24.2 JOURNAL OF VISUAL CULTURE

Abstraction, diffraction, experimentation: the making of 'The Amber Spyglass' in Philip Pullman's trilogy *His Dark Materials*

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Abstract. This article traces the construction of 'The Amber Spyglass' (2015[2000]) from Philip Pullman's homonymous children's novel, to explore two interrelated conceptual issues. These are the problem of abstraction as a productive and experimental practice, and that of vision as something materially mediated rather than pre-given. The author's contention is that the making of 'The Amber Spyglass' dramatizes the situated character of knowledge production in a compelling way, allowing us to grasp experimentation as an ethically grounded and politically committed practice. The article offers a 'diffractive' reading of an episode narrating the construction of this fictitious visualization technology, by putting the story in conversation with writings by AN Whitehead and Félix Guattari, as well as feminist writers Karen Barad, Maria Puig de la Bellacasa and Donna Haraway. This is done in order to lay bare the materially and socially generative character of knowledge practices for crafting alternative visions of the world in times of ecological collapse.

Keywords. abstraction • 'The Amber Spyglass' (2015[2000]) • diffraction • experimentation • *His Dark Materials* • mediatization • speculation • vision

Introduction

His Dark Materials is a trilogy of fantasy novels by British author Philip Pullman published in the mid to late 1990s. The novels, which are often considered to be an exponent of the genre of 'children's literature', narrate the battle between the authority of the 'Magisterium' (or the church) and a motley army of committed fighters assembled from multiple worlds. Only some of them are human: witches, polar bears and harpies, scientists, liars and voyagers come together in a quest to put an end to the rule of the church's institutions, whose aim in turn is to cement the power of the 'Authority' (or God). The stakes in this confrontation between the 'god trick'

journal of visual culture [journals.sagepub.com/home/vcu]
SAGE Publications (Los Angeles, London, New Delhi, Singapore, Washington DC and Melbourne)

Vol 24.2: 1–18 DOI 10.1177/14704129251381719

of infinite vision and domination (Haraway, 1988: 581) and the quest to end domination, to learn and know in an entangled world of difference, are multi-layered and present themselves differently to the various characters in the story. One way of framing these stakes is as the opposition between, on the one side, the Magisterium's pursuit of control, purity and separation, for the sake of subjugating the bodies and minds of the totality of the worlds' multi-species population, and, on the other, the assertion of the possibility to thrive while knowing differently. In doing so and in posing the problem of the role of technology in the production of alternative knowledges as an ethical and political matter, the trilogy attests that 'knowledge-making processes are inseparably world-making and materially consequential' (De la Bellacasa, 2017: 97).

The novels have been subject to some scholarly interest, with many of their distinct tropes, concerns and philosophical implications thoroughly examined – such as the stark critique of monotheistic religion; the status of science; or the instantiation of a panpsychist word-view (cf. Gooderham, 2003; Lorrimar, 2022). Here, my interest is not so much in offering a comprehensive engagement with the trilogy's complex cosmology or in interrogating issues pertaining to representation, which tend to be at the forefront in some of the existing scholarship (cf. Green and Robinson-Green, 2020). What I would like to do instead is to explore the way in which the experimentation with visualizing technology is dramatized in the trilogy as an instance that can teach us something about the stakes of approaching problem-solving as an experimental and situated practice in times of ecological collapse. In particular, I am interested in the specific way in which the interrelation between the quest for vision and knowledge is narrated in an episode in a chapter titled 'Oil and Lacquer' in the third novel of the series. The chapter traces the process of the speculative, experimental construction of the imaging device after which the third volume itself is named: 'The Amber Spyglass'. One amongst several peculiar technological tools in the novels, it is an optical device making apparent an elemental particle called 'Dust', expressive of the entanglement of matter and thought in the universe of the series.

My contention is that the process of making the amber spyglass may be instructive both as an instance of the operations of 'abstraction' in Alfred North Whitehead's sense of the term, as well as because it arguably dramatizes the mediation of vision and the situated character of knowledge production in a particularly compelling way, allowing us to grasp experimentation as an ethically grounded and politically committed practice.

In what follows, I want to engage with the speculative potential of Pullman's narrative, harnessing what may be considered as *His Dark Materials*' somewhat privileged epistemic position in terms of its capacity to instigate novel connections and resonances. By virtue of it being a children's fantasy

trilogy, its tales cannot easily be read as an exercise in creating mirror-like representations of 'our' world – something that some feminist writers have convincingly argued against. The insistence on reflexivity as a methodological approach in accounting for the position of the researcher or writer ultimately ends up reinforcing a separation between, on the one hand, the world 'out there' – to be known in fragments, mastered and represented – and, on the other, the subject producing knowledge *about* the world (but never for or with it). Instead, the optical metaphor of 'diffraction' has been proposed as an alternative way of conceiving of a mode of knowledge production that embraces the state of being in the middle of things and 'marking differences from within' (Barad, 2007: 89; see also Haraway, 2018).

From the point of view of classical physics, diffraction patterns of alternating intensity are produced when any kind of waves interfere with each other, but diffraction as a phenomenon has gained an important status for quantum physics as well. Namely, it lies at the very core of what is known as the 'wave-particle duality paradox' where particles such as neutrons or photons may be observed to *also* produce diffraction patterns under certain conditions – thus challenging some of the fundamental presuppositions about the behaviour and properties of matter. Karen Barad, a feminist philosopher of science with a background in physics, have contributed to making insights from quantum physics relevant to methodological discussions about knowledge production, most notably through their theory of 'agential realism' that 'account[s] for materiality as an agentive and productive factor' (Barad, 2007: 225). They have also put forward the term 'diffractive methodology' as a way of 'thinking about non-representational methodological approaches' (p. 88), and this is the approach that I would like to put into practice in my reading of Philip Pullman's 'The Amber Spyglass' (2015[2000]). My aim is to speculatively deploy such diffractive reading to allow for the emergence of patterns and resonances between texts, without attempting to exhaust them or represent them as 'wholes' in and of themselves. Doing this matters if we are interested in conceiving of the practice of research as one amongst many material–semiotic processes of shaping and making sense of the world, rather than one that claims for itself a dominant epistemological role in these processes.

In the next sections, I would like to bring together a series of interlocutors to enable 'otherworldly conversations' (Haraway, 2007) between them, whereby the making of the fictitious imagining device from Pullman's novel shall be treated as a fertile common ground where different questions can be elaborated and reconfigured. These are, on the one hand, the problem of abstraction as a productive and experimental practice as well as that of vision as something materially mediated rather than transparently pre-given. In exploring these issues, I pay close attention to the specificities of the spyglass's construction as it is narrated in the novel, while engaging writings by AN Whitehead, Félix Guattari and Maria Puig de la Bellacasa in an attempt to join

in 'a speculative search for critical stories that feed a sense of possibility' (De la Bellacasa, 2017: 126). In the words of De la Bellacasa (2017: 7) , the speculative approach 'connects to a feminist tradition for which this mode of thought about the possible is about provoking political and ethical imagination in the present', and it is precisely the wish to make room for such a possibility amidst ecological destruction that drives the current examination.

Technologies for world-building

The novels unfold in a universe of countless parallel worlds, with the two main protagonists – the children Lyra Belacqua and Will Parry – joining the uneven fight against the rule of the Magisterium. In Lyra's world, all humans can see and interact with their 'daemons' – an aspect of their subjectivity that takes the shape of an animal – with daemons being one of the captivating and much discussed aspects of Pullman's world-building that arguably attest to his affinity to non-Western-centric figurations of subjectivity.[1] Lyra and Will are each entrusted with looking after and probing out the capacities of peculiar instruments: these require them to cultivate different skills, different ways of relating to the material interconnectedness of their worlds and different ways of acting upon the universe. The effects of interventions into the worlds afforded by these technological tools may well turn out to be constructive, destructive, or both.

Whereas Lyra is able to interpret a rare compass-like device called an 'alethiometer',[2] which, when read properly, can tell the truth but also give its reader advice, Will carries the 'subtle knife'. The knife can be used to cut windows between worlds, enabling passage, exchange, and communication across them, but it also – as it gradually becomes clear – puts forward its own covert and more sinister intentions,[3] tearing at the very fabric of the universe. Arguably, Lyra and Will's experimentation with these two instruments, their learning what they enable and foreclose, as well as their capacities to affect the world while gaining knowledge of it, constitute a main driving force for the novels' generation of ethical, political and epistemological questions. The gradual understanding of the operative logics of the alethiometer and the subtle knife also discloses more about the operations of the enigmatic elemental particle referred to as 'Dust' in the books: 'a name for what happens when matter begins to understand itself' (Pullman, 2015[2000]: 31).

References to quantum mechanics are abundant in *His Dark Materials*, as well as in 'The Book of Dust' (Pullman, 2017, 2019) trilogy published more recently[4] and expanding the timeline of events narrated in the original set of books. Besides the alethiometer, other instruments that feature in the trilogy invoke even more explicitly what would be a popular understanding of quantum theory: the 'lodestone resonator' from 'The Amber Spyglass' is

a communication device that uses the principle of quantum entanglement by making split particles resonate with each other, whereas a 'resonating chamber' is an apparatus that – at the devastating cost of splitting a human from their daemon – produces an immense amount of energy that can be used for the detonation of a bomb. All these instruments, as well as the subtle knife and the alethiometer, rely on the properties of Dust for their workings and are already in existence in the universe of *His Dark Materials* when we first encounter them in the narrative. In contradistinction to this, we read about the *making* of the amber spyglass, and as such are granted much more insight into the setting that necessitates and enables its construction, into the situation that its maker must work within, as well as of the way in which the instrument's capacities are discovered and probed out in response to matters of concern whose full implications only unfold in a context of experimentation and collaboration.

As we shall see shortly, there are certain constraints and limitations that make up the situation that Mary, the spyglass' maker, works from and which act upon the particular way in which her 'situated knowledge' of her own context, in the words of Donna Haraway, is formed. As Haraway (1988: 591) writes:

> We seek those ruled by partial sight and limited voice – not partiality for its own sake but, rather, for the sake of the connections and unexpected openings situated knowledges make possible. Situated knowledges are about communities, not about isolated individuals. The only way to find a larger vision is to be somewhere in particular.

Thus, in what follows I would like to take the speculative terrain charted out in Pullman's novels, as one whose imaginative partiality brings into sharp relief two interrelated conceptual issues: an understanding of abstraction as a constructive material practice, as well as of vision as mediated in experimental processes of production. The most important lesson of 'The Amber Spyglass' is, however, that knowledge, vision and technological invention all bring with themselves both joys and obligations. Learning to attend to both of them at once presents itself as a particularly pressing ethical and political question.

The making of 'The Amber Spyglass'

In the story that I am interested in, physicist Mary Malone indeed finds herself somewhere particular: in a world that is not her own. There, she spends some time living with the *mulefa* – sentient beings, whose existence is symbiotically tangled with the lives of large seed-pod trees that grow on this world. These trees provide the mulefa with round and flat wheels whose central hole perfectly matches the claws of the mulefa's feet. With time and after continuous riding, the wheels break, and the seeds contained in them

Figure 1. *A fresh instrument.* (2024). © Photograph by the author.

can be planted. These very trees, upon whose thriving the mulefa depend and which in turn rely on the mulefa for their reproduction, have come to be threatened because Dust, which used to fall on and pollinate them, has ceased to do so.

Figure 2. *serves the same purpose of foreign travel;* (2024). © Photograph by the author.

In the multiple worlds narrated in Pullman's novels there are many words for the elementary particle that surrounds sentient beings, but also any object in which intelligence or purposefulness has been invested. While the mulefa can see this Dust, Shadows or, in their own language, 'sraf', Mary Malone cannot do so with her naked eyes, which prompts her to construct a device that

Figure 3. *it shows things.* (2024). © Photograph by the author.

would allow her to discern these particles. Not yet knowing that she will be tasked with helping the mulefa to revert the process of ecological disruption that would lead to their extinction, she is at first led by her curiosity in her speculative undertaking. Indeed, initially 'she wasn't sure what she wanted to do, except that she knew that if she fooled around for long enough, without

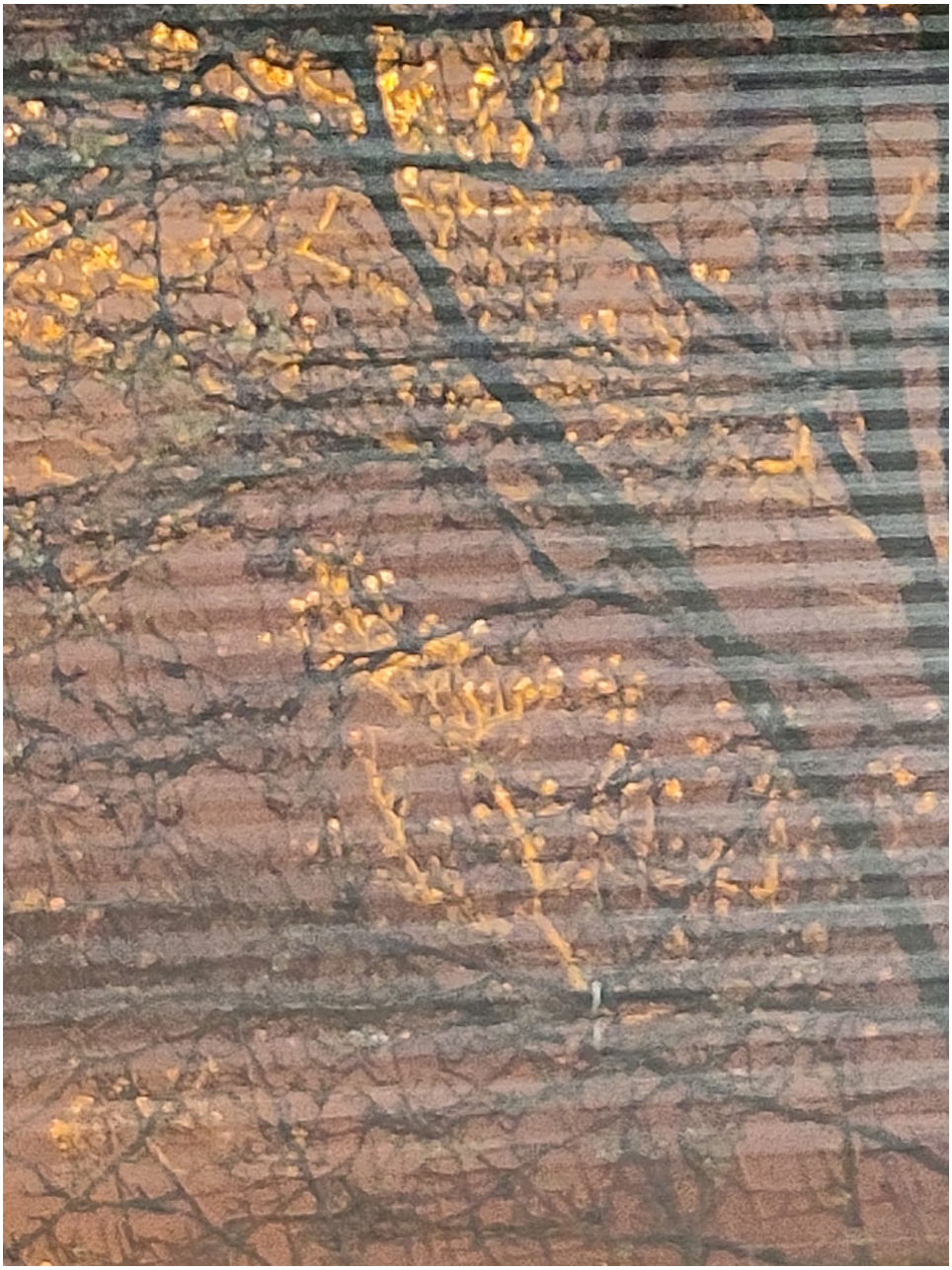

Figure 4. *in unusual combinations.* (2024). © Photograph by the author.

fretting, or nagging herself, she'd find out' (Pullman, 2015[2000]: 226).

The process of building what will become the amber spyglass is long, laborious and, above all, the result of experimentation and speculation. At first, Mary follows her intuition and curiosity and attempts to construct a *mirror* which

would help her see Dust. She speculates that, if light in its property of waves can be polarized when reflected on water, then perhaps also sraf particles can be polarized through a mirror. Doctor Malone's initial plan is to make this mirror by adopting a technique which she learns from her hosts and for which she uses sap lacquer, the product of another tree. After the sap is boiled, dissolved in alcohol and thickened, the substance can be used as varnish by putting coat upon coat on a base of wood or shell. . .

> . . . letting each one cure under wet cloth before applying the next, and gradually build up a surface of great hardness and brilliance. They would usually make it opaque with various oxides, but sometimes they left it transparent, and that was what had interested Mary: because the clear amber-coloured lacquer had the same curious property as the mineral known as Iceland spar. It split light rays in two, so that when you looked through it you saw double.

After many trials and the patient application of layer after layer of sap on a piece of wood, Mary decides that a mirror won't do after all – she removes the wooden base and attempts to look through the amber glass in the hope of finally seeing the sraf particles. Nothing much changes. She then ventures to break the carefully constructed glass in two and tries again by juxtaposing the pieces and probing different distances between them. Nothing again. It is only after she takes a break from work to look after her friend Atal and tend to her impossibly smooth-surfaced and oily claws and wheels that Mary comes across the crucial element that allows her to see Dust. The oil, functioning as a lubricant for the wheels of the mulefa and which she accidentally drops on the glass, allows her at last to see the sraf whose golden haze surrounds all mulefa and their cultural products.

I will come back to the role of oil, chance and care further below, but here I would like to highlight the peculiarity of the amber spyglass as an object. Its gradual constitution demonstrates that it is practically built through the accrual of surfaces: Mary 'laboriously painted her mirror over and over again, seeing hardly any difference each time as the layer of lacquer was so thin, but letting it cure unhurriedly and finding gradually that the thickness was building up' (Pullman, 2015[2000]: 226–227). Each new layer of lacquer adds something barely distinguishable and yet qualitatively different to the previous coating; it is only through their accumulation that a new and highly specialized 'object' can come into being.

The surfaces which build up the spyglass can only become as transparent, smooth and flat as desired through a tiresome process of polishing: 'a whole day of rubbing the surface gently, in smooth circular movements, until [Mary's] arms ached and her head was throbbing and she could bear the labor no more' (p. 227). It is the properties of this external surface that create the conditions

for the admission of yet another and final layer – of oil, but we could perhaps also add friendship and care. After having fully covered the surfaces of both pieces and added its own meaningful alterity and properties to them, the oil becomes a further element, integral and indispensable to the functioning of the imaging device.

Objectification as a process of abstraction

What interests me in this story is the profoundly speculative and experimental character of the creation of this visualizing technology. By stressing the labour, time and attentiveness required for the production of the object, the episode makes explicit the processual character of the production of the instrument through a process of layering. It is not to be taken for granted that its surface is flat or rugged, smooth or rough, oily or dry, transparent or opaque; these properties depend on the material and social processes, which led to their production. To a certain extent these processes become ingrained in them, which need not necessarily mean that all properties remain unchangeable or an essential part of the object's constitution. On the contrary, some of them might well replace or discard each other, such as in the case of a rough surface becoming smooth or a transparent one – opaque.

My contention is that these productive processes of articulation can be understood in terms of abstraction. The abstraction – when understood as 'extraction' or separation – of the surface from the rest of the object is necessary for the attainment of a state in which it will be possible to relate to and act upon it. Here, I am adopting a notion of abstraction as formulated by Félix Guattari (2012[1992] in *Chaosmosis*), where he suggests that 'by "abstract" we can also understand "extract" in the sense of extracting' (p. 35). This understanding of abstraction emphasizes its material aspects as a practice that might as well 'cut through' an object and involve the separation or removal of something but, in doing so, it is always also *productive* of novel characteristics, spatio–temporal–energetic arrangements, and relational possibilities. Abstraction is also differentiation, because it serves the selective extraction and intensification of certain relevant properties, which only emerge as distinct through this very same process. Furthermore, this mode of relation can be described, with Whitehead, as objectification: 'Thus "objectification" itself is abstraction; since no actual thing is "objectified" in its "formal" completeness' (Whitehead, 1985: 59). Hence, it is about the extraction of features which are relevant to others – and never about a full assimilation of the actual thing as a whole.

The way in which objectification takes place can be elucidated through a striking passage in AN Whitehead's (1985) lectures on 'Symbolism', in which he describes an encounter with a wall. In the moment of contemplating it,

certain characteristics, such as colour or spatial perspective, are abstracted from that one thing we call a 'wall'. These elements are 'relational' between the perceived object and the perceiving subject; they are also 'very *abstract* entities because they are only arrived at by discarding the concrete relationship between the wall-at-that-moment and the percipient-at-that-moment' (pp. 39–40). Whitehead goes on by stating:

> This concrete relationship is a physical fact which may be very unessential to the wall and very essential to the percipient. The spatial relationship is equally essential both to wall and percipient: but the colour side of the relationship is at that moment *indifferent to the wall*, though it is part of the make-up of the percipient.

Here abstraction has something to do with an indifference to and a discarding of certain concrete properties or relations, while retaining and attenuating others. Whitehead defines abstraction as 'nature's mode of interaction' (p. 60) and insists that this interaction 'is not merely mental'. Instead, he proposes a conception of the world as 'functional activity' (p. 61) – a formulation which is starkly at odds with notions that would oppose the thinking and abstracting (human) mind, on the one hand, to the world of passive things that would only await their apprehension and description, on the other. In a world conceived as functional activity, *thought merely conforms to nature when it abstracts* (p. 60):

> By this I mean that every actual thing is something by reason of its activity; whereby its nature consists in *its relevance to other things*, and its individuality consists in its synthesis of other things *so far as they are relevant to it*. (1985: 61)

We can say that the individualized character of the amber spyglass is the result of a synthesis of actual things (and the indifference to others). They have come together by virtue of some of their features becoming relevant to each other: Mary's concern with constructing an imaging device is one of the elements which come to partake in the constitution of the new entity, while some of the others are, for instance, the attention she pays to different practices of her hosts' everyday life (i.e. their use of sap lacquer), which she acquires and puts to a different use; the materiality of the polished surface – its hardness, smoothness and transparency – which allow it to be covered with oil while *remaining* smooth and transparent.

In 'Science and the Modern World', Whitehead (1967: 114) beautifully writes: 'A fresh instrument serves the same purpose as foreign travel; it shows things in unusual combinations.' He is quick to clarify that the 'gain' of such a fresh instrument is not about mere addition but rather about transformation. This means that, through the unusual combinations it allows, each new instrument

acts upon and transforms the world. One can broaden this claim onto the processes of production which led to the object's gaining of consistency and capacity to act upon the world: in the case of the amber spyglass, each new layer and element that comes to partake in its construction (but also each time when something is selected, extracted, removed) not merely adds itself to a complete whole, but rather transforms the entire assemblage. Transformation is here not to be mistaken with perpetual flux, contingency and instability – on the contrary, Mary's concern is with stabilizing the properties of the surface, which would permit her to see the world differently and to acquire useful, exact, and situated knowledge of it.

My aim here is to, with Whitehead, conceive of abstraction as a productive, and not merely as a reductive practice. For instance, when the piece of wood – essential in its role as a base for the application of surface upon surface of lacquer but no longer needed – is carefully removed, this action profoundly transforms the object in question: this step of the abstraction process has turned the mirror into a piece of glass. A previous step, the cumbersome polishing of the glass's surface, had transformed the surface's opaque character into transparency. Thus, abstraction partakes in the constitution of singular objects and is productive of (their) distinct properties. The smoothness, flatness and transparency of the surface of what will become the amber spyglass are achievements, not pre-givens.

The stabilization of the spyglass as a distinct device is predicated upon it being isolated as an object or, in Whitehead's words, as a system. Again, with him we can assert that 'the conception of an isolated system is not the conception of substantial independence from the remainder of things, but of freedom from casual contingent dependence upon detailed items within the rest of the universe' (Whitehead, 1967: 47). As Alberto Toscano (2008: 61) makes clear in his take on Whitehead's account of Galilean abstraction – this 'abstraction remains a relative or conditional one'. This is an important point for the understanding of the construction of the device as the outcome of a process of constructive abstraction – when separating the transparent surface from the piece of wood, one does away with the casual dependence upon it – a 'detailed' item in a universe of things.

When examined in terms of the way in which an instrument is situated within and may act upon a wider ecological[5] context, the description of the mode of articulation of the imaging device as contingently independent from certain items (while synthesizing others), can be brought in conversation with Félix Guattari's writings. In both his collaborative writings with Gilles Deleuze (Deleuze and Guattari, 2004[1972], 2013[1980]), as well as in 'Chaosmosis' (Guattari, 2012) or in the essay 'On Machines' (Guattari, 1995), his concern is with emancipating the machine from its technical over-determination

and from mechanicist visions of it. To such an understanding he opposes the notion of a 'machinic assemblage' as a possible conceptual vehicle to account for the processual character of the machine as well as for the fact that its coming into being relies on probing out relations of alterity to other machines – which might or might not be technical at all (p. 9). The question of whether and how these enter into the constitution of the machinic object can, then, with Whitehead be framed in terms of relevance or concern. Thus, we can say that the mode of producing the amber spyglass explicates that 'the technical object cannot be limited to its materiality' (p. 8) but is rather composed of affective and social components alongside material ones: it is Mary Malone's situatedness within the society of the mulefa and her concern with their survival that accompanies and drives her scientific and technical work.

Fooling around with oily fingers . . .

If in the previous sections I attempted to read through Philip Pullman's account of the experimental production of a fictitious imagining device and Alfred North Whitehead's conceptualization of abstraction as a material and constructive practice of interaction – a reading that is in part informed by Karen Barad's proposition for a 'diffractive methodology' (Barad, 2007: 88) – in this final section I set out to trace the interrelation between vision and knowledge production in the episode recounted above.

Before doing so, it is worth making explicit a methodological assumption that drives my engagement with the speculative terrain of *His Dark Materials* – a story that may at first sight be taken to be too benign or removed from the acute urgencies of life on a planet rent by wars, ecological destruction and extreme inequality. Arguably, the narratives unfolding in the worlds of the trilogy are captivating partly because of their political, ethical and epistemological relevance to our context of capitalist-driven devastation of the intersection of mental, social and environmental ecologies (Guattari, 2000). This relevance notwithstanding, I do not wish to claim an *analogy* between our world and the world of the mulefa as a starting point for the current exploration, nor do I believe that establishing relevance by analogy should be used as a justification that we take a story seriously. Rather, what I want to do here instead is to assert a practice of 'fooling around' – as Mary Malone would put it – with divergent stories and materials that might be productive of novel patterns and connections. Similarly to Whitehead's (1967: 114) writing of the gain of a 'fresh' instrument, we might indeed be 'show[n] things in unusual combinations' when engaging with the relational affordances of different materials, with the resonances between stories, with the ways in which instruments are put together and how they may be remade. These potential insights and the obligations that follow from them cannot be known or secured in advance.

Let us look again at the making of what would eventually become 'The Amber Spyglass'. In effect, the device's purpose is to *enhance* Mary's vision, who, unlike her hosts, is not able to see the elemental particles whose altered behaviour is at the core of the imminent ecological collapse in the world of the mulefa. (It is important to reiterate that at the time she does not yet know that help will be asked of her). As recounted, the spyglass is the outcome of a laborious experimental process involving multiple steps at which the capacities of the materials that come together are probed out. What Mary does is to patiently probe out and explore 'the compositions of relations or capacities between different things'[6] (Deleuze, 1988: 126) – that is, she plays with the relations and capacities of lacquer, air and wood, between light, Dust and surface, between oil and lacquer, and so forth. While absorbed in the making of a visualizing device, she trusts her intuition but also follows these very material and relational capacities-in-composition. (Indeed, her intuition, curiosity, and capacity for wonder become material forces within these compositions). The Chapter itself takes its time to recount this production and thus invites us as readers to narratively inhabit – and relish – the mediation of vision as a material and abstractive process.

Arguably, vision becomes something multiple and predicated upon experimental processes. For instance, when Mary first attempts to look through a 'sheet of clear brown-yellow lacquer' (Pullman, 2015[2000]: 228) to see the sraf particles, the image she obtains through this is double. When she puts two sheets together and looks through both of them, 'the amber colour was denser, and like a photographic filter it emphasized some colours and held back others . . . and everything was single again' (pp. 228–229); whereas when she moves them further apart, 'everything seemed its normal colour, but brighter' (p. 229). In all these instances, vision is curiously transformed, even when Dust remains invisible. Crucially, the accidental application of oil on the arduously constructed amber surface permits Mary to finally see sraf. This is a vision and a form of knowledge that she is only able to obtain because she has allowed herself to be distracted from her immediate task at hand. 'Sometimes the mulefa would groom each other's claws, out of pure sociability, and once or twice Atal had invited Mary to attend to hers.' Sensing that this is what her friend wants at this moment, Mary leaves aside the pieces of lacquer to look after the claws that the mulefa's wheels fit into:

> Atal was soothed, and so was Mary, by this contact . . . she didn't grudge the time she spent with her, and now she was happy to clean the wheel-holes of all the dust and grime that accumulated there, and smooth the flagrant oil gently over her friend's claws while Atal's trunk lifted and straightened her hair. (p. 229)

It is only when Mary returns to the sheets of lacquer after having spent time with her friend that she realizes that the areas where her oily fingers have

touched their surface have acquired the capacity to make Dust visible. This episode beautifully attests to the importance of working with contingency and chance but also of attentiveness and care in our experiments with knowledge- and vision-making technologies. Here, touch and vision are not opposites – inquisitive, situated and committed, they work together to produce richer accounts of the world.

This dwelling on processes of mediating vision is very different from what Maria Puig de la Bellacasa (2017), in her engagement with the relation between touch and vision in her book *Matters of Care*, recounts as the contemporary proliferation of 'touching technologies' that '*conceal* material mediations while pretending quasi-transparent immediacy' and whose main problem is 'what will count as real' (p. 104, emphasis added). To this techno-capitalist appropriation of touch and vision she counterposes 'a caring politics of speculative thinking [that] could reclaim *hapticity* as a way to keep close to an engagement to respond to what a problem "requires"' (p. 110, emphasis in original).

Mary's spyglass is anything but immediately and self-evidently given, while the stakes and consequences of the 'reality' she partakes in only gradually make themselves apparent. The knowledge that the spyglass grants access to is one of an entangled world of difference. There, matter and thought are not separate from each other – matter *loves* Dust and Dust is matter obtaining knowledge of itself (cf. Pullman, 2015[2000]: 31; 454), whereas thought and imagination are interwoven in the making of these worlds. Mary's newly acquired vision permits her to see that it is not only the survival of the large seedpod trees and the mulefa that is endangered, but also that of the entirety of the multiple universes. Through observation she comes to understand that Dust is leaking out of the universe, damaged by the workings of the subtle knife, but also by the explosions of bombs detonated by 'resonating chambers' that also use the principle of quantum entanglement for their workings. If cuts made by these instruments are not mended, she realizes, then 'all conscious life would come to an end . . . Thought, imagination, feeling, would all wither and blow away, leaving nothing but brutish automatism' (p. 453). This prospect and the severity of the stakes in many ways resonate with life as many of us experience it in 'our' world today – even if the 'problems' and the 'solutions' to ecological devastation that we may have at our disposal are arguably less intelligible and readily available than those narrated in Pullman's books.

Hence, the vision and knowledge she acquires through material and imaginative processes of experimentation are what, on the one hand, open up a novel field of action, while, on the other, they place an ethical and political obligation on her. The extent of this obligation, however, only gradually discloses itself to her.[7] Mary comes to fully understand the stakes of the situation she's

acting within after having spent considerable time following her intuition and curiosity to see more and better of the world, time for learning from the mulefa and building friendships, understanding what gives pleasure to her friends and what presents itself as a source of fear, what matters to them and what needs to change. This is, I believe, one of the important lessons that may be drawn from the engagement with the fictitious terrain of *His Dark Materials*: that the struggle for clearer vision and more accurate knowledge is inseparable from the pursuit of not only more just and freer, but also more of joyful ways of living in multiple worlds.

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Notes

1. Gloria Anzaldúa's writings have brought forward the most compelling characterization of daemons I have encountered so far – much more so than scholarship directly engaging with *His Dark Materials*. In 'Light in the Dark/Luz en lo Oscuro' (2015: 4), she writes:My naguala (daimon or guiding spirit) is an inner sensibility that directs my life – an image, an action, or an internal experience. My imagination and my naguala are connected – they are aspects of the same process, of creativity. Often my naguala draws to me things that are contrary to my will and purpose (compulsions, addictions, negativities), resulting in an anguished impasse.It is perhaps possible to discern a resonance between the worlds figured by Anzaldúa and Pullman, without erecting simple analogies or falling back onto comparative readings of their work.
2. From αλπθεια – 'truth' (Greek).
3. As the king of polar bears, Iorek Byrnison, warns: '. . . sometimes a tool may have other uses that you don't know. Sometimes in doing what *you* intend, you can do what the knife intends, without knowing' (Pullman, 2015: 181; original emphasis).
4. At the time of writing, only the first and the second volumes that make up 'The Book of Dust' trilogy are out: the prequel *La Belle Sauvage* was published in 2017, whereas the sequel *The Secret Commonwealth* (set after the events narrated in *His Dark Materials*) was published in 2019.
5. My use of the 'ecology' is here informed by Félix Guattari's writing in *The Three Ecologies* (2000[1989]) where he is characteristically engaged in multiplying the understanding of the term to indicate an interrelatedness of environmental, social and mental ecologies.
6. This is how Gilles Deleuze describes the object of study of 'ethology'.
7. When she first gains that capacity to see sraf, the mulefa ask for her help with understanding why the seed-pod trees – on whose thriving their survival depends – are dying out, and with averting this process. She then constructs a platform in the crown of one of these trees and, by observing the behaviour of Dust through the amber spyglass, she comes to understand that it has stopped pollinating them. Continuous observation with the device then leads her to grasp that it is not just that sraf is no longer falling on the trees, but that it is seeping out of the universe – thus making her realize the full extent and possible repercussions of the damage made.

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