Jones, 2003).

This 'animal turn' has forced humans to examine their relations with animals as disembodied food (Belasco and Scranton, 2002; Yarwood and Evans, 2000), which resonates with the previous discussion about how plants (and their various parts) are disassociated from their original homes when placed in supermarkets and on our human dinner plates. This disassociation of animals (and plants) makes it hard to see their agency

in action because of the excising power structures, against which they often appear insignificant. But this does not mean that they are without it; there are initiatives in animal geography to engage with individual animals and their personalities (Bear, 2011) and to examine human/non-human animal relations through the lens of hybridity (Hovorka, 2017) which 'transgress and displace boundaries between binary divisions and in doing so produce something ontologically new' (Rose, 2000: 364). All of this could, with cautions, be the inspiration for a new or critical plant geography.

Animals and plant have already been brought together, Head and Atichson (2009), examine Lorimer (2007) and his work on 'animal charisma'. His paper notes that we, humans, are more inclined to help with animal conservation if we find the species attractive or exciting. Similarly, Head and Atchison think that humans are more likely to get excited about certain plants – or plant assemblages. For instance, a rainforests hold more charisma than a residential lawn, and this, often holds more sway that the more rational arguments that can be made for plants that may be much less pretty, evocative, notable or even noticeable (lots of grasses, for instance).

This shift in sensibilities can then be transferred to the way we think about plants and their value, especially when thinking about plants as food. How we have treated crops for instance, translates into how we consume them, as we see with organic food which has become somehow 'better' and more virtuous, more charismatic, thanks to its marketing (Guthman, 2003). As a cultural opposite to the organic, we find Genetically Modified Organisms (GMO). Where organic foodstuffs are seen as pure and a 'good' consumer choice, GMO crops have been the cause of considerable controversy. Their use (and the control judged necessary) has been fought over by organic farmers, not only because of

their status as 'non-natural' but also as they were perceived to threaten not only local ecosystems, but also the livelihoods of farms who did not want to use them (Reed, 2002). What is interesting from a plant perspective is that discussions around changing a plant's genetic makeup is rarely discussed in terms of the plants' health or wellbeing, but rather with reference to its repercussions for everything – indeed, everything human – surrounding plants and their assemblages.

However, as indicated, there are also small signals of ways beginning to afford plants more of their own 'voice' and agency. Plants have a connection to seasonality which cannot always be manipulated, and thus force us to bend to their rhythms (Tsing, 2015). While this is not an intentional display of power by the plants, it does force us to think about the fact that they are not here to please us and our every whim. Cloke and Jones (2004) also note this consideration in their work on trees and cement that plants do have agency to disrupt our human lives (or in the case of their work on graveyards, our deaths). So if we do away with the notion that matter (and by extension plant-life) is passive, we find that humans are not the only actants, as Latour notes (Bennett, 2010). This realisation also invites us to think about who the actant is and how it experiences and sees the world.

While it is all well and good to be interested in plants, their individuality and assemblages, it is also important to ask how, exactly, we might do this. Questions of research method, and the data to be derived from such methods, are pivotal here. Lorimer et al (2017) seek to think about animals by looking at 'animal atmospheres'. While their paper is about animals, something of the attitudes and approaches suggested could potentially be transferred to the way in which we think [9]. Beginning to think about atmosphere means

9 Plants literally make our atmosphere through the process of photosynthesis which captures carbon dioxide and turns it in to glucose and oxygen.

thinking about a sensory and embodied existence. Lorimer et al. use Jacob von Uexkull's notion of the *umwelt* (lifeworld) as it does away with the binary of self and surrounding, and posits the self (in this case the plant) in and part of its surroundings in what could of course be termed an assemblage, in the manner already deployed, but now with a thorough-going phenomenological sense of countless life-worlds created by the intricate, habituated, rhythmic, seasonal and more connections between 'self and surrounding'. Lorimer et al. also note that the 'subject' – an animal, but it could be a plant – is not limited to the input from its own group, but also includes any other signs which might be useful and relevant for them to pick up on. These signs are not necessarily accessible to humans and are therefore easily overlooked. An example of this might be how animals are sensitive to changes in the weather-atmosphere (or as Ingold (2010) calls it, the 'weather-world'), something which certainly also holds true for plants, again in ways which humans might be insensitive to and therefore dismiss (Lorimer et al 2017).

Evaluations and conclusions

In broad strokes, it can be seen that there are general concerns around plants within the field of geography and its cognates, ones which have been present for most of the 20th century and still are alive today, and others which have developed more recently. Moreover, the consistency with which certain questions have cropped up reveals there to be an (understandable and justifiable) trend in what roles plants play in human lives. The question I set out to answer, however, was concerned with plant lives and how they have been studied. If I was to borrow from critical animal geography, and think in terms of what and who is awarded agency, I would say that plant worlds have been given very little credence, and have thus not studied, but rather have been configured as a backdrop (just as one can consider animal husbandry) to human activity.

While there has been developments in the field, it is perhaps more interesting that so many things have stayed the same. Work on agriculture and food more generally has been of constant interest to geographers, the major change being in their methods of study. While Sauer in 1952 was interested in how food historically has been taken around North America, Tsing writing 60 years later (Tsing, 2015) uses the matsutake mushroom to track a whole host of different communities who have nothing but a mushroom in common. Moreover, wanting to interact with and be close to plants is not something new, but seen across the literature, just as they have always been considered alive, probably because of their biological (scientific) categorisation as such, as organic, as opposed to rocks and soil, inorganic (if often containing organic material). What has changed is in line with how animal geography has changed to embrace the ideas of agency, even individuality, in non-humans, with an acknowledgement that human discourse and action is not the only player on the field, but that we can learn from listening to other species and working as well as living with them.

While there has been a shift in the philosophical thinking about plants from Martin Heidegger's view in 1929/30 that they could be 'lumped in' with animals (Moyle, 2017) to thinking about plants having memory (Gagliano, 2017), there are still some themes which have been present throughout the past century. Future plant geography might benefit from drawing on more philosophical work which has begun to be interested in plants, especially through the work of Marder, whose work is beyond the scope of this literature review due to its heavy engagement with philosophical theory (Marder, 2011; Marder, 2013; Irigaray and Marder, 2016). One philosophical idea – already introduced in Cut I – that I find attractive in thinking about plants is what Barad's (2007) intra-acting, which is when two things meet in time and space and affect each other rather than merely inter-acting where the meeting leaves both parties unchanged. This notion of inter-action allows the existing

notions of hybridity and assemblage to be further explored, while still acknowledging the individual organism's agency and action. Head and Atchison (2009) note that more-than-human geography is relational and can therefore be used to study many different things at the same time, and more importantly to delve deeply into the relationships between things. Moreover, a use of experimental methods, involving detailed and individual studies of single plants and the individual's network, might help better to understand the plant-world and plant-life – grounded, placed, lived – as opposed to plant-worlds and plant-lives set in global contexts and human prioritisations, yet while still being aware and interested in the assemblages and relations that the plants have to each other and to us (humans).

A challenge which might be found in plant geography beyond plant-human geography is that of representation. This challenge is also found in animal geography, where there is a desire to present 'lively ethnographies' which fully capture the flightiness and affective lives of animals, but also a recognition that ultimately the work cannot but be *restricted* to representations of this liveliness rather than actually being able to let the research audience feel the materiality and life of the animal. This is a topic discussed within non-representational geographies, but scholars have not yet been able to create an animal atmosphere outside of the actual experience: the challenge of the more-than-representational still, unsurprisingly, remains (Lorimer et al, 2017).

It is impossible to ask a sunflower what its world looks like, what is important to it, and then there is the question of whether a single flower's opinion should even be taken into account. I think the development of plant-life-thought is showing a step in the right direction, namely to consider the importance of understanding what plants are and what their lives look like. This development is crucial, not only to enhance our (human)

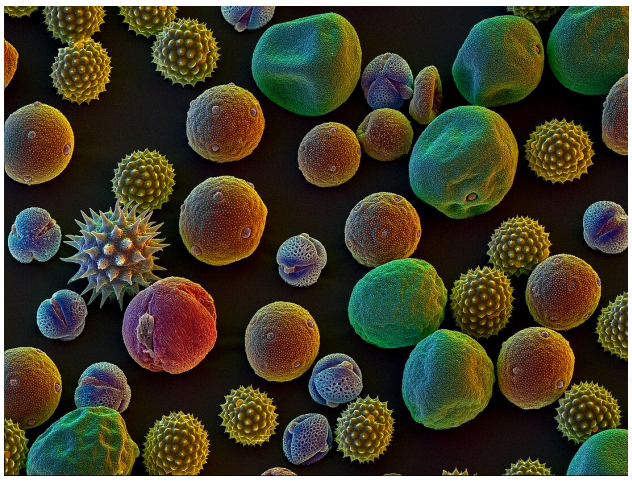
relationships with plants as resources and beings with which we share spaces and experiences, but also in engendering a more critical plant geography which considers – however hard it is to conceive, and even given anthropomorphic snares of the very notion – the point of view of the plant itself and its relations out-with, and with, humans. The methodological and ethical challenges raised here resonate throughout the thesis that follows, notably in the next chapter when addressing my own approach to negotiating these challenges.

The chief purpose of this section of my literature review, Cut II, is to examine the changes in how geographers have thought, and continue to think, about plants over the past century. I have been much more acquainted with animal geography and the critical geographical scholarship surrounding it, and would like to see, as well as be part of, a movement within plant geography that begins in similar ways, to question taken-for-granted assumptions about what we know about plants, their worlds, and lives. I think it is important for us as researchers not only to concern ourselves with human relations with plants, the benefits we gain from our with intimate relations with them, their importance for human sustenance and their uses in combatting human-made problems of pollution and climate change, but also with what it means to inhabit a plant-world, what we as humans with a different type of impact can do to make plant lives better for their own sake and the wider assemblage that we all inhabit.

Cut III: Palynology Q&A

1. *What is pollen?*

Pollen grains are structures which hold what are identified as 'male'[10] gametes (germination cells) of plants. The structure is simple, with an outer structure called the exine, the inner called the intine, and the actual genetic material inside. When a male gamete (i.e. the pollen grain) comes into contact with what is identified as the 'female' gamete (the ovule, which is found in the 'female' flower), there is possibility for fertilisation. The pollen grain carries two important cells: a tube cell, which creates a pathway to the ovule, and a generative nucleus, which divides to create two male gametes, one that acts as a key to gain access to the ovum and one to fertilise it (see **figures 2.1 and 2.2**).



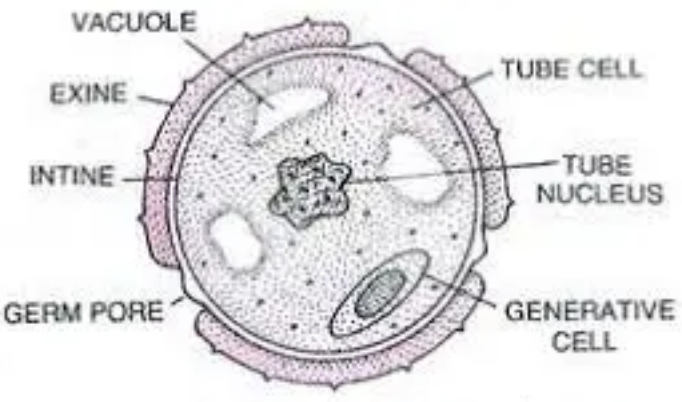


Figure 2.1 (left): a variety of pollen grains in different shapes and sizes https://www.science-photo.de/bilder/11539239-Assortment-of-pollen-grains
Figure 2.2 (right): annotated diagram of a pollen grain https://www.cosmic-core.org/free/article-182-geometry-of-plants-part-5-pollen/

Pollination can occur between different parts of the same plant (self-pollination) or between plants of the same (or similar) species (cross-pollination) depending on the species. The latter can happen with the help of biological actors such as insects and animals, called pollinators, as well as due to abiotic ones like wind or water. Different plants have adapted their pollen to be suited to one of these types of pollination, to

[10] The scientific convention is to differentiate plants into heteronormative roles, while acknowledging that some plants are 'bisexual' and can contain both 'male' and 'female' parts. There is a whole literature on queer ecologies and how nature, including plants can be queered (Gandy, 2012; Mortimer-Sandilands and Erickson, 2010; Gibson and Gagliano, 2017; Morton, 2010; see also https://www.queerbotany.com for an extensive reading list).

maximise their chances for successful pollination and fertilisation. Plants which have adapted to insect and animal pollination produce pollen which is large, sticky and spiky. Moreover, these plants often produce colourful and aromatic flowers which attract the pollinators to visit, often rewarding the visit with nectar. These plants often produce a relatively low pollen count, which limits the amount of wasted pollen.

Aquatic plants are highly specialised in their pollination: some put flowers above water to allow for insect pollination, while others have developed tactics to pollinate under water. Plants adapted to wind pollination, on the other hand, produce small, light pollen often with air-sacks to ride the wind with. These species also produce a lot more pollen which is released in so-called 'pollen rains', as this productivity increases the chance of a successful pollination. It also means that the majority of pollen released is indeed 'wasted' and lands on either the ground or on bodies of water: that pollen, of course, is the raw material of the palynologist, particularly the palaeopalynologist searching for deposits of such 'wasted' pollen across the landscape.

Bringing the pollen grain's structure and function into a conversation about time, there are two points I feel it is important to bring up. Firstly, pollen is released seasonally. This means that it is in constant cyclical-conversation with climate, weather, insects and animals. Temporalities have co-evolved to ensure that there is a correlation between flower blooms, as well as with abundances of insect and animal life tied to breeding cycles, which are also entangled with weather. With a disturbance in this balance, the future of this co-operative and symbiotic relationship is threatened. Another tie between pollen and time is found in the exine structure. The outermost layer of the pollen grain is made from a polymer called sporopollinin, which has an extraordinary resistance to degradation. It is

therefore very well-preserved in anaerobic environments, ones with an absence of 'free oxygen', which is what quaternary geologists look at in their pollen analyses. These are not really fossils, then, but the actual pollen grains which can give insights into the lives of past plant assemblages. I will discuss how we can know what the past might have looked like from analysing these pollen grains, but ultimately it is because we assume that there are parallels then with how these plants live today (with which plants produce which sorts of pollen with which capacities for being dispersed through what media and over what distances). This assumption ties the past to the present, but, as well as reconstructing the past, pollen analysis helps to point towards the future: as such it becomes crucial for current environmental and climate change research.

2. What is palynology, and am I really covering it all?

Simply put, palynology is the study of pollen and spores, but, depending on what information you might want from or about pollen, there are many different avenues to explore. You might be interested in: areopalynology, which concerns itself with how pollen moves in air; pollen morphology, concerned with the physical properties of pollen; vegetation history, requiring genetic and evolutionary palynology; paleopalynology, which is a dating technique used in Quaternary geology; forensic palynology, used among other things to solve crimes; or melissopalynology, which studies pollen found in honey. While it is important to specify which aspect of palynology is being discussed, there is an assumption that palynology refers to paleopalynology when speaking to climate scientists, my own primary route into encountering the science of palynology.

My focus for now is hence paleopalynology and its use in vegetation and climate reconstruction. My interest lies in time, and how palynology can act as a link between

pollen across time. Some of my fieldwork encompasses being-with pollen and thereby exploring pollen in the present day, as introduced in my next chapter. Looking at past pollen – or, better, looking at how climate scientists 'look at' past pollen – will allow me to draw links back in time, but also to look forward as a combination of past and present climate analysis is what is deployed to envisage the future of pollen and the planet. My concern for temporalities, flagged in Cut I above, plays out here.

Pollen studies are not new. Aided by the invention of magnification lenses, pollen has been studied from the 1500s onward, with the first pollen fossils identified in 1836 (De Klerk, 2018). However, while pollen morphology was studied and there was a growing understanding of the relationship between pollen and allergies in the 1800s (Ramachandran and Aronson, 2011; Mitman, 2003), it was not until the 20th century that pollen analysis as we know it today was introduced. In particular, the Swedish geologist Lennart von Post is credited with the invention of the pollen diagram and, furthermore, pollen statistics. As World War I was underway, neutral Sweden was looking for a local and conflict free fuel source and turned attention to the southern peat bogs (Nordlund, 2018). A 'catch phrase' of von Post when it came to palynology became 'think horizontally, act vertically', referring to the fact that palynology is broadly landscape vegetation reconstruction of a region (the horizontal) through the extraction of sediment cores (the vertical). It has been over a hundred years since von Post first shared his findings and pollen diagrams – the latter a graphic representation of his findings – with the world; and, while he is often held up as the 'father of modern palynology', it is also noted that he was not alone but guided by Gustaf Lagerheim, while Gunnar Erdtman (among others) also played an important role in developing palynology in its early days (Gillard et al., 2018).

While statistical pollen analysis was developed at the end of World War I, World War II also played an important role in the development of the discipline, not only in output, but also in the presentation of pollen science. Pre-WWII, there was a steady increase in articles written in a variety of languages, but there is a break in publications in the 1940s, attributed to WWII. There is also a clear drop in German-language publications following the war, when English steadily becomes the dominant and common palynology language (Marten, 1968). While there has been lots of writing in palynology since – and development in techniques, especially with the development of technologies for sediment coring and, crucially, analysing the contents of cores in the laboratory – the methods and principles still in use today are largely the same as laid out in Knut [11]Fægri and Johannes Iversen's classic *Textbook of Pollen Analysis*. The book, written in 1950 by a Norwegian and a Dane, point to a continued engagement with palynology from the Nordic countries, where this practice was originally conceived. It has been through four editions, the third and fourth published after the death of Iversen in 1971.

It is also worth noting that palynology works in collaboration with other disciplines. As noted above, there are many branches of palynology which all contribute to different areas of pollen studies. Paleopalynology, along with vegetation reconstruction work, operates not only with geology and botany to make climate prediction models, but also with archeologists to give deeper and better understandings of past human life and activity, from determining what sorts of agriculture was cultivated when, to substantiating the timelines proposed (Edwards et al, 2015). The role of pollen analysis in reconstructing past agricultural landscapes is central to some of my own fieldwork, as will be seen, especially in chapter 5.

[11] Unless stated otherwise, all technical information about the practices of palynology and about pollen morphology and physiology are taken from Fægri and Iversen's 4th edition of Textbook of Pollen Analysis from 1989 and Bruce Knoxs Pollen and Allergy from 1979.

3. What are the strengths and limitations of using pollen to study past plant assemblages?

Because of the sporopollenin's structure, it is very hard to break down when deprived of oxygen, which means that it is extremely well-preserved and identifiable. Nonetheless, there are two big limitations with using pollen to recreate past vegetation assemblages. Firstly, all landscape reconstruction is essentially speculation. There is no way of knowing what actually happened or if the pollen found is what we think it is, as there is no DNA left in it. Secondly, palynology is almost exclusively concerned with pollen from wind pollinated angiosperms, as those pollinated by insects or animals produce less pollen and what is produced usually is much more precise in its delivery: i.e. much less pollen is lost and able to enter into a geological process.

There is an assumption of uniformitarianism which means that pollen (and most other lifeforms) are essentially the same today as they were a few thousand years ago. Looking at the modern lives of the pollen producing trees allows us to envisage what the life-words and ecologies of past vegetation assemblages actually looked like. This means that we can draw assumptions about what other plants may have existed alongside the wind pollinated angiosperms. Thus, if a typical Swedish pine forest today looks and behaves a certain way, under certain conditions, chances are that it looked and behaved similarly in the past as well.

We can see the spread of indicator species which hint about changes in climate and how this spreads across an area over time. A rapid change in pollen counts can (coupled with ash and other bioindicators) tell us about wildfires, volcanic eruptions, droughts and more, and we can see where plant assemblages change in phases related to longer climatic change

as well as to annual variations. Because pollen rains mix in the air, they create a rather uniform distribution that can be taken to represent the local region, and thanks to the excessive amounts of pollen released during the pollen season there are enough to analyse, measure and derive statistically significant observations. The relationship between seasons and pollen also means that there are nearly endless repeats which can be compared and contrasted.

4. Where do palynologists find their pollen grain samples and how are they analysed?

As pollen is best preserved in anoxic (oxygen-free) environments, palynologists often obtain their pollen samples from sediment cores found beneath lakes or peat bogs. These cores also hold other information that allow the pollen samples to speak to other events observable in the core. In order to get a picture of what past vegetal assemblages looked like, it is important to consider regional (larger) and local (smaller) spatial scales. Pollen can travel very far before dropping into the drainage basin of a catchment area where it is either eaten by critters living therein, decomposes or is transported through waterways until it is deposited in a lake. Thus, samples taken from lakes hence represent more of a regional picture of the pollen landscape. Localised samples are taken from sheltered locations, as this allows for a better idea of what the local pollen composition might have comprised, and thus weeds out the potential outliers. It is important to take samples from multiple sites and to compare them. Pollen is observed under microscopes after it has been chemically treated to remove other materials which might obscure the grain structure, which allows for easier counting of grains and makes distinguishing the species more rigorous. In my own participatory research, I engaged with pollen scientists both in the field, searching for ancient pollen to enable reconstructions of past vegetation assemblages

and (human) land-uses, and in the laboratory, when trying to make individual pollen grains 'materialise' ready for microscopic and other analyses.

Pollen diagrams allow for the surveyor to look at the distribution of pollen over time and across species or at least genus. The benefit of using this diagram is that it is easy to view and to interpret: i.e. easy to read and to compare with other diagrams used in geology and climate science. The pollen from any particular type of plant is represented as a percentage of the total pollen count in the sample. The percentage is telling for deriving the overall vegetal assemblage composition, but does not always allow for an investigation of a single species, for which other models are developed.

Innovations in computer modelling have allowed for new techniques such as the Landscape Reconstruction Algorithm (LRA) and Multiple Scenario Approach (MSA) to make new and complex climate models building on pollen data (Twiddle, 2012). LRA combines data from large and small lakes to eliminate some of the uncertainties which may arrive from just counting overall regional pollen amounts. LRA thus takes into account the pollen production of individual species. MSA is useful as it can make many different outcomes from predictions of past climate and the models can be compared with actual pollen data, which is also used to predict future climates (Twiddle, 2012).

5. What other secrets can we learn from sediment cores and how does this work with pollen?

It is important to repeat and underline that pollen cannot tell us everything we want to know about past climate and vegetation assemblages on its own. One metaphor which readily applies to studying a sediment core is the work of a detective: it is full of clues

which must be analysed by the right expert to put together the puzzle and solve the mystery of what happened, when and, crucially, where (in that the pollen found in a core can have derived from many different sites, some maybe at a considerable distance from where the core was drilled).

I was lucky enough to be able to see one of the core samples that researchers from the Earth Science part of my university School are analysing. Professor Jaime Toney and PhD researcher Mike Zwick unwrapped the core for me[12], and helped me to identify the sediment layers which indicated the changing seasons as well as to distinguish biological material and volcanic ash. All of this work, combined with chemical analysis and carbon dating, can tell us about the conditions present when the pollen were deposited. We need the whole core, as well as techniques which have been developed across different disciplines, in order to say anything significant about the core at all.

All of this then underlines a point that Jamie and Mike made while showing me a sediment core: vegetation and climate reconstruction is collaborative work. Most papers written in climate science are collaborative, with many names listed as authors, not because everyone necessarily contributed to the writing but because they have contributed to the making of what is being written about. It is normal that the person doing the data analysis has never been in the field, or that the fieldworker collects samples that she cannot process herself but needs to send away to a laboratory or a technician with the capacities actually to do the analytical work. While I strive to understand why this important work is being done, this realisation has also prompted me to be more 'okay' with not necessarily understanding the 'how' of what is being done. I am able to engage with it up to a point, but it does not mean I

[12] This will be discussed further in chapter 4

necessarily need to know how to run an LRA or produce a pollen diagram on my own. With this remark, I also introduce a theme of 'the amateur', a position that I realise I have been occupying throughout my project, not just in relation to the science but also in relation to its humanities-artistic components. The generative figure of 'the amateur' is one that I address in the next chapter.

6. Why is this interesting or important?

I have chosen this area of palynology to focus on because it lets me engage with the past, present and future. While later work will root me in the present through practices of being-with, observing and participating, looking to an established natural science gives me the ability to draw together – to reflect through my critical-plant geography lens (Cut II) – on the temporalities of seasons and longer climatic developments. In a time where the climate seems harder and harder to predict and the seasonal rhythms upon which so many human activities rely shifts, pollen seasons become an obvious indicator and a good candidate for a flagship event/phenomenon to observe and to engage with. The delicate temporalities and relationships built between plants, pollen and pollinators, as well as weather, force a stark obviousness when they are not timed perfectly. By looking back, we can look forward, and, while looking forward, we have to look at where we are now as well, otherwise we will not be able to work towards the future we want. While I will not have the opportunity to look back at the past vegetations assemblages that are present in my particular fieldwork area in Denmark, I will know how one would go about it.

Conclusion

This chapter has sought to create three clear literary cuts, where the first sets a tone for the projects as one which concerns itself with the thickening of relations through the concept

of shimmer, the second to place my thesis in a plant-oriented geographical literature. Lastly I wanted to introduce some of the more technical and practical aspects of palynology which will be referenced throughout thesis in one place. Moving forward, each chapter will introduce new bits of disparate literature which will inform the relevant chapter and thicken the relations between my thesis, wider geographical literature, and literature beyond.

There is a personal metaphor wrapped up in all this as well. I have a past in the USA, a past that is in my DNA, unknown to me, and a more recent past in Scotland, but more broadly in Denmark where my life has happened and is now happening once more. Likewise, I travel in my project the US to uncover my own past as well as a pollen past, and to Denmark to sit with my present attachments and contemplate my future involvement. Certain themes have hence emerged – I acknowledge quite late in my project – with a 'decolonial' flavour: reflecting my own complex racial heritage, refracted through growing hesitations about the 'whiteness' of palynology and pollen analysis, its awkward links to 'settler science', and to a certain irony about pollen being free to travel and to settle, whereas for humans the conflictual politics of who travels and who settles – where, when, for how long, with what future implications – really do seem very different.

Chapter 3: A drifting pollen methodology

My methodology chapter was the chapter I have been the least certain of how to write. There has been a sense of meandering and searching for the 'right fit' throughout my thesis – the match between my ideas for the thesis, for what it addresses and why, and exactly how it goes about realising these ideas – which ironically is how I have come to understand pollen. In effect, throughout my thesis work I have been searching for something into which to breathe new life, and, if and when failing to do so, seeking to find ways to retain a snap-shot knowledge of the world in which the knowledge-seeking has emerged. As these somewhat oblique remarks indicate, I do have some sense of 'failing': of having an initial notion of wanting to get close to pollen, to detect the 'shimmer' as discussed in chapter 2, and seeking to devise engaged methods that would enable this to happen; but of then being disappointed, confused even, when the methods did not straightforwardly deliver what I had hoped. More positively, stepping back to appraise what my methods did accomplish – what empirical materials had emerged; what forms of knowledge – my judgement was that something different or other was occurring. To anticipate, it was how scanning critically across my 'drifting methodology', taking all its stuttering ingredients together, created something else again, a different kind of 'shimmer' perhaps, that was as much about the science as about the arts components. It was even suggestive that my more ostensibly experimental arts-based methods were less successful in realising what I had initially envisaged than were my more conventional encounters with science – the humble observing, learning, chatting, fieldwork, opening gates. I have attempted to relate the latter through a mixture of creativity – a poem, a photo-essay, a herbarium, and more – and more orthodox 'reporting', as well as deliberately sliding into the picture a wilful sensibility of 'the amateur', to be discussed shortly. In sum, though, my thesis arguably reflects a certain failure or mis-match, or more *ad hoc* reworking of the findings from and linkages between, in terms of methodology.

I have found myself leaning into the messier, more emotional and personal sides of the research. This means that I have been honest about the failures and disappointments that have cropped up during the research. I have a strong sense that what I wanted to do in my thesis was to be transparent and authentic, which means including the things that did not necessarily go as planned and reflecting upon what these unexpected twists and turns have meant. Morever, this is a deeply personal thesis. I have put a lot of myself into it, not only thematically (see especially chapter 6), by bringing my own personal identities and relationships to the forefront, but also my beliefs, opinions and feelings. I have done this to show that research is emotional and personal, even if those things are often at risk of being written out of a final publication. This thought might be termed 'positionality' as it works to situate the author, but I have tried to go beyond that construct and invite the reader into the reality of my research which has not always been as satisfying and neat as I might have hoped. It is also to stay honest in places where my text could easily have been written to sound like I was always two steps ahead when in reality, the work was much more organic and generative with new ideas germinating throughout the process.

There is of course always an emotional and personal aspect to research as this thesis aims to make clear. However, it is not always explicitly stated, and traditionally is hidden as the researcher becomes a 'body in a field', not a person but a vessel which can research and report (Driver 2000). Those who study the history of science, might say that scientific knowledge is 'universal', and that it is their role to put it in its time and place (Ginelli 2003). Feminist geographers have worked to highlight the importance of *what* body is present in the field and for whom the universal applies through taking seriously the intersectional identities of the researcher. Furthermore they centre intersections identities and the many complexities they hold (Dias and Blecha, 2007; Al-Hindi and Eaves 2023).

I am also not the first to admit to failure or to be weary of certainty. I especially resonated with the concept of the loser (Harrison 2015). In chapter 4 I engage with enchantment and its place in geography, my own disenchantment and disappointments, something Harrison relishes. He urges us not to be swept away with enchantment and to blindly follow a pre-defined set of questions. I too have tried to let go of a rigid adherence to a hypothesis, but instead be open to the possibility of investigating (and noticing) new avenues of interest. Later in this chapter I introduce the figure of the amateur and how seeing myself in this light has allowed me to feel comfortable in my disenchantment, similarly to how Harris paints himself a loser; someone who does not wish to get swept up in the enchantment and excitement of the research.

The chapter comes in two parts. Firstly have tried to put into words how I have approached the research in terms of an otological musing on how I see myself as a researcher and what kind of worlds I believe I am working in, before tackling *how* I went about my research in a more epistemological consideration. I have also included two short notes, one on the fieldwork which was undertaken in the United States in Spring 2019, and the second a note on how my thesis has been affected by Covid 19, as the pandemic forced me to change certain aspects of the writing. Secondly, I have created a substantial table which shows how my fieldwork has been spread out during the project – meaning the overall suite of 'field' methods, more-or-less actively pursued, running chronologically over the years of my PhD thesis research – noting when and where it took place, who participated in it, and how it has contributed to the thesis (and nods to where in the thesis it is 'written up'). I have placed this table at the end of the chapter: much of the normal work of a methodology chapter is carried by the table, and I hope that readers will work back and forth between my text in this chapter and the table.

An ontology of drifting knowledges

The focus of this thesis has shifted and meandered as I have read, explored, and spent time in the field. I began with the intention to stay-with the more-than-human aspect of pollen, and, while I still believe that the thesis retains some of that focus, it has also evolved into more of a 'human' project as my own human body and identity became undeniable parts of the project. Doing the work it has become apparent that the only way I am able to engage with pollen, in practice and in theory, is through my own body and through a lens of my own experiences. Thinking of this as an 'ontology' sounds a lot grander than it feels; what I mean to say is that the work becomes impacted by my own positionality in the world. Chapter 6 (Drifting towards a rooted diaspora) which deals, very personally, with my experience of being a person with mixed racial heritage stems from my own experiences, and how they relate me to pollen and palynology. Had I suffered from pollen allergies,[13] this would have played a significant role in my thesis, just as I imagine being a beekeeper would prompt me to pay closer attention to the relationships between pollen and pollinators. I will shortly write more about my 'amateur sensibilities' and their impact on shaping this chapter, but I want to acknowledge here that the idea of the amateur is an idea of someone who is passionate. Just as this thesis could not be written without my body, it could not have been written without my passion either, the drive to search for and understand the topics have been essential for the work to be done and I think it is important to remember this and to make sure it is not hidden behind an intellectualisation or claims of objectivity.

While I want to stay away from being person-focused on an individual as this project in its essence is about relations – diverse relationalities between humans and pollen, between

[13] While I did not suffer from these allergies at the onset of my thesis writing, and therefore did not pay much attention to them, I have since developed what I believe to be allergies related to tree pollen in the spring time which has made me ponder what alternate routes the thesis might have taken as I am experiencing a whole new intra-action between my body and pollen.

environments and pollen, and more – I want to highlight a quote from Lennart von Post[14], who appears in chapter 4 (Enchanting the mundane). His motto was 'think horizontally, act vertically', which refers to thinking about the landscape (horizontally) while digging (vertically) into the ground. I want to adapt this spatial metaphor to how I am currently thinking about my thesis. In terms of thinking with the horizontal, an important emphasis has indeed been on the relationships between humans, between humans and non-humans, and even between non-humans, matters tackled more conceptually in chapter 2. I view these relations as horizontal, drifting across physical earthly spaces, and I think it is important to think of these relations as 'equal'. Thus, while the thesis prioritises my own experience to some extent, it also strives to remember that this emphasis is only because *I* am the one writing the thesis and deciding what to focus on, and that *my body* is the one doing the work. Acting vertically comes out in what I have chosen to work with, particularly the piles of different times, legacies and futures that I sense to lie atop the specific sites from where pollen has been extracted, analysed, tabulated, quantified, and the like and the relations – or intra-actions – running between these sites. The focus on time and the legacies that e.g. colonialism has left and are still being dealt with speaks to 'acting' (in this case researching) with how the past has impacted the relations that I witness today.

Another way of thinking about myself in research comes from Jakob von Uexküll's writings about *Umwelten*.[15] He cared more about contemporary horizons (than about the vertical hierarchies), worlds assembled from multiple bubbles of perception and response (Ginn, 2014, 131; Ingold, 2000). In other words, the idea of *Umwelten* lays out a certain level of perception and inter-action with its surroundings and other umwelten. Like von Uexküll, I

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14 von Post is one of the biggest names in palynology and really changed the game with the invention of the pollen diagram. Ref his paper: He is discussed in some detail in chapter 2.

15 There is a direct translation in Danish of 'omverdenen' which I think really makes me connect with the concept even more. The term literally means 'the world around you'.

am interested in these contemporary horizons, how my own body inter- and intra-acts with those I come into contact with, but in this thesis I hope also to incorporate the vertical, not so much in a hierarchical sense that Ginn suggests von Uexküll is not interested in, but in the temporal sense to which von Post refers. This means that I want to know about the past inter- and intra-actions which are invisible, but still present and influential in the horizontal and contemporary relationships with which I engage throughout my research.

A term which appears again and again the thesis is 'Shimmer'. I have outlined this concept in chapter 2, but want to note here in the methodology chapter that it has been the basis of my whole approach to the thesis. If seeing shimmer, or vibrancy in the interconnectedness of matter (human and more-than-human) is integral to how I understand the world, it must also be integral to how I seek to learn. Shimmer however, is more than just the connection, it is importantly something which moves (Bird-Rose 2017). Pollen moves, whether it be by wind, water, or pollinator and its shimmer is quite easily seen in these movements, in the fertilisation of an ovum, or the ingestion of another being, where it gives energy and life. However, I also found merit in the shimmers of the slower vibrancy of pollen which has a life underground, the pollen which palynologists unearth and study. As my research progressed i learned that shimmer - to me - was something less 'magical' and much more tied to the tangible and arguable my human engagements, observations and learnings. More than that, it was by finding my own place in the shimmer that it became visible to me.

Amateur sensibilities

I have included this section about the notion of an 'amateur' as a concept which crops up again and again throughout the thesis. This is because I have found that much of the time, I have felt like an amateur. Not feeling that I could take on the mantle of a scientist, an 'artist', a science communicator or anything else that seemed to fit into the various

fieldwork I undertook, made me look for a title that did feel appropriate. I found that 'amateur' felt like the right one. What is an amateur, and what are their sensibilities? There are many ways to characterise an amateur, but the first that comes to mind, for me, is the opposite of a professional. There are several possible overlaps in the two terms, potentially a great knowledge, a passion for the subject and a curiosity to know more. The academic researcher – ostensibly a professional – might even go to an amateur to gain knowledge, as we see amateurs gather in societies and organisations to share their knowledge. However, I think one big difference is that a professional earns a living from their knowledge and are acknowledged as having authority on the subject, holding status and indeed forms of power in this respect. A formal education from an established institution also gives the professional a credibility which is easily recognised by their peers and 'proves' a rigorous training in methods and exposure to literature surrounding a subject which has been deemed appropriate by the institution and convention (Merrifield, 2017).

I acknowledge that I am a trained researcher, a human geographer by education and institutional affiliation to date, and at the end of the day I am indeed an academic, part of an establishment which has shaped my skills and methods. Admittedly, though, I am not a professional in any other areas of my life. I am not a gardener, a poet, a scientist, an artist, or more: here, in all these guises where I sometimes appear in this thesis, I am undoubtedly an amateur. I even conceive of my approach here as that of wilful amateurism. Going into my fieldwork, be it a plant initiation retreat or a lab observation, I strive to be present with a sensitivity to my situation, which is appropriate, respectful and trimmed with curiosity. I also carry with me my amateur sensibility, brimming with enthusiasm but also the possibility for letdown and disappointment, both of which I surely also experienced. I cannot escape myself in my research, as my body and my mind, with all their past and physicality, are always present. This means that my excitement,

disappointment and my emotions exists in my research, sometimes at the forefront, and sometimes hidden, but they are there, whether I want them to be or not. And with me comes my curiosity.

I like to think this thesis is driven, at least in part, by curiosity (Phillips, 2010). Not only curiosity for pollen or plants, but a deeper curiosity for how things work. I have always been interested in how the world works, whether this was through the natural sciences, religion or literature, I want to know why and how we understand things. Furthermore, discovering the term 'more-than-human' opened a whole new way of relating to the non-human critters and matter that I am enmeshed with. This project has allowed for me to be curious in many different ways: I have spent time in a pollen lab, been a part of palynological fieldwork, written poetry, taken photographs, partaken in a plant initiation and much more as will be revealed in the thesis. Admittedly, the range of activities and experiments might seem a bit excessive and aimless, a touch amateurish; however, I think that there has been a method to the chaos.

More than just understanding the why of things, my curiosity with regards to the methodology has left me open to understanding different versions of the *how*. I entered my work with an attitude which left me open to pursue different avenues of understanding pollen in its form, as grain, as a material shimmer between plants and pollinators, but also with an eye for how this shimmer can be understood by humans who create our own shimmers around this process. By exploring and experimenting with different modes of understanding and translating my experiences, I hope to awaken the curiosity in the reader as it has in me.

While doing the fieldwork for my thesis, it became clear that not everything worked the way I wanted it to, or thought it would a lot of the time. While I have tried lots of different

things and had lots of different ideas about how they would go, it is safe to say that I was not always correct. I have included these feelings of frustration and disappointment in the thesis because I think they highlight that even someone who technically is supposed to be a 'professional researcher' (or at least becoming one) makes mistakes and misjudges the project at hand. I do this because I think everyone does. This was my experience with Scott and Ana as well: we plan and follow the plan as best we can with no guarantee that the plan works the way we expected.

I also hope there is a disarming quality to this uncertainty and fumbling. I have not gone into this as a thorough-going scientist or an artist or anything else really, but I have harboured dreams about being both of those, and this experience has opened my eyes to realities about some of the identities I wished to don, one that I had never contemplated. Looking back part of me thinks that my meandering through pollen worlds is solely due to bad planning on my part, or the inability to stick with just one thing, but as my thesis comes together I do see patterns of interest and themes emerging which may not have been what I thought was obvious when I started out, but have been working all along to this point of convergence. And this is where my training as a researcher comes to the fore. The sense-making of my amateur endeavours highlights the importance of expertise: we need people who know what they are doing – scientists who know their 'science'; artists with developed creative skills – and who have done the research, been peer-reviewed or otherwise publicly validated, and go beyond (but arguably still build upon) loving something for a personal passion. There may still remain a role for me too as the professional geographer with a particular facility for drawing together such disparate materials, something that has long been a feature of the geographer's work (often sitting between different disciplinary and epistemological approaches to the world's landscapes).

An epistemology of drifting knowledges

Now that an idea of how I understand the thesis and my place within it, I want to make a quick remark on exactly *how* I wished to understand the vertical and horizontal shimmers that I set out to explore (and as I have increasingly come to understand them through the research). Instinctively I had two modes of operation, Being-with and Investigating:

- *Being-with*: While I quickly released myself from any conviction that I could 'be' pollen, or something more abstract like the 'spirit of the dandelion'[16] or the practice of palynology, I certainly found that I could be *with* it. Through participant observations and ethnographies which focused on being open to new and surprising experiences, I have striven to give and create space for 'just' being there and to allow for the unexpected. This has resulted in me seeing myself as the amateur, as just explained, and allowed for experimentation, failure, disappointment, wonder and enchantment.

- *Investigation*: This has been a more deliberate approach to my work, and has perhaps been more relevant in the planning and writing phases of completing the thesis than in during the actual fieldwork. Looking at my notes after fieldwork was a way of investigating what I had noticed by being-with and led me to interrogate my own motivations and look at what I have been drawn to, subconsciously and consciously. In one way, the whole thesis is an investigation and, as much as I have let myself drift with what opportunities and interests have arisen, I have still intentionally chosen where to land and what to 'pick up' along the way.

I have tried to approach my work, not only the research itself, but also the write-up, with

[16] See chapter 4.

an open mind to what the thesis might become. The 'creative turn'[17] in geography has tended to focus on the visual representations of the world through photography, comics, illustration, and more, which not only relays the world, but to some extent makes it as the image. For a long time the image has been regarded as the 'truth-teller' for many reasons, including an assumption that it holds more information that a text ('a picture is worth 1000 words'), and leaves an illusion of objectivity as the viewer is free to draw their own conclusions about what they see, seemingly unshaped by prior ideologies[18] (Hawkins, 2020). While I did use photographs (especially in chapters 4 and 5), there was never any intention from the beginning to have them as a focus, but rather I later noticed them shimmering throughout my notes. Indeed, in being-with the research that I had already done, I found that they did have an importance and were able to convey something different more effectively than could the text alone.

At certain times I have called my work an 'art/science collaboration'[19], but I am not sure I am completely comfortable with that label. I do not feel I have enough art or enough science in my thesis to claim that it is an art/science collaboration, but rather feel – echoing some remarks already made – that it has become an inquiry into how an amateur like myself can move with science and its history and translate it into a more experimental

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[17] The 'creative turn' has led to a wider acceptance and acknowledgement of ways of research, journals like *GeoHumanities, Space, Place, and the Humanities* which, in its April 2023 issue, has an article on the colour of place (Edensor, 2023), applied theatre (Olsen, 2022), and reflections on the identity of being a geographer and a creative practitioner (Kelly et al., 2023). Examples of how more creative and practice based works also appear across geographical publications and include Lantto's (2020) experimental piece on the San Pedro river archive, Chege's (2022) poetic encounter with magnolia trees, and Brice's (2022)'s piece on cranes and sketching.

[18] The most obvious reference to how images are perceived is John Berger's *Ways of Seeing* (1973), which has long influenced geographers' work. Another appropriate reference is the work of Gillian Rose, who (among other things) discusses the many traditions and methodologies that surround looking at, and working with images (Rose 2016).

[19] Art/Science collaborations have a place in geography: things like Jeremy Mendes, Leanne Allison, and the National Film Board of Canada's 'Bear 71', which monitored a single female bear in Banff National Park, Canada, from 2001-2009 (https://bear71vr.nfb.ca/), allowed an interactive discovery both of the bear's life-world and the park itself. Moreover, there are the works of geographers Sasha Engelmann on art in the atmosphere (Engelmann 2014, 2021) and Harriet Hawkins, who explores several different art science collaborations and expressions in her book *Geography, Art, Research* (Hawkins, 2021) . Closer to home, Hannah Imlach works as an artist with the Royal Society for the Protection of Birds and the University of Glasgow in the environmental humanities within the Geography department (https://www.hannahimlach.com/Research).

language that has elements of poetry and autobiography woven into it. Perhaps this approach sits better within the geo-humanities than in a more formally demarcated realm of scientists and artists 'in collaboration'. In many ways the thesis is concerned with knowledge, where and in what context it is produced, its many different variations and valuations, and what that means for its intended and unintended audiences (Hawkins, 2020).

Writing drifting epistemologies

Once I began writing my thesis, it was clear to me that it would be written in a somewhat informal, even 'casual' voice. I recall a conversation with one of my fellow Phd students where we lamented the fact that a lot of the academic writing we encountered was hard to engage with because of an air of performance. It seemed like it was working very hard to *sound* academic and to obscure its message in such a way that we were not quite sure what was the message, only that it *must* be intelligent. We promised each other not to write like that. In the introduction to my literature review, I mentioned my father. While this thesis is not written with him in mind specifically, I hope that it is written in such a way that he, and people like him without a university degree or any training in reading academic texts, are able to follow my arguments and even enjoy them.

I wanted the feeling of the thesis to be reflected in the writing style. Throughout my research I have tried to be present and lean into disappointment and failure, and to report it authentically. The writing has tried to reflect a certain intimacy, frankness, and honesty, and I have attempted to make the writing conversational and casual because I am trying to show that research (in the natural sciences as well as the humanities) is real work involving real people doing real things. I also want the thesis to be authentic to me and how I try to be in the world, to be inclusive and not to take myself too seriously, less I miss out on new

perspectives. I have chosen to use footnotes throughout the thesis for many of the same reasons. I want the reader to be able to focus on the central narrative in the main text, detecting the emotion of the writing, rather than having to feel a pressure to pursue every nuance of a larger disciplinary debate or historical context. These things must be available, which they are through the footnotes where they are present for the reader to consult without being taken out of the thesis itself.

This more conversational style has been broken up by more creative endeavours; poetry, photography, and small exercises in creative or experimental writing. Again, I wanted the thesis to reflect the process of writing; I tried things out, some of them worked, others did not, but it was a constant process of re-thinking how I could look at pollen, plants, and palynology in new ways. More than that, it was also an experiment in how to connect to a human audience in a multitude of ways, trying to explain something about which I am not an expert in a way that potentially makes sense to other non-experts and that, rather than necessarily being strictly 'objective', seeks to evoke a feeling or a point of view. I began the thesis with an intention of it being more experimental in its form. I expected at least part of it to be illustrated in a 'comic' style and would have liked to have spread the poetry and illustrations (be they photographic or hand drawn) more evenly throughout the thesis. It became apparent to me that this was too ambitious of a task for my skill level – another intrusion, as it were, of the amateur – and, upon reflection, it might have been more prudent for me to have paid closer attention to how I envisioned to put the thesis together while conducting my research. I do however think that my ambitions led me to try a lot of different things and I stuck with what worked, something that I would not have known had I not tried.

I hope it is apparent that the thesis has a more essay-like quality to it which has been,

above all, inspired by writing outside of textbooks and traditional academic journals. While texts like the collections of essays in 'The arts of living on a damaged planet' (Tsing et al., 2017) and the broad category of new nature writing has inspired me, I also specifically think of the podcast 'The Anthropocene Reviewed' by John Green. I listened to it when it first began in 2018 until its end in 2021; and, when I ask myself 'what I want to sound like', that is it. Green somehow manages to combine a material reality with a cultural past and personal intimacy that takes seriously the non-human while keeping the lens of the human eye at the centre of his stories. While I perhaps try to grapple with more of the natural world, there is a sense of shimmer in Green's work in how he binds together the temporalities of his own life with that of the objects and phenomena that he reviews. These elements are also found in my other sources of inspiration, which I trust is evident in the thesis.

A note on the US fieldwork

I spent two months in the American South West as part of my research, commencing with two weeks at the University of Arizona in Tucson, where I spoke to people from different departments and visited the institution's dendrochronology lab(oratory). I then was at Northern Arizona University in Flagstaff for a few days, getting acquainted with Professor Scott Anderson's pollen lab and meeting Dr. Ana Ejaque[20], before we spent a week in California (see table for further details). After we returned from California I spent another few weeks in Flagstaff primarily in the pollen lab and putting together my field diaries from the California trip. While reading about palynology in Scotland and trying to become familiar with the nitty-gritty of the processes and diagrams, I was very much under the impression that it was a science primarily (and perhaps even exclusively) concerned with climate and biodiversity. However, meeting Ana and Scott (see Table 3.1) opened my eyes

[20] Scott and Ana will be properly introduced later in this chapter.

to a whole new side of what palynology can concern itself with: namely, people. I was introduced to Scott through Professor Jamie Toney from my own home department, who had worked with him at Northern Arizona University. Scott was not sure there was much he could do for me initially, but remembered that his former student (Ana) was writing a proposal and put me in contact with her. She was happy for me to join the preliminary scouting fieldwork to gain a sense of what palynology can look like in the field and even kindly wrote me in to the proposal.

In particular, Ana's project[21] was focused on how the missionaries and the mission systems which were set up in Southern California interacted with the local native populations. While palynology most obviously pertains to climate history and the changes in natural environments and ecosystems, i was surprised to learn that it can play an important role in bio-acehology which uses organic matter (in this case pollen) to investigate a human past and questions about colonialism, exploitation and dispossession, which will be explored in more detail in chapter 6. Ana's project was not aiming to tell the whole story of these encounters, but in particular to investigate the changing agricultural practices involved, for which the pollen types present in and datable from local pollen records are crucial as they are very clear indictors to changes in farming practices. Thus, in combination with historical documents of landownership,[22] the pollen diagrams are able to teach us about how practices changed for both the mission systems and the indigenous peoples. This line of inquiry is similar to previous work that Ana had done in California, notably in Santa Barbara, where she worked with the introduction of cattle and the out-phasing of using controlled fires to manage land.[23] Speaking with Ana, she reflected on her own background

[21] Nothing has been published from this research as of May 2023.

[22] Whether everyone involved believed in the concept of ownership of land is a valid one.

[23] Anderson et al. (2015)

as someone who has moved around a lot in her home country of Spain, and her attraction to a Mediterranean climate was partly where her interest in the migrations of people in a broadly similar climate, the western seaboard of North America, might derive.

I want to note too that the fieldwork we ended up undertaking was not exactly what Ana had planned. This plan itself did not become finalised until the day before our departure from Flagstaff. The original plan was to begin in San Diego, as we did, and then to spend three days on Catalina Island. Ana wanted to investigate the island and to uncover how land practices had changed there, and first and foremost to assess whether or not there would be valuable pollen sites for continuing this investigation. An archeologist who had been working on the island did not think there would be any suitable sites, however, which created a sense of frustration in Ana and in Scott. I think there was a feeling that, while Ana also considers herself a form of archeologist (a paleoarcheologist who is using biological rather than strictly cultural objects to learn about the past), the people – here the professional archaeologist – who was 'gatekeeping' our access to the island was arguably not taking her seriously. Instead of letting her do the work, allowing her to determine for herself whether or not there were ties suitable to *her* area of expertise, that decision was made for her.

The locations that we were able to visit were hence pre-determined and, because of obvious time constraints, a little rushed, especially compared to what they would have been the case had we stayed on the island, as initially envisaged, for several days. This rejection led us to visit a host of other sites in Southern California. Ana did a brilliant job looking through maps and using her and Scott's knowledge of the area to find things we could do and places we could visit as a substitute for the days originally allocated to Catalina Island. There were nonetheless places where we were not able to gain access because we did not

have time to make the right contacts, obtain the right permits, and so, which skewed the research for Ana and Scott (but arguably proved very useful for me as an insight into a rather different kind of pollen 'drift').

How Covid-19 changed my trajectory

There is no getting around the fact that the Covid-19 pandemic has significantly changed the course of my research. After returning from my trip to the United States, I initially kept in touch with Ana and Scott, and even arranged to visit Ana in France to work on analysing the samples that she had gone back to collect in the fall of 2019. But, due to the onset of the Covid-19 pandemic I was unable to travel, and have not been in contact with either of them since. I have also not seen any research outputs related to the locations we visited.

I had imagined my time in France to focus on 'the lab', its practices and spaces, and the anticipation was that the ways in which the materiality of pollen was altered (or not) in these conditions would take up the majority of my chapter 6. Some of the underlying themes of context and isolation – to do with isolating pollen from its context, in both the site where it had lain for centuries and even in the materials assemblage of rock, soil and organic matter that is a pollen core – have still made it into the chapter, although they have changed their focus. Instead of an external lab-focused chapter, it has become much more introspective and has taken my own positionality into account, referencing back to some opening remarks about 'positionality'. I did not intend for the thesis to become so personal, nor did I plan for it to touch on how colonialism and settler science has affected my own understanding of my place in the research.

This has led to another change in the direction of the thesis; I was imagining it to be more plant and specifically pollen-centred, meaning that the very material of the pollen, its

shape, size, general properties would be more prominent in the thesis. However, I think being forced away from this trajectory has opened new doors to help me think deeper about what my role as a human, and more specifically an African-American woman, as interwoven with palynology and settler science more broadly, as well as what this means for how I approach searching for new knowledge and handling what I find. But there are surely gains to these shifts in emphasis, not least in that they have prompted a sharper ethical and political edge to my reflections, perhaps suggesting how the shimmer can become dulled or how I might become distracted from it. Or maybe it is just a question of a different or other shimmer, one demanding that the likes of plantations, slavery, and colonisation (by peoples and plants) become part of what shimmers beyond and around the pollen.

Fieldwork table

This table outlines the various 'field' activities undertaken throughout the thesis timeline. It also details where various events took place, who participated, which 'methods' were deployed and what they have contributed to the overall thesis. The thesis in general has a feeling of being in the 'middle of the mess', both because of its ever-changing experimentation, but also because its narrative has been organised thematically rather than chronologically. Constructing this table is an attempt to order the chronology and to give the reader the chance to go back and line things up while reading the empirical chapters.

'Fieldwork'	Where	When	Method	Who	What	Overall contribution to thesis
Dandelion Initiation Ceremony	Ærø, Denmark	Spring 2018	Ethnographic participant observation	Carole Guyett + other initiates	I partook in a Plant Initiation Ceremony held by Carole Guyet, a medical herbalist, shamanic practitioner. . The ceremony involved fasting and several rituals to connect to the 'sprit of the dandelion'.	This experience is detailed in chapter 4. While it was originally envisioned as an experiment in an alternative connecting with plant-matter and spirit, it drove me to be more curious about the natural sciences, gave me a greater respect for the integration of science and humanities working together, but also provoked a more critical stance for me on what appeared as an almost 'colonial' appropriation of nature as spiritual resource.
Book of shimmer	Allerød, Denmark	Summer 2018	Observation + being-with, creative book making.		Observing a small plot of land in my parents' backyard and turning the observations/ thoughts into a small, illustrated book.	This experiment in creative writing/research is found in chapter 4, and was a lesson and creative exercise in placing myself within the shimmer of pollen.
First look at a core	Glasgow, Scotland	Fall 2018	Observation	Prof. Jamie Toney, University of Glasgow Mike Zwick, University of Glasgow	I was able to look at section of a core sample taken from a Canadian lake and learn about how they are formed.	This observational work is referenced in chapter 4. It was my first look at a pollen core sample, which was very helpful in understanding what a core actually is, how it is obtained and how pollen is only one part of a bigger puzzle when it comes to telling the story of the past.
Witness Stones	Kent, Ohio, USA	Spring 2019	Observation		Saw stones and landscapes.	This observational work informs elements of my thinking in chapter 6. It entailed an unexpected detour which made me more attuned to the role that time plays in witnessing shimmer.
Visit University of Arizona	Tucson, Arizona, USA	Spring 2019	Learning	Prof. Chris Cokinos, University of Arizona Prof Victor Baker University of Arizona	Spent time in the English department to learn about creative science communications, and was introduced to various students working with science communications as well as the geology department.	This encounter informs the broader cast of my thinking throughout the thesis about arts-sciences engagements. This visit was illuminating in terms of opening me to creative science communication and meeting people who were working in many different fields. Speaking to Prof. Baker in the geology department gave me a particular idea of how geology and the humanities might work together.

'Fieldwork'	Where	When	Method	Who	What	Overall contribution to thesis
Visit New Mexico State University	Las Cruses, New Mexico, USA	Spring 2019	Learning	Ass prof. Eric Magrane, New Mexico State University	Spoke to member in the geography department about creative science communication	Similar to the above in its influence on the thesis, this conversation was almost a counter point to my conversation with Prof. Baker, one speaking as a scientist to the incorporation of the humanities, the other a humanities scholar on the importance of science. While neither conversation has made it directly it into the thesis, the day and ways of thinking about the art/humanities/science conversation have impacted how I think about and have written the thesis.
Introduction to Scott's Lab at Northern Arizona University + getting ready for fieldwork	Flagstaff, Arizona, USA	Spring 2019	Participant observation	Prof Scott Anderson, Northern Arizona University Dr. Ana Ejaque, Institut des Sciences de l'Evolution-Montpellier	Was introduced to Scott's lab, shown pollen samples and the chemical treatment process used to separate pollen from sediment.	This participant observation work is reported in chapter 5. Here I was able to see a paleo ecology lab first hand and chat to students doing work. I was also introduced to the process of chemical sediment removal to extract the pollen from soil samples. Speaking to Scott about his work and influences, and meeting Ana and being introduced to her project, opened my eyes to a more human focused use of palynology.
Taking part in Ana's fieldwork				Prof Scott Anderson, Northern Arizona University Dr. Ana Ejaque, Institut des Sciences de l'Evolution-Montpellier	My role in the fieldwork is best classified as participation observation. I went on the trip to observe how Ana searched for pollen and places which might hold pollen and its stories. I helped practically in the field using the auger, digging, filling and labelling bags, carrying equipment etc.	This participative fieldwork informs various passages in chapters 4 and 5. Being part of Ana's fieldwork in general put me into a whole new position of experiencing 'natural science' fieldwork beyond a class trip. Each place we visited will have their own sections of contribution.

'Fieldwork'	Where	When	Method	Who	What	Overall contribution to thesis
	San Diego, California, USA	May 2019	Participant observation	Prof Scott Anderson, Northern Arizona University Dr. Ana Ejaque, Institut des Sciences de l'Evolution-Montpellier	We scouted for sites which might be suitable to take samples from. One of the most promising, from which we took a sample, was at the Kendall-Frost March Reserve, protected by University of California San Diego. We also visited Gujame Regional Park, as well as the St. Luis Rey Mission and the MILITARY STRUCTURE, which historically have been important. Moreover, Ana used historical maps to reconstruct an idea of where it might be helpful to look for pollen grains.	Seeing how the material (the samples we took) were used together to inform the search was much more of an holistic approach than I had expected and was a good introduction to what was to come. Moreover, the use of historical and contemporary maps was a great example of how the natural sciences and humanities aid each other.
	Oceanside, California, USA	May 2019	Participant observation	Prof Scott Anderson, Northern Arizona University Dr. Ana Ejaque, Institut des Sciences de l'Evolution-Montpellier	We did not take any samples here, but looked at maps of Buena Vista and visited the site which we were not able actually to access. There was also an area of interest next to the town of Carlsbad, but it was a military base and therefore not accessible.	A good example of when things did not go to plan.
	Catalina Island, California, USA	May 2019	Participant observation	Prof Scott Anderson, Northern Arizona University Dr. Ana Ejaque, Institut des Sciences de l'Evolution-Montpellier	Drove across the island and took samples to identify possible sights of interest.	While this was supposed to be the place where we spent most of our time, but unfortunately were unable to do so. It gave me an insight into some of the friction that can occur during fieldwork and to the varieties of sites which can be used to sample from.

'Fieldwork'	Where	When	Method	Who	What	Overall contribution to thesis
	Ventura, California, USA	May 2019	Participant observation	Prof Scott Anderson, Northern Arizona University Dr. Ana Ejaque, Institut des Sciences de l'Evolution-Montpellier	Stop 1: Alessandro Lagoon. Collected samples. Stop 2: McGrath Lake. Here we were unable to get to the actual lake as it was surrounded by poison oak.	While Alessandro Lagoon was able to showcase a highly unusual place to look for 'nature' (at least to me, as it was sandwiched between a highway and residential area), it was one of the places Ana had found last minute. McGrath Lake might have been an interesting place, according to the maps, but was inaccessible as the lake was surrounded by poison oak.
	Tejon Ranch, California, USA	May 2019	Participant observation	Prof Scott Anderson, Northern Arizona University Dr. Ana Ejaque, Institut des Sciences de l'Evolution-Montpellier Rangers	We were taken around the ranch by a ranger. We took samples and spent time noticing the land.	Aforded an insight into what accesses may be granted to an academic researcher with a reputable institution to vouch for you. This experience opened me up to questions of access and how and why land is managed in the ways that it is.
	Wind Wolves Nature Preserve, California, USA	May 2019	Participant observation	Prof Scott Anderson, Dr. Ana Ejaq Prof Scott Anderson, Northern Arizona University Dr. Ana Ejaque, Institut des Sciences de l'Evolution-Montpellier ue	We were taken around the preserve by a ranger. We took samples and spent time noticing the land.	Afforded further insight into what accesses may be granted to an academic researcher with a reputable institution to vouch for you. This experience opened me up to questions of access and how and why land is managed in the ways that it is.

'Fieldwork'	Where	When	Method	Who	What	Overall contribution to thesis
Analysis of sediments at Scott's Lab	Flagstaff, Arizona, USA	May 2019	Observation and learning	Prof Scott Anderson, Northern Arizona University Dr. Ana Ejaque, Institut des Sciences de l'Evolution-Montpellier Marina, lab assistant, Northern Arizona University	Spent time in Scott's lab, seeing more of his storage and pollen samples/library. Moreover I spent time with his assistant Marina, who was doing analysis in preparation for their upcoming fieldwork in Norway.	Much as the initial visit to the lab, I spoke to those using it, mainly Marina, a former student of Scott's working on a project with him. She was mixed race (black and white) like me, and speaking to both her and Scott about the 'make-up' of paleo ecology was a prompt for me to start thinking about some of the things discussed in chapter 6 regarding race and representation in paleo-sciences and geology in particular.
Drive along the Colorado Plateau	Flagstaff, Arizona, USA, (Snow Bowl, Montezuma Well)	May 2019	Ethnography	Prof Scott Anderson, Northern Arizona University Dr. Ana Ejaque, Institut des Sciences de l'Evolution-Montpellier	Scott took me for a drive along the Colorado Plateau, from top to bottom, in order to illustrate some of the more big-picture ideas that palynology helps to understand. Travelling down the mountain suggested the way that climate changes over time shapes the vegetation which in turn is what palynologists use in order to assess past climates.	This drive was a very helpful illustration of how an ice-age works. Moreover as an educational tool, it really made it much easier to understand the principles I had read about and to visualise the changes the landscape had been through. It also prompted in a poetic response, included in chapter 4.
Write up and discovering patterns	Glasgow, Scotland + Copenhagen and Sorø, Denmark	2021-2023	Interpretative inquiry		The process of writing the thesis has made me look back at notes and photographs which showed me patterns I had not yet recognised (see chapter 5) and opened me up to new ways of understanding what the work I had already done meant and how it linked together.	Looking over the notes, diaries, literature reviews, photographs, poems etc. I have written since the beginning of the thesis has led to a better understanding of how I have processed learning about pollen and how my thinking has evolved. Noticing patterns has opened new possibilities for themes to emerge and make the thesis coherent.

Chapter 4: Enchanting the Mundane

This chapter wants to engage with both the mundane and the enchanted. I began with an urge to rush or even skip what I viewed as 'mundane' as I could not see the 'shimmer'[24] in the mundane, as it felt flat, lacking sparkle and glitter and perhaps more importantly the feeling of interconnectedness and intra-action that makes shimmer shine. I knew this chapter had to engage with some of the science I encountered, not necessarily the fieldwork, which the next chapter tackles, but here putting focus on my introduction to palynology and the people involved. I think that secretly I always wanted to be a scientist. Perhaps the vestige of Lutheran christianity that comes with being Danish makes me appreciate the things that come hard to me more than the ones that come easy, but I always looked at the natural sciences with a mixture of wonder and resentment. Wonder for the seeming magic of the concepts I could not grasp, and resentment that other people can. Stories on the other hand, came easy. This led me to become involved in the local Baptist church, where I found that I could easily make sense of the cosmos set out in (simplified) Sunday school lessons. Outside the church I read books every chance I got, and wrote my own stories. Even when I had nothing in my hands, stories were swimming in my head at every hour; narrative, metaphors, and tropes were a language I understood. As I grew older and began to understand some aspects of natural sciences I was still mystified by the mathematics that lies behind a lot of things, but I also began to understand that a lot of what made science 'science' was incredibly mundane. The quote below from the sci-fi novella 'To be Taught if Fortunate' (Chambers 2019) sums up my feelings rather succinctly[25]:

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[24] I have referenced 'shimmer' in chapter 2; it is the live and constantly in-flux relation between things (Bird Rose, 2017). In this context I do not mean that I could not see where shimmer might lie in the natural sciences - it is abundant - but that the mundaneness of the minutia does not shimmer to *me*.

[25] This assumption will be challenged in chapter 5, Searching and Noticing, where parts of 'doing science' were brought alive to me in ways I did not expect.

> Science, you see, is boring. I don't mean discovery, and I don't mean knowledge, I mean the activity of science, the procedure. That list above can only be written thanks to four years of ice cores, of photo captures, of wind logs, of melt measurements, of databases, of arguments, [...] of washing pipettes and stacking slides and decontaminating gloves and goggles exactly the same way every single time. The work is tedious. It is slow. It is not for everyone, even though the end results are.[26]

This speaks to all my concerns about 'doing' science. To me, counting and measuring are repetitive and tedious, and, because of the striving for uniformity and 'objectivity', the practice becomes mundane. It is part of the shimmer, though, since every time a specimen is passed under a light microscope it enters a new intra-action, which refracts its shimmer and entangles it in new assemblages. For me, it is hard to be-with that process, to see the shimmer in the lab. Perhaps a deeper knowledge of the lab -of the 'science' as it were- would make the shimmer clearer, more in focus for me, allowing the resonances of a shimmering assemblage to emerge. As I will touch on in later chapters, fieldwork was not mundane for me, and shimmered so vividly that it makes me question whether I should have gone into the natural sciences at the beginning of my academic career.

In a sense, then, geography has been a good place for me. I have been able to engage with the 'story' of natural science, to become enchanted by the 'discoveries and knowledge' while staying where I flourish, in the wider narrative of 'thought'[27] that surrounds the discovery and knowledge. This appreciation for, and ability to engage with the natural sciences has pollinated my worldview and how I understand the stories that are told about

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[26]The narrator is an engineer on an exploratory mission to explore a select number of planets and moons outside our solar system. (Chambers, 2019, Loc 731).

[27] According to Cresswell (2013) the discipline of geography is both profound and 'everyday'. It is the job of the geographer to read the layers of the everyday. To me it is being able to read the layers of the everyday that makes geography profound; and, while it might be read as 'common sense' (Cresswell, 2013) to see connections, the enchanting thing about geography is the attention to the shimmer which is what binds the everyday together.

the natural world as well as how I tell the stories about the world around me and my place in it. As I am enchanted by my discoveries I hope to be able to further enchant others.

This chapter is split into five sections. Firstly, I take a brief look at what is meant by the term 'enchantment' and how I wish it to be understood in the chapter. Second is a discussion of what I understand natural science to be and how geography, as discipline, has played a role in shaping its, at times, problematic relationship with place and matter through the idea of settler science and Alexander von Humboldt. Thirdly, I engage with an inherited herbarium, think about the legacy of the practice and how it might be capable of shedding an inherently colonial history. Fourthly, I invite the reader to join me in the 'armchair' where I look at both the history of palynology and my resistance to its mundanity before moving to how I try to enchant a palynology textbook. Lastly, I take the reader into the field, specifically to a plant initiation ceremony that left me questioning my relationship to science and what I thought of as a spiritual connection to nature, before concluding with my thoughts on how the bringing together of a traditional 'natural science' and a space for enchantment has led me to reconsider my own perspectives on my role as both a researcher, and a person in the world.

Enchantment

The language of magic has slipped into the everyday language with words like 'charmed,' 'spellbound' and 'enchanted'. I want to explore this last term a little deeper, as it is used in academic geographical literature and was a word that came up organically for me in my own encounters with pollen. Of particular relevance for me is a paper authored by Tara Woodyer and Hilary Geoghegan (2012) on the 'enchanting of geography', where they argue that the discipline – akin to wider social science and cultural studies – has long been in

thrall to 'disenchantment', a sense that the objective world is all we have and that the task of geographers (and others) is to engage with it critically, exposing its problems and limitations. They consider an alternative, wherein geographers are allowed a more enchanted, more enthusiastic embrace of the world and its contents, not assuming that the sciences, reducing everything to bits of physics and chemistry, remotely exhaust what can be said about the matter – the non-human matter – amongst which we humans live.

An important name to bring into this Jane Bennett. In her book The Enchantment of Modern Life (2001) she describes enchantment thus:

> As I'm using the term, enchantment entails a state of wonder, and one of the distinctions go this state is the temporary suspension of chronological time and bodily movement. To be enchanted, then, is to participate in a momentarily immobilising encounter; it is to be transfixed, spellbound. (Bennett, 2001, p. 5)

Being enchanted with one's work is then a suspension of the norm, something which is happening, a process in a moment (perhaps moments) which might occur at any time during life and in this case during research. Woodyer and Geoghan (2012) remind us that enchantment is not necessarily only about the pleasurable feelings of excitement, though, and that enchantment may also carry an 'uncanny' quality, maybe disturbing and disorientating, which nevertheless captures and stills us in the moment. Enchantment in geography is then a way to bring the discipline to life, and, in their own words, it:

> … expand[s] the ways in which researchers might think and do differently, enabling broader political and ethical interventions in the world. For geographers, this hope comes in the form of 'enchantment' an open, ready-to-be-surprised 'disposition' before, in, with the world. (Woodyer and Geoghegan, 2012, page 169).

I believe that this is the 'way to go' not just for geographers, but for all research to be open to unforeseen possibilities, to embrace the unknown and engage with the things which at first glance look to be out of place. In my own attempts to connect with the 'magical' and to be enchanted, I have found a strange balance of looking to be enchanted *and* looking away from the enchantment only to be captured by it[28].

Within the study of enchantment, disenchantment still cannot be ignored. It can be argued that the disenchantment of the world began with the (Western) Age of Enlightenment, where rationalisation and intellectualisation became the new ideal and what would later be named a positivist approach to science became the dominating trend, causing the world's wonders and marvels to be so de-mystified by science that people have lost their imagination and spirituality (Woodyer and Geoghan, 2012). I do not agree with a thesis which states that science in and of itself is disenchanting. For me, it was precisely science which excited and enchanted me: it was knowing more about a thing and being close to it which brought out a magical wonder, not what dampened it. There is of course also some truth to the idea that enchantment will look slightly different for everyone (Bennet, 2022).

Herbariums: on gathering plants and knowledge

I use the term 'natural science' throughout my thesis to mean things like biology, geology, chemistry and physics, sciences which, while impacted by, and acknowledging human presence and influence, are not primarily focused with human constructs of society etc., as opposed to things like anthropology or sociology which are entirely focused on such matters. Geography interestingly positions itself as something in between; it deals with the interactions, the meetings, of human and environment, and in a sense tries to get at the

[28] A notable critique of enchantment notes the dangers of becoming too swept up in the positive associations with the word and a fear of becoming blind to the realities of the world. Moreover, there may be a danger of missing something as we 'suspend our disbeleif' in the enchantment (Harrison, 2015)

shimmers of connection. While this is partly what has drawn me to geography as a discipline, the less exciting truth is that historically, geography has also been a tool of empire and colonialism. The discipline is entangled with the ideas of exploration and establishing of settler-colonial enterprises which has led to (continued) dispossession of land as well as colonial and racist violence (Hunt, 2014; Daigle, 2016; White and Castleden, 2022). This has produced frameworks, systems and institutions which are are founded in a settler-colonial mentality which influences the way the mainstream approaches the world, including natural science and scientists (White and Castleden, 2022). A useful term here is settler science, which refers to the science of the settler in places like the Americas, Australia, India, much of Africa, basically anywhere that has been colonised by Europeans, and especially in places where the settler is still in power and has replaced the native population as the dominant people. The belief of settlers that their way of life is the *right* way of life has meant a tremendous amount of violence in order to impose their world views.

There is an aspect of spectacle, and with it enchantment, that can easily worm its way into 'settler science', at least for the western, settler audience. While climate change is a real and very pressing threat, to peoples who have experienced genocides it may be 'just' another apocalypse and because this one suddenly threatens the way of life for the settler, it erases or at the very least 'forgets' the ones that have gone before it (Koch 2021). Luckily the settler-colonial narrative has an answer to the apocalypse: The lone white male scientist. This figure, who has previously been cast as the explorer comes in many shapes and sizes, but their genius has always, and will always find a solution to a problem, be it looking for resources in the 'new world', how to live in the desert (Koch, 2021), or even how to colonise Mars. One of the men who has been praised for his exploration, and is cast as someone ahead of his time is Alexander von Humboldt. I want to focus a part of the

chapter on him as an example of this lone-white-male-scientist/explorer who has been credited with being 'more' than just that. After a brief look at him and his legacy, I will look at one of the common plant-collector tools, the herbarium, in order to see if i can find any merit in the colonial practice of plant collection, and whether there is scope for it to shred some of the colonial connotations in order to create room for shimmer and connection between the human and more-than-human.

As I have laid out above, building empire, expanding geographical knowledge and collecting plants are deeply entangled both in practice and time. While learning about this history, there are certain names which have popped up again and again. Alexander von Humboldt[29] is one of those names that has caught my eye over and over. His illustrations of mountains have proven to still be relevant and accurate, and his ideas on multi-species approaches to ecosystems are still relevant 250 years after his birth (Acle-Kreysing and Fuentes, 2021). I have a large-scale graphic novel about von Humboldt and his explorations in my bookshelf at home, with its colourful illustrations and prints from his original notes spilling off the pages in their abundance: it is meant for children, but I think will excite most of readers for its aesthetic value if not the story.[30] However, the collector of plants in this book, and in the real-life mission was Amie Bonpoland, the botanist who travelled with von Humboldt, just one representative of the long tradition of bringing back plants from expeditions. The two are portrayed as curious and adventurous explorers who

[29] Alexander von Humboldt is most famous for his five volume *Kosmos* published 1845-62 which detail his expeditions to the South American continent and highlights his holistic and indeed aesthetic approach to studying the world along with a wealth of new scientific and statistical knowledge of the colonies. He is an important figure in geography as he brings together both human end environmental aspects of place (Kellner 2023).

[30] The book *The Adventures of Alexander von Humboldt* (2018) is written by Andrea Wulf who has also written *The Invention of Nature: The Adventures of Alexander von Humboldt, the Lost Hero of Science* (Wulf, 2019), illustrated by Lillian Melcher.

treat the people they meet with respect and dignity,[31] but always with the plants as their main focus. Schweninger (2016) argues that:

[...] Humboldt's work is that of a Romantic scientist whose attitudes toward the land and its people are based on hard science as well as the scientist's unique ability to maintain a Romantic understanding of connections and interrelations of that land and those people (page 88).

This is a foreshadowing of that the rest of this chapter will try to engage with; namely that I have found science without 'romance' (or as I have labeled it, enchantment), will always be lacking an ability to grasp its own shimmers, and that the enchantment without the physicality/matter (in this case expressed through 'science') will lack a substance that *can* shimmer.

Humboldt's work, while not necessarily appreciated in his own time[32] is an example of someone who was able to integrate his own enchantment with the world with a practice of natural science, founded in careful research and observation. There has been a call to return to 'the field' and more direct encounters with nature (Dixon et al., 2013), which in many ways is what my thesis was at the beginning of this project, and as will be reflected later in this chapter. Collecting plants was an important part of Humboldt and Bonpoland's work though the expeditions are perhaps more known for there contributions to the fields of mining and climatology, I want to think about how this plant collection can be seen as a way for Humboldt and Bonpoland to create more direct nature encounters.

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[31]Humboldt's early writings indicate that he had a strong sense of what colonialism was doing in its colonies, i.e. stripping the land and people of their dignity, sovereignty, and attempting to reduce the land and people to resources that would enrich the colonisers and settlers, thereby reducing the colony to a resource itself. This is especially prominent in his writings about the Spanish colonisation of what is now known as Mexico (Wells 2005). Moreover, he was thought of as old-fashioned and naive and these early writings are not what he has become famous for, though he continued to keep the human-environmental relations in his work (Wells 2005). Humboldt was an abolitionist, and his writings indicate that he interacted with and appreciated the knowledge of the local populations he met on his travels. Moreover, he was a pioneer in the idea of a multi-species assemblage which also takes humans into account as an actor which changes the environment (Acle-Kreysing and Fuentes, 2021).

[32] Not only his views on colonialism caused a stir, but *Kosmos* (1845-62) was heavily criticised for its inclusions of art and philosophy, and deemed 'unscientific' because of its engagement with the humanities (Dixon et al. 2013).

One of the main ways to preserve plants on their long journeys around the South American continent and back to Europe was to create a herbarium. A herbarium is a collection of plants which are pressed dry and arranged on sheets of paper. This practice lost a lot of plant details, like colour and smell of plants, as well as their context, but most plants would die on long voyages, so this was still a good way to bring back plants in some way. It allowed botanists and other 'natural scientists' to study plants and create vast archives of the resources found in their colonies. I do not want to make it out that people like Humboldt and Bonpoland were necessarily the ones to collect the plants themselves. Local people would have been used as guides, and, not only would they have had a much better knowledge of the places Humboldt and Bonpoland visited, they would also have much more intimate relationships with the plants. They would known of uses and patterns of the plants collected, as part of what are now often termed 'indigenous knowledges[33]', which is invaluable knowledge that the explorers would have wanted in their plant-collecting forays.

The history of the herbarium is problematic at best, but I do not think the practice has to be. As I spent much of my 2018 summer in Kulhuse, Denmark, I tried to become more acquainted with the area. In this process I met with a family friend (Kirsten) who has been visiting the area since her childhood. I told her about my project and she kindly gifted me a herbarium she made for a school project in 1965. Kirsten grew up in Copenhagen, and the herbarium was intended to be a summer project for the children in her class to collect any

33 This term refers to the knowledge of the land of the people indigenous to it. It is however, a fraught concept, as it holds within it, tensions created by an 'us' vs. 'Them' binary which often is more of a narrative than an actuality. Based in a lived, and experience knowledge of place and practice, indigenous knowledges have often been deemed 'too empirical' and 'too situated' even when the knowledge itself maps on to and corresponds with that of western science (Briggs 2005). I find this notion that western science is objective, universal, and *not* situated to be a good example of how settler science promotes itself and has established dominance, I also think it oftentimes would be a good thing to situate the science, not just its practices, but also its practices *in situ*.

and all plants they came into contact with. Figure 4.1)shows Kirsten's herbarium. The plants have been glued onto the paper and annotated in the bottom right-hand corner.

Figure 4.1 Kirsten's Herbarium

The searching for, and collecting of, plants is such a deliberate act that it forces noticing (see chapter 5) and being present in your surroundings. Kirsten collected plants in her parent's summer house garden and the surroundings, which were familiar to her, but also in more unknown locations where her family was on holiday, Oslo, Norway and Smaaland, Sweden. She was not visiting other Scandinavian countries to steal their botanical secrets; a 9-year old girl picking flowers on holiday is not the same as an organised imperial excursion. The practice of identifying and collecting plants on a small and intimate-individual scale, in a local setting, might help to build and strengthen a connection to place

and situation. It is the paying-attention to, the searching and noticing[34] which opens new ways of connecting with place[35].

Figure 4.2 My own budding herbarium

[34] These ideas and discussions will be the focus of the next chapter, Chapter 5, Searching and Noticing, so I will not spend too much time on them here.

[35] There are many contemporary practices of making herbariums and encouraging other to do so in order to encourage nature encounters like Herberia 3.0 (https://herbaria3.org/), to use as a personal reference for herbalists like Outdoor Apothecary (https://www.outdoorapothecary.com/herbarium/) or the Herb Society of America (Williams, 2005) or for personal enjoyment.

Kirsten had six empty herbarium sheets left with which I could start my own local herbarium. I had noticed a cornflower in her sheets which I had just pressed myself and was relieved that some things had not changed. There were a few other plants that I recognised from the area, some had already passed their flowering time, while others came up later in the summer. I tried finding the same plants as Kirsten had collected in the area which I have visited since I was a child. I feel that this area of Denmark is familiar and in the last few years I have been putting more effort into getting to know the area better. In Chapter 6, I explore a local oak which is the oldest tree in Denmark. I have spent time here as a child and as an adult and am slowly learning to forage in the woods, to know which plants to expect during the changing of seasons and how the first mosquitos of the summer are big and aggressive, the last ones small and never-ending. We have had a bumblebee-nest under our deck which allowed me to witness the fuzzy, bumbling pollinators carry pollen to their nest, living next to me, neither of us interfering with the other. It is almost hypnotic to watch the big bodies fly back and forth with purpose and all the time in the world.

While creating a herbarium has helped me as an individual to understand a small place, including the bees that fly and the pollen that drifts, the practice is also still in use in an academic context. Baker (2022) explains how she works to create a herbarium of plants used by (among others) the Fort McKay and Cree First Nations in Saskatchewan. Being mixed native and settler, she is navigating her place in both worlds, and by being-with and collecting plants she connects not only to the language and customs of her tribe, but also to the land which she walks. Her article asks whether enchantment can illicit care in those who are enchanted, and Baker uses the practice of creating a herbarium as a 'spell' to be enchanted by and to enchant others. She does, however, note that the native community with whom she interacts describe their relationship with the land in a language of

obligation, kinship, and relations, rather than through the language of enchantment, a pertinent warning perhaps. The overall sentiments here are ones I hear echoed in writings like Donna Haraway's 'Make kin not babies'[36] and other calls to see nature as more than a resource: as a part of our family, which I do find compelling and exciting.

The renewed interest in indigenous knowledge[37] is exciting, but I think it is really important that there is not a repeat of past mistakes and a recolonisation of this knowledge, and that the 'settler' impulse does not come to dominate (again). As I describe later in the chapter with regards to a plant ceremony, there is indeed a risk of creating new 'herbariums of knowledge', picking and choosing what fits into current academic trends and removing the knowledge and its practices from their situated contexts. The gathering of resources – be they material or intellectual – to serve a 'metropolis' is nothing new, but, where settler science (as described above) concerns itself with the ways in which the settler has steered the discourse and practice of science (Sylvester et. al., 2019), I am talking about the dis-assemblage of systems that will never be properly whole again when reassembled, especially when they are reassembled in a new context with new parts added. This is not to say that good things cannot come from these new assemblages, but it is important to keep the fact that it is a reassembly in the foreground and to take seriously what that means for an idea or practice.

Places like Kew Gardens hold large herbariums to this day, which are important archives

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[36]This phrase comes from Donna Haraway's *Staying with the Trouble, Making Kin in the Chthulucene* (Haraway, 2016). It refers to a call to forge connections with kin (those we as humans live with), wether that be other humans or 'critters'. By expanding our understanding of who is part of 'our' family, our multiple 'oddkin', 'we' will be better equipped to care for and engage with the multitude of lives on the planet. This will be explored further in chapter 6.

[37]As noted above, there has been great violence associated with the suppression of indigenous knowledge in favour of a settler-colonial logic which still is pervasive today. There has however, been a turn which wishes to take indigenous knowledge and science seriously in geography (Herman 2008)

for learning about the plants and their histories.[38] The herbarium is almost bound to contain at least some pollen, depending on which stage of the plant's life it is picked from. This pollen will have dried in the pages of the herbarium, mine and von Humboldt's, and while it is not preserved in the same way as that in the pollen cores discussed later, it is preserved nonetheless. Thus the pollen is kept on record almost by accident, at the very least as a secondary archive.[39] These herbariums are assemblages, not only of plants and pollen, but also of how the methods of gathering and productions of the collections have changed.

The Armchair

I have called this portion of the chapter 'The Armchair' as it focuses on the work I did inside (or at least stationary). I lay out the work whereby I immersed myself in the history of palynology as a science and as a community. I also engage with some of the 'primary' texts and more recent journals and articles which have helped shape my understanding of the subject, whilst grappling with the lines between the mundane and the enchantment of those assemblages.

Part I: Setting the scene

While many aspects of this project were unfamiliar to me, diving into palynology was perhaps the most daunting (and see also my discussion in chapter 2, Cut III). Having no prior experience with palynology or geology, I was excited, albeit a bit apprehensive to dig into the subject. The biggest hesitation was about the fear of the mundane. By mundane, I

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38 https://www.kew.org/science/collections-and-resources/collections/herbarium 18/08/2022. We still see Geographers working with Kew, notably Professor Felix Driver of Royal Holloway, University of London. https://www.kew.org/science/our-science/people/felix-driver accessed 11/05/2023

39 Researchers at places like Kew are working on drying and freezing pollen just like sperm to preserve it to pollinate and diversify plants suffering from disease and are struggling with the effects of climate change. https://www.kew.org/read-and-watch/pollen-not-to-be-sneezed-at

mean repetitiveness, and a feeling of what I was reading being so instructional and void of the embodied experiences. I knew that I would be able to understand what I was reading if I put the effort in, but I was also aware that there was a big chance I would find it really *boring*. I know that is completely subjective, and I really hoped that I would be able to find some sort of enchantment in the literature. However, I did not only want to start off reading textbooks or journal articles with my amateur status, so went in search of an alternative route into palynology. The route I found, was an attempt to understand the history of the science through its most prominent figure, Lennart von Post. As I progress in my writing, I have discovered that this is an exercise in repeating what I have just been criticising, namely singling out a specific (white) man as the mascot of a much more complex system. I think that I fell into this way of doing my work because that is how a lot of the history about palynology is written, Manten (1966, 1968) looks back on the history of the science, determining its beginning to be linked to von Post lecture in 1916, positioning him as more important than others in many respects. This is not to say nothing has been written about anyone else, but to highlight that I have fallen into the trap of focusing on a single 'hero' in the same ways that I criticise in my section about the herbarium and Humboldt. From the 'armchair', then, I will focus on what I found in that trap and how I have worked to navigate it and what narratives have been built for me in my reading. I have also read textbooks and traditional 'scientific' literature which I will discuss in the following section. I wanted to have some ability to move in the field and to understand something about the matters of the history I was engaging in.

Part II: The amateur

I have already established that I wish I was more of a 'natural scientist' than I am. I have a romantic idea that if I were more scientifically minded I would have an easier time navigating the world. I do not actually think this is true, but I know that it would make it

easier to dive into the discipline of palynology if i were already trained in a more adjacent and easily transferable discipline. I have more specifically focused on paleopalynology, which concerns itself with pollen found primarily in the ground and is used for climate and vegetation reconstruction.[40]

An obvious place to start my search for a place in the discipline was, as noted in chapter 2, with the *Textbook of Pollen Analysis*[41] (Fægri & Iversen, 1950). The book was written in 1950 by Knut Fægri (Norway) and Johannes Iversen (Denmark) and points to a continued engagement from the Nordic countries where paleopalynology was originally conceived. It has been through four editions, the third and fourth published after the death of Johannes Iversen in 1971. My copy is the second edition, and it states its purpose as being the unification of palynological knowledge in a common language.[42] I was recommended the book both by Professors Jamie Toney and Scott Anderson, working in very different university contexts, which surprised me. They both mentioned that the book has all you really need to know to get started in the field, even though the last edition came out in 1985.

As someone with an 'amateur' - even 'pre-amateur' – status as a paleo-palynologist, I was not only trying to cultivate a relationship with the science but also an appreciation for it and its contents. As already noted in chapter 3, the word 'amateur' comes from the same root as 'amour' or love (Merrifield, 2017), and thus there must be some love, passion or at least appreciation for the subject. The discipline has deep roots in Scandinavia and, as a

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[40] I have given a more detailed explanation of what palynology is as a discipline in chapter 2.

[41] Færgi & Iversen (1950) Textbook of Pollen Analysis. Wylie & Sons, Chichester.

[42] Up until this point palynology was written about in local languages and was therefore only accessible to few people at a time which hindered the sharing of methodologies: see Marten (1968).

Scandinavian myself, this was a point of connection to latch on to.

While I do appreciate reading this textbook and getting to understand paleopalynology, I felt there was something missing for me to grasp, not only in terms of my missing aptitude for the subject matter, but also of how it 'really works'. Like all disciplines, there is a certain amount of jargon and pre-presumed knowledge which led to me having to stop constantly to look things up: terms like 'sporopollenin', meaning the chemical compound of which pollen shells (exine) are made – this material is extremely hard to break down in anaerobic environments, thus allowing for the preservation of pollen structures; or 'Pollen Rain': an event where large quantities of pollen are released at the same time, which can leave a permanent record in the geology of a place. Some of the words and processes I learned about are palynology-specific and relate to particular methods or instruments, but a lot of the things I had to learn were about soil, botany, geology, and biology. There were various visual aids that both helped and hindered my understandings as well. I will get into a more detailed description of what a pollen diagram is, and how I found it to work with them in the section about von Post, but will briefly mention them here as something which took a lot of my energy when reading.

At fist glance I thought the pollen diagram (figure 4.3) was straightforward if I looked carefully, but on further inspection I found it hard to follow. Moreover, it assumes a knowledge, or access to knowledge, of various tree-species pollination behaviours, in terms of timing, frequency and quantity, making the drawing up of a pollen diagram more complex and statistically minded than that with which I feel comfortable. This is of course how and why it is used, but the simplicity of its appearance is deceiving, which is perhaps why von Post was the first to use it and received so much credit for its invention. The

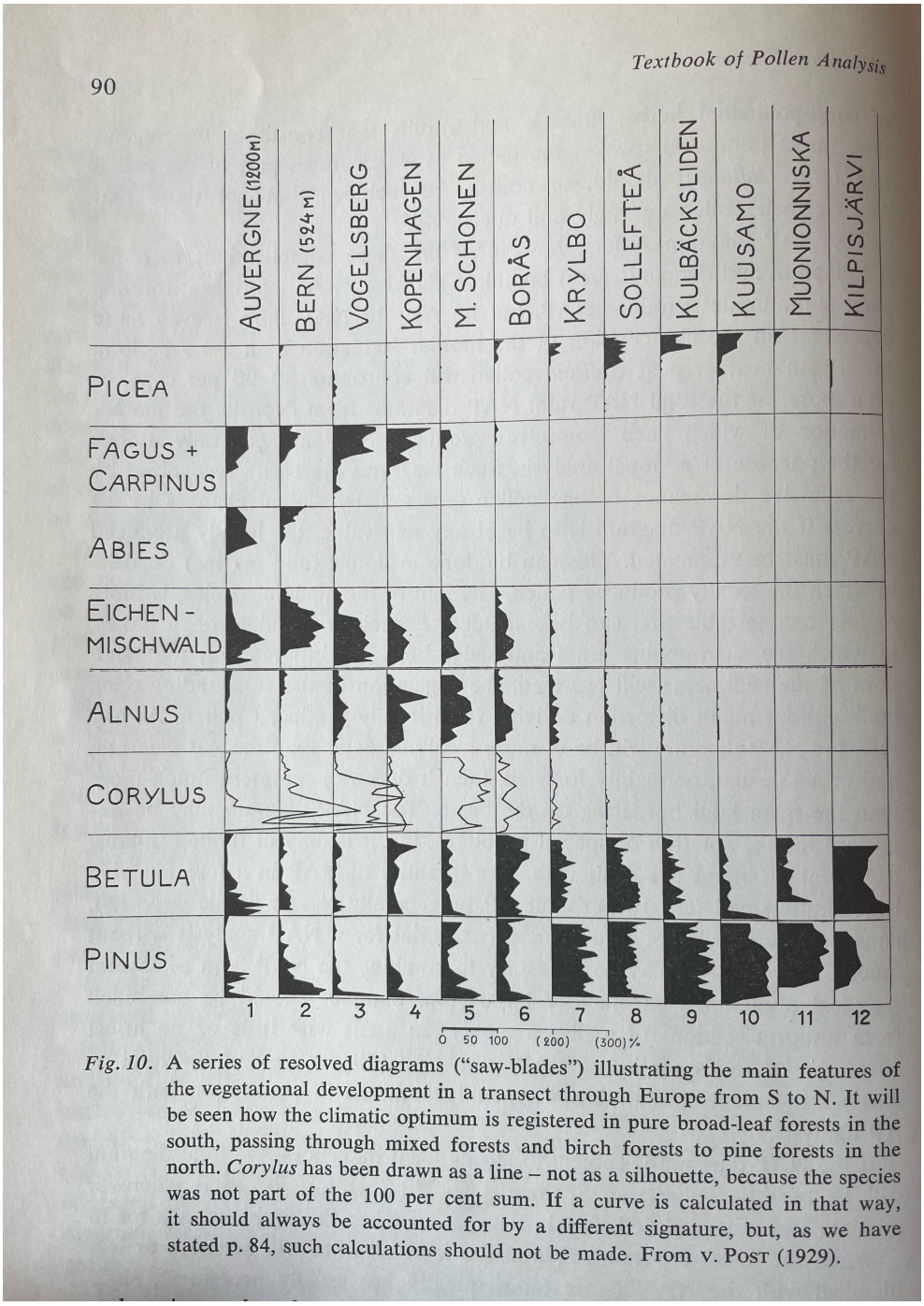

Fig. 10. A series of resolved diagrams ("saw-blades") illustrating the main features of the vegetational development in a transect through Europe from S to N. It will be seen how the climatic optimum is registered in pure broad-leaf forests in the south, passing through mixed forests and birch forests to pine forests in the north. *Corylus* has been drawn as a line – not as a silhouette, because the species was not part of the 100 per cent sum. If a curve is calculated in that way, it should always be accounted for by a different signature, but, as we have stated p. 84, such calculations should not be made. From v. Post (1929).

Figure 4.3 Example of pollen diagram from *Textbook of Pollen Analysis*
Fægri, K., and Iversen, J. (1964) Textbook of Pollen Analysis, Second Revised Edition, Blackwell Scientific Publications, Oxford

diagram is perhaps more hypnotic than enchanting to me in that way; I can stare at it for a long time and get lost in its intricacies, but that does not mean I am actually following what is happening. That said, I think with repeated use and a broader and deeper knowledge of both statistics and botany, I would quickly be able to engage with the diagrams with no

problem.[43]

Part III: Immaterial immersions

In the preface to the second edition of the *Textbook of Pollen Analysis*, Fægri and Iversen make a point to repeat themselves from the 1950s edition and write:

> No key, however ingenious, and no illustrations, however tastefully executed, can replace the personal knowledge of pollen forms acquired from working with actual preparations. Every pollen analysts should have access to a well-stocked 'pollen herbarium' for comparison of any problematic form that may occur in his [*sic*] preparations. If properly executed, keys and illustrations may serve as guides in the identification of a pollen grain, but all identifications should be verified by comparison with recent pollen material. To the experienced worker a key may substantially serve as an aid to the memory, to the beginner it may serve as an instruction in the very difficult art of observing pollen morphological features. (Fægri & Iversen, 1964, page 10)

The quote confirms that I am not the only one who thinks that practical experience makes it much easier to understand theory. Most of my practical experience came from my fieldwork in California, and the time I spent in Scott's pollen lab at Northern Arizona University, as explained in chapter 3 when laying out my methodology and research design. However, before I was able to travel from Scotland to the United States, I spent a few hours with Professor Jamie Toney and PhD student Mike Zwick from my own home department, inspecting a core full or organic material drilled from a field site (see also chapter 5), leading to the following reflections in my research diary.

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[43] It has been more than 100 years since von Post first shared his findings and pollen diagrams with the world, and, while he is often held up as the 'father of modern palynology', it is also noted that he was not alone, but guided by Gustaf Lagerheim, and that Gunnar Erdtman (among others) also played an important role in developing palynology in its early days (Gillard et al., 2018). While statistical pollen analysis was developed at the end of WWI, WWII also played an important role in the development of the discipline, not only in output, but also in the presentation of pollen science. Pre-WWII there was a steady increase in articles written in a variety of languages, but there is a clear break in publications in the 1940s, attributed to WWII. There is also a clear drop in German-language publications following the war, where English steadily becomes the dominant and common palynology language (Marten 1968).

After reading about pollen I knew I needed to experience some tangible real-life aspect of palynology. I contacted Professor Toney, who works with biomarkers at the University of Glasgow, and, together with PhD candidate Mike Zwick, she was able to show me a core from southern Saskatchewan Canada on which they were then working in 2013. As it was unwrapped, a sulphuric stench filled the room, revealing, I was told, a large amount of organic matter in the core. Jaime and Mike patiently let me look over the core and answered all my questions and corrected certain of my assumptions, pointing out how to detect – in the spatially separate colours and textures of the core – changing seasons, leaves and shell fragments which had not decomposed, as well as a volcanic event detectable by a layer of black ash. The pollen itself was invisible to the naked eye and University of Glasgow does not have a pollen lab where I could have a look at the pollen (I was able to look at actual pollen samples during my fieldwork at Northern Arizona University).

Seeing things laid out before me in 'real life', off the page, brought palynology and its subject-matter much more starkly to life. Having the material/matter in front of me opened up a whole new understanding of and excitement for the field and the data, as it became more viscerally present and the idea of a core much more tangible. Just as I gained a more intimate understanding of flower anatomy with my microscope,[44] having the actual core in front of me, with the added bonus of being there with someone who actually was able to 'read' it, brought together the different dimensions of which I had already learned through the books and papers. Here, then, perhaps lay a sort of 'enchantment', not wild enchantment maybe, but, for me at least, something that felt more attuned to the pollen

44 I bought a small digital microscope to look at pollen in a private setting. This did not give me the same level of detail as an electronic microscope would have, but in my amateurish attempts to know and to see pollen, this was what I felt was approachable..

itself, even as it was largely encased and invisible in the mud and remains of the core.

Perhaps the most important thing I learned, though, was that even the people I thought were experts did not know everything and did not do everything themselves. This became evident later as well, but Jaime and Mike were very clear about not doing everything themselves. The specialisation which occurs in climate science means that one person might be an expert in biomarkers looking at specific lipids, while someone else works on the diatoms or volcanic ash. It is the collaboration of these various components which bring together the actual meaning making of the core and the story it holds[45]. This was encouraging to hear as it demystified the myth of what I imagined held me back from being a natural scientist, the ability to understand everything, and the concept of the sole, lone researcher who is able to complete all tasks on their own. Moreover, it lifted someone the fear of the work. The quote from *To be Taught if Fortunate* (Chambers, 2019) which I used when introducing this chapter also speaks to the mundanity of what palynology can be, a repeated set of tasks which by the time the samples reach the lab, are not complicated or difficult. The cleaning of the pollen was exciting for me the first time I saw it done; indeed, I might go so far as to say it was somewhat 'enchanting'. The novelty for me and my curiosity about a 'scientific/chemical' process conjured images of the processes in my mind and led to me writing this poem:

Chemical Pollen Extraction

OH - Potassium Hydroxide - Organic Acids
The first to break their bonds
Relax their shoulders and sigh,
Relieved of an era's tension

45 Two papers have been published on this specific project: Plancq et al. 2017 and Plancq et al. 2019

HCL - Hydrochloric Acid - Carbonates
The bones of the dead
Fizz with excitement and release
A lake's lingering ghosts

HF - Hydrofluoric Acid - Silicates
This one is nasty
It eats only gems and painless,
toxic, holes in your skin

The Acetolysis Cocktail- Organic Matter
One last toast will wash
The past and its layers of humus
and years away

This perhaps gives me away; I have a wish to understand the world through the natural sciences, but, when presented with the opportunity to engage with the chemistry necessary to clean pollen and learn about the compounds and molecular structures that make sporopollenin immune to the chemical processes, instead I wrote a poem. It is a poem about the imagined deaths of the materials that the pollen has been held in for centuries, letting myself be enchanted by the imagined ghosts of the sediments. I do not think that palynology is entirely void of this imagination – in fact, a good portion of imagination is necessary in order to engage with the immaterial aspects of the science – but it is not a response, a glimpse of the magical perhaps, that would be allowed anywhere near the textbooks or (normally at least) the lab. Moreover, the poem worked for me as a way to translate the names of the chemicals into a language which was easier for me to interpret and understand.

A big part of paleo-palynology is landscape reconstruction. Both Anna and Scott would

have photos of their research sites next to them as they were writing up their work, to remind them of what the sites were like today, but, experienced as they are, these photos also served as indications of what the sites might have looked like in the past. Knowing about a place, its morphology, geology, palynology and human history, is a key to imagining what that place has looked like in the past, which is itself key in reconstructing its past flora-profile. In some ways this is one of the most enchanting aspects of the science to me, at least the most enchanting thing which is not found in the open air, in stunning scenery. It calls for a sensitivity to the landscape and the pollen which is cultivated over a long period of engagement with the material and practical side of things. The reading of these landscapes in the present day is combined with the reading of the pollen which leaves clues about the landscapes of the past; thus, through knowing the mundane practices of the material, the enchantments of the immaterial become known.

A way to think about these intra-actions between the researcher and the pollen in the lab is through way of 'assemblages'[46], gatherings together of diverse human actors, material objects, immaterial ideas and learned practices. An anthro-techno-pollen assemblage is created in palynological work, notably because the human needs technology (varying from an auger, to chemicals and microscopes) to access, observe and in various ways measure the grains (their abundance, their sizes and shapes). In the following chapter I discuss more of how assemblages play out in the field, so here I want to stay with how the lab works. The assemblage allows my eyes to perceive the pollen, and thus the pollen's story: its place in time is thereby made available for my mind to make the material immaterial. The photos Ana and Scott keep with them while they do their lab work further speak to

46 Thinking through groupings of things as assemblages opens up the possibility for a redistribution of agency within the assemblage, as well as an experimental realism orientated to processes of composition (Anderson et al. 2012). Moreover, assemblage thinking allows us to see space and place as precarious wholes, made up of the relations between the humans and non-humans that inhabit them (Müller 2015).

these links between the material and the immaterial-imagined spaces. They are able to read the language spoken by the pollen remnants, and through that give qualified, contextualised guesses as to how the landscapes and plant assemblages on their desks have changed throughout time.

Part IV: The spirit of von Post

In my section about the herbarium I tried to trouble the idea of the single hero figure which has had a tendency to dominate some science narratives. I wanted to avoid this narrative, but looking back at my notes and my reading lists, one person stands out. Lennart von Post, Swedish palynologist, is hailed as the 'father' of modern palynology and has been unavoidable during my research. In this section I want to spend some time with the persona that has been built around him and his legacy, and highlight some of the other important people around von Post.

I found that an accessible way into palynology, and the people behind it, to be the recent centennial (1916-2016) for the talk of Lennart von Post which introduced the pollen diagram and popularised pollen analysis. Lennart von Post was born in Sweden in 1884. He originally wanted to study zoology but was led into geology by Rutger Sernander, plant geographer and University of Uppsala, and von Post is indeed famous for introducing the pollen diagram. He developed the diagram by building on the work of other palynologists linked to his own corings of peat bogs in southern Sweden. His work was presented at the Sixteenth Scandinavian Meeting of Natural Scientists in Kristiania (now Oslo) in 1916[47]. The past few years have seen a number of publications dedicated to the advance of the field and the March 2018 issue in *Vegetation History and Archeobotany* is dedicated to the

[47] (De Klerk, 2018; Gaillard et al., 2018; Edwards et al., 2017; Marten, 1966)

topic. These publications are more concerned with the history of the discipline and its development than with the nitty-grittiness of the methods, and use the people in the discipline (especially von Post) to tell a story about the importance of palynology.

Pim de Klerk (2018), for instance, helps us to think about the history before von Post and writes through the awareness and study of pollen prior to 1916. People long knew that plants produced a powder-like substance that played a role in fertilisation, but it was not until the 17th century with the invention of the microscope that anyone was able to have a good look at pollen grains. Marcello Malpighi and Nehemiah Grew were contemporaries who worked on and corresponded about pollen and understood its place in the reproductive cycle (De Klerk, 2018; Marten, 1966). Between these first observations and von Post, there was lots of work done on pollen morphology which concerned the physical appearance of the grains and their behaviours. Their appearance tells us about the difference in airborne versus pollinator-borne pollens, their sizes, structures and interactions with their environments (De Klerk, 2018), and a growing understanding of the relationship between pollen and allergies during the 1800s (Ramachandran and Aronson, 2011; Mitman, 2003).

The invention of a new way to display palynological information was of course a significant new technique, but also important to appreciate are the changes that it brought about in palynology as a discipline. Pollen studies had up until this point been considered descriptive, but the invention of the analysis and its statistical underpinnings pushed palynology into a realm of quantitative science which was more easily communicated to a wider science community, acquiring considerable value for its capacity for providing (quantified) ages and hence potentially dating of geo-materials from past landscapes. This

is why von Post's early work was so vital: it created an identity and purpose for the discipline which, in the scientific climate of the early-20th century, made it more widely recognised.

Reading about von Post makes it clear that he was quite a character. De Klerk (2018) indicates that von Post might have been a rather arrogant man. He had a certain 'aristocratic arrogance', according to De Klerk's reading of Fægri and Iversen's introduction to the English translation of his 1918 paper. The latter authors suggest that there was a presumption that his ideas were so good that the rest of the world would learn about them whether or not they were written in Swedish. However, they still dedicated the first edition of their book *Textbook of Pollen Analysis* (Fægri & Iversen, 1950) to him, an acknowledgement of how important he was in the community. And von Post was of course right, since he and his work are world-famous even though he did not write in English or Russian, which became the leading palynology languages in the period 1916-1956 (Marten, 1968). I bring these things up because it helps me as someone, more used to the social science or humanities ways of investigating, to remember that the science – and the numbers – that I may find daunting and intimidating are indeed created by real people who are as delightfully complicated as myself. The amateur in me is heartened to discern the humanity, potentially error-prone but also potentially open to some form of enchantment, of even the most austere of scientists.

Yet von Post is of course not alone in making palynology, and I only highlight him as a moment in history which aided my search and confidence in the subject. Another benefit of looking at a singular person is the net of people they are associated with, learn from, and influence. It also places the discipline in a specific place and context, in this case

Scandinavia. To be sure, von Post's Swedishness is a vital part of his search for pollen, just as the timing of this starting-point for seriously scientific pollen study was important in the delay of the popularity of the discipline. As WWI was underway, neutral Sweden was looking for a local and conflict-free fuel source and turned its attention to the country's southern peat bogs where von Post, reflecting this new attention to the south, did his first pollen analysis (Nordlund, 2018; Marten, 1966). His 'motto' when it came to palynology became 'think horizontally, act vertically', referring to the fact that palynology is broadly landscape vegetation reconstruction of a region (the horizontal) through the extraction of sediment cores (the vertical). This motto is very indicative of the science: think about the landscape by digging into its history.

My own thinking about palynology is shaped by the people I read about, the people who are presented to me as important. The von Post centennial has shaped my understanding of what the discipline is, when searching for a way into palynology. These historical accounts serve several purposes in my search for an understanding and sympathy for pollen analysis. They made my foray into the topic less daunting and more approachable. Being reminded that science and seemingly complicated diagrams are made by people who have their own intricacies and personal quirks is comforting, and gave me the space to imagine myself finding some of the answers to the many questions posed by my non-palynology trained brain.

However, just as my reading shapes my understanding, the researchers and people with whom I have come into contact during my project, like Scott, also tell me what and who is important to focus on when coming from 'the outside'. The people and places to which I am led do not necessarily tell me very much about the practices of palynology, nor do they

do much in way of instruction in becoming a palynologist, but they do give me a sense of how palynology works behind the scenes. It is not a science done by robots, but by people with relationships, and their stories bring the science alive and into a context of real people living real lives. Palynology is done by people who suffer heartbreaks and fall out with their bosses, people who are passionate enough about their work to write letters about it and talk with 'stars in their eyes'; and encountering these people and reading their stories helped me to understand that palynology does not have to be this scary big black box of 'science' done by people who are smarter than me.

Part V: Disenchantment

My hypothesis that palynologists are (at least somewhat) enchanted by their work was certainly confirmed by the time I spent with Ana and Scott; they were enthused and clearly held a great deal of not only pride, but love for their work; and, while I am not sure they would insert any account of spirituality into describing what they do, I think the reverence and respect for not only their practice but for the 'higher goals' present within it suggest a form of sustained enchantment. Without that, I think it would be hard to uphold such a level of enthusiasm for anything. For myself, the enchantment happens in the meeting of the science and some intangible sensation that I do not understand fully. My status as an amateur betrays me, but I do appreciate both – the practice and goals – and am able to be even more enchanted, perhaps precisely because I realise that, even if I understand *all* of 'the rules', there are still questions to be answered; and that, above all of this, there is the problematic of shimmer.

The enchantment is perhaps the awareness of shimmer. Shimmer is, as I have explored earlier in the thesis, the connection of everything. It is the awareness of all the threads which tie the world together, and it is also the awe of this knowledge. If to be enchanted is

to be surprised, spellbound and sensing “the temporary suspension of chronological time and bodily movement” (Bennett, 2001, p.5), then shimmer is enchantment to me. As I note in my Little Book of Shimmer[48] (without using the word enchantment), the dizzying excitement came from this realisation and acknowledgement of the shimmer present around me. This enchantment can be found in the small things, the single flower and how it has adapted across time to bloom shortly and live symbiotically with its pollinators, or an oak tree which is over 1000 years old and has witnessed the making of a nation and each year deposits its pollen in the surrounding bogs. I am enchanted by these things the more I know about them, and the more time I take to appreciate them (informing, of course, the slowness and occasional wilful amateurishness of my methods, as covered in chapter 3). Being enchanted, especially when doing field and experimental research, has been crucial to me, but moreover it has taught me patience and perseverance as themselves mundane tools of enchantment. The sense of wonder that I was able to enact because of my amateur status has perhaps been helpful in terms of reaching a state of enchantment. Exactly because I came to the research as an amateur I was able to be surprised and enchanted by what I learned, my reactions un-biased from years of training.

While my childhood self might be disappointed in my lack of magical abilities and engagements, she would hopefully be proud that I have stuck to the materiality of things; that I still am able to be enchanted and to approach things with curiosity and openness. Perhaps being in the state of enchantment is to be an active participant in the shimmer of the world. Just as shimmer is something which is in constant process, coming in and out of view, so enchantment is not always visible, something I find myself consciously experiencing; but, when it does come into glittering focus, it opens up the world in ways that I could never previously have known and asks questions that I never before knew to

[48] See chapter 5.

ask, allowing me to be-with the shimmer across time and space beyond my here and now.

The field

I have called this portion of the chapter 'The field' as it focuses on 'the done', on what gets done in my project, outside of my own sphere and partially in a literal field as material space (and sometimes even more literally an actual field on a farm). Thinking of the field as a physical place where the body encounters other bodies, and as a particular and contextual moment,[49] I was determined to explore outside of books, and thereby ended up in a place that both challenged my assumptions about myself and also allowed me to experience practice rather than only rely on theory. In this section of the chapter, then, I deal with the Plant Initiation Ceremony for the Dandelion in which I participated, in 2018, and reflect on some of the ways in which the *doing* here was an embodied act which left me unsettled.

Part I: Setting the scene

I set out on this part of my fieldwork blindly, without an exact expectation of what I would find, but with a hope that it would provide an alternative to the books and diagrams that I had encountered thus far. Partially, I wanted this experience to prove that I was right to be sceptical of a purely positivist, objective, driven engagement with both pollen and the plants that produce (and in turn are born from) pollen. In this portion of the chapter I want to do two things: firstly, I want to give a detailed descriptive account of my experience at the Dandelion Retreat; and secondly, I want to explore the disenchantment that the

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49 While 'the field' can be thought of as a moment with distinct spatial and temporal bounds (Massey, 2003), it also holds a 'messy' interconnectedness (Alaimo, 2010) which I might describe as a shimmer. While this bounded 'moment' of my experience indeed takes place in a particular time and a particular place, I am unable to engage with all the shimmer which exists within it because I myself am finite. There is also a discussion to be had about the concept of 'field' being something which is itself an aspect of settler science, as discussed earlier in this chapter. While calling this part of my research 'the field', I continue in that tradition to some extent, but, as with my discussions on the practice of the herbarium, I hope that the field can be reframed to more of what Massey and Alaimo suggest: namely, as a space for encounter for those of us who cannot be everywhere at once.

experience held for me.[50] While reporting this encounter does not deal directly with pollen, I feel that the experience has been vital for my understanding of how to engage with science and the notion of shimmer as something which does enchant me and deepens my appreciation and engagement with the more-than-human, and therefore to pollen, much *more* so than did my engagement with the ostensibly enchanted, supposed-to-be magical, qualities of the Dandelion Retreat. In a way, therefore, what I relate here is *negative*: a curious case of where enchantment was absent even when, *a priori*, I anticipated it being present, in part as a means to reflect back on those situations where I had not expected to be enchanted, such as in the lab, when in small ways I actually was. Moreover, to anticipate, I found myself quite critical of a 'colonising' move, almost a form of 'settler science' logic, that permeated how the Dandelion Retreat treated of plants and pollen.

My father suggested I join him in a Plant Initiation Ceremony in the spring of 2018, on the Danish island Ærø[51]. The retreat took place at a Bed & Breakfast/yoga studio in Tværby on the south-west side of the island, run by a German yoga instructor. My father and I took the train and ferry to the island where we caught a ride with one of the other initiates and arrived to meet everyone else. The ceremony was held by Carole Guyett, an Irish medical herbalist, shamanic practitioner, and Celtic priestess trained by a traditional wise woman in the Western mysteries.[52] On the face of it, then, it should have been a space full of enchantment, rich with magic.

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[50] As this reference to 'disenchantment' alludes, I did not have a positive experience at the Dandelion Retreat. This is not to say that any individuals who attended were there with ill-intent, or behaved in inappropriate ways that I am aware of, but rather a result of me not being fully prepared for the ceremony and its cosmos, and also the real-time synthesising of my own thoughts and reflections as they pertain to the topics. This experience has helped me think through my relationship with the more-than-human, things surrounding 'magic' and my own place in it all.

[51] The island is located in the South Funen Archipelago and is sparsely inhabited.

[52] This description comes from her author's page at the publisher Simon & Schuster: https://www.simonandschuster.co.uk/authors/Carole-Guyett/483742777 accessed 04/12/22.

In her book *Sacred Plant Initiations, Communicating with Plants for Healing and Higher Consciousness* (Guyett, 2015), Guyett explains that there are initiations for plants throughout the year, each associated with a different event (see below). These plants are based on the Celtic traditions of Guyett's home,[53] and there are different plants associated with different parts of the year and different celestial events. The plants and their calendar are as follow:

- *Primrose* - Bealtine, beginning of summer: Initiation and new beginnings
- *Dog rose* - Summer Solstice: Opening the heart
- *Oak* - Lughnasadh, beginning of harvest: Strength and guardianship
- *Blackthorn* - Autumn equinox: Embracing the shadow
- *Elder* - Samhain, beginning of winter: Ancestral healing
- *St. John's Wort* - Winter Solstice: Bearing the light
- *Angelica* - Imbolc, beginning of spring: Walking with angels
- *Dandelion* - Spring equinox: Connecting heaven and earth

Each plant ceremony is practised at the relevant time of year. We participated in the Dandelion ceremony just as the plants began to show themselves in the ground. Guyett uses the word 'diet' about the ceremony, and so we fasted and only consumed a dandelion 'elixir' which was made from various parts of the dandelion. Guyett notes that this practice of consuming plants in order to gain their benefits is quite common throughout the world, although today is mostly associated with hallucinogenic plants to induce a state of mind which opens up the person to a new understanding of themselves There is also a thought that by consuming the dandelion, we 'become' the dandelion: it is what will fuel and power us for the ceremony and we are thus imbued with its energy (Guyett, 2015).[54] With an introduction to the ceremony's logics and our surroundings in place, we were ready to

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53 While I can see there are bases for the practices since Carole Gyuett is the one running the ceremony, I still wonder what is the purpose of bringing Celtic traditions to Denmark, and whether there would be more sense in having someone local lead practise in their own locale.

54 Obviously we consume plants as food and therefore benefit from them, but here she means a spiritual connection rather than a physiological one. (Guyett 2015)

begin.

Part II: The devil

Before ascending to the yoga studio where we would spend the weekend, we were going to cleanse our auras with sage[55]. The herb was lit and placed in a small clay bowl, the smoke spilling from it, which was then wafted over us individually with the feather of either an eagle or a condor. When it came to my turn, the bowl broke with a clean fracture straight down the middle. The woman performing the cleansing looked alarmed: this had never happened to her before, and my attempts at joking about it were met with stern silence. Another bowl was found and, my aura satisfactorily cleansed, we ascended to a yoga space above the house and gathered around the altar.

It was a high-ceilinged room with plenty of natural light streaming in through slanted windows. Carol sat on a stool with her back against the wall. The rest of us were plopped around in a wide circle on blankets and meditation pillows. In the middle of the circle sat the altar, a low IKEA coffee table (you know the one, LACK, square and cheap). In the cardinal directions, bowls were placed to represent each element: East = Air, represented by a feather; South = Fire, represented by a lit candle; West = Water, represented by water; and North = Earth, represented by sand. In the middle was a vase of dandelions and crystals, and around the altar a sheet was placed where people could bring their own 'holy' objects to be blessed. These included several Native American tobacco pipes, a rose-quartz

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55 Sage has a long medicinal history throughout the world and is known for its healing properties and as a digestive aid. Native American traditions have often used sage as a cleansing tool. The popularity of this ritual has meant that white sage which is often used, is in danger of becoming endangered (Outlaw, 2016): see The Herbal Academy https://theherbalacademy.com/sage-throughout-the-ages/ accessed 10/01/23. While the plant sage is not something which has been appropriated in the West, but rather been part of a culinary and medical tradition at least since the middle ages (Outlaw, 2016), the use of the smoke cleanse in this ceremony was clearly appropriated from a Native American tradition, underlined by the use of feathers which had indeed come from North America. While the idea of cleansing oneself before entering a ritual made perfect sense to me, I wonder if there might be a way to do so which was more in tune with the traditions of the land where we were seeking to perform this ritual.

Buddha necklace[56] the size of a child's fist, a deck of tarot cards and a full-sized sword. I was unaware of this expectation, and so did not bring anything to the sheet. The room was furthermore decorated with pictures of dandelions in bloom, and vases with the flowers and leaves were placed on the altar and small tables and stools around the room. I noted both the absence of live plants and that we were above ground while trying to commune with a rooted spirit, and it struck me as odd to be so far removed from the plant itself and its habitat when we were going to ask it to come to us. I find it further ironic that the theme for the dandelion and the spring equinox is connecting heaven and earth. While the symbolism of a plant which has deep roots into the earth, and simultaneously stretches far into the sky with a sun-like crown is very obvious and really does work, removing ourselves from the earth, and the grounding which is half of the 'connecting', struck me as curious.

A deck of Tarot cards was passed around the circle, with each of us drawing a card. I drew The Devil. I was not familiar with this card, as I do not practice tarot but was told it symbolised a sceptic.[57] Throughout the weekend I felt that this was how I was viewed, an outsider, troubling and maybe troubled, and furthermore young and inexperienced. I had explained that my participation was part of my academic research, and I think this made some of the other participants a bit overbearing. Not only was this my first time

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[56] This bringing together of objects with vastly different cultural contexts was an unexpected experience, and added to my apprehensions around how the whole ceremony was centred much more around the people attending than the plants and their spirits.

[57] After looking around, I have found that The Devil can have a quite violent connotation. According to thetarotguide.com, it represents addiction, violence, and feeling trapped. However, this card may be a sign for the 'drawer' to take control of situations which seems out of your control: https://www.thetarotguide.com/the-devil accessed 10/08/22. According to bustle.com, 'When we get this card, it is an invitation to think about where we want to go in our professional lives. Where do we want to be seen? What sort of legacy do we want to leave behind? These are some questions to contemplate when you get this card': https://www.bustle.com/life/devil-tarot-card-meaning-explained accessed 10/08/22. I think those who knew these things about the card had a bit of an internal laugh. I was presented as a 'researcher' from an academic institution who was there to observe but secretly did not believe in what we were doing. In reality. I came to the ceremony hoping to prove that what we were doing *was* magical. I hoped to be enchanted and taken away from the mundanity of reading botany textbooks, and to prove that the magical could do more than science. Ironically, I experienced the opposite. This form of magic was more than mundane or disenchanting; to me, it bordered on disingenuous and made me seek answers in the natural sciences which in turn *did* enchant me once I let them.

participating in something like this, but I had a feeling that they were thinking 'just you wait and see' and expected me to have some sort of epiphany. Everything can be painted to look prophetic in hindsight, but I was feeling like an outsider with something to prove, and drawing a tarot card which is as antagonistic as The Devil does seem fitting for the situation.

Part III: Immaterial immersions

If I look at the amount of time we actually spent with dandelions in their own natural habitat (outside, their roots still attached to the ground), compared to the time spent above ground in the yoga studio with only the flowering cuttings and pictures, I came away with a feeling that it must have been intentional at some level, to remove our bodies from theirs. On our first evening we walked a maze barefoot which had been laid out with stones to connect us to the land we were visiting. The following day we walked the land, taking care to notice the (real) dandelions which we would later be-with to connect with the Spirit of the Dandelion.

After finishing our round, we returned to a specific dandelion that Carole had spotted on the way and we were invited to admire it, and give it gifts. I was unprepared; while around me, my fellow initiates brought forth gemstones, flower petals and jewellery to offer to the Spirit of the Dandelion, I was stumped, not knowing what the rules of this particular ceremony entailed. I do not think reading the book would necessarily have helped me here: I do not even know that everyone else had read it, but there was a familiarity, a knowledge that in order to receive something from the dandelion, we had to bring an offering to it as well. I ended up singing a song, like one of the other women did. It was a snippet of a hymn, the words altered to be more nature-oriented than god-oriented, just in case the

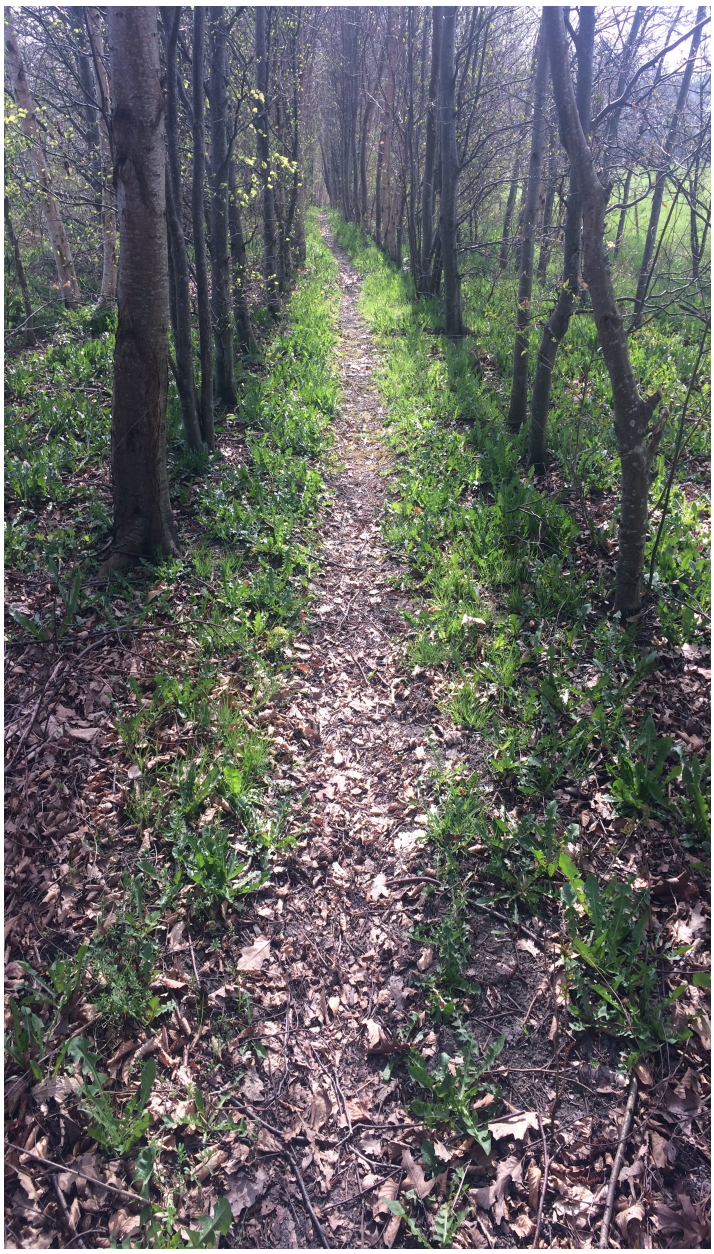

Figure 4.4 Dandelions lining a path on the outskirts of the land on which the Dandelion Ceremony was held. Personal photo.

flower would take offence. I sang quietly, in Danish, so only my father and one other woman would understand me.

I wondered if these gifts were what a dandelion would want. I am tempted to say that this particular dandelion would probably not want its crown stroked, have crystals placed on its leaves or have people sing to it, *and* I think it is worthwhile to take a step back and consider the bigger picture. While there is a way to look at this as a singular plant, living its singular plant life who would probably just want to be left alone, it is also possible to

encounter this plant as a representative of the greater dandelion population. There is a difference between the health and wellbeing of a singular plant and that of its ecosystem, although the two are of course intertwined. Perhaps this particular plant would have liked a bit of fertiliser and for us to bring it pollinators, water it if the weather got too dry, and so on, but if we look at the plant as an emissary for not only the dandelion species but, rather, for the ecosystem of which it is a part of, I think it might have a different ask. If I allow myself to believe that the dandelion has something to say, it must be for us to look beyond it. The only thing I can be enchanted by – as I was gradually coming to learn – is the overall interconnectedness of its lifeworld, the shimmer if you will. The shimmer of the dandelion's lifeworld (its intra-actions both in the singular plant perspective and the 'spirit', broader metaphorical sense) must be shimmer*ing* in order for me to become enchanted. It is debatable whether this realisation will cause me to act,[58] but it nonetheless is affective and, personally, I can see that the more of these spells are put upon me, the stronger that spell-bindedness becomes; and the more I allow myself to be enchanted, the more compelled I am – at the very least – carefully to consider my own position in the shimmer and how myactions resonate throughout it.

After our communal thanks-giving, we now wandered off to find our own individual dandelions to be-with.[59] I had noted one by the front of the house earlier and decided it was as good as any. The dandelion had not yet sprung, but the flower bud was visible, a tight knot waiting for the right time to spring forth. It was located close to the path to the

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58 In her 2022 paper, Rudbow explores whether being in nature (specifically the north coast of Zealand, Denmark) and/or participating in groups that work to preserve nature (in this case the Amager Commons) is the same as loving nature, and whether that love might engender care. She uses the term 'enchantment' as one that might capture encounters with this nature, but finds that it is not a word her participants would use to describe their own experiences with nature. She focuses on what she calls 'indoor people', people who do not spend the majority of their time outdoors, and do not necessarily have a very detailed knowledge of nature. Rather, she finds that the care and action is not correlated to how much the indoor people use nature, and acknowledges that there is a need for *more* than enchantment to enact care as shown by the current environmental crisis we find ourselves in, adding furthermore that this crisis calls for new ways to engender and demand care. See Rudbow, 2022.

59 The more-than-human language of 'being with' was not explicitly used, but it was how I took this suggestion to sit with a singular plant.

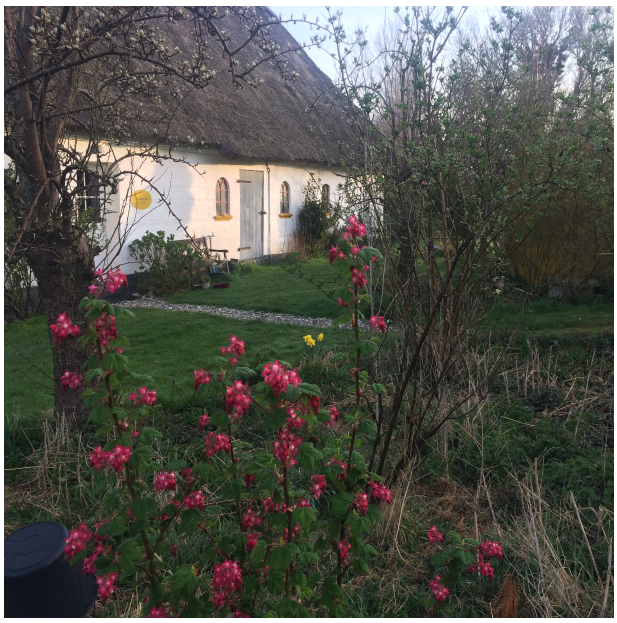


Figure 4.5 (left) the Bed & Breakfast and the path that leads to the door.
Figure 4.6 (right) The Dandelion I tried to be-with.
Personal photos.

door, which meant it had been stepped on, and the grass and other plants surrounding it were equally low to the ground, and probably not in the best state. I also noticed the noise from the road and found this place fitting for a plant of such resilience. I sat with it and waited for it to reveal itself to me in some way, but regretfully found nothing.

Part IV: Dismemberment

All of the time spent with the dandelion (both alive and depicted or decapitated) was with the goal to allow us to meet the Spirit of the Dandelion. On the first night we meditated, with music and brass bowls, inviting the spirit of the dandelion to come and be with us. We sat/lay around the room, closed our eyes and were invited to journey to meet the dandelion. Carole described a landscape for us to walk through until we got to the 'place' where we could meet the dandelion.

I remember the imagined space much better than the physical one. I walked through a

forest of tall fir trees at dusk, their fallen needles soft under my feet, holding on to the warmth of the day. As I walked I saw a clearing ahead; it was on the other side of a small, fast-flowing brook, in the fading light, full of tall swaying grass. I crossed the brook, the water icy but shallow, and stepped into the meadow where I was bid to lay down. As it darkened, I grew a little chilly, and saw stars appearing one by one across the blackening sky. Something approached. I am sure it looked different to each of us, but to me it was a plump root body, with fat root legs and arms, and a collar of sharply-toothed green leaves around a bright yellow head. He – it had been indicated that the dandelion was a masculine spirit– was very tangible, with still-damp soil in his crevasses with yellow pollen-sacks ready to disgorge. The first night he just looked at me. He did not sit down, but stood, slightly bent over me, observing my spirit. The auto-suggestion of the whole exercise, set up to push us into meeting the Dandelion Spirit, can easily be detected and critiqued; and yet, the experience remained palpable, suggestive. I tried my best to immerse myself in the exercise and found that I was able to 'let go' and make myself be-with the internal imaginations of the spirit.

The second night we all journeyed back to our individual meadows, but this time, instead of simply meeting the Dandelion Spirit, we had a favour to ask: dismemberment. Now, this was exactly what is sounds like, and according to Carole quite a profound experience where we ask the spirit to take us apart, limb-by-limb, cell-by-cell, and then to reassemble us, imbued with his strength. I got as far as the limb-by-limb part before I felt too distracted to stay in my own meadow and ignore what was happening in the yoga studio. Around me people were groaning and yelling, moving around as they were dissembled. I do not think this was anyone else's reality, but to me it felt as if there was a competition going on, not just in this instance but all weekend: who was the most spiritual, who was most easily able to tap into the magic that was flowing around us? Such a reflection inevitably took me out

of any chance of being enchanted by the experience.

The idea of assemblage and dis-assemblage is interesting, suggesting that it is possible for the components that make up our bodies (and or spirits) to be taken in isolation and that they are not always in an intra-action. I do not think of it this way: rather, I think that the exercise consisted of consciously putting the mind and body into a new assemblage of body-dandelion-spirit which *is* able to change the nature of other assemblages, but never cuts the bonds of those preexisting assemblages.

Part V: Disenchantment

I intensely wanted this to be an enchanting experience. The promise of enchantment, connection, and ritual that had excited me when we first began the retreat and the diet let me down. Going into the ceremony, and thinking about paying attention to, and being-with the dandelion, and by extension its pollen, was an enchanting idea; and I believe that, done correctly, there is ample opportunity to develop a closer relationship with a specific plant by being-with it and investing in learning about it.

However, this experience was disenchanting to say the least. I do not mean to put down Carole or any of the participants in the ceremony, or to claim that they were consciously trying to be appropriative, to enact what could be cast as a weirdly contorted version of settler science's 'extractivism'. I also cannot shake the feeling that that was exactly what was happening: the mixture of different sacred practices – using feathers from birds that have never seen Ærø; invoking the strength/wisdom from a non-defined elsewhere - all felt so disconnected from the initial idea of the plant diet, and hence the performative aspect of the ceremonies left me uneasy. There is also a question of 'using' the plants and not

honouring them by even having a live plant present during the ceremony. Rather than honouring, it felt exploitative, almost as if we were trying to extract the power and strength from the dandelion like a resource we could take home, away from its place of origin and use as we wished.

In this sense I do see the strong colonial resonance pop up, but, rather than physical resources like timber or clean water, we were here appropriating and taking from the dandelion and not giving anything back. I almost see this as a colonial-type endeavour. Not that anyone involved wanted it to be extractive, but I noticed that all the conversations were about what the participants gained *from* the dandelion, and how they could take what they had received back with them, with nothing focused on how to give back to the individual plants or the wider ecosystems within which the plants dwell. Moreover, there was no engagement with the question of whether the dandelion even wanted to give us anything. Instead, there was an unspoken assumption that the dandelion was giving away its strength willingly. Whether or not that was actually the case, I found it interesting that this question was never asked, that we never asked permission to seek out the dandelion, but rather sought it out and demanded it share its strength, demanded that it dis-assembled and re-assembled our minds and bodies, inserting ourselves into its already-shimmering-assemblage without having anything to offer it in return. Nothing here, ironically, seemed especially more-than-human; it even seemed in many respects all-too-human.

As is evident, I was not exactly comfortable in this setting. I felt grossly out of place and disjointed. There was one aspect of the retreat which really did speak to me, however, and which I found to allow a meaning and a deepening of connection with the dandelion. We

fasted from the morning before the retreat and and broke the fast together on our last afternoon. The only things we ingested were water and the dandelion 'elixir' mentioned earlier, made from parts of the plant; roots, leaves, stem and flower all mixed with a dandelion honey. It tasted like strong mead and we were given a small cup of it three or four times a day, which tasted best in the morning when it was cold and was palatable in the middle of the day when it had sat out and gotten warm. Not only did this create cohesion and a shared experience in the group, it was also a tangible and materially embodied connection to the plant, but it was not enchanted or magical, merely everyday and banal.

Passing conclusions: Magic and science

Originally I wanted this chapter to be a conversation between the concepts of 'Science' and 'Magic'. However, my understanding of magic as something more-than and something which could take me somehow 'beyond' the mundane quickly proved to be the wrong fit for the chapter. In a bigger picture, magic can be thought of in a similar way as natural science, namely a set of rules for how the world works,[60] but this idea of a system of magic takes some of the enchantment out of it for me. However, to me the very relationship between magic and science has developed into a form of enchantment of discovery and knowledge, one closely bound up with how the two may potentially work together in the illuminating – or eliciting, or stumbling over – of the particular shimmers of particular

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60 Magic and enchantment are easily confused, to be enchanted by something may indeed feel 'magical' or otherworldly, but magic is perhaps better thought of as a system which seeks to enact changes in the physical world (Sack, 1976; Curry, 1999).
Historically magic acts like natural science in many respects; it is a set of natural laws which very much rely on the physical and spatial dimensions of, for example, the planetary movements or the drapes of fabric (Sack, 1976), and magic in one form or another has led to scientific discoveries (Curry, 1999). There are perhaps obvious tensions between these magical laws of nature and objective science, namely that science operates in a framework where every theory must be tangibly proven, whereas magic relies more on its system and theory than on 'proof'. However, the move towards 'affect' in the social sciences changes this relation between science and magic: first and foremost, it removes science from its place of objectivity, and posits that magic (and in some cases science) is just another way of understanding the world (Sack 1976). I lean more towards a mixture of these two approaches: hence, for me, science *as* magic, the natural laws which science works by *are* indeed magical, and seeing science as such is precisely what makes it enchanting.

patches of the world peopled by intra-acting humans and non-humans.[61]

The following is a series of tweets by Jarod Anderson a writer, and host of the fiction podcast *The Crypto Naturalist*:

> *I love science.*
> *I also love the concept of magic.*
> *I don't find that these ideas conflict.*
> *Fact and magic go together like sound and song,*
> *like ink and poetry,*
> *like truth and metaphor.*
> *A good metaphor does not destroy the truth.*
> *It brings it home to a human context.*
>
> *For me, magic is about meaning.*
> *An interpretive act.*
> *An intentional cultivation of awe and gratitude.*
> *Understanding the physics of a heron's flight is lovely and enriching,*
> *so too is contemplating the subtleties of why seeing a gliding heron transforms a moment into a poem.*
>
> *There are two paths to magic: imagination and paying attention. Imagination is the fiction we love, the truths built of falsehoods. Paying attention is about intentional noticing. The geometry of a beehive. The perfect slowness of a vulture. The feel of life inside a tree.*
>
> *Magic requires our intention, our choice to participate. We must choose to meet it halfway. And when we do, we often find that magic isn't a dismissal of what is real. It's a synthesis of it, the nectar of fact becoming the honey of meaning. A nod to the unquantifiable.*[62]

I really resonate with this description of the relationship between magic (or enchantment/

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[61] This thesis is interested in context and placing magic and science within the appropriate contexts and physical spaces. In her 2020 Masters thesis, Essi Ruuskanen draws on her own practices of magic and art to find a way to become more connected with her home and the land in Finland. Magic to her, is a way of connecting with place, it is a series of practices which allow her to be more present, and more attuned to the spaces that she shares with the non-human inhabitants of the land, as well as those who have lived on the land before her, cultivating traditions and practices which are now thought of as magical (Ruuskanen, 2020). This is the sort of attunement I think magic can help with. While the desire for objectivity in the natural sciences that Sack (197) outlines is admirable, it runs the risk of generalising and erasing the history of place, and what impact that history may have on the place. By approaching a place through its traditions, there is an allowance for the dimension of time to shimmer.

[62] The Crypto Naturalist Twitter post from 22/6/22 at: https://twitter.com/CryptoNature/status/1539694233422123009, accessed 05/01/2023.

wonder) and science, for, while the two might seem contradicting, Anderson makes a case that they two sides of the same coin, which not only enhance but enchant each other. The strict devisions, both those set up by convention and my own personal expectations, between magic/enchantment and the natural science have only limited my enjoyments of both. Had I gone into learning about palynology with this sense of wonder and curiosity rather than an expectation of boredom, I think I would have been more focused on the science rather than the history, and thus might not have fallen as deeply into the trap of focusing so much of my energy on von Post. Similarly, had the Dandelion Retreat been able to look up from the deep immersion in metaphor and imagination to take into consideration the physical properties and processes of living dandelions in complex ecosystems, then the magic might have been more readily obvious to me. What I saw as a complete lack of interest in these things meant that I was in turn pushed *away* from the magic and the enchantments that I was seeking. This realisation illustrates the need (at least for me) to embrace more than magic and more than science.

Anderson mentions two paths to magic: *imagination and paying attention*. The act of paying attention is exactly what the next chapter 'Searching and Noticing' centralises, where I take myself out of the analysing armchair or the artificial retreat, and let my body be-in-the-field and there to explore how the two palynologists I followed in Arizona/ California, Scott and Ana, were enchanted by the field, and how their scientific and experienced knowledge of places let me become enchanted as well.

Chapter 5: Searching and noticing

In this chapter I wish to draw a distinction between 'searching' and 'noticing', both comprising important practices integral to academic inquiry but also to so much else that humans (and likely non-humans) do in their worlds.[63] They are related practices, and often noticing leads to searching, while during a search something may be noticed that was not the original object of interest. A certain degree of intentionality is attached to both words, although 'searching' is cast as the more active and intentional, whereas noticing perhaps gives an impression of more causal and passive happening. I want to trouble that distinction and argue that both searching and noticing are complex exercises which do have different scopes, but in my work are equally intentional and have been equally useful, and ultimately have both given me interesting and valuable insights. I have also chosen to focus on a 'shimmering middle distance'. By this I mean that what I am searching for, or hoping to notice, is a shimmer which is present both in the intimate and in the wider planetary sense, or perhaps the ability to see the shimmer. Moreover, as I hope this chapter will show, I have found that it is the middle distance, somewhere between searching and noticing, which reveals shimmer to me.

As stated in my methodology (chapter 3), I have gone about getting to know my subjects and their worlds through two modes of what I term, respectively, 'being-with' and by what I call 'investigating'. These terms translate well on to noticing (being-with) and searching (investigating). Part of this chapter will centralise my own independent noticing and searching, particularly as I strive to encounter plants and pollen in the most near-to-hand

63 This Searching is defined as 'to look somewhere carefully in order to find something' while noticing is 'to see or become conscious of something or someone' (Cambridge Dictionary, https://dictionary.cambridge.org/dictionary/english/search https://dictionary.cambridge.org/dictionary/english/notice-

of spaces. But much of the chapter will highlight the work that Scott and Ana[64] carried out, *their* own searching and noticing, wherein my relation to this work will be present through an act of witnessing. I participated in their work, but my role was to observe their undertakings more than to be an asset to their search, although in practice I was able to provide some useful assistance (if only as the gate-opener). In witnessing, though, I hope to be able to bring forth some of my observations about and reflections on what I witnessed: on what I both noticed and on occasion more actively searched for.

Searching, on the one hand, is obviously active: it implies looking for, investigating and being intentional, possibly with a question in mind. Once that question has been answered the search is over, although etymologically it is interesting to consider that *re*search, what academics supposedly do as their professional labour, perhaps implies a process that necessarily requires searching again (repeatedly searching). That said, there is usually a beginning, the start of the search where the object searched for is determined; a middle, where various methods are deployed in the search; and an end, when the object is (hopefully) found and the search is over. This limiting of scope allows for a focus that enables an attention to detail which brings the seeker into an intimate understanding and relation with the sought, or perhaps allows for the sought to be placed into a larger assemblage if this is what is the nature of the investigation.

Noticing, on the other hand, is more open-ended and by definition refers to something that

64 Professor R. Scott Anderson of Northern Arizona University and Dr. Ana Ejaque of Institut des Sciences de l'Évolution de Montpellier. As my work with them has been very intimate, I will be using their first names throughout this chapter. Reference has of course been made to them both in my methodological reflections in chapter 3.

announces itself.[65] In my work, the noticing highlights the agency of the non-human subject which has emerged, in one respect the tiny objects of barely-noticeable pollen, barely perceptible without mechanical aids, and what they appear to do. Paying enough attention to what I collect, observe, write and otherwise produce has allowed me to notice as an accompanying practice of engagement (being-with) that has revealed patterns and logics which have been, to some extent quite unconsciously, woven into my work.

I hold open the hope that I will be able to keep a balance between searching and noticing. Sometimes a search has been diverted by something noticed, and sometimes something noticed has led to a more systematic search, and thus these two practices are interwoven and connected. They enhance each other more than they contradict, and this is the strength of embracing both as – I hesitate to lend them the formal attribution – methods. This chapter will look at how searching can be impeded and aided in various ways by systemic, institutional, mental, and physical obstacles, as well as considering how what and how we search is bound up with our own unavoidable bodies and histories. In addition to a fairly conventional narrating of field search practices, there are a few more experimental moments in what follows, harkening back to how I have previously characterised my own ambivalently 'amateur' efforts as both scientist and artist. I have laid out a photo-essay of pictures taken which, when revisited, has revealed delicate patterns within what is noticed and what has been searched for, these two definitely not being the same, as well as certain impediments wherein the searched-for is abandoned in favour of the noticed. I have also narrated a drive down the edge of the Colorado Plateau in the form of a poem, offering an experimental way of sharing the experiences, another way of writing

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65 While 'searching' only has a shadowy presence in the standard methodological literature, 'noticing' is almost entirely absent – except in a chapter on 'Noticing' by Eric Laurier in the *Sage Handbook of Human Geography* (Laurier, 2014). Here Laurier is interested in observing, and how observing the same thing multiple times leads to noticing different layers of an event which in turn leads to a deeper understanding of it. My versions of noticing are more focused on the things which have caught my attention without conscious observation.

about how the landscape can be used to understand the last ice-age's shaping of landscape. What the poem also conveys, moreover, is subtly differing emphasis in what is being searched and noticed between myself with Scott, the pollen landscape researcher, and myself with my partner, on a more personal and 'touristy' journey. Moreover, in a final section I will think throughout with the anthro-techno-pollen assemblages that are present throughout my research, their affect on me and on the pollen, and how this active search and attention transcends the being-with of shimmer.

My witnessing role is a deliberate choice: it is a search with opportunity for noticing. I think that this noticing is central to the thesis as a whole. Indeed, as the amateur I am, and have laid myself out to be in a previous chapter (chapter 3), I can try things out, whether that be painting or poetry, and these things may be more or less effective in communicating what I am trying to convey. I am content to 'fail' a bit, but believing that my efforts at witnessing – noticing, then searching, or sometimes *vice versa* – and the traces left here, in the chapter, usefully open up different pollen landscapes for care and attention. Furthermore, I think this openness to potential disappointment helps me to witness 'better', as I am not married to a single outcome. But the witnessing which is done, witnessing of science at work, witnessing of pollen and plants, is about being there and taking seriously the materiality and tangibility of the work done, the people doing the work and the objects which they work with, as well as taking seriously and being-with what is witnessed.

Noticing flowers

In my search for pollen I began with the literature, reading botany and horticultural textbooks to understand the process of pollination, the distinctions between self-

pollinating plants, wind- and insect-pollinated plants, the difference between an anther and stamen, and so on.[66] Becoming aware of pollen as matter that matters has made me aware of it in everyday situations and makes me attuned to its presence, effects and importance. I now have the resources better to notice pollen, although – a simple but essential point – for most humans, most of the time unless perhaps allergy sufferers, pollen goes unnoticed, unnoticeable, chiefly because individual pollen grains are so small, specks in or on almost any landscape. Much of this project is about pollen which not only is 'invisible', because of its size, but also because of its time. Here though, I stay with what *can* be noticed, and thus noticing the barely-noticed, the unnoticeable, is a key horizon for everything that follows.

This section of the chapter explores two of the more in-depth moments of noticing within my work. The first was an intentional one where I sat down in order to notice any moments of shimmer – of pollen announcing itself to me, relating back to my discussion in chapter 4 on the dandelion and whether or not wanting a plant, or part of it, to announce itself is even the right way to go about establishing a relation. My noticing work here occurred during intense observations of a small plot of home land. The second was a more accidental affair, not pre-planned, concerning the patterns that I noticed 'crop up' while reviewing some of the photos taken during my fieldwork which have acted as field notes for me.

In both cases, I soon began to see – to notice – the features that I had read about in real life flowers and began to appreciate just how every plant has found its own way of attracting the right pollinator or maximising the release of pollen by a gust of wind. While I

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[66] The Literature Review, chapter 2, explains these terms in depth with illustrated diagrams.

noticed these things without trying to, I also became interested in a more active noticing which I would not quite describe as searching, but perhaps simply as observation. This section will work with both of these noticings. Firstly, I share a 'book' that I created in the summer of 2018: this material deals with the more active noticing, the sitting down and waiting for something to shimmer at me. Secondly, I have included a photo essay which deals with the noticing I did not notice until I evaluated the photos taken during my research.

The self in the shimmer

I made a book, my *Book of Shimmer*, which I titled 'Situating the Self in the Shimmer of a 1m x 1m Microscape' about a small piece of land in my parents' back yard.[67] Having just recovered from a concussion, I wanted to do something that was light-touch, relatively undemanding, and would not make my head hurt: spending time with the tiny wildflower meadow seemed doable. I brought out my camera and a notebook to record what I hoped to find. I quickly gave up on counting pollinators; their small, busy bodies evaded me and the movement of pollen between the flowers they visited even more so. I felt a growing unease because of this, and a concern that I did not know their names. I have become more familiar with pollinators and especially with pollen in the meantime, but wondered (and wonder still) whether it is easier to notice something when you know its name.[68]

In Ursula K. Leguin's *Wizard of Earthsea* (1968), you can gain (magical) power over

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67 The garden is located in a residential area in the town Allerød, in the northern part of the island Zealand, Denmark. The suffix -rød indicates that the place used to be covered in forrest and has been cleared. The Allerød Warming or Allerød-Bølling Oscillation (a warming period which took place around 13,900 to 12,900 BP) is named after this town.

68 As already implied and here made clearer, there may be a difference between a kind of 'pure' noticing (something intrudes, impinges, calls for attention, however fleeting) and a more 'prepared' noticing (when there has been some prior knowledge-gathering and an expectation that something may be seen/noticed). As the chapter progresses, I will be engaging in both and blurring the lines. Searching and noticing, are like most things, not binaries but lie on spectrum.

someone or something by knowing its true name. This move works in a fantasy novel where the author makes the rules and the notion of a 'true' name is, well, true, although the ancient philosophies of 'nominalism' clearly suppose that knowledge's power lies very much in its capacity to name (to attach names to worldly things[69]). I am unconvinced that it is something to carry into the 'real' world. I had an idea that I would somehow know the plants I was observing better if I knew their names, but what names? The ones given to them by Carl Linnaeus[70]? Their 'common' names? While these names might tell me some of their properties and human uses of or intentions towards the beings in question, they also arguably prescribe what something is understood as and for, and thus may leave out a myriad of interesting things about the plants with which – with whom – I was spending time. This is perhaps a bit of a step above noticing even if it is not a full-blown search. The deliberate nature of wanting to notice something skews it towards being a search, but I think the open-ended-ness of the search lends it toward an acceptable degree of noticing.[71]

Let us take the dandelion as an example. It literally means 'lion's tooth', named after the sharp edges on the leaves (see section on the Dandelion Retreat in chapter 4). In Danish the flower has two names: *Løvetand* (Lion's tooth) and *Mælkebøtte* (Milk-bucket). These names tell me about the leaves and about the white sap inside the stem of the leaves and flowers. However, they do not tell me anything about the bright yellow which is

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69 Nominalism still crops up in debates about science (Scholarly footnote to nominalism - still crops up in debates about science: eg. Mozersky (2021) who sets *nominalism* up against *contingent history* as two ways of understanding nature and science.

70As I discussed in the previous chapter (Chapter 4), there is a long and fraught history over who has created the scientific conventions of today's language.

71 This is actually to reference a complex, indeed quite ancient, debate about naming – in many religions/cosmologies, some supernatural force (Christian God, Aboriginal Ancestor), names (even songs) call the world and its components into being. In such an ontology, name and thing are intimately interwoven in their making, nature, truth – the Italian philosopher Giambattista Vico (1668-1744) even called this the era of 'poetic geography'. Of course, with Ferdinand Saussure's linguistic semiotics, a decisive break was established between 'word and thing' (or, more precisely, between sign [itself split between signifier/signified, or sound-image and concept] and referent). The magical powers of the name are thereby dispelled, seen as nothing but human artifice, although for many people arguably such powers remain. Another version of the debate derives from Ancient and Medieval 'nomenalism', an argument that the names given to 'abstract objects' or 'universals'– such as an animal or plant species – are ultimately meaningless, just abstract impositions.

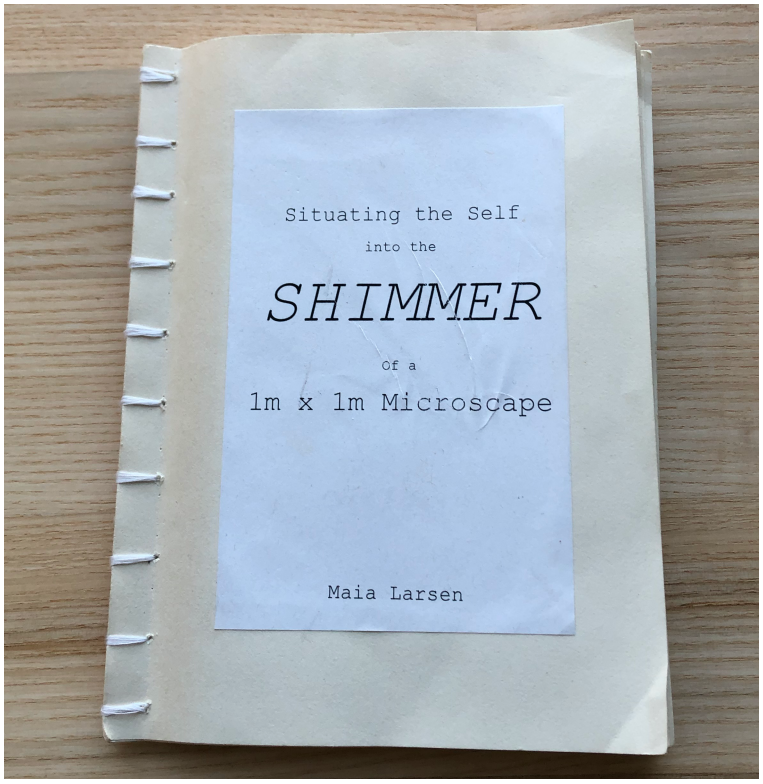

Figure 5.1 Front page of the self made, and self bound small book I produced in the summer of 2018

characteristic of the plant's flower, and do not describe the puffball that will spread the plant's seeds. Naming the plant for its colour would also be misleading because I do not see the same colour as a bee or a dog, nor do I experience or value the same things as non-humans, and it also does not take into account that the plant does not flower most of the year. Therefore, I do not think that there is an inherent 'superior' value in knowing the name of something: indeed, if that were the case, I should strive to learn all of the names, human and nonhuman, given to the plants in question. To take this argument further, it could be interesting to think of how a pollinator, for instance a bee, experiences a dandelion and orients itself around it. In very human terms, the bee's experience[72] of the dandelion might even be more valid because of its much closer relationship to, and its reliance on, the flower.

[72] Bees orient themselves through sight, smell, and communicate with each other by 'dancing'. Thus they can share information about where to find food sources or places to stay away from (Wester and Lunau 2017).

Figure 5.2 and 5.3 pages from the book

Figure 5.4 and 5.5 pages from the book

Figure 5.6 page from the book

Returning to my *Book of Shimmer* (see figure 5.1-5.6): there are other ways to know something and to discover new things about it than knowing its name and observing. I touched the plants, the hardness of their stems, the softness of the leaves and petals. I dug my hands into the soil in which they lived and felt the points where it was dry from the sun, and then dug further until I found the dampness which nourished the plants. I think that I expected this activity to engage and to enchant me, and that I would somehow become part of the shimmer of this little plot if I inserted myself into it and went searching for that connection. It was in a small way a reprise of my feelings from some activities at the Dandelion Retreat. This attempt at being enchanted was not paying off, maybe because the search was overwhelming the noticing, and it frustrated me.

The idea of a flower meadow, however tiny, attracted me because of the continued effort to focus my attention on the ever-elusive pollen. I tried to engage with the flowers, the carriers and advertisers of flower pollen, but instead of spellbinding me and taking my breath away with their intricacies, they just went about their own lives and were not bothered by my presence. They were wholly indifferent to me, to the human in the 'room'. thinking back to what I have written in chapter 4 regarding the dandelion and what I imagine its attitude to me as a human was, I can apply some of the same thinking here. The individual plants or pollinators probably do not have an 'opinion' on me as and individual, my presence and my observation. While I was able to observe pollinators darting and bumbling between flowers, cross-pollinating as they went, the magic of what I was witnessing never quite shimmered at me in the way I had anticipated. This indifference is of course my own experience of events, and it is impossible for me know what these critters felt about my presence, if anythingI felt as if the whole microscape I was trying to 'shimmer-with' was ignoring my attempts to communicate, to be-with-them. I had come to this place, to these plants, to prove that I did not need to know their Latin names or be able to draw and annotate complicated diagrams, and yet here I was, shimmer-less and alone. I felt a dread that I did not know enough and that I should have done more research into native pollinators and asked my father to keep the seed pack he had sowed months ago. This was more than just the anxiety of the 'amateur' in the face of the 'expert', I feel; more a deeper concern with the incommensurability between what I *knew* (what I could observe), and what I might have *known* had I 'put in more effort', had I been an expert and what I was possibly missing in my amateurness. I am a part of the shimmer of the plants, pollen, pollinators, etc., but the feeling of disconnect hid the shimmer from me.

The little book that I made for this project lists the different ways in which I attempted to

engage with the small plot of land, using my various senses, and how I became frustrated with the lack of shimmer I felt. But all was not lost, and the book concludes on a realisation of what my place in the shimmer can be. I used a mix of water colour painting and inserting dried plants and soil in the book to capture some of the tactility of the experience as well as short pieces of text (**Figures 5.2-5.6**). This simplification and processing of the experience helped me to understand its value in a fuller way, and also allowed me to keep the plot of land which is now just grass alive in some way.

Once I got over my disappointment with the dis-enchanted lack of shimmer, I was able to stop searching for connection. In drawing back from the immediate materiality, paradoxically enough, I found myself in it. I have known that 1 m^2 for most of my life and have seen it change seasonally and throughout the years. It has been a playhouse, a strawberry patch, a wildflower patch and is now 'just' grass. My place in the shimmer is hence on a bigger scale, panning out from the microscape where I initially expected to find it; I have witnessed the place for years, in different contexts and for different reasons, and as such I bring it with me, in all these guides, into my relations with the rest of the world. Moreover, I could also argue that my humanness in a climate-changing capacity now involves me in a new relation which can be configured on a planetary scale: from tiny plot to whole earth. Humans, then, are part of the shimmer, perhaps our biggest problem is that we have added too much artificial glitter to the mix.

The shimmer which emerges with this resignation and acceptance has actually helped me to ground myself, not only in this tiny bit of garden, but in a wider feeling of belonging within the planetary, not only as a witness who is able to search for and notice the shimmer between non-humans, and not only as the relations and intra-actions between humans and

non-humans, but an understanding and a delight in being part of that shimmer. It turns out that the shimmer, for me, was *not* there in the microscape, in the most intimate pollen landscape, even though it was more, if I can put it like this, pollen-sized. Or, rather, it was there *but* only in a suite of inter-connections with other spatial scales, and indeed time-scales: my search with microscope and dirtied hands ultimately led me to notice something quite other and different.

Snapshots

One of the things I tried to remember during my fieldwork, and throughout the process of researching this PhD, has been keeping field notes and writing things down (see also chapter 3) Unexpectedly, I have found that photographs have provided a whole new set of field notes.[73] Looking back through pictures on my camera and phone, I found that I have taken many pictures of flowers, and that these pictures act as snapshots that take me back to a time and place in a different way than is the case with reflective writing. I want to include some of these photographs as I would field notes, acting in a way as vignettes or snapshots of my time. Just as field diaries sometimes capture the unexpected discoveries which turn out to be more or less relevant later on, my photo reel has given me an insight into the things that I have noticed – or, perhaps better, barely-noticed – during my PhD process. Only looking again, with different eyes in different contexts with differing ideas in mind, do some of these noticings (re)surface.

I did not set out to use photography as a creative method, but, in line with the practice of noticing, I have noticed things not just in the world, but within my own work. I think it is

[73]Photography is a well established research method in the social sciences and is often practiced with intention. Different types of photographs are used in research, including archival photographs, photography by the researcher and research participants (Holm, 2014).

important to pay attention to these patterns that have emerged, ones which strike as more significant in retrospect, as they clue me into an awareness of what I have been noticing and prompt me to examine how that barely-noticing impacts the rest of my work. Specifically, looking at these pictures, I have noticed three distinct 'groupings' of elements which have evidently grabbed me as of interest. I will first go over each of these groupings individually.

1. Flowering yellow

This collection of photos (Figures 5.7-5.12) was taken at various locations during my field-trip to Arizona and California. The yellow colour,[74] standing out in its brightness and its location in the desert against an otherwise barren backdrop, has captured my attention. All the pictures were taken in spring of 2019 during the rainy season in the American South West. While there, it was easy to forget that we were in a desert because everything bloomed and I felt surrounded by life.

I have arranged the pictures in a collage format to showcase the brightness of the yellow and to mimic my experience of seeing them as a real-life collage, meaning a real assemblage in an overall (pollen) landscape. This engagement with yellow has served as a

[74]While every pollen grain looks different, a google image search shows pictures of flower pollen which is often yellow, and this is the colour most associated with pollen. See: https://www.google.com/search?q=pollen&sxsrf=AJOqlzUPbC4L1ch89dvrgOMQu5E3tYmLUg:1674733324669&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiR_KPnk-X8AhV7SkEAHZ5EC-YQ_AUoAXoECAEQAw&biw=1280&bih=787&dpr=2), and perhaps this has subconsciously influenced my noticing, and steered it towards the yellow.

reminder of how various plants have developed to grab the attention of their pollinators,[75] and how this coloration has become beautiful not just to insects, but also to the human eye.

2. Visible anatomy

These photos document times when I stopped and really noticed the plant anatomy that I had been leaning about. These flowers are found in a large geographical range from the small Danish island of Ærø to California's Pacific Coast, and one of the things that has struck me about them are the similarities in the anatomy which are so far apart. Moreover, as similar as the anatomy can be, it is also evident that the plants have evolved with distinct mechanisms for pollination, whether it be by a specific anatomical feature of a pollinator (such as bristles or legs) or by wind, and that the niches or broad-cast nets in play here are deliberate strategies which remind me of the plant agency.[76]

I have grouped these pictures by colour/pollination strategy. The first (white) grouping (Figures 5.13-5.15) all show a very exposed stamen and anthers; the second (red) grouping (Figures 5.16-5.18) all show a similar colour, but very different flowers; and last the linden tree grouping (5.19-5.21) all show the exposed flowers which rely on wind pollination. The plants which display white and red flowers are insect-pollinated and thus have developed flowers which are visible and very varied in shape and size, accommodating a range of different insects. The Linden tree, on the other hand, is wind-pollinated, which means its

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75 While 'pollinators' is a broad term, they are generally understood as animals and insects which move pollen from one plant to another allowing it to be fertilised. Plants are not able to accommodate all different pollinators, which means they have co-evolved with certain pollinators and thus are tailored to those that most efficiently will pollinate them. Many factors play into how plants present themselves, fragrance, shape, colour, and even whether or not they grow in high or low light conditions will affect then types of pollinators that visit the plants. As pollinators have different bodies and sensory organs from humans, they also experience plants differently from us. For instance, honey bees see UV light which humans do not, meaning that they can see patterns on flower petals that are invisible to the human eye(Wester and Lunau, 2017, Aguiar et al, 2020, Tuljapukar, 1997).

76Here as elsewhere, I knowingly deploy terms (like 'deliberate' and 'strategy') that are of course, in standard depictions, almost only ever reserved for intentional human agency.

flowers are exposed allowing the pollen to be taken by the wind and carried to other linden trees.

3. Pollen graves

Lastly, I noticed pollen being more visible than I initially thought it was in my everyday life. While the pollen grains perhaps did not stand out in their tiny individuality, spring bore plenty of evidence that pollen was all around, from blooms, to insects, and to my husband's runny nose. An unexpected pollen encounter happened in winter, though, and in a moment where pollen brought along connotations of life. This meeting with pollen happened in Vester Kirkegaard, a cemetery located in western Copenhagen. Two things struck me about the location of this encounter; firstly, that this sign of life was found in a place that we routinely associate with death; and secondly, that the pollen I did see was not even going to be remembered in remotely the same way as will be the people whose names were all around me on headstones.

I noticed the pollen on the asphalt walkways between the graves where it had left a smear of bright yellow and had been mushed by the unrelenting rains. From pine and yew trees, this wind-borne pollen had been produced in large quantities and would have spread far and wide in the right conditions. This pollen, however, had found its way to the ground with no way to become anything more. It would not pollinate; it would not enter into a process of preservation and lie in an undisturbed grave like the people under the tombstones around it. Nor would it be excavated in hundreds or thousands of years to help eager palynologists uncover what plants the city of Copenhagen deemed worthy of preservation. The location of the cemetery was also interesting: there is the obvious link to death in this place, but, as Cloke and Jones (2004) discuss, trees are, and have for a long

time been, essential parts of large cemeteries, and are the ultimate expression of life. These non-human agents are part of shaping the place and, while the pollen alone is perhaps not a strong visual aspect of the space, at various stages of its lifecycle it nonetheless will take up space in the air before it washes into the gutters and wastewater systems of the , these pictures (Figures 5.22 - 5.25) are stand-alone and show various pollen on concrete which, like the yellow flowers, stands out, the yellow on the grey.

1. FLOWERING YELLOW

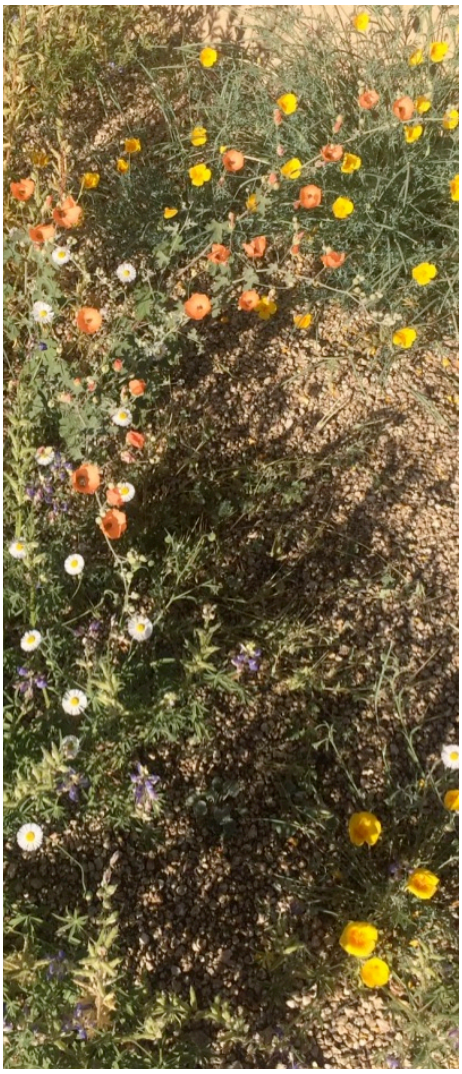
5.7 - 5.12

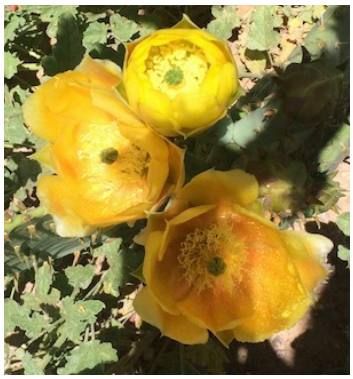
2. VISIBLE ANATOMY

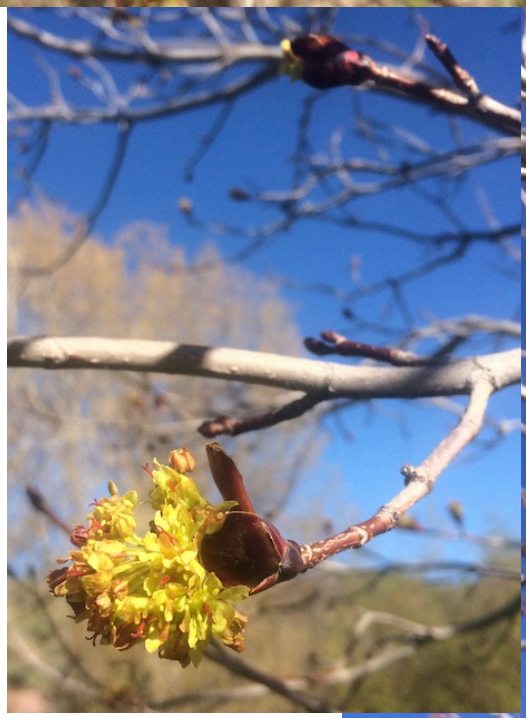
5.13 - 5.21

3. POLLEN GRAVES

5.22 - 5.24







Searching with lab and field assemblages

The previous section of the chapter has been focused on what I have noticed during my research, and now the chapter will turn to the more active searching. A very deliberate point of departure in my search for pollen, and its shimmers, was going to Northern Arizona University, where I was able to engage with palynology as science and practice (see also chapters 2 and 4). The following sections will focus on this search, my own search for an embodied and tactile encounter with the practice of the science I had already studied. Moreover, I was able to be part of Ana's and Scott's searches and experience the search for pollen firsthand.

For me, being able to take part in the searching for pollen brought together the theoretical and tactile parts of palynology. Getting dirt under my fingernails and being in the landscapes where the pollen has travelled made me better understand the literature that I had read about palynology, but, reversely, having read about palynology made the landscapes and the dirt meaningful in a profoundly different way. Moreover, having Ana and Scott with me, able to 'translate' some of the literature and the landscapes. Through the fieldwork I was able to notice a 'middle distance' or a meeting point of the macro-landscapes and macro-timescales with the micro pollen grains which exist in the soil. A palynologist's search for the non-human pollen is deeply meshed with very human technology and expression. In this section, I will look at the material tools and translations which aided our search and enabled our noticing of pollen and its effect on the imagined pollen we were searching for.

Before diving into specifics, I want to speak back to the notions of assemblages and shimmers that I have discussed in the literature review. In my work, I see assemblages as

the defined collections of objects and/or subjects (human or non-human) which make up a bounded assemblage, as when my body may become entangled with another body or object, making us an assemblage, as for instance in my use of a microscope. Shimmer, alternatively, invites alertness to the tensions and vibrations between those objects. In her 2018 novel *De Ansatte*, Olga Ravn writes:

> I live, like numbers live and the stars, as tanned hides cut from the bellies of animals live, and nylon rope, as every object lives and is in alliance with one another. I am like one of these objects. You have created me and given me language, and now I see your defects.[77]

The definition of being alive in this quote from a non-human is about more than the tasks performed, but rather speaks to the place of that being as entangled with a greater shimmer of understanding that binds bodies/objects together. The tools that we – Scott, Ana and I – used to get closer to the pollen all have a wider place and importance than our specific use-case. Indeed, while there is a delegation of tasks taking place, I want to acknowledge that the shimmer does not only come alive (though it may be intensified) when assemblages form, but also than the mere existence of an object, its creation and materiality are all part of what makes it alive.

Searching on the edge of the Colorado Plateau: reflections on what matters

Scott took me on a descent of the edge of the Colorado Plateau to show me how the vegetation changed as we drove, explaining that this is a 'compressed' way of seeing an ice-

77 The quote is from a robot working on a spaceship, which has a crew of both human and non-human employees, giving interviews about their experience taking care of alien objects. This is an extract from one of the robot employees which insists that it is alive even if it is not human like some of its crew mates. Furthermore, the robot insists that it is part of the shimmer humans have created. I use this quote to illustrate the fact that the tools used during the search for pollen were integral and became extensions of our bodies (the auger and microscope) and our minds (maps and records) which brought them into the human-pollen assemblage. Translation by myself.

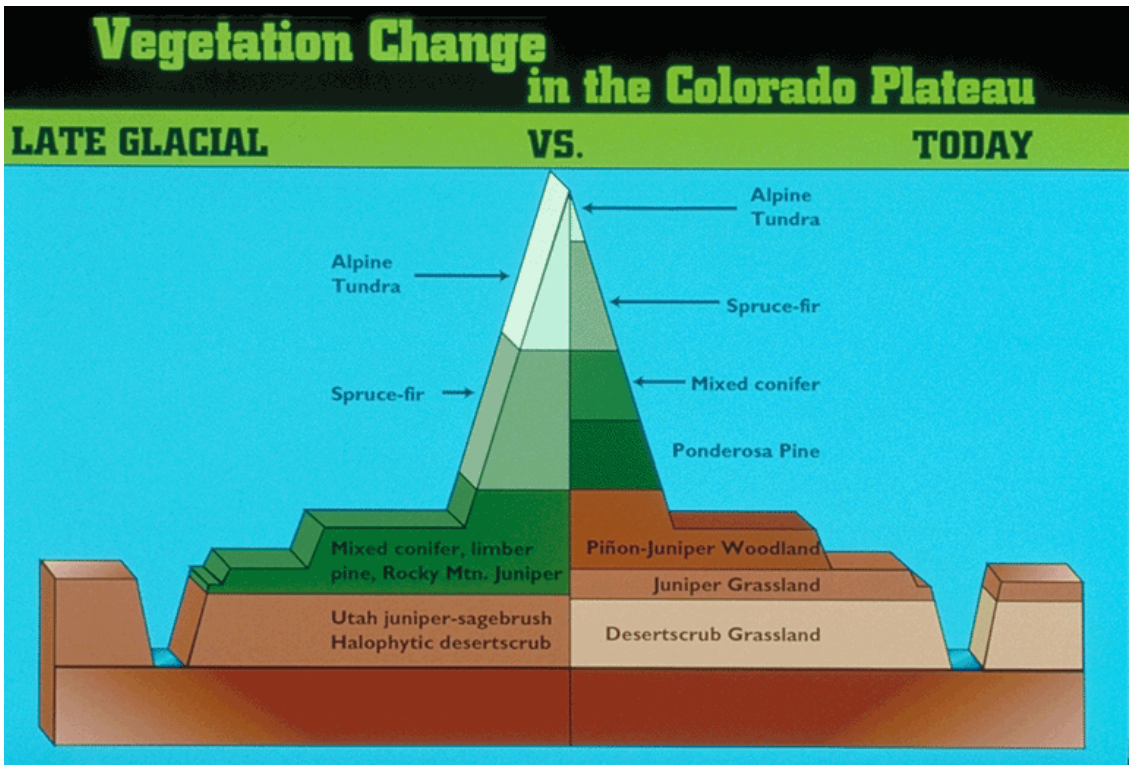


Figure 5.25 diagram showing vegetation change in the Colorado Plateau

age, because of the temperature changes due to elevation. As **Figure 5.26** shows, the vegetation distribution on the plateau has changed significantly since the late glacial period, but the types of vegetation – and their ordering relative to height above sea-level – remain similar to what obtained in the past. The vegetation bands have moved up the plateau as the climate has warmed and have also given way in the lowlands to a new category of desert-scrub grassland. The drive was a way for Scott to show me in real-time, as it were, what his research is searching for. Pollen has been an important contribution to understanding how the landscape has changed, as already underlined in chapter 2, and every stop we made on the drive divulged information about the past climates. Scott asked me to imagine these past climates and showed me research sites along the way.

This drive with Scott did not immediately relate itself to the thesis themes and questions, but rather was an effort from him to help me understand his work better. Instead of 'just' describing the trip or leaving it out altogether, I thought it was important to include and to

have it stand alone in some way, in order to be outside the fieldwork that we did with Ana, but still be part of the time I spent in Arizona. In reflection, moreover, it becomes obvious to me how this drive perfectly captured the deeper logics informing Scott's searching through pollen landscapes – macroscapes of a different order, scope and significance, to my backyard pollen microscape.

I chose poetry[78] to narrate the drive as a way to process the impressions and their affective impacts with which I was left. Pollen is inherently light and mobile. I wanted the feel of the poem to drift similarly across the landscape and across time with the ice-age in mind. The visual effect of having less text on the page adds to the lightness of the pollen grains and the drifting. The movement around the American South West is drift, as are the timelines. There is also the hope that in the poem there can be a sense that some things are lingered upon (pollinated and expanded) while other things are passed by and do not take root. The poem is split in two, the text which is aligned to the left is the drive with Scott, while the text aligned to the right is from my independent travels with my partner, Peter. Moreover, it is split into searching with Scott and noticing with Peter, the poem hopes to offer a light-touch comparison of the different modalities of searching - noticing. By doing both I hope to also allude to the middle distance between the two practices, and acknowledge that one without the other does not capture shimmer for me.

[78]Geography can be thought of as world-making, by creating a discourse about what the world is, geography shapes it. This world-making can be expressed in many ways, including poetry. Writing poetry, can thus be a way for the geographer to express their sense-making of the world (Cresswell, 2014), which is what this poem tries to do.

Searching the edge of the Colorado Plateau

In the Grand Canyon State

April brings me

The hottest temperatures

I have ever seen

It snows for three days in May

Scott takes me up the mountain

To show me an ice-age in action

But waits to tell me anything

Till we reach the top

Instead we talk

Of our shared Scandinavian heritage

How it gets dark at 3pm

And how to pronounce æ, ø, å

At the top

Snow lies in piles

And the ski resort

Is closed for the season

The air is crisp

Scott points to the trees

And to the snow

They go together

The spruce and the fir

He tells me

Live here in the cold,

It is their niche

You can tell
From looking at them
In the air
And in the cores
Here on the edge
Of the Colorado Plateau

The spruce and the fir
Stand tall and proud
On the brim of a picture
In miniature
Of an ice age

We get back in the car
And drive down while he points out
How the landscape
Changes as we descend

We stop at the sight
Of deer that stand
Frozen, staring
By the road

They will only be
Remembered by association
Their spirits haunting
The spaces between the trees
Which will live
Through their pollen

In the earth

Remembered by their shells

Peter and I talked about what we really wanted

He wanted to go to Colorado

And see the dwellings in Meza Verde

Because he had dreamed of them

Since he was a boy

I wanted to go Utah

And see the oldest tree

A forest of aspen

Which is

Technically

One organism that goes on

For miles

We went to Meza Verde

And drove around to see

How the indigenous people of this land

Had lived in rocks

There was snow on the top of the mountain

We never got to the aspen

I hope we will come back

For I am haunted by

The forest that is one tree

As we descend further

The trees change

The spruce and fir

Replaced

When I think of Flagstaff

I think of Ponderosa Pine

Which holds the city

Together and smells

Like a dream

Notice

Scott points

How these trees are unwell

Are they?

It is because they are so close to the road

And the salt they spread

For the cars

Poisons the trees

So they look frail

And unhealthy

But at least

We can get up the mountain.

I wonder if someone looks

Thousands of years from now

At the pollen from the road

And that from the trail I hiked

The previous weekend

Would they see

A difference?

We arrived in Flagstaff in the dark

And almost got lost trying to navigate

In a city which has chosen

To prioritise the stars

It was not until we woke

The next morning

In a strange house

In a strange city

That the pine trees

Rose around us

Their needles soft underfoot

We were a bit late

For the Pollen Event of the year

That happens every spring

When the Ponderosa

Sends out invites

To a ball and a celebration

Of life and love

The wind shakes the trees

Sending pollen flying

All over the descent

Falling

It carries the hope

Of new life

And new seed

To be spread

You can see it on the air

The bright powder

Rises and swarms

Like clouds

Of golden dust

Covering windshields

And sidewalks

Making people sneeze

Some pollen pollinates

Some of it

Falls to the ground

And is forgotten

But some of it will fall

Into a lake

Or be carried away

By packrats

And create an archive

That tells the story

Of the edge of the Colorado Plateau

Through the sporopollinin

Which will never die

But lie as the remains

Of the Viking Kings

Buried

A whole world with them

If I look closely

The landscape before me

Can be read though

The pollen

And the ice

We stop at the side of the road

Where we have a view

Of the pines behind us

And the Saguaro below

The desert spans

As far as the eye can see

And blue skies

With little white streaks

Of cloud

Drifting lazily above us

Have you been to Sedona?

Scott points

To a part of the desert

Which is especially red

Yes

It is one of the best drives

I have ever taken

By far

We drove to what felt like the edge

The pine trees stopped

And the cliff dropped

Into nothing

Well

It dropped

With a small road

Winding down

Into red and green

The walls of red stone

Hugging us in their history

The green oaks hanging over us

With life

Of today

The valley which spread out

With towering formations

Of rock

Have seen more

Ponderosa pollen

Fly off the cliffs behind us

Than I can dream of

Instead of Sedona

We head slowly

Down the mountains

Into shrub

It is juniper

and oak

The two stand

Bushy and dry

Always together

They are like the pine

And the spruce and fir

Key species

For identification

Their pollen line

The pages of journals

Which study the past

Of the American South West

And the cores

Which may one day

See a microscope

We get to Monetzuma Well

It opens like a hole

In the desert

Deep blue

On the sides we see

Where people used to live

In caves carved

Above the water

The people there did well

For a while

The pollen tells us

As much

They traded and farmed

The well

And the flowing stream

Boarded by trees

Kept the people

Safe until the day

It didn’t

It is suspected that the people

Of Montezuma Well

Were not killed by the desert

Or settlers

But by the well

Slowly

Of lead poisoning

We drive away

From the ghosts watching

Us stomp around their home

With the sun in our eyes

To Stoneman Lake

Found even further down

And very important

For the Palynology of the South West

There are not many lakes

In the desert

So this one

Small and wet

Surrounded by vegetation

And expensive homes

Has of course been

Invaluable

Scott and Ana have been here

They took a core

Stretching over thousands of years

And 73 meters

Of soil

You can still tell

Where their gear

Has left marks

In the landscape

On our way to California

In the Toyota Sequoia

The biggest car

I have ever been in

We stopped in Dateland

A small town

That does all things dates

The artifice of the place

A date planation

In the middle of the desert

Will not be lost

When someone

Looks at the pollen traces

Left behind

Just like the Joshua Trees

Who are dying

The slowest death

I ever knew

Because the large animals

That used to eat their fruits

Thousands of years ago

Have gone extinct

And no longer spread their seed

We do not drive

All the way to the desert that day

Instead we head back

To Flagstaff

Back in time

To the Ponderosa

Which live in the town

Enveloping it

In the scent of warmth

Searching the lands of the Spanish Mission System: reflections on gatekeeping

My fieldwork with Ana and Scott was very definitely about searching. The trip itself was designed as a 'scouting trip' for more in-depth fieldwork planned for the fall of 2019.[79] Our mission in the spring of 2019 was hence to search for suitable sites for cores to be taken. Ana's research was connected to the Spanish Mission[80] systems and how the missionaries and indigenous peoples that they encountered may have interacted with each other. As a paleoarcheologist, she uses pollen (and other materials) to reconstruct past landscapes, and in this case she was interested in farming practices and how the colonisers and the indigenous peoples exchanged knowledge, keeping in mind that it was not necessarily as

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79 The field trip has been mapped out in chapter 3: when discussing my methods, it may be beneficial to keep this chapter at hand to see maps and keep track of where the different places mentioned in this chapter are. As far as I know nothing has been published on this work yet, but I can maybe look at some of Ana's previous work and see if I can put in a footnote to explain what kind of things she does? Yes, definitely do that – and probably should be discussed when you first introduce the work of Scott and Ana.

80 Between the late sixteenth and early nineteenth centuries, Catholic missionaries set out to establish and operate missions across the Spanish colonies in the Americas. Using indigenous labour, they erected missions, introduced European agricultural and husbandry practices. There is however, a growing interest in how these indigenous communities interacted and lived with the mission system, rather than solely focusing on their introduction into the colonial operation (Panich and Schneider, 2017). Ana's questions revolved these latter themes, and she expressed that rather than focusing on how the missions went about their colonisation, the was more interested in how the indigenous people took from the missions and used their knowledge to their own advantages.

straightforward as a fair, equal exchange in most cases. The search for places to take cores consisted of taking smaller soil samples which could be analysed to see if they contained pollen, and therefore were viable places for core extraction, but in order to take those samples a host of *a priori* decisions had to be made about where Ana should be looking in the first place (in the hope that these 'hunches' would be confirmed and to inform plans for the proper fieldwork season).

Being part of the scouting mission was perhaps the most open-ended part of the budding search. The search for sites was not so much about finding the perfect samples and looking for the right type of pollen, but rather to see if there was pollen there at all. Ana's preparations and searching for sites only took us so far. As the following shows, the landscape on the map and the landscape underfoot can vary greatly, and may bring many surprises. There is a poetic irony in looking for something as small and material as pollen in maps and historical accounts;[81] you would think the guesswork would stop once you get to the location in person, but sometimes I think the opposite was true. Once we were there and saw the features of the landscape, a thousand new questions spring to mind. Ana brilliantly investigated and appraised the sites before arriving, but maps from the 1800s do not always show the hill above your site or other factor maybe complicating the pollen story, and you start to wonder whether this land has been dug up since the 1920s. Without an intimate knowledge of the research site, of each and every research site, it was sometimes hard to determine which features should attract our sustained attention.

[81] Because of the properties of the pollen exine to stay intact and keep its recognisable shape and features, it works very well as an archive. The pollen does not keep record of the specific DNA of its origin plant, but is able to tell part of the story of a past landscape. Just as reading one letter from 1000 years ago does not paint an accurate picture of what life was like for everyone in a given community, a single pollen grain will only reveal that this single pollen grain was present. Rather, pollen is looked at as part of an assemblage of other pollen, debris and alternative biomarkers. These then form an archive together which can be examined and deconstructed in order to form an understanding of the landscape which created it.

The old maps also often did not capture the taxing accessibility issues faced in person: were sites even going to be accessible to our preliminary searching. This section of the chapter hence introduces the physical and metaphorical gates which we met and passed through while on this field trip. The relationship between accessibility and searching is highly revealing of numerous themes pertinent for this thesis. While we were fortunate that Ana had prepared well, those preparations were aided by Ana and Scott's academic contacts, their identities as academics and especially Scott's local knowledge.

Academy

To recap, the search for suitable augering sites began before any of us arrived in California, and long before Ana and I came to Flagstaff. Ana had begun the search back in Montpellier by researching the area through modern and historical maps. As a staff member of an academic institution, she has access to larger databases than does the average person and is well-trained and experienced in identifying appropriate sites from map evidence, which allowed her to coordinate our trip to line-up with relevant people as we travelled. These pre-arranged meetings did not, however, always go as planned.

Our original plan was to spend three days on Catalina Island, having access to a car so that we could explore and take samples as we went along. Ultimately, we only spent one day on the island due to a disagreement about the likelihood of gaining results. Ana and Scott wanted to have a chance to look around for themselves, but the person who coordinated the visit (an archaeologist) did not think we would find anything (no workable pollen deposits). This disagreement was clearly something that bothered Scott and Ana: it derailed a lot of planning and meant we had to re-think the whole trip. There is here a question not only of *what* we were looking for, but also *how*. I am sure that the

archaeologist who thought it would not be worth our time to visit the island was not trying to hinder the search, but rather that her criteria for searching were different to ours. While we were afforded much freedom through our university affiliations, there was still some degree of area-expertise present. While we did not have an expert knowledge of the island, the archaeologist did not have an expert knowledge of the palynological practices which would tell Scott and Ana what they needed to know. This disconnect between place and practice was something which was not discovered/noticed until it was too late to give the archaeologist more information about what we needed or for her to trust that the expertise of Scott and Ana would be enough for them to make the assessments once we got to Catalina Island. However, because Ana, and especially Scott, were affiliated with universities (in Scott's case a relatively local one) we were able to gain access on shorter notices. The downside was this circumstance gave us less time on the island, which meant that we were not able to take as much time as we might have wanted to explore sites, and also meant that we were more reliant on our guide[82] (Wendy) to take us to places she thought would work.

On out first morning of the field trip we awoke in San Diego. Ana had been looking at historical maps to determine where we might find good places to auger and decided on a salt marsh in the south of the city. We went and found that the area, Kendall-Frost Mission Bay Marsh Reserve, was fenced off by University of California San Diego (UCSD). There were no opening hours listed, but a phone number to contact the university. Scott called and was able to get someone to meet us there later in the afternoon. His credentials were enough to get us access to an area which the people living across the street were not able to visit. Moreover, as we were looking for something very specific, our searching had a recognised purpose – nothing vague, nothing 'unscientific' – which I am sure helped to get

[82] Wendy was not the person who had cut the trip short, she was the one tasked with driving us around the island.

us in. The woman who gave us access made it clear that she hoped we would find something there, not only for Ana's research, but also so that she could use it talk up the case for retaining and maintaining the reserve. Having a historical significance attached to the place, one that went beyond the environmental, would add to the importance of the place and help make stronger claims and proposals for funding and projects at the site.

Personally, I struggled with my role in this visit and my place on the 'team' in general. I was there to observe and work with Scott and Ana, but, when asked by the woman who let us in to the reserve what my role was, I found myself saying that my interest lay somewhere in Science Communication. While I can certainly justify that answer, and to some extent do see this project as a way of communicating, not science exactly, but a relationship with a particular scientific practice, I am not a professional science communicator; there is a language associated with that role in which I am not fluent, and where again I find myself the amateur. I do not have the map literacy that Ana used to plan our trip, nor do I have the knowledge of paleo-palynology or the American South West which allows me to understand the landscape the way Scott does. The things that I noticed and documented were flowers and the elaborately painted shed which stood on the grounds: I am not trained to notice whether the plants growing there were indicative of anything in particular, nor how to communicate to a public audience what Scott and Ana were doing.

Thus, my own re*search* is set apart from the search Scott and Ana were engaged in on the field trip. While they were looking for pollen to find places potentially to search deeper, I was along to take note of their search and their relationships to the places and pollen. Sometimes this created a tension between being an active 'searcher', taking in what was

important about the places we visited in the manner of Ana and Scott, and having goals and ideas what I was hoping to find, with the latter rubbing against my wish to take a step back as the more passive 'noticer'. As with all of the things I write about in this chapter, it was about finding a balance, I had to be both searching and noticing at the same time in order more fully to be-with the experience. I think that wanting to engage with palynology 'beyond the books' meant that I had to find a middle ground between identifying with palynology as a science, being comfortable with the knowledge I had gained and kept gaining while in the field, and keeping my role as an outsider intact within myself, in order to notice and question things which a palynologist might take for granted, thus exploring their role in the shimmer without trying to inhabit it.

Rangers

The ease of access given to us at certain sites, relative to other users or hoping-to-be users, became almost painfully clear at the end of our trip when we went north to Tejon Ranch and Wind Wolves Nature Preserve. Tejon Ranch is closed to the public, while Wind Wolves only has certain areas available for hikers and arranged tours. We, on the other hand, were given access to both places with guides. Ana's arrangements meant that not only were we able to tour the places, but were allowed to wander, collect samples and ask questions. While I will discuss some of the physical barriers later, I think it is interesting that an institution like a university, which in many instances is not at all accessible to most people, is what allowed us into these places.

I do not think you need to be an archaeologist or palynologist to appreciate the beauty and value of these places, yet it was our affiliations with academia that allowed us in. There are

of course also the rangers, managers and other staff who take care of these places, but their access then becomes tied with a daily labour and an aspect of care and management from which we were exempt on our short visits. And these ties in turn determine what we look for when in these places, different perhaps from what would have been the case if we had been tied in these more everyday ways to the places concerned. Our search for sites with pollen remains led us to look for places that had been wet for thousands of years: that was our number one criteria, because perpetual wetness (or dryness in some cases) is what will preserve the pollen long enough for it to be analysed. Our rangers did not know where these sites were, or necessarily what their characteristics were: instead, their searches were much more personal and based on their own tied-in starting-points.

One of the things I hope came across in my methodology is that I experience and act in the world from my own body, where it has been and where it goes. This is of course unavoidably true for everyone, but its multiple implications for what can be searched and noticed have a huge bearing on everything that I am covering in this chapter, but perhaps especially in the more 'formal' *re*search entailed in Ana's Spanish Mission inquiries. A curious example of this dimension, which I noticed during our fieldwork, arose during encounters with three park rangers at Gujame Regional Park, Tejon Ranch, and Wind Wolves Preserve. The rangers all had similar jobs, but their varied backgrounds and interests were readily apparent when speaking with them for even a short time. I will outline a little about each ranger[83] here:

[83] I have changed the names of the rangers. A park ranger is someone who is hired by either public or private parks/ ranches/nature reserves, here they work in teams to manage the lands. The responsibilities of a park ranger may vary widely and include instructing the public on how to be in the parks and answering guest questions about the parks history, geography and ecology. Furthermore a park ranger is expected to work as first responders and to manage wild- and plant life. Many rangers have degrees in environmental science, biology, geology, and forestry. careerexplorer.com https://www.careerexplorer.com/careers/park-ranger/#what-are-park-rangers-like accessed 25/01/23

Richard
Gujame Regional Park, Oceanside, CA USA

Richard sat in a small white hut in the park, in a small room with a cluttered desk, surrounded by maps, folders and stacks of paper. The walls behind and around him were plastered with more maps, posters, and information sheets. He was a recent graduate student with a history degree. This came up again and again as Scott asked him about the area. Richard was able to tell us about the history of the park, who owned it when and about its relations to the nearby ranch and mission. He knew very little of the ecology of the park, however, or about the past of the landscape in the area. He was able to point us to a small museum of the ranch which used to be attached to the park, in the hope that this might hold some information. Unfortunately, it was more focused on a recent history than we were interested in.

Elliot
Tejon Ranch, Tejon Ranch, Lebec, CA USA

We met Elliot as a part of a bigger meeting with a more senior staff member at Tejon Ranch. Elliot's job was to take us around the lands and help us with access. His background was in ecology, which was clear as he was able to tell us a lot about the flora and fauna of the ranch and had a good feel of seasonality and rhythm of the place. He was also able to tell us about how the ranch is run today and the points of history that he has had to learn for his job. Elliot did not have the knowledge of the landscape's past but was eager to bring suggestions to Scott and Ana, which to some extent misunderstood what they were looking for.

Mark
Wind Wolves Preserve, Bakersfield, CA, USA

Wind Wolves Preserve is partially open to the public, which means that part of the rangers' job is to interact with the public and instruct them on keeping safe at the preserve. Mark had a background in youth work, and chose to become a ranger because he loved the outdoors and the physical work on the land. He was new to Wind Wolves Preserve and did not know very much about the history or ecology of the place, so his most important job was to take us around where we wanted to go and to open gates and fences, something I ended up doing as he drove.

I point out the differences in the three men, not to pit them against each other or say that one had more valuable information or experience than another, but rather to examine what I noticed in my interactions with them. While none of them indicated that this was something they wanted for the rest of their lives, they all came at their jobs with their own passions to the fore. *I* noticed that *they* all noticed different things about the landscapes, and that none of it was really what Scott and Ana were searching for. There was hence, underlying our ranger encounters, an interesting balance between knowing the place (*this* nature reserve) and knowing a 'subject' (history, ecology, youth work even). But perhaps this is what geography as a discipline can offer: an integration of the diverse human and non-human inter-(and intra-)actions of and between places.

I have chosen to write about the rangers in this chapter, under the subheading of 'gatekeeping', because what we notice, and what we search for as geographers or palynologists, all boils down to what gets us interested in something in the first place. For all three rangers, access to the lands they worked on was clearly something they valued, but not necessarily for the same reasons. For both Elliot and Mark, they were working on land which is not easily available to the public and therefore gain their access through their work. I think it is fair to acknowledge that it would be impossible for these men to know everything that we ideally wanted them to know, but a question might be whether we attended sufficiently to what they did know – what *they* noticed – as possible useful additions to our own stocks of knowings and noticings. They were also themselves 'gatekeepers', quite literally in certain respects, for what we would be able to search for in the places over which they held official jurisdiction.

Tensions within this gatekeeping of these particular lands extended beyond, but still included, the physical gates, the specifics of who showed them to us. The three rangers

have been trained to know the physical features of the lands, and their own varied interests help them to notice and then to point out what they notice to others. A big part of Ana's project was focused on the relations between settlers and indigenous populations. The built environment no longer reflects these peoples or their practices, and the maps Ana was able to obtain were all written and drawn by settlers, thus hinting at the problems with settler science/society and its historical treatment of indigenous peoples.

I wonder, therefore, what might have happened if we had been shown around the land by a member of the local indigenous community.[84] As such a big part of Ana's project was and is about the indigenous people of the region, it might have been a valuable thing to have some of these people present on the project. While it was helpful to visit the old Mission in San Diego, it is only one perspective on the events pertaining to land ownership, access and utilisation crucial to the history in which she is interested, and, as the previous chapter has discussed, there is an imbalance in the representation of indigenous knowledge present in what I have referred to as settler science.

Fences

While I have outlined some of the structural and mental fences that shaped our searching, I will now turn to the physical barriers we met. I should say here that I am a healthy and able-bodied person and that none of the physical work was overly draining on me, and I am immensely grateful that I was able to follow along with Scott and Ana on this field trip, certain physical demands notwithstanding. This subsection clearly fits within the remit of 'gatekeeping': firstly, as explained, there was the business of the gatekeepers we met, both intentionally and unintentionally keeping knowledge and places from us, and secondly there were the actual gates and fences which kept us out. This is not to say that the gates

[84] I do not want to imply that there is any form of 'duty' to show us around, and the question of the individual's role in educating others is a topic I pick up on in the following chapter- I acknowledge that *I* am not the right person to determine who should have access to what spaces, and that this is a very complicated topic, both in terms of its history and present.

Figure 5.26 interior gate at tejon ranch

Figure 5.27 road at tejon ranch

Figure 5.28 bog at Tejon Ranch

Figure 5.29 Scott with auger at Tejon Ranch

and their keepers do not hold value, keeping us safe, and being the holders of that knowledge was what allowed for the possibility of our search.

Some of the fences encountered were easily circumvented like the one in Mission Bay. Here Scott was able to call the University of California San Diego and arrange for us to visit and sample the Kendall-Frost Salt Marsh. Being a well-established academic figure who is affiliated with a university meant that he was trusted and the gate was 'opened' without having sought permits beforehand. Tejon Ranch and Wind Wolves Nature Preserve, were opened for us on account of more advanced planning. Indeed, the fences within and around these places were not all open to us at first glance. While we were able to go where we wanted once the proper official access channels had been negotiated, the internal fences and gates still needed physical climbing or opening. At Tejon Ranch our ranger opened gates for us and he drove in front of us, leading us along to the specific sites or sorts of locations that we had indicated we wanted to visit, indicating where to look and what places might be 'worth' the effort. This was similar in Wind Wolves, except I was the one opening the gates.

Figures 5.26-5.29 show some of our sites of inquiry at Tejon Ranch. I have included them to illustrate that this was a place where the 'gate-keeping' was held more by a structural framework of landownership than by physical gates. Instead, the fences inside the ranch were used to regulate the animals that live [85]n the ranch, ensuring to what they could gain access for pasture, water and shade (maybe varying with the seasons) and what would remain out-of-bounds to them (such as delicate or valuable plant life). Even within a space which has been secluded from the rest of the world, there are hence limits to who and what

[85] A small pig-like animal

can move around once allowed inside. Moreover, there is also the terrain to be considered. We were taken around in a truck but had to cross streams and wade in a bog to get to where we we thought it might be possible to take samples (Figures 5.28 & 5.29). Being at – or, rather, on – the ranch did not feel restricted, or like we were fenced in, but, when the ranger (Elliot) told us about the wild javelinas we saw running in the distance and about the hunting which takes place on the ranch, it reminded us that there were others (humans and non-humans) who used this place for more than research and preservation, and that it was a culturally working landscape which we had been allowed to visit. It was this working landscape which was being fenced off and fenced in.

We found a similar thing at Wind Wolves: here, however, the preserve is partially open to the public, so fencing off certain areas was in some cases also for the safety of guests. I was tasked with opening the gates that we drove through. I rode with the ranger showing us around and jumped in and out of the car, opening and closing these heavy gates, and at one point I got a small gash on one arm from a nail on one of the gates, while sore shoulders was a more general sensation. I had forgotten about the actual, bodily labour of gates and fences, this lifting and pushing, along with the nettle stings, tick and mosquito bites that were the price which our bodies paid in order to go searching for the pollen. This physicality of research was not on my mind when I started the fieldwork, partly because this is not what is written about in the typical palynological research paper. Scott and Ana know that this embodiment was part of the work, though, but largely take it for granted and not as something worth widely communicating. That said, they did warn me in advance that we would get dirty and be exhausted, and, while I had believed them, it had not occurred to me in such an acute sense before. To be sure, looking at published

Figure 5.30 roses to protect nesting terns at Ventura Beach, Ventura CA
Figure 5.31: Sign to keep off beach to protect nesting California Least Terns at Ventura Beach, Ventura CA

palynology work, this part is omitted.[86]

There are of course also naturally occurring fences to consider. When we visited Ventura Beach and went searching for McGrath Lake, we met several of them. We crossed the point where the Santa Clara River meets the Pacific Ocean: it was passable, but required some balancing of equipment and enduring of wet feet. As we moved closer, though, we met a new obstacle: birds. We could not actually see the birds, but ropes and signs had been hung around the breeding ground for the California Least Tern (see Figures 5.31, 5.32). While it would have been easy to dodge the ropes, we obviously did not and respected the birds' breeding grounds: there would otherwise be a breach of professionalism that could potentially undermine any status that our university affiliations and 'science caps' might have provided. On a more personal and dare I say 'moral' note, disturbing nesting birds is just wrong, and I do not think any of us would be happy to do so. It felt a little silly to walk more than a kilometre further just to get around the birds, but it was also the right thing to do. The next barrier that met us was poison oak.[87] There were thick bushes of it growing around the lake which we were unable to get past, and therefore we had difficulty getting a good look or any samples from the lake. The poison oak was not something that would be immediately obvious if we had prior local knowledge, but as our expectations came from maps, we were not able to force the oak, something we could possibly have known was there, although it might have changed our plans had we known what we would encounter.

Close by Ventura Beach, we found Alessandro Lagoon (Figure 5.33). While the sign

[86] Now, this is not necessarily the purpose of a palynology research paper. As I noted regarding poetry, the way information is shared and presented is how the world is made: ie. the omission of strenuous labour and muddy boots is a deliberate choice. It might take away from the findings and moreover, there is not a tradition in a more positivist leaning natural-science practice to include the self in the research in the same way as in the humanities.

[87] A shrub found throughout North America which causes an allergic reaction resulting in rashes upon skin contact.

Figure 5.32 Ana and Scott in front of the sign at Alessandro Lagoon

proclaimed that the lagoon was 'open' (an interesting concept for a lagoon), there was no open gate for us to pass through, so we tried to get a better look by going up a hill behind it where we saw a man with a fishing pole disappear through the fence. We decided to have a look for ourselves and found a way in. We would not have entered through the broken fence if it had not been for the sign which stated that the Lagoon was 'open', a statement we took to mean that we were allowed access. Even though we were forced to look for a way in that was not the gate, there was no real fear of trespassing so we climbed through the hole on the back side of the site (Figures 5.33-5.36). We were able to take samples here among the mosquitos and the reeds, neither of which made the work any easier.

In this instance, the physical fences which had been put up had already been disturbed and

Figure 5.33 and 5.34 fences surrounding Alesandro Lagoon

Figures: 5.35 and 5.36 Holes in fences at Alessandro Lagoon

thus entering was easy. Moreover, the fact that there was a welcome sign which stated that the lagoon should be 'open' made it feel less like trespassing, and more like using the back door. Our search was disrupted by the padlock on the fence, but by noticing what was happening in our surroundings, specifically the man with the fishing pole gaining access, we were able to continue our search. Here noticing and searching worked together to allow us to access the lagoon. There had been an attempt at 'keeping' these gates shut, the padlock on the fence (Figure 5.29) showing that some measures had been taken to keep the gates closed, but the holes looked like they had been there a long time.

Maps and museums

As stated, in order to know where to begin the search for potential pollen sites, Ana looked at historical maps in order to identify potential sites of interest. By comparing past and present maps, she was able to see changes in the landscapes which gave her a better idea of whether or not there would be suitable pollen present. Figures 5.38[88] and 5.39[89] bear witness to past and present configurations of Mission Bay in San Diego. **Figure 5.37** is from 1854; and comparing it to the present-day image from Google Maps (**Figure 5.38**), the shapes of what is now the Mission Bay Park and the North Island have clearly shifted, although it is evident that there has been water here since the 1850s. This is important information; it means that the areas have likely been wet since then, which gives any pollen a better chance of being in usable condition.

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[88] http://imgzoom.cdlib.org/Fullscreen.ics?ark=ark:/13030/hb338nb17g/z1&&brand=calisphere Title: [Pueblo lands of San Diego, Calif. / Henry D. Fitch]
Description: 4364 S4 Relief shown by hachures. Shows drainage, lands granted in 1769 to the Pueblo of San Diego, settlements, roads, etc. Oriented with north toward upper left.Pen-and-ink.From: U.S. District Court. California, Southern District. Land case 390 SD, page 72; land case map D-1436 (Bancroft Library). 'Exhibit A. G.J.B. attached to deposition of Santiago Arguello, July 5th, 1854, taken before Coms. ... Burrell'; **Creator/Contributor:** Fitch, Henry Delano, 1799-1849, author United States. District Court (California : Southern District). Land case. 390, Related Name Indexing Term; **Date:**
[1854]**; Contributing Institution:** UC Berkeley, Bancroft Library

[89] https://www.google.com/maps/place/Mission+Bay/@32.7492405,-117.2920136,12z/data=!4m5!3m4!1s0x80deaa76214d8b9b:0x7d7b08c967ffa67!8m2!3d32.7805494!4d-117.2426259

Figure 5.37 Map of Mission Bay, San Diego CA 1854

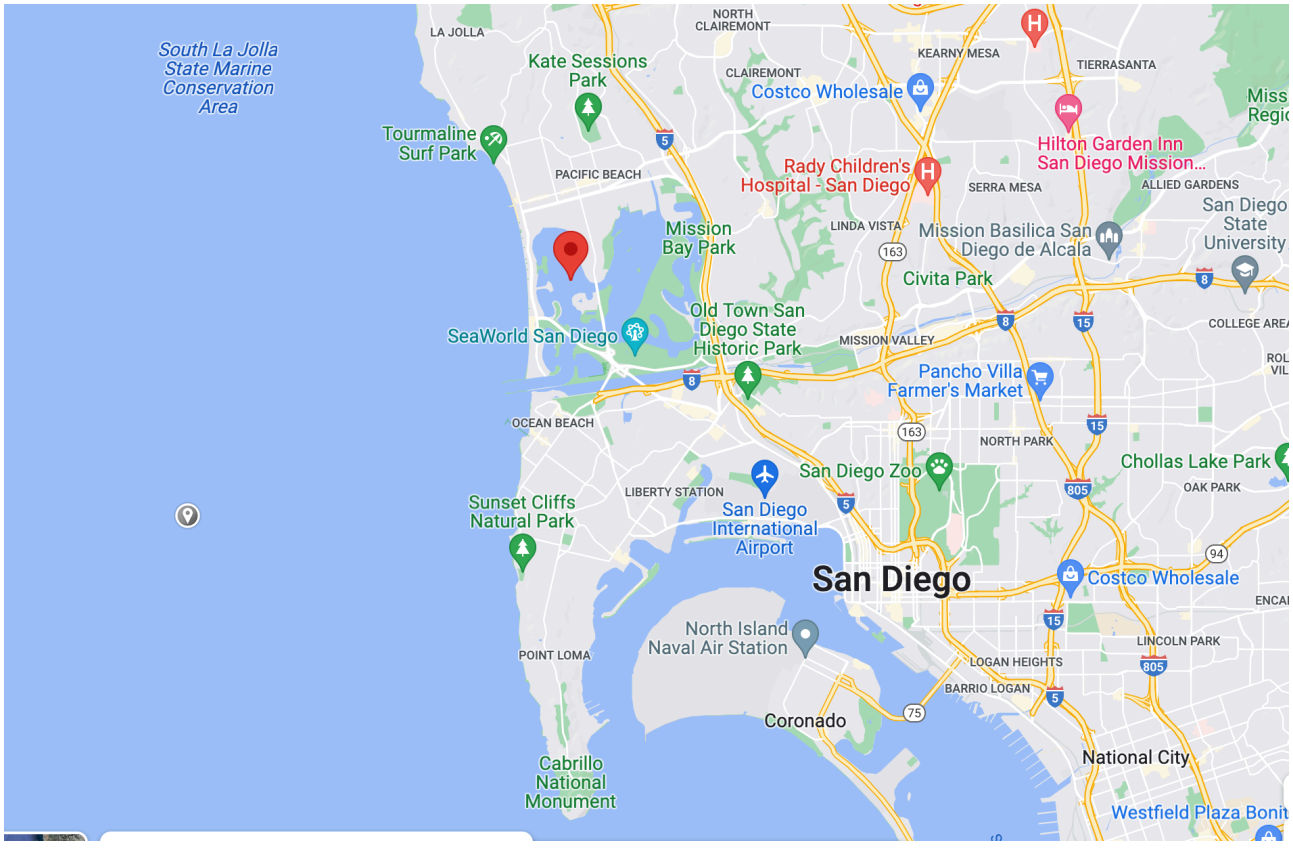

Figure 5.38 Map of Mission Bay, San Diego 2022

Moreover, once on site we were able to visit the old Mission San Luis de la Rey[90] and would have visited the museum of the San Diego Presidio if it had not been closed due to construction work taking place[91]. Visiting the old structures which 'housed' – and from which diffused – some of the power struggles and cultural formations that Ana was looking to study through pollen gives an idea of what the cultural landscapes looked like at the time and, in turn, gave an idea as to how the region's agricultural systems operated.

I do think that in a sense, which is wholly unscientific and will not make it into the final publications on this work by Ana and Scott, 'being there' also gives a sense of 'being-with'. I did not ask Ana if she was thinking of the possible pollen assemblages which would have been present at the time the mission laundry was in use, but I could not help for my own part start to think about not only the assemblages of plants in the garden, but also the assemblages of people who might have used it. In terms of the mission there is of course a large question of the colonisation and land-use practices, which changed after the missions were set up and relations to and between the local people were dramatically altered. We talked about that matter, and Ana wondered whether there had been some sort of skill exchange and to what extent the native people who became enslaved by the Spanish colonisers were part of shaping the agricultural strategies with their own knowledge of the land.

The artefacts of the buildings we visited were built testimonies to what had taken place and

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[90] This mission was set up in 1798 and is still home to Franciscan Friars. The mission houses a museum and gardens which are open to the public and provide education on the history of the Spanish Mission System and its impact, not only on the Friars' history, but also of the colonisation of the area and its displacement of the native populations. visitoceanside.org

[91] The Presidio Reál de San Diego, or Presidio, is the first permanent European structure built in what is today the State of California. Construction began in 1769 by soldiers and priests arriving from New Spain (Mexico), and was used to defend the territory against other nations wishing to establish themselves in the area. presidiosd.org

are the witnesses of these events, some of which have been documented by the maps and historical sources that Ana found. There is an imbalance, however, as the structures and artefacts which are preserved, and readily available to both the public and researchers, give little sense of the exclusionary, enslaving settler-indigenous relations that are a crucial aspect of these historical pollen landscapes. Thus, we were able to visit both religious and military structures used by Spanish colonisers, to look at their maps and records of the lands, and to engage with contemporary landscapes which have been formed by the mission system. The accessibility and the prevalence of *this* composite narrative as being a reality of how Southern California has become what it is today means that the history of what came before the Mission, and what the people native to the area experienced, is not as easy to engage with and thus may not be given the same amount of attention and appreciation. The routine noticing here, and opportunities and sources for noticing, inevitably means that much remains unnoticed, unseen, unregistered.

Another documentation of events is one that we found on our way in a few places. At Kendall-Frost Marsh, the house on the grounds held posters and documents that we were allowed to look at, and which told us about the place and its history, including maps we had not seen before which helped with an understanding of the place's past. We were pointed in the direction of an old ranch by 'Richard' at Gujame Regional Park which showed us the history of the ranch and its owners. While the maps, museums and documents are all part of our search-assemblage[92] it is clear that moving around sites forges a deeper relation and agitates – or at least holds a potential to agitate – the shimmers. I hesitate, nonetheless, to afford the same enmeshment to these experiences as I will afford to some of the tools that we worked with. These places and maps are not

[92] We learned that the park had been part of a bigger piece of property which was run by a rancher and had been managed much more intensely than Ana had originally anticipated.

extensions or enhancements of our bodies, but rather they allow us to move in a context of place and time – as situated nodes sometimes holding resources enabling pictures to be drawn beyond their immediate premises – which necessarily informs our search.

Tools

While I argued that the maps and museums were not extensions of the body or something with which I became physically enmeshed, the work in the field, lab and the tools to which I was introduced arguably entailed exactly that. There is a range from full assemblage or becoming a temporary assemblage, all the way to working with and relying on material that was directly harmful to my body and needed to be set in a strictly distanced relationship. In between lie the delegations of tasks of everyone/thing in the lab and the field[93]. I want to think about two tools that we used in field and lab, asking how their intra-actions with my body created a new version of a 'me' or a new version of the pollen we were looking for. I have added small 'epigraphs' to each tool as my way of expressing my bodily 'becoming' with them and how the pollen-world is changed through the intra-actions.

- Auger

  Putting your weight into the turn, you feel the auger move deeper into the ground. You pull back to put your weight into the next turn. The sun is mercifully hidden behind a thick layer of clouds, but the work is enough to make a sheen of sweat cover your brow. Your arms push as the blade turns and the exhale of your breath cuts an earthworm in half. When you are finished a small, inconspicuous hole gapes before you. You know it is deep, you have dug the depth yourself, and the hole now lies in bags at your feet, numbered and ready to be taken back to be processed. You sling the auger

93 This portion of of the chapter wants to think about this relationship between thing-ness that was also touched upon in chapter 2. It hopes to emphasise the relationality between my body, the tools and the pollen and their coming together to be more-than they are in isolation. Latour argues that we should begin with the *action* rather than the *actor* i.e. it s the performance of tasks which together create an assemblage, and the assemblage is the thing (Stanica 2016) .

across your shoulder and adjust your step to its swing. // There is a shift in the world around you. You have been in the same place for hundreds of years now, ever since you found a rest here, things have been mostly the same. You have shifted with the seasons, with the water saturation of the soil which holds you tight. But mostly you have laid here, getting to know the minerals and rocks, the other organic matter which, like you, refuses to break down due to the lack of oxygen. But now you are turned, swung around and up, with your friends loosening their hold around you until you are knocked loose into a plastic bag.

The auger is used to dig out soil samples. It allows for a deep but narrow chunks of soil to be dug up. Because this is so preliminary an exercise – the one that I was undertaking – it is a small one that does not take proper cores, as in coherent tubes of sediment, which means that we have to put the samples in interval-marked bags. You place the auger and turn it, letting gravity help you dig deep, although there still has to be downward force applied. The auger becomes an extension of the body as it enables the user to dig much easier, and in a more controlled fashion, than with a spade. Much bigger versions of these augers may be used to dig out full cores at a later stage, but for now we are just looking to see if there is anything there at all, pollen-wise. The auger is held in the hands and makes the user a human-auger assemblage when in use, but it is easily de-coupled. It does, however, give both human and auger a new configuration and new abilities to be put together in that way. The auger needs the human body to turn it, and the human body needs the auger to dig with the depth and precision that duly becomes possible. This assemblage allows me to search for pollen in places that would otherwise be inaccessible to me and thereby to access an awareness of the shimmer which exists beneath the grass.

The auger also disrupts an assemblage as it creates a new one. The pollen which is dug up has lain in the ground for anywhere from 10 to millions of years, and it has been part of that place/space, situated within the context in which it was deposited, until (forcefully)

disturbed by the twisting tool. As the auger removes the pollen and its immediate surroundings, it becomes part of an actively moving assemblage with the auger and the auger-pusher, before being put in a plastic bag (a new assemblage again) and enters the state of sample.[94]

- Microscope

  You momentarily forget you are not one. You acutely feel the pressure of the microscope against your face; and, while you adjust it to find the right focus, you shift uncomfortably on the chair, but, as soon as the focus locks and the pine pollen grain becomes sharp, it is all you see. You do not notice your hands finding a calm landing on the sides of the instrument, nor the voice beside you fade, you just try to listen. All there really is, is the pollen grain. You note the little sacks, there to enable the grain to fly further and hold the roundness in your mind. The moment you pull back your head, it is gone. The pollen grain only exists when the microscope and you are fused. // The light which shines from below is stronger than anything you've ever experienced. You've been stripped of everything you clung to; it was broken down and fizzed away beside you until you were left alone, floating in a solution of violence before being put on the slide and fed into the light. You are naked under the lens, the lens reflects the light back down onto you and you are exposed.

The electronic microscope enables the human eye to see the minuscule pollen grains. I found (as I always find when looking through electronic microscopes) that it completely sucked me in once I found what I was looking for. My search for the pollen grain is not only enhanced, but entirely made possible by the microscope, and thus I become part of this particular anthro-techno-pollen assemblage, but only when I look through the microscope. There are many fine tunings that must be done on the microscope – chiefly adjusting the

94 Latour in pandora's hope writes at length about this, how things shift their state as they are moved and categorised differently. For humans, the 'being' of a thing depends on their relation to human technology and human categories, it thus does not become an actant without being in relation (1999).

focus – in order to get the right picture, and it is a cooperation between my hands and the microscope that sets alive the shimmer of the pollen.

Encountering conclusions

Throughout my time spent searching I often deliberately adopted the guise of the 'wilful amateur', both because I *was* an amateur in my methods of searching and within the discipline of palynology, but also because it allowed me to hold some distance to my failures and use them as learning moments, rather than have them reflect back on to me as someone who was not 'doing it right', especially in my fieldwork (and limited lab work) with Scott and Ana. The portion of this chapter, and my work in general, which has dealt with noticing has not been as obviously amateurish to me, as it has been a less conscious endeavour which has revealed itself to me as I have worked. There is also a question of perspective here; And even Ana and Scott perhaps seem like 'amateurs' if it is contended that the focus of the search ought to be, say, more critical-historical: addressing how the pollen landscapes of southern California have been made, marked and marred by settler societies (and settler science) and their enslavements (of indigenous peoples) and extractions (of plant resources from plants both indigenous and imposed).

I have wondered about what I have noticed in my own endeavours – in my *Book of Shimmer*, in my photographs, in my recollections (poetic and otherwise) of 'being-with' Scott, Ana and many others (human and non-human) assembled in the field –realising that often that for which I was searching, the shimmer or enchantment (chapter 4), remained out-of-reach, precisely *when* I was searching for it. Instead, it more likely revealed itself, if always at the margins, when I stopped searching, then being noticed – and noticeable – in a more indirect fashion: realising that the shimmer shimmered (the

matter mattered) but only in the more inchoately felt sense of long-term inhabitation of a local life-world (my parents' garden), or in my less cognitively focussed wanderings in, through and around the various pollen landscapes of interest to Scott and Ana (leading me to muse on fences and gates, presences and absences, old exploitations and new prohibitions, diverse plants, animals, substances and sensations). As with my thoughts arising from chapter 4, the shimmer is often where you least expect it to be: not in intentional efforts at communing with small plant-and-pollen worlds, not in what was initially inspiring my photographic investigations, but more in the margins, the unbidden reflections, the accidental revisioning, always in the relations – the intra-actions – shuttling hither and thither around *everything*, the overall assemblages in play.

And then there is the strange problematic of pollen – of microscopic phenomena usually too small to be noticed, demanding exacting search work to recover them from the landscape, from the local and regional resting places, but a search work that cannot but abstract/extract them from these contexts, an active searching that, in its intensity, focus, planning and indeed abstraction or extraction, cannot but be so much more than a 'mere' noticing – a search work that perhaps inevitably cuts into the possibly shimmer-some, enchanted relations of just 'being-there'. As pollen is sought from its tiny places of repose, set to work in the big paleao-palynological project of disclosing key facts, associations and chronologies explaining the changing characters of past landscapes – the ecological and maybe human histories, in the later case maybe also differently extractive versions, of given localities and regions (potentially scaling outwards) – across lengthy time periods, so its individuality is lost; its specificity, its intimacies with particular plants and pollinators, what might be regarded as its own 'truthfulness', even perhaps its shimmer (as supposedly attends the lonesome dandelion at the door). Yet, maybe here too, regarded otherwise, maybe through the half-steps and part-understandings of the amateur, there remains

something that evades the search, something hardly noticed or noticeable, but just maybe eventually still discerned, something that shimmers almost in spite of itself.

Chapter 6: Drifting towards a rooted diaspora

This project has evolved from a wish to unfold the pollen grain and its being, as it were, to a much more substantial reflection on my own place in-between occupying the natural sciences and a wish to engage with a more creative and authentic part of myself. I believe that this in-betweenness is reflected throughout the thesis, and that this final empirical chapter will round out the sense of how my own position as a mixed-race black woman has found that the idea and the reality of pollen resonates – curiously perhaps, in unexpected ways – with an experience that encompasses mine. However, it has also made it blatantly obvious that I am indeed an amateur, a word referenced and considered more throughly in chapter 3. Engaging with the natural sciences was an amateur endeavour, as was engaging with the likes of the dandelion retreat (see chapter 4) as in effect a spiritual amateur. This chapter leans on the part of the amateur which has love or passion for their subject, and in so doing I have found the ways in which both the story of pollen and a broader story of plants relates to my own story. And this is why I believe the project as a whole works, since when I use my own body to dig up past-pollen, I cannot ignore the past of my body and how it relates to the reasons for digging up pollen.

Identity is often thought about in terms of roots and rootedness, and even being part of a diaspora is related to the ability to create new roots (DeLoughrey, 2011), but my experience of drifting and feeling rootless means that I identify with the drifting pollen and its 'hope' to create something new through connection. This chapter hence deals with the links between plants, the African-American diaspora, and 'context', meaning how relations to place are shaped by the past and by their physical expression. My fieldwork, in the United States and in Denmark, has brought new questions of where I belong, what being in relation to the spaces and land surrounding me means, and how my heritage and physicality have impacted this belonging or its absence. I have investigated the rootedness

of a specific site, the oldest tree in Denmark, Kongeegen, in Jægerspris, an area which has meant a lot to me throughout my life, which has led to reflections about being rooted not because of genetics but because of engagement and investment in place through being-with it.

Risotto and context

Throughout my life I have been asked the same question that most, if not all, people of colour living in white spaces have been asked: "Where are you from?" There are several ways to answer this question, I usually start with where I grew up, then move to where I was born, moving on to my parents every time the question is repeated or expanded, I have become weary of 'giving it all away' from the beginning though, there is some part of me that hopes the asker will realise how absurd their line of questioning is. For some people this is enough, but for some what they really want is to know why I look the way I do. Why am I black, and where does that blackness come from? One of these conversations which stands out to me, was a conversation with a 30-year old man who grew up in London. I was at a dinner party, making risotto for a group of people I did not know and he asked me the question, and our conversation roughly went something like this:

"Where are you from?"

"I'm Danish, I grew up outside of Copenhagen."

"But like, where are you *from*?"

"Well I was born in Massachusetts, in the States, but we moved when I was 2. My mom is American, my dad is Danish."

"But like where were their parents from?"

"Well my dad's parents were Danish; I think he had a Swedish grandmother. My mom's parents were from Connecticut, I think? I think her grandparents came up from South

Carolina, but I'm honestly not sure, I haven't met anyone from her side of the family."

"Oh wow." Silence. "So what I'm asking is, well there is a Nigerian woman in my family, she's married to my uncle, so like where in Africa does your family come from?"

"I don't know."

"How could you not know?"

"Well, have you ever heard of the trans-Atlantic slave trade?"

After reminding him that Europeans had literally bought people and sailed them to newly established colonies to exploit their labour, systematically erasing their identities, traditions, and languages for profit,[95] he continued to ask me how he could be a better ally, how could *he* be more inclusive to the black community, and all I could tell him was that perhaps he should do his own research. While I recognised that it was not my job to educate him, I also realised that I was unable to. The way I look, especially to white people, presents as black, and with that I often experience an expectation that I understand 'a black experience'. For this man in the risotto situation, there was even an expectation that I could and should educate him on a Black British experience as someone who had only lived in the UK for 4 years as a young adult. I more fully understand the expectation that I have an understanding of an African-American experience, but for me it becomes a sore spot: I do *not* have that experience because I have always been outside that context. I have never had peers to reflect and refract that side of me, nor have I been in an explicitly African-American environment. So while my genetic makeup suggests one thing to the world, my lived experience is another. Today there is a notion of an African Diaspora in

95 Even today we readily see the colonial legacies that have dismantled and erased countless ways of meaning-making, language, and knowledge. This older, placed 'epistemology' has instead been replaced with 'settler science (see chapter 4) and leaves the contemporary post-colonial writer to renegotiate the very language which has been created to erase all which it wished to ignore. Moreover, the violence of the actions remind us that even botany is never pure or apolitical, and that the systems of classification as well as the projects of exploration and discovery are all colonially entangled in the project of empire (Subramaniam, 2019).

which African Americans arguably play an important role.[96] Although the American part of that identity is what has been mostly important to me, it is not the part that people see: they see the coarse hair and dark skin first, and thus there is an immediate leap to an idea of 'Africa' to which I feel I have no connection. Being someone who is so obviously out of context has led to people being curious about me, my body and my identity and has at times made me feel like I am being put under a magnifying glass.

Being out of context, I have been laid bare in the same way as may be a seed or pollen grain which is put under a microscope. The desire to categorise and glean insight into my genetic history is exactly what is being done with the pollen grain from a sediment core: it is isolated, the species is determined and an examination of the host context in which it is found is used as a clue to deduce what its original context may have been.[97] This process is not as easy as it may seem! Like pollen and seeds, people move without there necessarily being a clear and logical pattern, since being forced to move or willingly moving from place and history can happen for an infinite number of reasons, personal, political, environmental, and so on. Sometimes an unexpected event changes a set course for people and for plants, and these unpredictable ways of moving are not always what was 'wanted' – as in anticipated, even required – from those who observe (Nazarea, 2005), whether pushy dinner-guest insistent on tracing 'racial' origins or palynologist with an hypothesis about pollen origins and dispersal-routes. In my own life I have found this in a refusal to believe what I have told people when they ask about my heritage. One (white) person refused to

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[96] I am tempted to ask the question when a group or an individual stop being a diaspora? Part of the definition of the diaspora includes rootedness and a relational aspect. There is a bind to a 'homeland' from which the diaspora has been spread, but there is also a notion of putting down roots in the new place rather than remaining nomadic. These roots might express themselves through assimilation or isolation and separatism (Subramaniam, 2019)). Metaphorically speaking this resonates deeply with pollen and plants in general. The putting down of roots, spreading your parts of yourself and growing in new places is a comforting comparison.

[97] Seed banks decontextualise seeds, in the same way as herbariums decontextualise plants, and pollen reference archives decontextualise pollen grains (perhaps not so immediately the cores, although they too are taken out of their physical and spatial contexts) (Chapman and Chacko, 2022).

believe I was 'mixed race' because, as he put it, "when I lived in Washington D.C. there were lots of black people and you look like them," or as a teenager speaking with a friend on the phone who once said, "but you don't *sound* black, I forget that you don't look like me[98]." Without serious probing it is impossible to discern my past, and, in a weirdly parallel fashion, it is only through educated guesses that palynologists are able to construct versions of past landscapes. They are never fully able definitively to say that something was 'a certain way' based only on looking at a pollen grain extracted from the context of one core, since consulting other historical evidence (like the maps and documents Ana found: see chapter 5) potentially aids a more diverse, if often uncertain, human understanding of what that grain experienced (where it originated and where and how it has travelled before 'settling').

Always being out of context visually has become the norm for me, so on the rare occasions when I find myself being the visual majority I actually end up feeling 'out of place' in a whole other way. I had this experience when meeting my aunt and step-grandmother for the first time in New York City in 2019; my husband and I took the subway to Brooklyn where they live and he was the only white person on the train. We both noticed, and neither of us mentioned it. For the first time in my life I was the visual norm and he stood out. And when we arrived at my step-grandmother's apartment, there, for the first time was *my* family, mostly darker than me, but their pictures and their stories were spread across the walls, an archive of a part of my family that I had never known. I saw the many 'grains' which had been spread across a context (and contexts) so different from my own, and how all of these different people had grown into a multitude of things that still held a relation to me. This was the first time that I met both of these women, and, apart from my mother announcing that she had received a letter once or twice a year, it was the first time

[98] These are examples of of me being told that I am either black or white, but without recognition that I am both.

that I really thought of my step-grandmother as part of my family. Standing in her living room, I also suddenly spotted pictures of me and my sisters. These pictures were part of the archive too: *I* was part of the archive without knowing it. While this woman and I were not blood-related, she claimed me as belonging to her context, and in her tiny kitchen eating her fishcakes I wondered what it would have been like for this indeed to be my context: for this to have been what a grandmother served, and to have gone to Denmark and to have cheese on nearly-black rye bread being something exotic. My trip to my mother's origins in New England put me into the context where I would still have stood out: I would have been the half-Danish, mixed kid, and I would perhaps have missed, even longed for, a Danish context to embrace.

As opposed to the risotto-man's expectation of my inclusion in a black experience, this would-be-grandmother had no expectations of me, she was just happy that she got to meet me because I was already part of the context of her life; her step-daughter, my mother, lived in Denmark. This fact did not make her any less related to me, or mean that we were not connected or part of each other's stories, just as it was obvious that I was welcome in her home. And that did not mean that I instantly *felt* at home, but the fact that there were no expectations of me to perform a Blackness or African-Americanness in any particular way, as I had feared would be a hinderance in our meeting – that instead there was a quiet assuredness that whatever version of myself I brought was enough – was a relief that allowed me to rest in the experience in a way that I have not experienced anywhere else. Perhaps this was exactly because I was not expected to be part of her family in the same way that her other grandchildren are expected to be, given the acknowledgement that I had not grown up in the same context and therefore could not be expected to fully be-of it.

Plant diasporas and an inkling of Eden

While my family history (as I tried to explain to risotto man) is partially white and Scandinavian, the expression of my body and my skin are African-American and most likely (and as far as I know) the result of slavery. I do not wish to insinuate that being taken as a slave to the American south (or anywhere else) is the same as the spreading of crops across the 'New World', but there is a literature which makes this point and I think it is an interesting and important one to consider.

In terms of plants specifically, there are several 'storylines' and comparisons to follow. There is the immediate extraction of plants from their original home, either to be studied 'back home' and/or used to educate and entertain, as we saw with the example of Kew Gardens or many herbariums in chapter 4,[99] which has a violent and extractionist history attached to it. The links to the people who were imported and extracted looms large here, taken from an ancestral context, a homeland and a place which has *roots*. People and plants are quite literally up-rooted, transplanted into a new soil context, a land with a history of which they so far have not been a part. That link between plants and soil can be transferred to people,[100] with relocated people being forced to grow for someone else, in a place where they do not know the seasons, the soil, and the crops being grown, meaning that there is a whole different relationship with the land on which people are growing things. Furthermore, the sensibility to see land as earth, something alive and to live-with rather than property, fenced and owned, brings a whole different lens with which to interact with that land; and seeing cultivation as food rather than profit, as the Africans

[99] This is not to say that I think Kew is doing 'evil' in the world. I have only visited once and have dreamt of going back ever since, it is beautiful, but to ignore its history is to fail to see all it is and how it and places like it have contributed to violence and imperialism.

[100] Eduardo Glissiant argues that humans are of the soil in the same way plants are, so moving them requires a new relationship to new land (Glissant, 1989; in DeLoughrey, 2011). Furthermore he argues that the violence of the plantation alienated humans from nature, rather than working with the land to provide for themselves, people were forced to work the land for capitalist gain (DeLoughrey, 2011).

who were brought to the southern United States did (DeLoughrey, 2011), meant that 'cultivating' a new sense of belonging on the land must have been nearly impossible. Furthermore, there was an idea that the dead would return to their homeland (DeLoughrey, 2011; Maddock, 2019), for who could rest in this place? Similarly, the plants that were imported and grown in the 'new world' had already been collected and examined, possibly even bred supposedly to change the plant to suit new conditions.

I like putting pollen into the equation here. While the plants themselves are rooted, their pollen will still travel[101] among the plants, and their seeds may still be carried outside of their humanly-designated spaces, beyond the plantation. As with a human diaspora, pollen and seeds are the most freely mobile parts of the plant, and it is through them that the plant species expands and is able to become something new, something that may thrive and come to belong in a new place. Today the beech tree is the national tree of Denmark, but it has only existed in the country since the retreat of the last ice age,[102] which means that it could be seen as invasive, or at least non-native, but still holds a prominent place in a human understanding of the Danish nation and its 'nature'. This idea of invasiveness is widespread and calling a plant invasive is a normally unquestioned part of a standard botanical vocabulary. While this is the case for the likes of the beech tree in Denmark and other plants which have spread due to climatic changes and environmental processes across history, pre- and post-human origins, some plants have been brought to new places by humans as an anthropogenic act. The Giant Hogweed or Japanese Knotweed, for instance, were imported to Europe from Asia because of their beauty, but today have

[101] Different plants have different 'preferences' for how to move about, or in other words, have adapted to their specific mode of pollination which may rely on compatible or even co-evolved insects or seasonal weather patterns.

[102] The tree did not become the national tree of Denmark until 1936, when the Foreign Misinistry was asked to pick one to represent the country in an Argentinian park. In a 2000 popular vote replaced the beech tree with the oak, which covers more of the country and has been important to Denmark in terms of timber production and is used as a symbol on the cover of the constitution (naturstyrelsen.dk 2023)

grown out of the control of their importers, now spreading to the detriment of the original, or at least longer-term, inhabitants of their host places. Another example of a plant species that has become iconic to a locale from which it does not originate is the tumbleweed strongly associated with the American South West. I remember driving through New Mexico and seeing the huge, dry plants blow across the desert background and thinking that this was out of an old Western film. But, like most of what I think of when I think of the United States, it is an import, something invasive. The tumbleweed was an accidental import from Russia, something which snuck onto a boat and was sailed across, and, like so many things, was not predicted to be part of 'America' (Subramaniam, 2019).

'Diaspora' comes from the Greek *diaspeiro* 'to scatter about, or to disperse around', immediately suggesting a link to plants. Indeed, the scattering of plants around the planet has created plant diasporas, and moreover the import of plants into new spaces, alongside intentional breeding and producing agrarian monocultures, can also be turned around into a story of resistance and revolution when we look at the cross-pollinations and the way some of these plants (those imported both on purpose and by accident) spread and compete with the native plants. It was said that 'The sun never sets on the British empire', but it could equally be said that 'The sun never sets on the empire of the Dandelion'.[103]

This line of thinking reminds me of a set of conversations I had with Scott and Ana about one of the Channel Islands of California. When we visited Catalina Island, we spoke about how it was used by the people who owned the land, and what the other Channel Islands were like. Scott told me of discussions about how one of the other islands, Santa Rosa Island, was to be 'reverted' to its 'native' state, suggesting a massive effort to remove all

[103]Crosby, (1986) Ecological Imperialism, 7: Subramaniam (2019).

non-native and invasive species from the islands, including pet cats, which was causing quite the debate. Scott was in favour of this course of action. There was an argument for this being a form of decolonisation and hence an honouring of the place to let it be what it had been before European intervention.[104] Ana, on the other hand, thought it was more complicated than that. By removing everything that had come to the island, she felt there was an erasure of the island's overall history. The things that had been introduced to the island, whether on purpose or by accident, all comprised what the island is today, as a product of all that it has been. Not acknowledging this history also puts the inhabitants of the island into question, human, animal and plant, and I think there was a fear that 'sweeping history under the rug' – through some attempt to recreate a primal, supposedly pure state – also means that those who have made the island their home will be swept away as well.

I wondered later if this was an American *vs*. European take on the situation. The vision of the 'New World', that there is an 'Eden', that there is still something untouched and unsullied, and that there is a new start, *vs*. a tradition that is so old, that the cities stretch back further than our minds can really comprehend, that the 'Old Country' rooted-ness means that the diaspora must take something of itself when it roots somewhere new, and where the thought of 'throwing out' things that are still of service or tradition is not as natural. There is an argument to be made that the invasive/non-native species that willingly and unwillingly have been introduced by humans are a form of violence, their competition with native species, especially the potential for them to out-compete these natives, another version of martial dispossession. I found it very interesting that Scott and

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[104] Interestingly, this idea of conservation can arguably be called colonial as it is thinking of restoring land to the idea of 'Eden' or what was perfect when first encountered by the 'explorer', a notion that leans on the idea of a 'perfect' wilderness which never existed and denies the constant changes which happen with and without human intervention (Subramaniam, 2019).

Ana took such different, almost opposing views on how to repair and deal with this violence.

Tracing bloodlines and making kin

I am, not only African-American. My father is Danish, and looks it. I have inherited his cheekbones, but none of his very stereotypically Scandinavian colouring, but I speak his language and have grown up in his country. To all intents and purposes I am Danish even if it is not the first impression people have when they see me. My husband is also Danish, and an amateur genealogist who can trace his family history back many generations and to very specific locales within Denmark, and in some cases beyond. The most popular image when thinking about genealogy is the 'family tree', rooted in the soil of the mother/ fatherland, anchored in history and soil. The literal rootedness of this image alludes to a deeper connection with the past, and initially genealogy was used (and for some still is) to determine pedigree, property, and inheritance, and to confirm – to prove scientifically, in terms of what is supposedly 'natural' and hence 'right' – a belonging to a specific family or region. This is not necessarily the case any longer as genealogical practices seeking to engage with the hidden histories of women, the working class, and those who generally have been marginalised throughout history (Nash, 2004) can attest. The advent of at-home genetic testing, which has entered the spaces of genealogy, creates an interesting interface between the intimate and personal, as well as a techno-scientific interface that has allowed for a shift in understanding of how genetic make-up can shape identity. I would like to think with two different versions of what this shift can look like, first on a human level, and then shifting into a broader, more-than-human notion of kinship.

Focusing on genetics encourages a focus on 'blood', on the role that genes play in

relationships, both those known and unknown to the bearer of those genes. I firstly want to focus on how that limits the connections one is able to make on the basis of those bonds, and secondly to think with the expansion of possible connections that can be made because of them. If genealogists limit themselves to thinking only about the closest blood relatives, a new focus can be found: do I have a long-lost cousin or is my aunt really my aunt genetically? Knowing these things can be helpful to determine genetic health risks and track the risks of future children developing genetic disorders, and it would also give someone like me (i.e. someone who does not look like they 'belong' because of their expressed phenotype) proof that I am indeed part of a group or family because my genetics say so.[105] There are however, also dangers with focusing solely on blood from the perspective of finding a sense of belonging. One danger is becoming obsessed over single bloodlines, like the people who follow the Y chromosome to give them a sense of brotherhood,[106] being able to determine a male pattern of origin which ends up erasing the fact that everyone has two sets of genes which mix to create a new person (Nash, 2004, p.7). Moreover, the obsession with blood relationships ultimately excludes a whole host of people who have served as meaningful kin in our ancestors' lives (e.g. step-parents and siblings, neighbours, and adopted relatives) -and here I think of my step-grandmother – but the idea of connecting with genetics also opens up the possibility of expanding the diaspora.

As I noted earlier, the term 'diaspora' means spreading or scattering. In the case of people, this dispersal across the globe challenges the notions of authentically belonging to any one place. The diaspora *belongs* both to where it has 'come from' but also to where it is now. A

[105] The phenotype is the part of the genetic code (DNA) which is expressed, e.g. brown eyes, whereas the genotype is the part of the code which can be passed on but is not visible in an organisms physique. Because my father has passed on the blue-eyed gene to me I could in theory have blue eyed children even though my eyes are brown.

[106] The most common carriers of the Y chromosome are those who are determined male at birth which means that this chromosome can be used to trace very specific male bloodlines.

diaspora is necessarily rooted rather than nomadic (Subramaniam, 2019), which means that there is a belonging to a new place that defies the logic of nationhood and citizenship because the identity of the diaspora is tied up in multiple locales and traditions. The question of who belongs to a diaspora can be understood through genetics. Wanting to be rooted in a longer tradition is something Catherine Nash (2004) notes among white communities in English-speaking countries like the United States, Canada, Australia and New Zealand. Here she sees a practice of self-making by wanting to be part of something older than the very young nations these people *do* identify as being part of. Anecdotally, I met two different people who claimed Scottish heritage (although neither of them were able to to pronounce correctly the place-names to which they were attached), and I do understand a desire to know *where* one's family comes from. I would love to know what parts of Western Africa my ancestors come from, not so much in order to explain it to the likes of risotto-man, but rather to explore what might be passed down to me. I would argue that many things have of course been passed down.

I also want to think beyond blood and genetics. I asked my husband how invested he was in direct bloodlines when 'doing' genealogy and he told me that, while this had originally been important to him, he was now at a place where it did not matter very much. He said that there was always a chance that people had children out of wedlock, and it thus was impossible to be certain who was *really* related to who. Moreover, he finds not relations but relation*ships* (who someone *considers* to be their parents, who they end up marrying or feuding with) to be much more interesting because these are the things that have almost always really made-up their lives. This points to genealogy being a guessing game in much the same way that palynology is. There is only so much information that can be obtained from archives, and that information is always out of the context in which it was created. Whether that be church records of baptisms or pollen grains in a core, there is never any

single piece of information that can give a full picture of the moment in which it – a singular piece of information, a birth-date, a particular grain – was archived. This means that the genealogist and the palynologist must become creative in one way or another, and become attuned to their relationship with the archived.

Kongeegen and rock and pollen witnessing

Figure 6.1: drawing of Kongeegen by Louis Gurlitt, 1839

I have previously noted the rootedness of the family tree; the idea that being rooted means a sense of belonging to a place, where the symbol of the tree might even be more interesting than the actual tree on that account. In this part of the chapter, I want to think with a specific tree, Kongeegen (The King Oak). Kongeegen (see figure 6.1) is located in Jægerspris Nordskov, (Lejbach and Blendstrup, 2017) and it is supposedly the oldest living tree in Denmark, aged somewhere 1500-2000 years old, possibly even the oldest oak tree in northern Europe. It was believed to be dead for a number of years, but began to put out

new shoots and is currently alive. I am attracted to the idea of wanting to 'make kin' with non-humans and to learn from someone – a non-human 'person' – whose mode of being is so different to mine[107]. As I described in the previous chapter (chapter 5), I tried both to search and to notice, and in many ways what I ended up doing was witnessing. Thinking with the mode of being that Kongeegen lives in, it is very much as a witness. Its relative immobility means that it is fixed to belong to one place, and in many ways is forced to bear witness to the things which happen around it; and, especially in the case of a being so 'old', Kongeegen gets to witness things that happen on many different temporal planes. A story I have read in several different places is that King Frederik VII of Denmark (1848- 1863) was on a ride with his wife and they were caught in a rainstorm. They took refuge in the hollow of Kongeegen, which at this point was already so large that they could comfortably ride their two horses inside to seek shelter.[108] This was course a very human moment which is why it is written about, a good story, but it is not necessarily the kind of witnessing that I wish to be inspired by, and rather I look to the very broad temporal span that the tree witnesses. Not only does the tree witness big events like climate change, and the change of its surroundings from marshland to deciduous forest, through to seasonal events like changes in snowfall year by year and the annual pollen release, and even further to the micro organisms that live in the oak itself, intimately experiencing the breakdown of its body while simultaneously creating new life through new acorns which might fall around it.

While I want to be-with, grow-with, drift-with the more-than-human, the conditions that I,

[107] An attempt at this 'kin-making' was done on my dandelion retreat, but as shown in chapter 4, the ways in which it was conducted was not something I responded well to. The acknowledgement that a non-human can indeed also be a person is nothing new, though it has routinely been excluded from western narratives, many indigenous peoples have ontologies which support this notion (Degnen 2018).

[108] The forest belongs to the nearby castle of Jægerspris which was gifted to the king's mistress and is still run as an orphanage in her name (Albeck-Larsen, 1959).

and many other people, live under are not ideal, and certainly not inviting this type of kin-making. Earlier I have alluded to my own heritage as being bound up in plantations, and what being forced to live as a slave on one of those plantations might have meant for the connection, not only to the becoming of a diaspora and the home that had been left, but also to the new connection to the foreign land. While this life in no way compares to mine today, I want to stay-with the idea of the plantation as creating land-alienation. The term 'Plantationocene' refers to the way in which the operations of colonial exploitative appropriation of land to suit export-oriented agriculture, dependent on forced labour (Wolford 2021). The process removes native plants, animals, and peoples[109] and thus does not give the people expected to work in and on those lands the opportunity to connect with that land, where they are forced to live and leads to further alienation and inability to make new kin in new spaces (Davis et al. 2019).

Making 'kin' is not necessarily only about human/non-human relationships, but to an extent is the creation of an assemblage. The bigger 'we' are able to imagine that assemblage, the more room 'we' can create for shimmer to take place, and the more kin can be included. The shimmer will of course shimmer regardless, but perhaps a widening awareness of the shimmer can create a place for humans to become more attuned to the meanings of the intra-actions which we have with non-humans. Haraway's notion of the odd-kin embraces this notion that humans can - and should - form kinships with the more-than-human, and that these kinships may be a way to reduce the alienation we are faced with in the plantationocene (Haraway 2015). I want to be inspired by this steady witnessing, moreover, I also want to be inspired by the more active process of pollination. Being able to spread part of one's self, while still maintaining a full self, is admirable. Much

[109] Microorganisms of course remain in the soil, and native species will try to re-establish themselves, but engaging with microorganisms is not always immediately accessible.

of the forest surrounding Kongeegen is only one of many oak trees in the area and there will have been a great deal of cross-pollination between the different oaks in the forest, which creates bonds into the acorns which fall and produce new life.

Another important aspect of thinking about Kongeegen (or any other single organism[110]), which I think ties in the importance of the physical and temporally current body, is indeed its complex amalgam of singularity and multiplicity. Ginn (2010, p.132) notes:

> The oak tree is both one subject with an *Umwelt*[111] and also an object in many other creatures' *Umwelten*. Each of these *Umwelten* 'cuts out of the oak a certain piece'. While this could be chaotic, it actually coheres in the oak, a subject that is solidly put together in itself, which carries and shelters all environments [*Umwelten*]—one which is never known by all the subjects of these environments and never knowable for them.

Just as I experience and influence the world (or *Umwelt*) around me and am being influenced by the intra-actions of those worlds meeting, there are the visceral and immediate connections which shimmer at these meetings. While the past informs and to a large extent shapes the present shimmers of the oak and how it is present in its/the world today, the contemporary and immediate unfolding of events will also impact the future of the tree. Mirroring my own self, body, and their temporalities in Kongeegen, is a reminder to be in the present and to be aware and notice the meetings between these worlds, not

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[110] It might be debated whether or not anything really is a single organism, as I touch on in chapter 2, as all life is intertwined. Humans for instance rely on out gut bacteria to be alive, yet we still refer to a person as a single organism even though we each have billions of micro-organisms keeping us a live.

[111] The *Umwelten* is referred to in chapter 3, and refers to a sphere or 'surrounding world' of a creature, in this case an oak tree. There's is also an interesting thought on whether the object of the tree becomes an extension of those to whom it is an object, and to what extent it is the interaction between 'subject' and object that makes an umwelt (Ingold 1990). As I see it, this is a deepening of the argument that there is a shimmering in assemblage which constantly creates a process or flux, making and unmaking the shimmer.

only their pasts.

Drifting from an oak to palynology, the latter is in effect a digging up of graves rather than an engagement with what is alive and easily accessible to the human senses. It is acknowledged as part of archaeology; and here, in the case of Ana's project, we see the past landscapes and, if we pay attention to them, the hauntings of what those landscapes mean.While Ana's project is looking for what the pollen can tell us about past human life, I think it is also interesting to look at what we can see when we stay with the material and do not try to connect it to the human. This experiment also allows for a longer view to be taken. Figures 6.2 and 6.3 are taken in Kent, Ohio on the Kent State campus.

I really liked the installation for two reasons: firstly, it awarded the stones agency by taking seriously their witnessing of the past. I know stones do not have eyes, and I presume that they have no way of recording what they witness in a way a human does, and has no brain to store memories in, however it does record in its own way, through its composition, markings, fractures etc. it tells the story of where it has been. Their presence and their belonging to the place is not dictated by their ability to speak in human expressions about their claim to belonging, but there is in this piece an appreciation for their belonging to the place. This claim, I suppose, maps onto the pollen which is still present in the ground underneath the installation, even if it has not been dug up and displayed[112]. The sculpturing of the stone, the sculptor writes, is to prepare the stones for their future witnessing, an indication that we sometimes need to story the non-human, or re-orientate our attention in a way that makes 'us' stop and really notice. The stone, like the pollen,

[112] The ground under the installations is part of a Kent University campus and has therefore been landscaped and 'dug up', probably on more than one occasion. What I mean here, is to say that it has not been treated as a palynological or geological research site, presented in the way this art installation has.

Figure 6.2 ‘The Witness’ Ginacarlo Calicchia 2010
Figure 6.3 Sign at ‘The Witness’ installation at Kent State campus from 2010 by Giancarlo Calicchia. The plaque lists the names of the sculptures and the text: these pieces of glacial granite have been part of the soul of Ohio. For millions of years they have been silent witnesses to the making of this part of the world. My purpose as a sculptor has been to shape, form and prepare them for millenniums of witnessing openly and freely…

however, will likely outlive humans in this places and continue to carry a witness and perhaps awareness which far exceeds human temporalities. The rocks are from the last ice age[113] and thus pre-date the 'historic' period by a long shot. This also speaks to a history that does not involve humans and allows for the rocks' own story and timeline to be significant.

A very different engagement with rocks and their solidity is offered by Dutch artist Bart Eysink Smeets, who took a boulder 'home'. The boulder has been determined to originate in Finland and has been in the Netherlands since the last ice age, circa 200,000 years ago.[114] Similarly, to the Kent example, I like how there is a notion that this boulder's history goes beyond the human and that there is agency in the rock itself, although I am hesitant about this notion. It reminds me of the discussion that Ana and Scott had about the Channel Islands: do we, humans, erase some history by moving this stone? Are we, by assigning anthropomorphic emotions to a boulder, presuming that the boulder does not belong just because it came from somewhere else? Is it not possible to be part of a new story, a glacial diaspora?

The project for which Ana was searching for suitable pollen landscapes to *re*search more fully was in many ways a project concerning the colonial violence towards both humans and land. The foundation of the project is very similar to previous work, also in California,[115] focused on the colonial settlements and their interactions with the native peoples and vegetation. I wonder if the violence here is perhaps too deep, too pervasive,

[113]Geosurvey Ohio https://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/Education/el07.pdf).

[114]https://northerntimes.nl/homesick-boulder-returned-to-finland-after-200000-years-in-drenthe/ and https://barteysinksmeets.wixsite.com/mysite/copy-of-de-steen-die-terug-naar-hui-1.

[115] See chapter 3 for more details on Ana and her previous work in this field.

ever to erase but rather will only be masked by 'rehabilitating' the place in some manner. I think that the earth, the land, will 'remember' the violence just as the body and the genes that it passes on can remember. It stores it, in plant material, ashes, diatoms plastic tags, and of course in pollen. Arguably, the pollen in some world regions holds a record of human abuses against others, human, animal and plant – of what plants were cultivated and allowed to wither and die, were introduced or evicted, and of what forms of human labour were enlisted to enable cultivation to occur, on what scale, for how long – than can ever be true of the local stone piles. The archive written about human violence of Santa Rosa will not be erased by reintroducing native species, but that does not mean such a reintroduction is not a way to (try to) make amends.

In her 2019 Masters thesis Hanna Bates uses the title *I thought the earth remembered me* and sets out to think about how we (humans) live on and see beauty in a damaged planet, a profound question also asked in *Arts of Living on a Damaged Planet* by Anna Tsing *et al* (2017). I too think the Earth remembers, although whether it remembers 'me' specifically is perhaps another matter, as I will consider further in a moment. Bates indicates that we (humans) are changing the earth in such a fundamental way through a longing to be remembered, in contrast to plants. She picks out mushrooms in particular as ephemeral, noting how they 'do their job' and disappear. This 'job' is what I think of when I previously mentioned the melding of *umwelt* and the intra-actions that ignite a shimmer between matter. I would argue, however, that noticing the shimmers we create is perhaps something that we as humans do not spend much time thinking about, but would absolutely notice if they stopped. Thus, fungus leaves a mark in the system albeit not being a tangible one. Her discussions on plant life, how it is always in process, maybe lacks a deep time perspective with its focus on the ephemeral, but I think that attending to pollen

– or a very ancient Danish oak tree – might be able, at least in part, to rectify such a temporal truncation.

Pollen is layered in the earth as a tangible memory, one which humans can read, though this availability to be read is of course not necessary for it to be there. Its multiple entanglements with other matter (rocks, plant material, ash) are abundant and in effect archived. If we think about the pollen for which Ana is looking, there is *more* than a memory in the pollen record, perhaps because of that violent human past mentioned earlier: perhaps because we need to be reminded; perhaps because there is a haunting. While Bates borrows her title from a beautiful Mary Oliver poem 'Sleeping in the forest', which in itself holds the idea of a shimmering assemblage:

I thought the earth remembered me,
she took me back so tenderly,
arranging her dark skirts, her pockets
full of lichens and seeds.
I slept as never before, a stone on the river bed,
nothing between me and the white fire of the stars
but my thoughts, and they floated light as moths
among the branches of the perfect trees.
All night I heard the small kingdoms
breathing around me, the insects,
and the birds who do their work in the darkness.
All night I rose and fell, as if in water,
grappling with a luminous doom. By morning
I had vanished at least a dozen times
into something better
(Oliver, 1978[116])

[116] http://www.famouspoetsandpoems.com/poets/mary_oliver/poems/15814

By allowing themself to be 'taken back', the narrator becomes part of 'earth', inhabiting a stone, moths, and experiencing 'becoming something better'. Taking the phrase alone 'I thought the Earth remembered me' begs me to flip it, because it was never the earth that forgot, it was us. Bates notes this point herself, and framing the flip of the words makes me attuned to these hauntings, the presence of the past stories, and the realities which lies beneath our feet every day. It is not important that the earth remembers me as an individual, but that I remember the shimmering assemblage that is the earth, and that I am part of.

Conclusion

This chapter has roamed across both time and place, but hopefully also been able to bring the importance of the minute into focus. While the pollen grain itself has not been the main concern, I have attempted to draw parallels between the grain, its genetic identity and its relationality to what it encounters, to my body and the parts of it and my heritage which make up my identity. The main point that I want to put across in this regard is thinking about pollen as something which is part of a larger story of both its origin plant and landscape in the same way as how I present myself and interact with the world becomes part of the story of my body/identity and how it is part of a larger narrative of human activity.

The ability to imagine the kinship and the shimmers which have existed when the records were taken is vital to make meaning of the information and to let it speak into a contemporary shimmer and story that impacts the ways in which we (a broader human and non-human 'we') understand the here and now. I hope that my thesis reflects this comfort and necessity for imagination by embracing a balance of 'knowing' in a traditional

Western science perspective, but also of experimenting through poetry and personal reflections on experiences. In the closing chapter of Donna Haraway's *Staying with the Trouble, Making Kin the the Chtulucene* (Haraway, 2016), Haraway engages in a piece of speculative fiction titled 'The Camille Stories, Children of the Compost', which is an imagining of the future rather than of the past, dealing with different future generations and their relationship with Monarch Butterflies and the changing meaning of being human. I believe that there is an importance in imagining the past, being curious about its intricacies as well as its problems, just as I believe that imagining makes possible multiple versions of what the future can be if we make room for it. One way to make such room for new possible futures is to rethink our present. Both looking back in time to what has come before and looking forward to what a possible future might look like spark a question of whose pasts and futures we are looking at (and are concerned about). I propose that the repertoire is expanded to include more-than-humans because a human-centred-species-specific-kinship cuts the human experience off from connecting with the myriad of life all around. Creating bonds with the more-than-human, and allowing a sense of their importance to match our own, creates whole new possibilities of how to relate to the life that 'we' share with and on the earth. I have a hard time seeing myself in the rootedness of the tree and the diaspora: I do not feel like a seed, full of potential to make myself into a tree because I already contain all I need to do so, but rather I feel like pollen. My identity has not been quite made-up, I have not yet found what will unlock and ground me, and I have come to terms with the fact that my drift through life might end up being no more than a witness to what I have experienced, and that I will not be more than part-of the shimmer I find myself in.

Chapter 7: An instructive failure to germinate

Clearly, my thesis has drifted and meandered, perhaps a little like pollen dispersing on the winds, into a shape that I had not foreseen at its outset. This concluding chapter hopes to capture how this meandering has come about practically, but also to reflect on how that drift has informed my practice and my understanding of not only pollen and palynology, but also the roles that body and identity play in how science and art is practised. Moreover, this conclusion holds space for the feelings of inadequacy and failures that I experienced in terms of the research planning and execution, but also the disappointments of not being able to produce the thesis that I had initially envisioned. That said, these disappointments have arguably led to a curiosity, and later on an understanding, about the fleeting nature of enchantment and the impossibilities of forcing it to shimmer. It has illustrated that shimmering – for me at least – is tied more to the mundanity of the everyday in-between moments of being-with and being engaged, rather than with some supposedly 'magical' moments of revelation and to take seriously the embodied and immediate tasks of 'science' rather than striving for enchantment in the orchestrated search for magic (like at the Plant Initiation Ceremony). Lastly, my conclusion reflects on the place of my research as part of an exploration into how to be and work with plants, a more-than-human which has not received as much attention as the animals and critters with whom we, humans, share space.

After earlier in the thesis introducing and placing myself in a academic context, using my literature review to explore a set of relational and process-orientated concepts and writings, including a consideration of historical and current plant geographies, I also gave room to some of the practicalities of pollen, its plants and the study of its past (palynology) in order to aid in the understanding of the rest of the thesis. After this opening, I offered an overview of my methods and how I see myself as an 'amateur' in my work, with the role of

the amateur being one that is open to both failure and enchantment from unforeseen sources. I acknowledge my amateur status as both scientist and, as it were, artist – as both the participant in scientific field or laboratory work and the person attempting creative ways to re-present, in words and images, my research inquiries – and even perhaps too as the geographer who seeks to put these disparate things together. In that latter respect, of course, I do have my 'professional' training as a geographer, from undergraduate through to postgraduate level, in which case how I have finally undertaken this project – and sought to write it through – does reflect a certain kind of geographical sensibility and familiarity with particular (disciplinary) debates and speculations.

My first empirical chapter dealt with the ways in which I have internalised a division between the concepts of science and the arts/humanities, possibly to a detrimental extent. However, through looking at the history of settler science practices, particularly as they pertain to plants, and then experiencing an alternative – and what I expected to be a spiritual – engagement with plants, I was able to shift my understanding of what diverse practices and knowledges mean for the shimmering assemblages of which plants are a part. My expectations of what would and would not enchant me were challenged, and ultimately led to a decisive shift in my understanding of how enchantment works: not as a magic spell, but as the project of constant engagement and presence.

My second empirical chapter made me even more aware of my amateur status as I found myself in the field, encouraging further reflections on my role as a researcher. Being in the field, specifically searching for matter led to further investigations – and drawing distinctions – between the active, direct *search* and what I was able, in a less structured manner, to *notice* when I tried to stay stationary and not let my own desire for a specific outcome drive my noticing. This mixed approach allowed for my amateurness to work in

my favour, and gave space for unexpected encounters, including with my own noticing of flowering plants in photographs, and for gathering a much better understanding, not so much of what *palynology* as a science or practice is about, but in appreciation for why people do it.

In my final empirical chapter I chose to focus my attention inward, while staying with both the embodied and temporal. Connecting the themes of settler colonialism explored in the margins of the first and second empirical chapters, and showing how they still show up in a modern context, I was able to tie together a settler past – initially addressed in considerations around the herbarium and the *doing* of palynological searching – with my own entanglements in a colonial legacy as an African-American woman. Moreover, it allowed me to think about the temporal and seasonal life of plants, and their pollen, as a way of connecting to and embracing a wider planetary awareness. The drifts of dispersing pollen and those of enslaved and other migratory peoples under colonialism (and its heirs) started to seem curiously entwined: the dislocations from original homes and the 'plantation' into new surroundings – sometimes fertile and nurturing, oftentimes not – began to appear as oddly equated in ways that I had not foreseen at the outset of my thesis. Questions of time and space, of movement and stasis, of the short-term and the epically long-term suddenly seemed to resonate against one another through my cultural pollen studies.

The thesis was not always planned to follow that specific structure. Once I had set my eyes on palynology as a central component of my thesis and began to think about science and art as two opposing 'forces' to engage, I fully expected to be enchanted and engaged with one, the artistic, and to reject the other, the scientific, for its lack of magic. I was, however, completely bamboozled and surprised to find, that not only *was* I enchanted by the magic

of palynology, but furthermore, where I had expected the more arts/experimental/spiritual portion of the research to enchant and entice me, I was let down. The enchantment instead came precisely in the mixing of the two, acknowledging that the scientific knowledge *and* the experimental *together* have been what create the shimmering enchantment for me. Indeed, to my surprise, encountering that shimmer also forced me to reflect on my own place in it, both in terms of my knowledge about what was in front of me and how to be-with it, but, even more so, my place in the temporalities of myself and my heritage as a parallel to pollen, and even more so the temporalities of my identity which, much like many plants, has been repeatedly moved, collected and classified by others. While my thesis began as a defiantly *more*-that-human geographical inquiry, almost wishing to suspend the human in accessing secret worlds and landscapes of the non-human, here pollen and its plants, it ended up actually being undeniably tied to the human. The amateur and multiply-positioned 'I' ended up making much more of an appearance, and mattering to my broad findings and conclusions, far more than I had ever anticipated.

Initially, I also thought (and in some ways feared) that the thesis would be more 'science heavy' and saw a structure of 'theory - field - lab' for my empirical chapters as sensible and logical. This structure, moreover, adhered to traditional and easy to relate to/imagine spaces that could then be subverted by alternative and experimental methods, challenging the ideas of what those spaces could be and do. There was also a notion that the role of science communicator would actually fit this space: I was hoping to bring together the two and somehow use the more experimental and (planned) artistic practices to illustrate the science that I encountered in a fashion that was more understandable and accessible to those who looked at me blankly when I mentioned the word 'palynology'.

Not being able to complete the final stage of my planned fieldwork (working with Ana in her lab in Montpelier) due to Covid-19 meant that I was unable to complete my third empirical chapter how I had planned, which forced me to reflect on how to proceed differently. Instead of looking through a microscope, I ended up looking in a mirror and found that an extension of my embodied engagement with fieldwork *was* my own identity, not only as an amateur, but also as an African-American woman with various temporally shimmering entanglements, in much the same way as is true of pollen. Therefore, looking at my place in the world, *and* in the research, became a way to connect beyond the scientific and to re-set my own understanding of what art is or can be. Even before realising that I would not be able to produce the thesis first envisioned, I was confronted with the feeling of failure and forced to come to terms with what happened when my fieldwork did not measure up to my expectations. A coping mechanism to make these feelings of failure relevant and even appropriate was to take on the hat of the amateur in order to rest and be content in any insecurities that may come with not being an expert; specifically, to accept the stance of being so dependent on others in order to explore the subjects that I was wanting to understand.

There is also a general sense of failure on a more personal note. For me, Covid-19 coincided with my first pregnancy and a big move – of home and life-path – which led me to take a break for my maternity leave; and now I have been working to finish my thesis before I have my second child. While these changes have given me new insights and perspectives, it has also brought unforeseen pressures and forced me to take breaks that I had not planned. Moreover, being removed from the physical in-person community to which I had access while living in Glasgow has impacted the motivations and vision for the thesis. I had planned the final empirical chapter (chapter 6) not only to focus on the lab but for its format to be more 'creative', with at least part of the chapter written as 'comic' or

graphic novella. Here, being an amateur felt exciting and challenging in a way that (in many ways like my attitude before the Dandelion Retreat) made me feel that I could tell the story of plants, and pollen science specifically, in a more experimental and creative way, thus somehow showing that it was possible to move beyond the scientific journals in order to say something significant about science. I had intended to carry forward this way of writing the chapter into its new content, but, with a deadline approaching much quicker than I had originally anticipated, I panicked and ended up *just* writing the chapter. I think that with a less pressured write-up, I would have had a better scope to implement some of the more experimental formats that I had imagined, but nonetheless ultimately I hope that the thesis as a whole still holds those intentions and that they shine through in smaller (shimmering) glimmers.

This thesis has become my own way of understanding a shimmer and my place in it. I recognise that is is not a piece of work to change the 'status quo' or synthesise completely new and novel theories, but I hope that it can contribute to the ways in which we, as geographers, may re-think our relationship to plants and our work with them. Through the explorations of my own embodied and temporal connections to pollen prompted by engagements with palynology and encounters with plants, I trust that this thesis is an invitation to notice and search for not only the minute details of pollen bodies and relations, but to do so in being engaged with, and enchanted by, the larger shimmer that we all share. I believe that there is room in this shimmer for a greater temporal and planetary awareness to be nurtured, and, while my thesis may not be a universal call to action, it may add in small measure to the conversation. This confirmation that my story, and my place in the world, indeed shimmers in ways that I had not expected from the outset has opened me up to the possibility that there is room for these reflections beyond myself. Furthermore, I see my work as a contribution to the field of what might be termed

'new plant geographies[117]' or 'vegetal geographies (Barua, 2023; Lawrence, 2022)', perhaps even a wider plant humanities, by introducing shimmer. Plant humanities are a growing field which focus on interdisciplinary research, and holds space for experimentation and innovation (Driver, Cornish and Nesbitt, 2022). While enchantment has already found a place within the more-than-human (Rudbow, 2022) (and thus in plant humanities to some extent), I feel that shimmer, and its ability to hold in view plant life and its constant temporal flux, is an important and helpful concept as it opens the possibility to embrace the many facets that plant humanities potentially encompass.

What has become clear while writing this very personal thesis, however, is that it is not enough on its own. While it may not have been easy, it would have been possible to tell the story of this thesis without the uncertainty and doubt, and to minimise the sense of failure and disenchantment that I felt throughout my research. However, I believe it is important that these things are not only included, but often take centre stage, as this is indeed exactly what happened. I have often been intimidated by how put together and present my work and in so doing to recount the intentions behind it. However, the experimental processes and methods with which I have worked have shown me that there is room for experiment and failure in geography. My 'try-it-out' methods also allow for my amateur sensibilities to be realised and for research to search for the predefined and to permit the unexpected to be noticed and included.

I hope my efforts here can speak with, and add to, the body of literature that concerns itself with a wider planetary ecology. It is not enough to be enchanted for something to change or even just for real care to be given (Rudbow 2022); for, however moving I have found it to write and however enchanting it may be to a reader, it is a small drop in a big

[117] The term 'new plant geographies' is not new, but came about in the middle of the 20th century, see Clapham (1945).

ocean. I trust that my attempt to think with plants, and pollen especially, can be an example of how the shifting from a human to a more-than-human mindset might take into account the interconnected entanglements that humans share with a wider planetary ecology: it is not 'us' and 'them', but a collective 'us' that encapsulates everything on the planet, living or not. Moreover, the temporal possibilities in thinking with matter and shimmer that fall outside a human timeline when it comes to something as hyper-object-like as climate and a planetary ecology are highly relevant: looking back in time but forward too, palynology and cultural inquiry into palynology's practice, as well as attending to the many ways in which humans have treated each other and the planet, give more than hints and suggestions on how to proceed in the future.

I began my thesis with Lennart von Post's motto: 'think horizontally, act vertically'. He looked at his landscapes and their horizons and dug down into the ground to read the past in his sediment cores. I want to flip his motto around, though, and say 'think vertically, act horizontally'. By this I encourage us to think about time and our place in it – as in our 'layer of the sediment core' (thinking vertical) – in relation to what has come before and the context of the 'now'. Then we must, informed by our place in time, act in the world around us (acting horizontally). Being able to situate oneself in shimmer, and to see it glittering, is messy and complicates research, as I have learned, but it also allows for new ways of doing and for noticing what actually comprises the shimmer.

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http://imgzoom.cdlib.org/Fullscreen.ics?ark=ark:/13030/hb338nb17g/z1&&brand=calisphere Title:
[Pueblo lands of San Diego, Calif. / Henry D. Fitch]
Description: 4364 S4 Relief shown by hachures. Shows drainage, lands granted in 1769 to the Pueblo of San Diego, settlements, roads, etc. Oriented with north toward upper left.Pen-and-ink.From: U.S. District Court. California, Southern District. Land case 390 SD, page 72; land case map D-1436 (Bancroft Library). 'Exhibit A. G.J.B. attached to deposition of Santiago Arguello, July 5th, 1854, taken before Coms. ... Burrell'; **Creator/ Contributor:** Fitch, Henry Delano, 1799-1849, author United States. District Court (California : Southern District). Land case. 390, Related Name Indexing Term; **Date:** [1854]**; Contributing Institution:** UC Berkeley, Bancroft Library

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