5 On Becoming Microbes and People with Texts

Moving Academic Writing Toward Responsible Agency

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Introduction

This chapter examines how the Sociology of Translation may contribute to concepts and theories for better and more sustainable worlds. If the Anthropocene marks the final human triumph over nature (Sariola and Gilbert 2020), post-humanist approaches promise to make room for non-human action, translated into stories of human and non-human interdependence (Pickering 2008). But who is to bring about sustainability in a post-human world, where humans and non-humans are acting equally? Who is the 'we' responsible for changing ways of being, so both human and non-human worlds may continue to exist? If things-in-themselves lack nothing (Latour 1988), who is responsible for protecting their existence?

In line with other chapters in this book, our point of departure is the argument that post-humanist decentring towards material practices misses important aspects of semiotic decentring towards language and text (Pickering 2008). The tradition of symmetrically translating the world, recognizing human agency as an open-ended becoming with non-humans, forgets the semiotic roots that broadened the notion of the 'actor' (Waldstein 2008), and now feeds an ethical responsibility towards the wellbeing of 'things'. In times of uncertain futures, human responsibility is surely in need of greater thematization within the Sociology of Translation.

Yet, in this chapter, we seek to take one step further in dealing with symmetrical decentring, by bringing the practice of academic textual production—inscription—into the moment of political engagement and responsible agency. We seek to develop this line of thought into an approach to human responsibility that includes the craft of writing texts and scientific stories. If as scholars we produce texts, we might as well hope to construct a chain of events that safeguards our semiotic-material worlds. But in order to conflate textual production and responsible agency, we must take seriously the extent to which the 'text', as the main outcome of scholarly endeavours, is also an actor, a translator, in a constantly

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emerging world (ibid.), and a product of a series of inscriptions as well as an inscription device (see Chapter 1). In line with previous reflections on actants and agency in this book (see Chapter 3), we investigate the agency ascribed to actors by textual work and inscription practices. By doing this, we want to outline a new dialogue between symmetric and asymmetric approaches to human and non-human agency.

To develop this approach, we want to talk about a topic where the stakes are enormous, namely microbes. Microbes are obvious biological entities, while at the same time they are also unavailable to humans without interaction through inscription devices, like microscopes and descriptions through texts. Moreover, microbes have recently moved from mainly acting as causes of disease, to global health preparedness debates (Kirchelle et al. 2020; Laxminarayan 2022). The production of antimicrobials on an industrial scale, from the 1940s onwards, has set in motion a cascade of events that have promoted both human and microbial change (Spagnolo et al. 2021). The debate on what to do about the development of resistance to antimicrobials often demands a human responsibility to attempt to regain control over microbes, to sustain human and animal life on the planet (WHO 2019). Such an urgency sharply contrasts with symmetrical approaches and post-human ontologies, in which humans and non-humans are understood as equally capable of acting.

A reinstating of asymmetric agency has been made: what should humans do so microbes do what humans want and need? This mode of action, created by unsustainable interpretation and textual production, that thematizes human rule over nature, shaped worlds and realities we may no longer endure (Pickering 2008). It seems that not only do we need more complex understandings of agency that allow for non-humans to act, but we also need to couple those with a more nuanced conceptualization of textual engagement.

Instead of 'theorizing' this argument, we aim to make it visible for the reader through our own interpretation of two texts about microbes: Nick Lane's *The Unseen World: Reflections on Leeuwenhoek (1677) 'Concerning Little Animals'* and Hannah Landecker's *Antibiotic Resistance and the Biology of History*. To 'see' contrast, we place the two texts in relation to each other. Both texts talk about events that have happened in the past, in which microbes and people are relating to each other. Yet they thematize different types of agency, of acting in the world. Both texts are authored by scholars and tell stories about other authors, other scholars. Yet, their take on authorship is different.

Nick Lane is a renowned evolutionary biochemist who writes not only to his peers, but also to wider audiences. In the text we analyze, he is writing for the British journal *Philosophical Transactions* at the Royal Society in London, the world's first and longest-running scientific journal, launched

in March 1665. Particularly, in a special edition celebrating 350 years of the journal, Lane writes about another author in the journal: Antoni van Leeuwenhoek and his famous 'Letter on the Protozoa', published in 1677, describing 'little animals' or 'animalcules'.

Hannah Landecker is a sociologist and professor in the field of science and technology. Her work focuses on historical accounts of biotechnology, and she has paid particular attention to the work of non-human actors, such as microscopes and microbes. This specific text about antibiotic resistance was published in 2016 in the transdisciplinary social sciences and humanities journal, *Body and Society*. Particularly, in this text, she assembles assorted authors to create a story about the 'biology of history'.

We read these two texts together to describe two contrasting ways in which microbes and authors are inscribed as actors in the texts.[1] At a first glance, Nick Lane's text about Leeuwenhoek's *discovery* of bacteria suggests a dualism between humans and nature, inscribing detachment and asymmetrical action, in which humans discover passive non-humans. By contrast, Hannah Landecker's text focuses on microbial action inscribing symmetric interdependence between humans and nature, in which the action of humans is dependent on the action of non-humans, and vice-versa. Yet, the contrast between these two texts enables us to think about our own agency and the possibilities enabled by the *production* of our text. These two texts become an artefact of our own reading and writing. In analyzing the kinds of microbial agency created by the two texts, we are necessarily complementing and extending our own modalities of authorship and agency—following Annelise Riles's (2006) modalities of response—in the practice of crafting our own text. Our text complements the agency of the two texts we analyze by inscribing the *proliferation* of actors elicited by them, but not accounted for in them. Our text prevents them from acting by momentarily making visible the processes of *rarefaction* of actors necessary to their agency, but not ours. Finally, we respond to the process of creativity elicited by them. We borrow from them the notion of *chimerism* to inscribe surprise and a novel way to translate agency.

Artefacts

The issue of agency in the Sociology of Translation is often connected with the tradition of considering the researcher's position with the same analytic repertoire applied to ethnographic objects (Pels 1996). Symmetry, in this move, has meant seamlessly extending the analytic repertoire to also scrutinize non-human actors, analyzing actions carried out by humans and actions carried out by non-humans with the same framework (Callon and Law 2005). Foundational insights borrowed from semiotics enabled the translation of actors into textual functions, in which texts created by laboratory machines and texts produced by scientists had the same

function: they were all inscriptions, treated as nodes in a web of signifying relations (Latour and Woolgar 1986). This provided an opportunity to move beyond textual effects of media and representation, into the material agency and co-constitution in the relations between humans and non-humans (Waldstein 2008).

However, the move of expanding the notion of what counts as actor, by replacing the distance between documentary practices in the world, and the analysis of those practices with symmetric networks, largely ignored the issue of the 'authorship' of actors in the world and researchers (Biagioli 2006; Riles 2006). Overall, science studies tended to rely on overdetermined and sometimes mechanical theoretical paradigms when talking about agency, particularly when relating to the agency of the analyst (Riles 2006). By contrast, contributions from social anthropology, often occupied with the researcher's positionality, have offered insightful takes on understanding agency and authorship. The place of the researcher within the outcome of research, named *reflexivity*, proposes that researchers explore the world, but that the knowledge they produce, the stories they tell, come about through a medium that already has a form of its own (Strathern 2004). To produce knowledge, to translate the world into written articles, documents, and book chapters, is an activity that necessarily must go through acts of interpretation carried out by the researcher, the author of the final text.

This form of agency through reflexivity, as an interpretive act, follows a tradition that links understanding to an irrational use of available schemes for sense-making, and an explanation of rational modification of schemes when assumptions about how the world works fail (Herman 2018). But there is an ambivalent strategy in this way of approaching reflexivity that we would like to avoid in order to carry out our experiment—that the agency of the researcher, naming authorship, relies solely on interpretation as a social/cultural toolkit that generates understanding and knowledge/explanation of the world (Moreira 2012). Reflexivity centred in the analyst interpretative agency conceals the interdependent agency of the researcher, the world, and texts.

Thus, we are interested in outlining new insights into how to complexify the concept of agency through *response* to and with texts; in short, human and non-human response, our own response alongside the responses of other actors in the two texts, which are triggered, pushed, contained, extended, and demanded by texts. Our attention to response draws from long-standing traditions in anthropology and philosophy that saw texts and documents as agents with authors.

Marilyn Strathern explored the concept of documents as *artefacts* to refer to texts as active participants in culture-making, mediating interactions and defining roles and responsibilities (Strathern 1988). As artefacts, documents/texts become material-semiotic entities, with dynamic and

performative features, actively participating in the production and transformation of knowledge, social relations, and practices. But in addition, this notion emphasizes the co-evolutionary relationship between authors and texts, where texts are not merely authored by analysts committed to self-reflexivity, nor absent entities for the sake of objectivity, but engage in a dynamic relationship with authors and other texts over time. As Annelise Riles remarks, analyzing texts as artefacts 'is also necessarily to think *laterally* about the epistemological and aesthetic commitments of one's own knowledge' (Riles 2006: 17, our emphasis).

Finally, we want to endorse that the conscious attempt of writing academic texts describing the actions of non-humans may entail a dialogue between symmetric and asymmetric practices as a form of responsibility to contra-act the too often dominating effects of human-centred narratives of control. But we want to do more than that. As our analysis will show, we might respond to the demands of sustainable knowledge practices and human change, with attention to the modalities of response demanded, promoted, and carried out by the texts we use and encounter.

Discovery

Lane's paper begins in the following way:

> Leeuwenhoek is universally acknowledged as the father of microbiology. He discovered both protists and bacteria. More than being the first to see this unimagined world of animalcules, he was the first even to think of looking—certainly, the first with the power to see. Using his own deceptively simple, single-lensed microscopes, he did not merely observe, but conducted ingenious experiments, exploring and manipulating his microscopic universe.
>
> (Lane 2015: 1)

We find it useful to start by disclosing that we have a particular interest in his use of the traditional scientific dualism between nature and humanity, a dualism between microbes and people, the subject observer and the object discovered. If we place his text in contrast with Landecker's text, we can see that they deploy two different forms of inscribing agency in the relationship between the human and the non-human. The first difference has to do with detachment in opposition to dependence. Lane's story starts centuries ago, with Leeuwenhoek and his letter to the journal. Leeuwenhoek is portrayed as being the only man in his time with the 'power to see' invisible animals. 'Seeing' is an action inscribed as human subjectivity: a human trait of having a 'startlingly original experimental mind'. This is further exacerbated by the structure of the story as one about a great scientist, which conveys a foundational orientation towards the human subject as the main actor,

the discoverer. Words such as 'ingenious', 'pioneer', and 'explorer' further enhance the doings of the human subject, the genius scientist discoverer. Moreover, Leeuwenhoek literally takes up space in the text. The second page is illustrated by a painting of the man occupying more than half of the page. The third page has a picture of Leeuwenhoek's handwritten letter to Henry Oldenburg, the founding editor of *Philosophical Transactions*.

Microbes, on the other hand, are talked about as if they were waiting to be discovered, analyzed, theorized, explained. Reading Lane's text is to 'see' the *detachment* between invisible objective worlds out there, not yet completely accessed by the human subjective eye. Leeuwenhoek owns his little animals, as his history is told in the text, until he is granted a fatherhood in microbiology. He discovered bacteria. Throughout the text, he becomes the discoverer of invisible microbes that exist independently of the ones attempting to see them. The story is human-centred, in the sense that it is about people's doings. It is asymmetric in the sense that humans do much more, and what they do is much more visible than what non-humans do.

By contrast, Landecker's text inscribes dependence. The history she traces is not about how people discovered antibiotics, but about how microbes developed resistance to human interference. Although she starts her historical account with Alexander Fleming's discovery, in 1928, she inscribes the action of microbes within his discovery. Fleming observed the ability of the *Penicillium* mould to inhibit bacterial growth. Moreover, microbes are not only discovered and tinkered with. They respond. Microbes ferment metabolic products valued by humans (ibid.: 25). As microbes started to be industrialized, they not only produced antibiotics, they also produced economic growth and revolutionized medicine (ibid.: 26). Their produce made farm animals grow (ibid.: 27). Agency is inscribed as symmetric, because what non-humans do is described as being as varied and valued as what humans do. In her text, resistance:

> Is driven by theories of antibiosis: a human leveraging of substances microbes create in mutually antagonistic battles for space and resources. Humans make antibiotics by farming microbes, chemically tinkering with microbial metabolites, and mimicking them with synthetic antibiotics. Antibiotic resistance arises when microbes gain the capacity to evade these drugs.
>
> (Landecker 2015: 22)

The focus of the text is not the biography of a person, but the conditions of an event, the emergence of resistance as a threat. What humans do gets entangled with what microbes do. The text is about the mutual and ongoing becoming of resistance, of a situation in which both people

and microbes take part, in the midst of humanity's attempts to control the doings of microbes.

The second difference we can observe by placing these two texts in contrast to each other has to do with the temporal depth of the actions performed by the actors presented in the text. Both texts talk about the past. But in contrast with Lane's text, Landecker's text shows how the act of discovery emerges and changes over time, in the relationship between microbes and people. First, the antibiotics act as miracle drugs that come from microbes to save people from diseases caused by microbes. Then industry discovers ways of producing antibiotics on a larger scale, by farming monocultures of microbes. Then microbes become a tool in genetic science, selecting 'a few resistant mutant individuals from a population' when low drug doses were applied (ibid.: 28). Agency is symmetric in the sense that both humans and non-humans are subject to change. Humanity goes from amazement with antibiotics, to industrial production, overuse, and despair. Microbes change from causing diseases, killed by antibiotics, to becoming uncontrolled and resistant. Antibiotics, once considered miracle drugs that have changed the course of human history, now represent humanity's biggest 'threat'.

> Penicillin was developed as a drug by Norman Heatley, Ernest Chain and Howard Florey in wartime England. It effectively treated bacterial infections … and its greater efficacy and relatively fewer side effects than therapeutic agents such as sulfonamides made it appear a 'miracle drug'. Today, however, fewer research articles or reviews recount the triumphal narrative; instead, they draw attention to scale.
>
> (Ibid.: 23, our emphasis)

As current practices of antibiotic use affect the future, what was once known becomes unknown. The discoveries of the past, made up of the relationship between humanity and microbes, are changed. Once seen as a triumph, the discovery of antibiotics in the past is turned into a problem caused by present practices of scaling up antibiotic production, and the future prognoses of losing control over microbial action and resistance to drugs.

> Antibiotic resistance confronts history of science and theories of conceptual change with a double movement in which the science of biology changes—but so does the biology of science, driven by the industrialization of bacterial metabolism. It is common to hear: 'we used to think … but now we know', as knowledge shifts; such reaching into the unknown and constantly correcting the course of knowledge is constitutive to the dynamic of scientific practice … In the case

> of antibiotic resistance, we might rather say: 'We used to think a certain way about antibiosis and pathogens. And then we changed the future'. What we thought we knew became the biology under study: the solution has become the problem.
>
> (Ibid.: 23, our emphasis)

In Lane's text, however, discovery evokes the evolving of human understanding about passive microbes waiting to be seen and studied. Only humans are subject to change. And this change is conceptualized as an increase in understanding of the microscopic world. Microbes are better understood as they are better observed, and as humans debate the veracity of Leeuwenhoek's observations.

These two texts stand for, we argue, two different ways of telling a story about people and microbes, in which agency is inscribed by textual actors in two different ways. In Lane's text, the moment when bacteria first became visible to humans is a significant event, configuring an anthropocentric story, a story about how people discover a passive world. In Donna Haraway's words, '"the story line" that "man makes everything" including himself, out of a passive world that can only be resource and potency to his project of active agency' (1992: 297). In Landecker's text, the moment in time when microbes act and react forms the starting point of the narration that describes the discovery and emergence of a relationship between humans and non-humans. It evokes symmetrical engagement, an emergent temporal interplay between pathogens, industrialization, science, and people, which all agency depends upon.

Production

But let us not hasten this conclusion. We must disclose that we have so far been concealing some parts of Lane's text. Although Lane does not thematize microbial action or change over time, that does not mean it is not possible to see it. Moreover, it has been argued that these two forms of talking about agency—encouraging us to recognize either detachment or entanglement—may mislead us to understand them as two different ontological positions that oppose each other, and which we can choose from (Pickering 2008). All texts are produced from particular ontological conditions, or according to Pickering, 'in the thick of things' (ibid.: 4). It is just that some texts attempt to hide the conditions of their existence while others engage with the 'basic ontological situation from which they themselves emerged' (ibid.).

In his essay about the work of Russian-Estonian semiotician Iurri Lotman (1922–1993), Maxim Waldstein (2008) suggests Lotman's material semiotics as a post-human framework for textual analysis, which we

find helpful at this point. According to Waldstein, Lotman and his colleagues propose a materialistic and historicist cultural concept of 'text' that is interchangeable with the idea of the 'machine' in post-humanist approaches (ibid.: 231). This means to propose to see the text as a thing, a complex material entity that translates—in the meaning of something that displaces, invents, and 'creates links that did not exist before and that to some degree modifies' the originals (Latour 1999: 179). For Lotman the text is 'a heterogeneous and post-human space, or a surface of emergence, in which various human, non-human, social and material elements enter into a set of unpredictable and performative interactions' (Waldstein 2008: 234). It allows for the play of semantic processing through signifiers and signified, and 'asemantic' sights and sounds of the material world (ibid.: 233). This adds a dimension of unpredictability, emergence and open-endedness, and offers an idiom shift that evokes the interdependent reflexivity we call upon in our text.

The text is more than an inscription device, it can be seen as a machine, an apparatus that enables vision. At the same time, texts are the outcome of material translations into language, as much as they take part in creating material realities. Materialities and objects of nature are made into realities by means of texts, that is, in material-semiotic versions (Asdal 2015). This means to say that microbes and other material entities are *found* in the world as much as they are a *product* of research practice and textual production. They are also artefacts.

Both authors used textual material to produce their own text. But while Landecker thematizes the material conditions of the actors in her texts, Lane draws attention to Leeuwenhoek as a discoverer. Lane's text focuses on how it was possible for Leeuwenhoek to build his 'power to see' that over time granted him with primacy of discovery. Thus it might also help us to 'see' the invisible, the action of non-human actors in his text. We can use our own text to think laterally about the production of microbial agency, and enable new visions of the action of humans in relation, response, and reaction to non-humans.

Instead of an either/or approach—*either* asymmetric, in which humans have a different kind of agency than non-humans that produce stories of ontological detachment, *or* symmetric, in which human and non-human agency has the same function in the story—we use our own text, our *artefact* (Strathern 1988), to create a dialogue between the two analyzed texts. Helped by Landecker to see action on behalf of the microbes in human–microbial relationships, we move to Lane's text and search for the role of other things, other non-human actors in an attempt to 'unsee' the detachment that is emphasized throughout his text. We find that in both texts, more-than-human characters populate their stories. We also find that Lane tells stories of becoming, of humanity in relation to microbes, particularly

through the action of lenses, microscopes, and texts. In Lane's text, we find stories about the manipulation of magnifying glasses, and texts debating the ability to actually see microscopic beings.

Leeuwenhoek lived during a time when the invisible world was starting to be observed and conceptualized. The idea of accessing things that the eyes alone cannot see was beginning to take form. And Lane does not hide the 'resistances' encountered by Leeuwenhoek and others. At that time, even the mentioning of 'animalcules' was considered indecent. Leeuwenhoek's handwritten letter to Oldenburg, which occupies space in Lane's text, is in fact his famous 'Letter of the Protozoa', the first publication mentioning Leeuwenhoek's little animals or animalcules. Placed in between the words of Lane, Leeuwenhoek's letter disturbs the focus on Leeuwenhoek's agency. The letter, not Leeuwenhoek himself, was the first actor to make microscopic worlds available to the eyes of others. We can see this because Lane tells us that the process of seeing microbes in fact took a long time and, quite literally, required translation.

Leeuwenhoek was Dutch, he wrote in Dutch, and his work was routinely published in *Philosophical Transactions* translated by Oldenburg, who was an editor in the journal.

> Oldenburg published several of Leeuwenhoek's letters in 1673 and 1674, which dealt with interesting but uncontentious matters. Until this point, Oldenburg had published almost all of Leeuwenhoek's letters within a few months receipt. *Now, he drew pause*. Of the next 12 letters sent by Leeuwenhoek, only three were published, and none that touched on animalcules. The invisible world could be seen by none but Leeuwenhoek. Therefore, Oldenburg's translation is an extraordinary monument to the open-minded skepticism of science.
>
> (Lane 2015: 3, our emphasis)

When Oldenburg translated Leeuwenhoek's letters, the scientific community was sceptical of both the idea of invisible animals and the practices, the procedures, and microscopes used by Leeuwenhoek. Thus, it was difficult to see the invisible living creatures. Here, Lane inserts Leewenhoek's words into his text:

> Leeuwenhoek first courted controversy in a letter of September 1674. Describing a nearby lake, Berkelse Mere, he noted that its water was very clear in winter 'but at the beginning or middle of summer it becomes whitish, and there are then little green clouds floating in it'. These clouds contained wispy 'green streaks, spirally wound serpentwise and orderly arranged'—the beautiful green alga Spirogyra. Then came Leeuwenhoek's first mention of little animals: 'among these

> streaks there were besides very many little animalcules … And the motions of most of these animalcules in the water was so swift, and so various upwards, downwards and round about that was wonderful to see: and I judged that some of these little creatures were above thousand times smaller than the smallest ones I have ever yet seen upon the rind of cheese'.
>
> (Ibid., direct quotations from Leeuwenhoek)

Leeuwenhoek's writing, says Lane, did not inspire credibility. Besides having no formal education, his texts sounded too simple, with superfluous details that conveyed irrelevant information, often censured in Oldenburg's translations. Because Leeuwenhoek wrote too colloquially, his credibility was weak. Rhetorical prose and colloquial language hindered everyone but Leeuwenhoek from seeing bacteria. Moreover, this inability to see was also related to microscopes, a new technology still in the making, still unavailable to most.

> But the natural philosophers of the Royal Society, in pioneering the methods we still use in science today, were not easily spun. Leeuwenhoek's letter had been read aloud over several sessions and attracted great interest, verging on consternation. Oldenburg wrote to Leeuwenhoek, asking him to 'acquaint us with his method of observing, that others may confirm such observations of these', and to provide drawings. Leeuwenhoek declined, throughout his life, to give any description of his microscopical methods, 'for reasons best known to himself', said Hooke.
>
> (Ibid.: 4–5)

Lane mentions a book published by Robert Hooke in 1665, called *Micrographia*, which describes observations of insects and plants with magnifying glasses, the word 'cell' being used for the first time. This book most certainly influenced Leeuwenhoek to develop his own single-lensed microscope. Hooke was a credible scientist at the time, supportive of Leeuwenhoek's work, who succeeded after a couple of attempts to see the animalcules. Without him, 'Leeuwenhoek might easily have been dismissed as a charlatan' (ibid.: 5). At the same time, Hooke's own credible descriptions of microscope construction and lens manipulation undermined Leeuwenhoek's 'simple' microscope. Hooke built and used much larger instruments with two lenses, the prototypes of current microscopes.

Leeuwenhoek's single-lensed microscope depended on the texts he produced, and the translation Oldenburg produced. Scientific artefacts and scientific texts, built over centuries after Leeuwenhoek's death, infer

meaning to our reading of Leeuwenhoek's descriptions of 'little animals'. Lane's story of the translation of Leeuwenhoek's texts challenges us to reread the current inscriptions from scientific machines. But should it also challenge our reading of current scientific texts, or the production of our own texts? How to understand the text as enabling vision? Naturally, Lane does not focus on how the action of discovery is premised on lenses, but it is the human action that is emphasized, the human making and using of the microscope, stemming from genius and curiosity. How might it have been described differently? Could Lane say that the microscope discovered microbes?

In our own reading of Lane's text, if we emphasize the dependence of discoveries on the role of microscopes, they can easily become agents. There are many attempts in the literature that we could use to support this move. We could extend the notion of agency to also include nonintentional or half-intentional action (Ashmore 1993). Another move could be to deny intentionality to humans by describing human action as 'performed', as effects (Law 1994). Yet another, could be to simply attribute intention to non-humans. This last option has been particularly unpopular (Pickering 1995).

But we want to take another road. In order to expand the notion of agency in and through text, we want to make visible our own interpretation, our work in producing an artefact in which non-human actors can act in Lane's text because we want to allow for that. But we cannot simply say that they take part. If we want these actors to be emphasized in our text as acting in Lane's, we have to engage with a chain of texts that demand reinterpretation. The texts by which Leeuwenhoek's microscopes and microbes were *subject to change* over time. We have to allow the temporal depth in Lane's text to emerge in ours.

Callon and Law (2005) suggest that the complexity of agency emerges by means of two particular practices—rarefaction and proliferation—by which the dialogue between symmetric and asymmetric translations can become visible. We then search for these practices in our texts, to demonstrate reinterpretation as the outcome of a complex interaction between human and non-human actors by means of textual artefacts interacting over time. In the following, we explore these two practices in Lane's and Landecker's texts, making visible the reinterpretation of discovery as a long, open-ended, and interdependent task.

Proliferation

Because Landecker thematizes non-human agency, it is not a surprise that many non-human actors play a role in her story. In addition to microbes, Landecker puts a lot of focus on antibiotics. They create resistance. As in

Lane's text, microbial agency depends on humans, but in Landecker's text this agency is mediated by the action of drugs.

> Antibiotics kill by selective toxicity, disrupting microbial structures or processes that do not exist in human cells. Their production is driven by theories of *antibiosis*: a human leveraging of substances microbes create in mutually antagonistic battles for space and resources. Humans make antibiotics by farming microbes, chemically tinkering with microbial metabolites, and mimicking them with synthetic antibiotics. Antibiotic resistance arises when microbes gain the capacity to evade these drugs.
>
> (Landecker 2015: 20, emphasis in original)

But they do not do so by simply acting, nor by acting alone. In her story, first microbes act; they take part in antagonistic battles for space and resources. They actually seem to have been there, quite detached in their own unseen world. Not passive, but disputing space and resources until humans interfere. By implication of human tinkering with drugs, these natural battles also become part of biology in Landecker's account. When humans start harvesting metabolic products and mass-producing antibiotics, human and bacterial agency become connected in a fight for life; humans are threatening microbial life to save their own, and the bacteria *answer* with resistance, to antibiotics, but also to humans. Maybe Foucault would say here that with great power comes great resistance.

> Mass production of antibiotics involved the industrial-scale growth of microorganisms to harvest their metabolic products. Unfortunately, the use of antibiotics selects for resistance at answering scale.
>
> (Ibid.: 19)

Landecker thus points towards a process of agency made through an 'excess of resources that interact with and undermine one another' (Callon and Law 2005: 731). Entities that can be scaled up or down, meaning detached from one context to another, while being reworked, summed, manipulated, get mixed with entities that cannot be enumerated, listed, or ranked. Resistance emerges as an answer at scale to the scaling up of antibiotics, while at the same time, unrelated discoveries are being made in other places:

> Once scientists started following plasmids carrying antibiotic resistance markers instead of pathogenic bacteria, they realized that these genetic pieces did not stay contained in species. When gentamicin was introduced in the 1970s, an intercontinental, cross-genera, cross-species

> spread of resistance to that antibiotic's specific mode of action was observed, due to the spread of an 'epidemic plasmid'.
>
> (Landecker 2015: 31)[2]

Her story tells that in the beginning, when antibiotics were being discovered, scientists believed resistance was a matter of microbial selection. Mutation happened spontaneously, and when exposed to deadly drugs, sometimes some selected individuals survived and continued multiplying (ibid.: 28). Microbes survived human biopower passively and by chance. Resistance emerged as a matter of fate. As clinicians observed resistance in treating diseases, new drugs were developed.

But in the 1950s, microbiologists studying microbes, in order to understand them rather than searching for new drugs that could kill them, discovered plasmids (ibid.: 29). These were understood as genetic communication between microbes, and used to move DNA in between cells, enabling the growth of bioengineering. The idea that microbes could spread genetic elements without selection, actively creating resistance through plasmids—in a way spreading the word in the community—only came later, with outbreaks of multi-resistant bacteria epidemics in the 1980s. Resistance was being discovered as a form of strategy, rather than a feature of chance. In Landecker's text, this discovery emerges out of the coexistence of two sets of stories happening at different paces:

> In this case, the *intentional* engineering of bacterial genomes has been the thread that critical social science scholarship has followed. The story has been humans making life, or at least remaking it to their own ends and modelled on their own desires—nature *intentionally* modelled on culture.[3] Increasingly visible, however, is another story moving at a different pace: the *unintentional* widespread mobilization of mobile DNA bringing new genetic features into chromosomes and plasmid and driving global antibiotic resistance.
>
> (Ibid., our emphasis)

One is the story of microbiology, laid out by sociologists. This story explained how life was being remade by humans, through moving the field of microbiology into an industrial landscape—biotechnology. This move generated a continuous proliferation of new biological links and entanglements. In Landecker's text, biotechnology produced the DNA necessary that proliferates human intentional attempts to model life. The second story is her own, in which microbiology is supposed to control the proliferation of DNA and plasmids, but unintentionally enables a loss of control, and spreads at global proportions. Events happening in microbiology, which were described and categorized in sociological accounts,

recombined in the form of DNA and transformed into industrial products in microbiological accounts, created the possibility of unintended effects in a sort of overflowing process for Landecker's story of resistance. A proliferation of textual material quite literally becomes Landecker's material in the emergent process of discovering resistance.

> What looked like a laboratory technique ready to remake the world can also be retold as a remade world about to remake the laboratory.
> (Ibid.: 29)

Resistance becomes discovery unintentionally done by inscribing—and therefore reinterpreting—sociologists and microbiologists in asymmetric attempts to control life. There is an excess of resources—of human intention and willingness to remake the world, of technologies that tinker with other beings—enabling a nonintentional symmetrical space, a global resistance—through a process of proliferation of texts and meanings. Yet, this whole action is all intentional and asymmetric, and it is made available to us by Landecker's text and her intentional acts of symmetric reinterpretation.

Rarefaction

Oldenburg was not the only one to translate Leeuwenhoek. Lane says that Clifford Dobell, a microbiologist, translated Leeuwenhoek's letters again from the original Dutch in 1932.

> Dobell reveled in the precise beauty of Leeuwenhoek's descriptions of Euglena, Vorticella and many other protists and bacteria, which *leapt off the page*, immediately recognizable to this expert kindred spirit. Leeuwenhoek had a precise and methodical mind, was acutely aware of contamination, resolutely opposed to the idea of spontaneous generation, which was only solved by Pasteur 200 years later.
> (Lane 2015: 3 our emphasis)

The fact that Lane mentions these two translations plays an important role in his text. When Dobell translated the letters, microbiology had already evolved together with microscopes, so he saw the creatures *leaping out* of the page. Previously seen as superfluous, Dobell praised Leeuwenhoek's descriptions emphasizing the mismatch between his thorough descriptions and the views of the scientific community at the time: 'It never occurred to him that Truth could appear indecent' (Dobell 1958: 73). The same effect is achieved in Lane's text. The contrast between Oldenburg's translation and Dobell's translation creates new possibilities in Lane's text. Oldenburg 'would eliminate superfluous details' (Lane 2015: 4) that were revealed

in Dobell's translations. The superfluous details, removed by Oldenburg, enable the work of other material entities (lenses and water), and unexpected images can be seen in Lane's text.

> Leeuwenhoek also reports experiments, adding peppercorns to water, both crushed and uncrushed (as well as ginger, cloves, nutmeg and vinegar omitted from Oldenburg's excerpts for *Philosophical Transactions*).
>
> (Ibid.: 4)

As in Landecker's text, there are two different timeframes coexisting here that are brought together by Lane's use of two different translations of Leeuwenhoek's original texts. The first is Oldenberg's translation that removes material actors. The second is Dobell's translation nearly 300 years later, in which the same material actors confirm the observations. In the experiment with pepper water, bacteria are visible. It is important to note that this did not happen in Leeuwenhoek's original text; bacteria were not seen when he published his texts. His iconic letter, which takes space in Lane's text, was not read by the scientists of his time because they did not speak Dutch. Neither were the microbes seen. He had to write several additional texts trying to convince others of his vision. And although his descriptions were immediately reinterpreted as bacteria by Dobell more than 300 years later, it was time and electricity that enabled this vision. But in Lane's text, bacteria are unquestionably seen in many forms.

> In a clarification to Constantijn Huygens and Hooke, Leeuwenhoek writes 'Let's assume that such a sand-grain is so big, that 80 of them, lying one against the other, would make up the length of one inch'. He goes on to calculate the number of animalcules in a cubic inch; for our purposes here, his calculation puts the length of his 'very wee animals' at less than 3 microm. Bacteria. He later describes bacterial mobility unequivocally.
>
> (Ibid.: 4)

Lane's use of Dobell's translation above can be read as more than just a reinterpretation of preexisting living microscopic beings, but as a process, an open-ended experimentation with texts that keep open the becoming of interdependence between human and non-human agency, dependent on lensed and textual artefacts. A pause in time emerges by literally giving space between different translations.

Leeuwenhoek as a genius is asymmetrically created by systematically removing his 'brilliant mind' through Oldenburg's omissions of material entities that were in fact necessary for experiments carried out by

Leeuwenhoek. But in Dobell's translation, centuries later, these entities are accounted for. In Lane's text, the contrast between Dobell's bacteria that leapt out of the page, and the invisible passive animalcules in Oldenburg's translation create a physical space between past and the present, a space where Leeuwenhoek was forgotten while bacteria became more and more visible, more and more active. The simplicity of Leeuwenhoek's writing is slowly transformed in Lane's plot, giving space to several events that describe the development of microbiology as a science dependent on the development of microscopes. Leeuwenhoek's discoveries become symmetrically dependent on the agency of material entities.

> Most of his discoveries were forgotten, and only rediscovered in the nineteenth century, 150 years later, being then interpreted in the context of the newly developing cell theory with little reference to Leeuwenhoek himself.
>
> (Ibid.: 7)

By using one translation after another, one new discovery after another, Lane's text makes the invisibility of microbes visible, and the forgetting of the simple Leeuwenhoek possible. Across the text, his 'simple' one-lensed microscope also disappears, as the development of theories in microbiology are summarized and compound microscopes developed. The little animals Leeuwenhoek saw were forgotten until the early nineteenth century, when compound and high-powered single-lens microscopes, developed by Joseph Bancks and used by Charles Darwin and Robert Brown, became mainstream. The microscopes Leeuwenhoek made and donated to the Royal Society in 1723, with corresponding specimens, were iconically made available to us as photographs in Lane's text.

> Only the galvanizing work of Brian J. Ford, who rediscovered some of Leeuwenhoek's samples in the library of the Royal Society in 1981, resurrected the glory of the single-lens microscope. Ford photographed Leeuwenhoek's original specimens using one of his surviving microscopes in Utrecht, and demonstrated a remarkable resolution of less than 1 μm. That left little scope for disbelief: plainly, Leeuwenhoek really did see much of what he claimed.
>
> (Ibid.: 7)

What makes Leeuwenhoek remarkable in Lane's text is the fact that he could not be accounted for in the past while vindicated in the present. There were no means: no textual descriptions translated into English; no electricity to provide light to his observations; no developed microscopes to see; and no developed theories to believe. The lack of resources—this

process of rarefaction—makes Leeuwenhoek at the same time asymmetrically the discoverer of passive microbes, while symmetrically connected to the rediscovery of his microscopes, quite literally artefacts, and reinterpretation of his theories, enabled by the clear view of not only present, but past microbes.

> Leeuwenhoek's 1677 paper, the famous 'Letter on the Protozoa', gives the first detailed description of protists and bacteria living in a range of environments. The colloquial, diaristic style conceals the workings of a startlingly original experimental mind.
>
> (Ibid.: 1)

No matter how the discovery of bacteria is reinterpreted in light of later conceptualizations of the human relationship to bacteria, it remains that the existence, and agency of bacteria *in the world* always affect the interpretation of bacteria *in the texts*. We cannot 'unsee' the consequences of antibiotics, even when reading about Leeuwenhoek's discovery as an event firmly embedded in the past. As such, Leeuwenhoek's 'little animals' are *translated* as protists and bacteria in Lane's text, and even as an event leading up to Fleming's discovery of antibiotics in Landecker's text. But our interpretation of both texts also depends on sets of *machines*, in this case microscopes and the chain of texts, that frame the translation and inscribe meaning in our reading of them. Machine-like texts enable visions of moving actors by manipulating heterogeneous temporal frames in the single space of the text.

In our text then, the act of discovery becomes a hybrid form, a dialogue between symmetric and asymmetric translations of the co-relations between humans and non-humans, in which reinterpretation creates new material beings in the present, as well as in the past. The microscope as an inscription device continuously demands reinterpretations of discoveries that magnify, measure, and categorize forgotten and invisible artefacts of the past.

Chimerism

So what is Leeuwenhoek's legacy? asks Lane (2015: 7). This question introduces a turning point in his text. The text stops telling Leeuwenhoek's history and starts creating his legacy by connecting Leeuwenhoek's discoveries with the development of theories about endosymbiosis. In the same way that the development of microscopes enabled translating invisible unreal animalcules into acting microbes capable of reacting to antibiotics, evolutionary theories translate and interpret Leeuwenhoek into visions of the origins of life.

We also want to reinterpret these two texts into legacy. We want to expand the possibility of our text to enable new visions of translation, by allowing the material entities made available to us by the two texts challenge our take on agency. The story of non-human agency in the Sociology of Translation bears a striking similarity with the story of bacteria we create with these texts. From invisible and unaccounted for, to a concept that holds the promise and fear of resisting human domination, hierarchy, and control. What if the discovery of microbes, as translated by these two texts, creates a rationale for better understanding agency? Lane starts by saying that only now is microbiology beginning to answer—with 'surprisingly uncertain answers—to Leeuwenhoek's questions; where did this multitude of tiny animals come from, why such variety and how to classify them?' (ibid.: 1). In a similar way, the humanities have long asked similar questions regarding the concept of agency; where does agency come from, why such a variety and how to classify it? Maybe only now we can come to find surprisingly uncertain answers.

For centuries, microbiology has connected questions about criteria for classifying organisms with concerns about the origins of life. What separates life from non-life? The organic from the inorganic? Lane tells us that although early twentieth-century pioneers proposed that life evolved as the result of symbiotic mergers of bacteria, and just like with Leeuwenhoek's observations of animalcules, the evolution of machines and texts was necessary in order to enable this vision. Endosymbiotic theories were also difficult to see and to believe.

> Leeuwenhoek's comparison with bacteria leaves open the tantalizing possibility that he had even seen organelles such as mitochondria, which with a diameter of 0.5–1 μm would have pushed his microscopical resolution to its limits … Another half century was to elapse before Lynn Margulis and others demonstrated that mitochondria and chloroplasts do indeed derive from bacterial endosymbionts. And even then not without a fight. I doubt that the idea of endosymbiosis would have shocked Leeuwenhoek; nor would he have been much surprised by the contemptuous disbelief of many biologists over decades.
>
> (Ibid.: 7)

Bacteria, a prokaryotic being (with no nucleus), merged with another, making more energy available for evolution into eukaryotic beings (with nucleus) and higher degrees of cellular complexity. The establishment of this truth was dependent on biochemistry, which demonstrates that the differences among different forms of life had little to do with a nucleus and different modes of respiration, but rather with degrees of specialization and organization. The idea that at a biochemical level, all organisms are

unified, established a theoretical basis for studying chemical processes in bacteria and extrapolating those processes to higher organisms, connecting human and microbial life.

> Another unifying theory. Albert Kluyver … realized that different types of respiration are fundamentally equivalent, all invoking the transfer of electrons from a donor to an acceptor. He appreciated that all forms of respiration and fermentation are united in that they all drive growth by means of phosphorylation. This opens the way for a better appreciation of evolutionary developments which have taken place in the microbial world, since the antithesis between the aerobic and anaerobic mode of life has been largely removed.
>
> (Ibid.: 7)

In Landecker's text, antibiotics have done the same. The unifying work of biochemical processes in Lane's text connects humans and non-human living things through natural symbiosis, evolution, and shared chemistry. The unifying work of biochemical entities in Landecker's text connects all living things through antibiosis, evolution, and shared ecology. By placing the origins of antibiotic compounds in natural existing soil, Landecker describes their excess as creating a particular chemical imbalance, in a process of changing all life in unexpected ways.

> Our commensals, our pathogens, our parasites, our domestic animals and fish and their commensals, the pathogens of our parasites, the avian scavengers of our cities and the wildlife—are all now participating in an antibiotic ecology … In this story, we have seen that lice can have epidemics of bacterial infection; bacteria have epidemics of plasmid infection; plasmids have epidemics of transposon and integron infection. Our epidemics have epidemics; our populations have populations.
>
> (Landecker 2015: 41–42)

Biochemistry then unified Leeuwenhoek's discoveries with present research for Lane, and merged history and biology for Landecker, through the work of yet another actor, neither human nor non-human, both human and non-human—genes. Suddenly, it seems then that in both texts, the plot has been all about *phylogenesis*, the process by which some new modes of life appear as a result of transformation, change, and evolution. Lane describes how the flow of 'genetic material' became the criteria to classify organic matter. At the bottom line, it was not respiration, neither the presence nor absence of a nucleus that helped microbiology to design life, but genes. Genetic material is also the basis for recognizing the process of

resistance in Landecker's text. At the bottom line, it was not economy or industrialization that helped biochemistry to design resistance, but genes. In both texts, studying, enumerating, isolating, classifying, and feeding the invisible world evoked genesis stories of life and interdependence between humans and non-humans, carried out by the work of genes (Figure 5.1).

> Francis Crick had already advocated the use of molecular sequences as a wonderfully sensitive phylogenetic signal … Zuckerkandl & Pauling formalized the argument with sequence data; and a mere two decades later, Carl Woese published his first 'tree of life'. Woese was soon dismissing Stainer and van Niel as epitomising the dark ages of microbiology, when microbiologists had given up had given up any prospect of a true phylogeny … Woese and his co-workers went so far as to argue that the term prokaryote was obsolete, being an invalid negative definition (i.e. procaryotes are defined by the absence of a nucleus). The three domains tree is still the standard text book view.
>
> (Lane 2015: 8)

The tree of life is represented as a drawing that speaks of years of research development about the origins of life and hypothesizes that all life came from the same primordial unicellular being. The tree, based on ribosomal RNA signature sequences data, shows the genesis of bacteria, archaea and eukaryotes from a common ancestor, and organizes biodiversity by evolutionary relationships (Mina and Kumar 2014).

We were surprised to encounter this expression—tree of life—in a text about microbiology. Thus, it also seems to contain the potential for

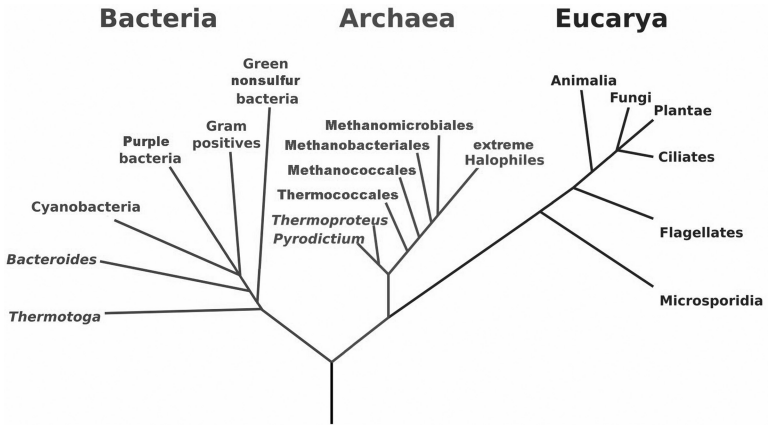

Figure 5.1 Woese's tree of life. (Wikimedia Commons 2013). https://commons.wikimedia.org/wiki/File:PhylogeneticTree,_Woese_1990.PNG.

criteria that might help us to draw the line, categorize, and separate the human from the non-human in the concept of agency. Lane says that in the case of life, differences are not expressed in any gross features of cellular function, but in respect to the detailed organization of the cellular machinery (2015: 8). If we paraphrase this, we could try to think of agency as never expressed in gross features of functioning as human (rational) or non-human (irrational), but in the detailed organization of an acting machinery. If we take agency as being an apparatus, a processing unit, the result of a specific organization, the organization of several 'tiny moving things', no apparatus smaller than one actor is recognizable as the site of either rational/irrational or human/non-human action. The difference is the detailed organization of the machinery, in which non-human action stands for a 'smaller degree of specific organization' (Lane 2015: 8). Yet, this differentiation seems to propose a symmetric understanding of agency which, as in the 'tree of life' in microbiology, is misleading. In Landecker's text, we find the argument that stories told by scientists and social scientists have material aspects, and that history-making is biological.

> The story refers to a recursive structure in which knowledge is produced in and through matter that itself has been altered by previous modes of thought. At the same time that we now know more, we come to inhabit the material future produced by what we thought we knew.
> (Landecker 2015: 37)

Knowledge production and textual production create material connections that enable the action of genes. Lane inserts into the paper about Leeuwenhoek his own texts, alongside Bill Martin's seminal work on the evolutionary genome, to argue for origins of life as a chimera, a process of fusion. A genetic chimera is an organism with more than one genotype, which in Lane's text places the origin of life in endless processes of fusion instead of shared ancestral unity.

> Woese's iconic tree is therefore profoundly misleading, and should be seen strictly as a tree of one gene only, it is not a tree of life. We cannot infer what a cell might have looked like, or how it might have lived in the past, on the basis of its ribosomal genotype. Eukaryotes are now plainly seen to be genomic chimeras.
> (Lane 2015: 9)

Lane explains that the origins of current phylogenic branches are now seen as fusion brought about by lateral gene transfer, and not bifurcation. The unifying theories in biochemistry created the possibility of conceptualizing endosymbiosis, where also the main binding instruments prevent us

from seeing that 'genes are an exchangeable currency' (ibid.). Lateral (or horizontal) gene transfer is also a crucial event in Landecker's text, preventing us from seeing the development of resistance. Bacterial capacity to exchange genes through transformation, transduction, and conjugation from another individual that is not its offspring enables quicker environmental adaptation by acquiring large genetic sequences. It enabled endosymbiosis, evolution, and more recently, resistance. In Lane's story then, the tree is transformed by Bill Martin's (1999) fusion tree, as life is transformed. The flow of genes, that generates resistance in Landecker's text, becomes the origin of all life in Lane's text (Figure 5.2).

A chimera in Greek mythology is a mythological creature that combines in one being the features of two distinct entities. Thus, chimerism expresses the relationship between the concept of translation and agency as chimerism and lateral gene transfer. Chimerism is the process of merging two distinct genetic materials. So instead of understanding translation as the transformation into something else, while 'keeping something about it the same' (Gal 2015), we have the fusion of two forms of action into a hybrid agency, combining the features of distinct symmetric and asymmetric forms of agency. Instead of understanding

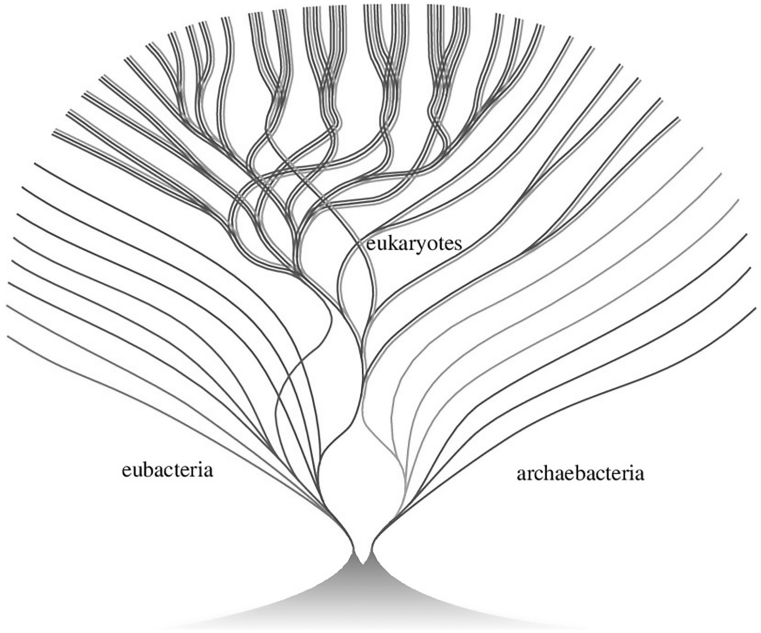

Figure 5.2 Bill Martin's genomic tree (1999). Reproduced with permission. Copyright 1999 & John Wiley & Sons, Inc.

action as 'something being done by someone or something' (Mol 2002), we understand it as a process of lateral *meaning* transfer that creates new beings, new realities.

> Pervasive genetic chimerism means that 'no hierarchical universal classification can be taken as natural'.
>
> (Lane 2015: 9)[4]

Our own text is an example of chimerism, in which symmetrical approaches dialogue with asymmetrical discoveries. Our case of how the agency of microbes is transferred to our interpretation alludes to the fact that both discoveries and machinery, both temporal organization of events and inscriptions of changing apparatuses, convey chimeras of understanding when we open up to meaning as a chimeric agent, open to new evolving forms. Such transfers draw attention to the fact that translations not only facilitate understanding, but they facilitate imagination. Therefore, a chimeric view of agency also enables new visions that potentially enact new material and concrete realities. In chimerism, there is also unpredictability.

Perhaps here we get to the 'answer' of how to understand and study agency. Action is a process of chimerism, always. No hierarchical universal classification can be taken as given because it is forever changing. So, it is not a matter of either asymmetry or symmetry, but how processes of lateral meaning transfer create realities that are both symmetrical and asymmetrical. Thinking laterally with a text one writes, using texts written by others, is creating reality-making artefacts.

Conclusion: Respons-Ability

One can say that a framework, a concept, a model, or an idea, is a tool that enables seeing. The metaphor of a framework as a 'research lens' which the researcher puts on in order to see the world in a certain way and write about it, permeates current notions of interpretative practice in research. In this metaphor, what we imagine is a human putting on a pair of glasses to see better something that is already there. The vision our work with these two texts helps us to evoke is a bit different. The microscopes invented by Leeuwenhoek not only help humans to see preexisting living beings but also creates them. But it does not do so alone and in the past. The invention of microorganisms depended on the texts published and translated by Oldenburg, the emergent living beings 'leaping out' of Dobell's text, and the pictures of Ford. As artefacts these texts found in the world were used and reused over time, by Lane and by us, while becoming a product of ours and others' acts of interpretation.

Both Lane's and Landecker's texts turned out to be stories about microbes and their relationship with humans. But through our work here, they also became partially ours. In Landecker's text, biology was made available to us in a historical form, and we observed the evolution of life forms, ours and microbial. Her text was not only about the history of microbial resistance, as we first thought. As it became an open-ended evolution, a change over time of both humans and non-humans in response to the environment, it also changed in response to Lane's text. It fused life as genes emerged as unifying actors in our text.

Lane's text was not only about the history of a genius man, as we initially thought, but about the open-ended becoming of a field, the evolution of microbiology as it responded to its environment. A man, a subject, subjected to change over time in response to the evolution of the biology of life. Ours and microbial, as the idea of chimerism, helped us to inscribe surprise and the creative features of textual work.

As for agency, we can see it take form when textual and technological machinery converge to form the chimeras we usually think of as interpretation. Actors 'leaping out' of the page calls us to evoke agency for the entities we encounter, to respond by inscribing the words in the world we all inhabit. As we have discussed with our reading of the two texts, we can 'unsee' what is already seen, we can 'unknow' what is already known as new agents, new agencies, are slowly added to our possible field of vision.

As we close this chapter, and open it to new interpretations, the proliferation of new chimeras, we will remind you, dear reader, that the actions of humans and non-humans, of scientific machines and textual artefacts, depend on a lot more than your own acts of interpretation. Responsibility rests on dependence rather than on decisions to emphasize human or non-human actors. What must be honed is thus the ability to engage in how we entangle ourselves in chimeras: allowing for unexpected actors proposed in the documents we engage with to constrain, produce, and transform us through the texts we produce. As we have shown, differences between human and non-human, symmetry and asymmetry make little sense when texts are translators. As Karen Barad formulates it, 'Responsibility is not ours alone … Responsibility entails an ongoing responsiveness to the entanglements of self and other, here and there, now and then' (Barad 2007: 394). The central action called for is no longer an imperative of taking charge and giving reasons but, rather, an ability to respond to and depend on 'others'. Responsibility is reimagined as an ethical injunction to work on the ability to respond to 'others' by allowing ourselves to be challenged—our fields, our worlds—to take care of the entanglements of our relationalities. This implies that response-ability is tied to processes of becoming different in and through the response (Meissner 2014) as we produce documents partially ours.

Notes

1 Our contrast is inspired by Andrew Pickering's use of paintings by Piet Mondrian and Willem de Kooning as two contrasting philosophical objects.
2 Landecker quotes O'Brien et al. (1985).
3 Landecker refers to Rabinow (1992); Giddens (1991).
4 Lane is quoting Ford Doolittle (1999).

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