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Atmospheres of science: Experiencing scientific mobility

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Abstract

This article uses notions of the atmospheric to engage with empirical material concerned with international mobility in science. It draws on recent conceptual work on atmospheres that frames them as allowing access to the affective qualities of everyday life and as 'productively nebulous': atmospheres exist between the local and the globally diffuse, the emergent and the staged, the intangible and the brutally present. Using atmospheric thinking, I devise 'apparatuses of attunement' to capture elusive aspects of life in science, as discussed in interviews with natural scientists about their experiences of international mobility. In particular I use ideas of the situation, atmospheric threads, and the staging of atmospheres to argue that scientists represent themselves as existing in between the particular and the general: they are never wholly at the mercy of the structures and expectations of globalized science, but are also never not in the grip of them. In closing I reflect on what this analysis reveals about the affective qualities of contemporary science, the forms of life being nurtured by the norms and expectations of research (policy), and the kinds of agency available to (these) scientists. The aim of the article is thus twofold: to demonstrate how concepts of atmospheres can be put to work in STS, and to contribute to research on international mobility in science and contemporary scientific careers.

STS has a long history of analysing the performativities of scientific methods and analytical techniques. We have also turned our attention toward our own theories, methods, and analytical tools (e.g., Law, 2004, 2017). Just as much as particle accelerators or survey instruments, our concepts are 'devices that take part in shaping the world' (Asdal and Marres, 2014: 2056). It is vital to use analytical methods that acknowledge that they stage the worlds they seek to describe – that are humble, generous, indefinite (Haraway,

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2016; Law, 2017). 'It matters what thoughts think thoughts … what stories tell stories' (Haraway, 2016: 35).

In this article I think with atmospheres. Atmospheres are, in brief, 'the shared ground from which subjective states and their attendant feelings and emotions emerge' (Anderson, 2009: 80), and thus 'force field[s] in which people find themselves' (Stewart, 2011: 452). I use atmospheres because they are 'productively nebulous' (Lorimer et al., 2019: 27). The notion of atmosphere can be mobilized to help tell stories from data in ways that do not elide complexities and contradictions (Law, 2004): They allow us to eschew tidy categorization and to present empirical material in a manner that maintains at least some of its tensions. As I will suggest, they also allow us to become attuned to the affective currents of particular situations. Thinking with atmospheres thus offers researchers a tool for generous and complex readings of material that demands our care, in the multiple senses of that term (Atkinson-Graham et al., 2015; Puig de la Bellacasa, 2011).

The context in which I do this atmospheric thinking is that of international mobility of scientific workers, and specifically an interview study in which natural scientists talked about their experiences of mobility. I use notions of atmospheres to parse out the complex and often non-coherent ways in which these experiences were presented, and to examine their affective qualities. I thus seek to make sense of these accounts of mobility through an approach that focuses on the nuances of specific empirical moments, that looks at situations, conditions and attunements, and that involves, as Stewart (2011: 449) writes, 'attending to what might be happening … the sheer buzzing of atmospheric fill'.

Overall, I will suggest that thinking with atmospheres not only offers insight into the affective qualities of contemporary science, but leads us to consider how scientists represent themselves as able to act, or not, within scientific careers that are increasingly competitive and precarious. In a context in which there is increasing public discussion of the degree to which science is liveable (Flaherty, 2015), how do researchers frame their choices and trajectories?

Building a life in contemporary science: Mobility and precarity

International mobility is both a global trend (Flanagan, 2015; OECD, 2011) and an aspect of scientific experience that makes explicit the complex ways in which contemporary science is simultaneously made as universal or globalized knowledge, and as specific, via insistence on the value of encountering different local research cultures. It can also be seen as one aspect of what we might frame as the new conditions of academic work, in which emerging regimes for the accumulation of worth and accompanying forms of valuation are subtly shifting how knowledge production is carried out (Allmer, 2017; Fochler, 2016; Fochler and De Rijcke, 2017; Hackett, 2014). Though – as Fochler (2016) has emphasized – these shifts cannot be understood as solely articulated through a focus on economic or monetary value, logics of capitalism are increasingly prevalent within diverse aspects of academic life (Brown, 2015; Rushforth et al., 2018). At least some of these logics speak to globalization and to the rise of international markets in knowledge and human capital production. Both individual academics and their institutions are framed as needing

to enhance reputational and other forms of symbolic capital in order to compete in a global marketplace (Fochler, 2016; Hackett, 2014; Kim, 2017).

The movement of people across national borders is central to these developments. International collaboration and mobility are represented as integral to science: As one *Nature* editorial put it, in the early days of the Trump presidency in the US, science 'without walls' leads to 'stronger research' (*Nature*, 2017). The excellent researcher is imagined by research policy as a 'hyperflexible jet-setter' (Zippel, 2017: 3), while 'a successful research career is inextricably linked with internationalization' (Wohlert et al., 2016: 6). Even beyond concerns about 'brain drain' and the globally skewed flows of excellent scientists (Kim, 2017), however, there has been increasing discussion of the forms of life that this globalized science is nurturing. Academic literature has explored the intense pressures that many junior scientists experience, the 'homelessness' of mobility, and the highly specific character of the excellent or mobile researcher in terms of their (lack of) attachments (Balaban, 2018; Loveday, 2018; Müller, 2014; Zippel, 2017). Scholarship on international mobility has at times framed it as a form of 'discrimination' that allows certain researchers – typically those who are male, middle class and/or with few responsibilities or ties – to prosper above others (Ackers, 2008).

The stressors that make up these new conditions of academic work are not experienced uniformly or in straightforward ways (Lam, 2010; Linková, 2013). The central point, however, is that it is increasingly precarious to craft a life in science. One's career – and often one's identity – hangs by fragile threads that may easily be broken by missed funding, a troublesome publication, or the inability to move to a different country (Lorenz-Meyer, 2018; Loveday, 2018; Müller, 2014). Accordingly, the situation of (junior) scientists appears to be marked by intermingled affects of hope, excitement, combativeness, and anxiety (Lorenz-Meyer, 2018; Loveday, 2018) – a condition that may be linked to Berlant's notion of 'cruel optimism': 'when something you desire is actually an obstacle to your flourishing' (Berlant, 2011: 1; see also Lipton, 2017).

Thinking with atmospheres

Much research on mobility has been concerned with its discriminatory potential or realities, or with articulating the various 'push or pull' factors that may trigger it (Børing et al., 2015; see Flanagan, 2015). There has been relatively little attention to the affective regimes under which it operates, and how these relate to the wider conditions of contemporary academic work described above. The research on which this article draws explored these dynamics, taking an approach based on previous STS work on epistemic living spaces (Felt, 2017; Felt and Fochler, 2012). This notion suggests that science is a space in which one lives and dwells, one that is patterned through wider structural developments within scientific governance – such as the rise of new public management – but where researchers still 'aim to express their agency through … diverse kinds of work' (Felt, 2017: 54). One aim of the study was therefore to explore the ways in which internationally mobile scientists framed their experiences, particularly in terms of the affective and agential qualities of these, and to investigate what scientists' talk about mobility might tell us about contemporary science more generally.

The research involved an interview study with 31 natural scientists working as postdoctoral researchers, assistant professors or associate professors, all of whom were then

based in Denmark but had either trained (completed a PhD) or spent time working abroad. The interviews lasted between one and two-and-a-half hours, and were semi-structured, covering experiences of mobility, its impacts inside and outside of the lab, and researchers' descriptions of differences in research practices and norms of 'good science' that they had encountered. Analysis involved repeated reading and coding of interview transcripts and of field notes taken after each interview, using a combination of codes relating to the research themes and in vivo or emergent coding (Coffey and Atkinson, 1996). It also involved a reflective phase of grouping, connecting and annotating key themes that emerged from interview talk, in a manner that sought to depict and articulate the complexity of the data rather than streamline or flatten it (Law, 2004). In this article, I focus on 'mobility talk': the ways in which interviewees talked about, and made sense of, their experiences of international mobility. The names of all interviewees (and of their family members or colleagues) have been changed.

How should we best tell these mobility stories? As I read and re-read this material I found myself thinking in terms of webs, infrastructures or, finally, atmospheres. The character of experiences of international mobility was elusive. They frequently involved non-coherence or tension – mobility might be simultaneously desired and imposed; permanent and temporary; pleasurable and painful – and were imagined as operating at multiple different scales, from the intimacy of interpersonal connections to the global dynamics of research. Different meanings of mobility were layered on top of each other. The work of Tsing on the making of universals in locally specific ways became one frame for thinking about these diverse meanings. For Tsing (2005: 6), global trends and abstractions can be thought of 'not as truth or lies but as sticky engagements' with particular local environments. Tsing uses the metaphor of friction – the 'awkward, unequal, unstable, and creative qualities of interconnection across difference' (p.4) – to explore how the local and universal meet. Similarly, accounts of mobility offer examples of the cosmopolitan – globalized science – being made through the 'contingent lineages' (Tsing, 2005: 127) of individual lives. But I also found notions of atmosphere a valuable thread to follow because, as Anderson writes:

> the concept of atmosphere is good to think with because it holds a series of opposites – presence and absence, materiality and ideality, definite and indefinite, singularity and generality – in a relation of tension (Anderson, 2009: 80)

Epistemic living spaces, Felt (2017) argues, are always both individual and general, involving both personal agency and powerful structures. To think with atmospheres offers a means of capturing some of these 'opposites' (Anderson, 2009: 80) in interaction. Atmospheres are also inherently affective. They are 'the shared ground from which subjective states and their attendant feelings and emotions emerge'. Importantly, this is true both in their meteorological sense and their wider meaning as 'the prevailing mood of a place, situation, or cultural representation' (Gandy, 2017: 355).

Part of the slipperiness of atmospheres is this movement between the meteorological and the metaphorical – or, rather, not quite the metaphorical, because even in this wider view atmospheres are still material and sensed, a 'force field in which people find themselves' (Stewart, 2011: 452). We might instead term this wider view of the atmospheric the

epochal. 'Epochs, societies, seasons, couples, places, buildings and much more can be said to be atmospheric', writes Anderson, 'in the sense that they are animated by singular affective qualities' (2009: 79). Recent thinking on atmospheres has often taken the politics of physical atmospheres as a focus and starting point (Calvillo, 2018; Gandy, 2017; Sloterdijk, 2009), using the meteorological to point to wider political dynamics. In contrast, in this text I am primarily concerned with the atmospheric in its epochal sense, drawing on work in which an atmosphere goes beyond the immediate – the atmo-*sphere* – to encapsulate 'everyday sensibilities' (Stewart, 2011: 445) or political moments. But I also want to make use of some of the techniques and approaches that have been mobilised to become attuned to particular physical atmospheres. Choy (2018: 56), for example, discusses an 'anthropology of elusivity' by unpacking the techniques used to discern elusive traces of matsutake mushrooms. Going beyond the specific 'apparatuses of attunement' (p.58) to particular scents that he describes, I take more general inspiration from the ways in which sensibility to particular qualities can be heightened through 'interlacings of equipment, objects, and structured attention'. If we are concerned with investigating the elusive – here, experiences of mobility – we might develop our own apparatuses for atmospheric attunement (Calvillo, 2018; Stewart, 2011), similarly comprised of particular forms of attention and equipment. It is just that the atmospheres we wish to notice, to become attuned to, are not primarily those of the air but of the everyday affective qualities of science.

In thinking with atmospheres I therefore wish to find ways to become attuned to the 'buzzing of atmospheric fill' (Stewart, 2011: 449) of science, as it is done within international mobility. Part of the equipment for this attunement is exactly notions of atmospheres themselves. One of the valences of the atmospheric is that it can be thought of in different ways: depending on the tradition one draws on, or the conceptual tools one chooses, atmospheres exist not only somewhere between the meteorological and epochal, but between the local and the globally diffuse, the emergent and the staged, the intangible and the brutally present. In making use of this indeterminacy we can produce accounts that hold together different performances of reality (Law, 2004), that are perhaps more 'aesthetic and performative than argumentative' (Atkinson-Graham et al., 2015: 739) but which thereby capture elusive aspects of life in science.

In the three sections that follow I think the interview material with atmospheres in three ways, drawing on slightly different versions of the atmospheric so as to become attuned to particular aspects of life as an internationally mobile scientist, and creating three subtly different 'apparatuses of attunement'. As a whole, the account hangs together in sometimes uneasy ways. Some of the ways I think with atmospheres are not consistent; the language may jar or use mixed metaphors. This, to me, is a feature not a bug – a way that the atmospheric can help represent the elusive, those 'objects that elude particular habitual knowledge' (Choy, 2018: 54), without flattening their character, and, in this case, a means of caring for the complex ways of living within internationalized science that are present in interviewees' accounts.

The situation: 'An atmosphere for living'

In this section I approach atmospheric analysis through the notion of the *situation*, drawing on work from affect theory that has framed atmospheres as the 'circulating

forces' of contemporary life (Stewart, 2011: 445). Within this work the situation is a key tool for investigating the nature of these mundane sensibilities. For Berlant (2011: 195), a situation is 'a genre of living that one knows one's in but that one has to find out about'; for Stewart (2011: 447), it is 'a moment of unforeclosed experience'. A situation is thus a space and moment of openess and possibility while simultaneously being mundane and ordinary. Something may develop out of a situation, something eventful – but, ultimately, it is most likely that nothing will happen. The situation thereby offers an opportunity for analysis of the atmospheres that run through everyday life, holding out 'what might be happening' for examination and allowing us to ask: 'how are such elements constituted *as* an atmosphere for living?' (Stewart, 2011: 449, emphasis in original). We might compare the situation with Choy's (2018) use of the notion of suspension within his 'anthropology of the elusive'. When something is in suspension it hangs in the air, becoming amenable to analysis in new ways; in the same way, the situation as analytical device somehow pauses the atmospheres of everyday life, holding them out for attention.

Parsing out situations can therefore give us insight into the ways that individuals build lives in science, given the affordances and attachments available to them. I explore this by discussing the situations of two interviewees, and the ways in which they made sense of those situations.

Brian was the first person I interviewed. He was an Australian who had been in Denmark for just over two years when I talked to him, an environmental engineer by training who had been working on a project on aquaculture. His situation – as for most interviewees – was complex. He had come to Denmark with funding from a European Commission mobility grant, but this had recently ended.

Brian:	… I'm at the looking for funding stage.
Int:	For more Danish funding?
Brian:	Yeah, to try and stay here. I mean, Denise moved with me from Sydney, and she loves it here. And I've got family here, my mum was actually Danish. So I've got half my family over here.
Int:	Was that a consideration when you were thinking about where to come?
Brian:	Yeah. The main consideration, really, was to just get out, get out of Australia, go somewhere else. I wouldn't say it happened by chance, but it seemed relatively straightforward, somehow.

A number of factors had come together to bring Brian to Denmark. He had, he said, been desperate to leave Australia (which felt 'stale') and experience somewhere new. The main consideration 'was to just get out'. But having family in Denmark meant that it was a relatively easy place to move to, as did the fact that his partner Denise was originally from the UK and was happy to move from Sydney. The desire to move came first; after that, 'basically I picked a country, figured out who was in my [research] area, and wrote an email, saying I'm thinking about writing an application'. The whole process had been so straightforward that Brian said, half joking, that perhaps he'd used up all his 'funding luck' at that early stage. Now, given that Denise had recently found a good job and 'loves it here', and that Brian was enjoying Danish research culture (compared to Australia, he

said, there was little hierarchy and 'everyone seems to feel more relaxed around each other'), the aim was 'to try and stay'.

We might think of Brian's situation as difficult. In fact, as a whole the interview felt relaxed and cheerful, in ways that the extracts above already hint at: there is talk of love, of family, of attachment to place and to a scientific environment, of desires being granted. Despite the uncertainty, Brian was happy with his situation: The funding was 'challenging' but the group he had been working with were 'supportive', allowing him access to the lab and to university resources even though he was no longer officially employed there, and supporting him in funding applications. Both he and Denise, his partner, were enjoying life in Denmark. The atmosphere for living that he (in collaboration with all the other actants in his story) had constructed was one marked by contentment. But it was also one that he characterized in terms of luck and serendipity. The disparate elements that comprised his mobility narrative – a desire to leave a home country, a partner from abroad, a particular line of scholarship with contact points in various places around the world, the pleasures of life in Copenhagen – had come together as they had in a 'straightforward' way, by chance as much as by deliberate choice. Though his funding – and thereby work – situation was marked by uncertainty, he framed other affective ties as stable: his partner, his family, his colleagues, his enjoyment of Danish life. He made sense of his mobility through this combination of desire (to leave, to stay) and fortuitousness.

Cecilie presented herself as much more ambivalent about her situation. She was a Dane, an assistant professor who had previously spent a year in a US lab and was just about to move, with her partner and two children, to Switzerland for a two year research position (though she said about this timescale, 'I have to be able to imagine to stay there forever, otherwise I wouldn't like to go'). She was a molecular biologist who told a story of following a single scientific thread through her career. Everything had happened because of the project she had been working on since her master's degree, which had turned into a continuous and ever-expanding programme of work:

> Actually, to be honest, I never really made the decision to stay in academia. I just was never done with the project. I'm still not done with the project … I've always been thinking, just finish this, and then I'm out. But now I've got the assistant professorship which was really a surprise … But maybe, sometimes now, I think, like, this project that I think I'm just finishing, it's going to take the rest of my life … I think that's what's going on.

Cecilie was unsure about staying in academia, unsure about the move to Switzerland, surprised that she had got her assistant professorship. 'The project' acted as the defining thread in her story of mobility, a single constant factor that had seen her through a deeply unhappy research stay in the US and through the breaks that she had taken when she had had her two children. It was the project that was taking her to Switzerland so that she could work in the pre-eminent lab in the field; in this she had the support both of her partner, who wanted to switch fields and would use the move as an opportunity to do this, and her Danish employer, who had 'really encouraged this' because she had thus far been primarily based at a single institution. The atmospheres of her life (and science) involved constant questioning, reflecting and wondering. The decision to move to Switzerland had been 'difficult', she said, and now

everybody's saying it's going to be great, it's going to be super for you, and I feel like I'm so stupid, everything will go totally wrong. [Laughs] So we are – we have that situation right now.

If the atmosphere Brian had crafted for living was one characterized by contentment, that which Cecilie narrated was one of surprise and uncertainty, framing these as not necessarily negative, but as somehow intrinsic to her life. The pieces that comprised her situation – the project, her employer's encouragement of her mobility, her family, her dread of another stressful research stay abroad – hung together for the moment, but seemed in constant danger of disintegrating. She made sense of her mobility through the directing force of the project but also through an openness to whatever possibilities might emerge (staying in Switzerland indefinitely, coming home immediately, staying for one year, three years …). The atmosphere she lived in was somehow untrammelled. She mentioned wider pressures, from her employer's desire for her mobility to the dangers of 'risking' her career by not working long hours in the lab, but did not frame them as defining her life. Anything, one got the sense, might happen.

Brian and Cecilie's situations were very different. This is true not just in terms of the mechanics of their lives in science – their backgrounds, trajectories, attachments, and resourcing – but in the ways in which they narrated and framed their experiences. At the same time one can see some of the 'background hum' (Stewart, 2011: 449) that seems to comprise contemporary lives in science (at least for those scientists who end up in Denmark). Atmospheric threads – global dynamics – that we will pick up on in the following section appear: a funding scheme that promotes international mobility, personal contacts that lead to jobs, the precarity of life on soft money. These threads are not, however, defining, but are combined with other aspects of the situation, and with other attachments and desires. Each situation involves attunements to wider dynamics, to specific and quite diverse attachments or affects (the pleasures of a place or a project), to possibilities at one moment or another. None of these attunements necessarily takes priority over the others. Their coordination is exactly individual.

The situation – this frozen and inevitably incomplete parsing out of the atmospheres through which one lives – is thus a useful analytical device because it sets the mobile researcher in the full context of the dynamics they live by. Family ties sit next to funding schemes promoting mobility, which sit next to personal attachments to place. A desire to travel sits next to the need to access certain technical equipment, which sits next to weariness with precarity (to take examples from other interviews). Each situation is unique, but somehow recognizable. Some of the resonances are the same. What the situation does, then, is to highlight that 'atmospheres for living' are 'not exactly intended or unintended' (Stewart, 2011: 449); they are not wholly chosen, nor wholly imposed. Brian (in collaboration with his partner and his collaborators) decided to leave Australia, and his choice could latch on to international funding structures designed to help him to do so but that, two years later, left him without a job. Cecilie might be driven by the logic of her project but this was never inexorable: The very fact that she had agonized over the move to Switzerland was because it could very easily have been otherwise. A situation is a meeting point between management and the way things are.

Frictions: Atmospheric threads and tendrils

If using the situation as analytical device helps to outline how scientists develop their own 'atmospheres for living', notions of atmospheric threads and tendrils can be used to identify some of the wider atmospheres through which they do this. Atmospheres, I have said, sit between the local and the globally diffuse. This imagination of them is derived from the meteorological. Air, Gandy (2017: 257) writes, 'is streaked with possibilities or "threads" exemplified by olfactory patterns, pressure gradients, and other endlessly changing meteorological phenomena' (see also McCormack, 2008). Atmosphere thus becomes something that exceeds local 'atmo-spheres' (Anderson, 2009) and that is constituted through threads or tendrils, even becoming points within networks (Latour, 2013; Skrydstrup, 2016). As with Tsing's (2005) search for how universals become specific, atmospheres are simultaneously local and global, taking on meaning and character through the connections they have to wider dynamics. An interview offers opportunities for such wider connections to 'precipitate' (McCormack, 2008), to become present as legible arguments or emotions. What atmospheric threads and tendrils precipitate within talk about mobility?

As we have seen in Brian and Cecilie's accounts, participants' narrations of mobility made sense of it through a number of wider structures and trends, often those concerned with the governance of science at a national or global level. One such atmospheric thread is the promotion of international mobility itself, something that was seen as present, in varying ways, around the world but was most explicit in experiences of Danish science policy. Participants spoke of mobility being built into funding structures, so that 'you cannot apply for a postdoctoral fellowship unless there's some kind of international mobility', as well as it being a necessity for gaining a permanent position. His current university, said Uffe, 'has a policy that they're not going to hire anyone in assistant professorships or associate professorships that hasn't had some kind of international stay'. Such developments were also made visible through stories of resistance, frustration or rejection. Carsten said bluntly, of a period of mobility built into a postdoc grant, that 'I was supposed to go there for a year but I didn't like it that much so I only stayed for half a year and left'. Iris, a Canadian who had spent time in the US, Sweden, and Denmark, said that she 'took the advice [to be internationally mobile] and it fucked me over', given that she was now left without a long-term position. One atmospheric thread is thus not only the promotion of international mobility, but the diverse valuations associated with it. It offers important forms of symbolic capital – such as employability (Fochler, 2016) – at both individual and national levels, but at the same time was often judged, by interviewees, as an unjust requirement: '[A]nyone that prioritizes family earlier', said Georg, 'will be hindered by the mobility requirements.'

Global economics, national policies of austerity, or inequities of research funding were other threads used to make sense of participants' experiences. Participants from southern Europe, for instance, talked about the dearth of research funding and opportunities in their home countries that had made mobility necessary, while those who had gained (highly generous, by international standards) Danish postdoctoral funding spoke of the privileged position in which this put them when they spent time in other labs or countries. The extracts below offer two contrasting accounts:

I was back in Portugal. So my idea at that time was to stay, to stay there. But that coincided with this terrible crisis, some years ago, and it was really, although I got a contract, it was very difficult to get additional project money for developing research, and because my research needs not just, you know, a computer, but I would need consumables and be able to hire people and so on, that was at that time really really hard, so I started to apply to other things, also considering leaving again. I applied for this project here in Denmark … and I got it and it was really an incredible opportunity. (Beatrice, Associate Professor)

… because I came with my own funding, that gave a lot of freedom to do whatever I found interesting … being on an independent grant, right, I guess my PI in Oxford was aware that if I didn't like anything, I would just go to another laboratory and do my stuff. Because I had my own salary. (Niels, Post Doc)

The story Beatrice tells of her mobility is one of changed plans and of having to follow the resources she needs for her science. The position in Denmark offered an 'incredible opportunity' because it allowed her to work without the financial constraints of her job in Portugal. In contrast, Niels, who had Danish funding for his postdoctoral work abroad, talks of the intellectual freedom that this financing allowed. Versions of this story were told by others: Caspar, for instance, spoke about being able to work a standard Danish 37 hour work week in a US lab where much longer hours were expected of others. Money, and where it comes from, is a central way of speaking about mobility. Its global patterning and flows – and the opportunities that access to it provides – were rendered explicit in interviewees' talk, bringing the supranational (austerity, inequity) into individual situations through moments of friction (Tsing, 2005).

Atmospheric threads did not only render visible dynamics of global economics, scientific governance, or policy, but also those of widely shared norms of scientific practice. Key amongst these are the worldwide connections and networks – and indeed, affective ties; the question of who one would *like* to work with – that were framed as integral to contemporary science. Mobility was often presented as a practical realization of science's reliance on interpersonal ties and friendships (Shapin, 2009). Many interviewees had gained previous or current positions not through open recruitment processes but through personal connections or collaborations, speaking of informal meetings at conferences and congresses as being central to their career trajectories. Selena, for instance, had been job-hunting in Spain after completing an obligatory semester abroad in Denmark for her recently finished PhD when 'I got an e-mail from [her Danish PI] saying that he had money for two years if I could be here in two weeks.' That the PI knew her, and that they had an existing relationship, was central (as, we should note, was her ability to abandon other ties and 'be here in two weeks'). Others talked about the need to keep travelling, if only for short trips, in order to develop and maintain a strategic network of connections and ties that might be useful to them at a later stage. Stories of mobility thus often narrated science as both highly internationalized – with collaborations and flows that were dispersed across the globe – and as highly personal, dependent on relations formed between individuals and small groups.

Thinking about this interview material through notions of atmospheric threads thus helps us to see how the wider trends that affect and organize science are made real in the lives of individual scientists. The interviews offer an opportunity for these global dynamics to 'precipitate' (McCormack, 2008), to become visible to the analyst. We have observed

certain atmospheric threads: the policy push for internationalization, global economic disparities, and science's continued emphasis on personal relationships and trust. But we should not assume that these are comprehensive, nor that they become visible within lived experience in homogeneous ways. Indeed, such trends may be figured in talk through their description, celebration, or rejection: They are assessed and experienced in differing ways, and differing affective qualities ascribed to them. Each interviewee had lived within such large scale trends in unique ways. Developments such as a (global, though differentiated) policy push towards international mobility (Kim, 2017) are always experienced as 'situated dilemmas' (Tsing, 2005: 267); they are, therefore, never experienced by scientists in the same ways, but – as we saw in the previous section – rendered real through the specificities of individual situations.

Affects: Staging the atmospheres of science

The final way I want to think with atmospheres is concerned with the nature of the present moment – in Berlant's (2011: 4) sense of 'mediated affect' – and with how this moment is being produced. What forms of life are being nurtured through international mobility, how are these dwelt within, and what dynamics are creating them? This discussion thus relates explicitly to prior work that has asked who is able to thrive in contemporary academia (Ackers, 2008; Lund, 2015). Here I draw on work that has discussed the 'staging' of atmospheres, as well as their affective qualities. Notions of staging assume that atmospheres are not natural or inevitable, but may be subject to management; though 'it can appear somewhat impossible to even try to stage a phenomenon as fleeting, ambiguous and vague as atmosphere' (Bille et al., 2015: 33), in practice actors from architects to political parties make efforts to define mood, at a scale from buildings to nations. Staging is 'a way of performing what the world both is, and should be' (p. 34). It therefore relates to normative visions not only of the world but of specific actors in it, their affects, and their behaviours. Staging efforts are, however, not uncomplicated: 'the way atmospheres are experienced depends in a number of ways on cultural values, prior experience, as well as personal background' (Popov, 2015: 31).

What forms of life do the atmospheres of science produce? We have already started to observe some of the affective qualities of contemporary science. Brian and Cecilie's situations both incorporate positive affects, such as contentment, attachments to places or projects, and feelings of hope or luck. At the same time, we have heard about 'being fucked over' by mobility requirements, of it being 'really really hard' to do science in situations with few resources, and of situations of uncertainty or of needing to pick up and leave with two weeks notice. The interviews frequently included stories of anxiety, of the 'brutality' of short term and precarious work, or of the exhausting and never-ending competition of contemporary science:

> [T]here's just a lot of competition. … That can be stressful. Yeah, you're never done running. You have to run all the time. (Caspar, Assistant Professor)

> The longest period I've had a contract was during my PhD I think. The rest have been like contracts of one year, two years. You always have to be like on the edge, thinking like what's going to happen with me? (Lisardo, [Contract] Associate Professor)

> I was really upset when I found out that my funding situation was such a mess, because I'm not just losing like, my career right now, I'm losing everything that I've built, which is brutal, I have a really good network of friends [here]. (Iris, Post Doc)

Such accounts of precarity, uncertainty, or injustice, and emotions of failure and anxiety – from being 'never done running' to 'losing everything' – were common. But they were rarely expressed in isolation. For many interviewees mobility had also been both intensely desired and intensely satisfying, both personally and in terms of their science. Benito's account, quoted below, is typical, if more lyrical than many:

> [T]ravelling around makes you a better person, a more rich person. In all honesty, from an academic perspective as well, the fact of travelling around, meeting new cultures, new people, is invaluable. You cannot do, you cannot live, you do not have money to buy, it's something that, I don't know the term in English, but it's the most important thing. How to get all these experiences with you, and how these experiences transform you into a different person. (Benito, Post Doc)

This duality is characteristic of the(se) atmospheres of science. The affective qualities of life as a mobile researcher involved both pleasures – such as the value of experiences of different cultures that mobility enables, or the satisfactions of engaging with 'excellent science' – and frustrations, anxieties, and experiences of loneliness or isolation. In this respect it is perhaps not surprising that, intertwined with this simultaneous experience of pleasure and anxiety or pain, there was a frequent emphasis on surprise or luck (as we have seen in Brian and Cecilie's accounts). The atmospheres of science were marked by 'cruel optimism' in that they twinned the pleasurable affects of optimism or excitement with the cruelty of failure, isolation, or anxiety; as such, one is never entirely in control of a situation (Lipton, 2017; Loveday, 2017).

This twinning of pleasure with frustration or pain is not only essential to understanding how science is lived, but relates to the conditions that produce this particular set of affects – to how these atmospheres are staged. Those interviewed were generally quite clear that research and university policy – often in the shape of targeted funding initiatives, but also in the production of particular expectations or recruitment strategies – had been key in staging the atmospheres in which they lived. Insofar as scientific mobility has its own atmosphere, one characterized by pleasures that are inextricably tied to anxieties, this atmosphere had been structured by demands or pressures to be mobile. Such demands were framed in diverse ways in the interviews: For some, the equivalence of excellence with mobility was a mundane aspect of their research environment, a rather unproblematic rite of passage that one should go through. For Niklas, his three-year postdoc in the UK was:

> largely a career decision. I mean, every senior figure that I've spoken to has been very clear about this, if you want to have a future in the Danish research environment, there's no way without going abroad for some years. (Niklas, Assistant Professor)

His mobility – during which his wife had travelled with him – was a fact of life, something that had to be done to be serious about science. Others framed the demand for

mobility in less accepting terms. 'You can choose', said Elisabet, about existing in multiple short term positions in different countries, 'give up [a career in science] or move'. For Niels, working abroad had been 'challenging' and done for 'the CV thing'; ultimately, 'it would have been so much easier and nicer in many ways just to stay' in the city to which he eventually returned. In these cases, and more generally in the interviews, mobility was presented as a necessity, driven by funding schemes, competition or employer expectations. Such policy dynamics are thus staging the atmospheres of science by making international work an increasingly taken for granted expectation.

These staging efforts – which have, in slightly different terms, been described through their effects in articulating the 'ideal academic' as attachment-free 'jetsetter' (Ackers, 2008; Lund, 2015; Zippel, 2017) – are not, however, definitive in creating atmospheres for science. Interviewees did not always live, feel and behave like the ideal academics the policy environment sought to produce: There was friction (Tsing, 2005) in how these abstract visions were applied. Mobility decisions were often taken through complex compromises, calculations and negotiations that enabled a performance that looked, to funders or on a CV, like an obediently mobile scholar but was also able to meet other needs. Niklas, who was quoted directly above, had (with some effort) managed to make his mobility work for his career but also, simultaneously, that of his wife: The couple had been able to time the births of their two children during the research stay, so that Niklas' wife was on (Danish) parental leave for the duration and wasn't penalized for a career break. Others carried out their mobility 'on paper', working in one place but basing their lives elsewhere and commuting across national borders. In other cases, the policy push for mobility was met with the desire for travel for its own sake; as with Brian's trajectory, support for mobility became an opportunity to be appropriated for one's own purposes, and international work a valuable life experience as much as a career move. In yet other cases, pressure to be mobile could be ignored because academic careers themselves were resisted or problematized. Camilla, who was between positions and considering jobs in industry, had 'never wanted to be a group leader'. She and others who represented themselves as disliking or being weary of the culture of contemporary science could resist the demand for excellence through mobility because they were (no longer) interested in the promised rewards of such excellence: a stable position as group leader or tenured professor. By letting go of attachments to a career in science, at least as it is framed in policy, they could craft an atmosphere for living and doing research that allowed other attachments to be foregrounded – including, at times, to the kind of curiosity-driven scientific research that was seen as no longer possible in the 'high pressure' world of competitive academic science.

The staging of atmospheres of science is therefore incomplete and constantly troubled by specific combinations of bodies, desires and attachments. Such atmospheres, as Bille and colleagues (2015: 34) write, 'cannot be controlled in any simple or unambiguous way by political agents'. This does not negate the considerable work that is being done today by university, national, and international policy and funding structures to create circumscribed and limiting visions of the good academic and academic career (Lund, 2015), and which ensures that certain people thrive in academia more readily than others. But it does suggest that the affects that these visions promote, and specifically the intertwined emotions of anticipation, hope, and anxiety that seem so dominant, are never

straightforwardly experienced. The atmospheres of science are always met by particular bodies. Collective affects are never wholly collective.

Lateral agencies

Each of the ways I have thought with atmospheres has foregrounded different aspects of interviewees' experiences – different ways that international mobility is made sense of at a particular moment. At the same time, this process of atmospheric thinking has led us to circle repeatedly around one central issue, that of how these scientists frame themselves as able or unable to act. The atmospheric has been a particularly useful device because it captures the tensions apparent in these mobile scientists' representations of their experiences. They both reference intense pressures (financial, institutional, cultural) to be mobile, and frame themselves as actively choosing that mobility. They tell stories of anxiety and precarity, and of the pleasures that come with that insecurity, both personal and scientific. They gesture to homogenizing global dynamics, but simultaneously exist in situations that are always uniquely contrived.

The atmospheric has thus offered a means of examining the frictions through which large scale dynamics within contemporary science are articulated within the lives of individual scientists. Atmospheric threads, from the norms of science to global economic inequities, are precipitated within scientists' accounts of their mobility; at the same time, the notion of the situation as a means of exploring 'atmospheres for living' allows us to see the diverse materials that scientists work with when they craft lives within science, from attachments to places or people to expectations about good academic careers. Thinking with the atmospheric slightly differently again, and examining the staging of atmospheres, shows ways that policy pressures to be mobile are resisted, appropriated or subverted. Taken together, it seems that scientists are never wholly at the mercy of the structures and expectations of globalized science, but that they also are never not in the grip of them. In this in-between space they resist, maintain other attachments, or reject or appropriate policy demands. They find entirely individual ways of living within increasingly homogenized career structures. The atmospheres they live in are thus both wholly unique and recognizably patterned by the wider dynamics that are structuring science – though, of course, these are the stories of a particular, delimited group of scientists who, albeit through diverse pathways, have ended up working in Denmark. It seems likely that similar interviews in Brazil, the US or Senegal would reveal different kinds of situations, different atmospheric threads made visible, different affective dynamics (though perhaps similar tactics through which these materials are crafted into liveable atmospheres).

We might link this in-betweenness to Berlant's (2011) notion of lateral agency. For Berlant – writing in the context of eating and obesity – lateral agency involves 'small vacations from the will itself' (p. 116). It is distinct from 'resistant agency': It is not about acting to unpick the fundamental structures of contemporary society. Rather, acts of lateral agency are 'directed toward making a less-bad experience. It's a relief, a reprieve, not a repair' (p. 117). Lateral agency has been framed as an agency of the precariat – a class in which many researchers would certainly position themselves (Courtois and O'Keefe, 2015; Hirslund et al., 2019) – but also as precarious in and of itself in that it involves the seizing of pleasures when and where one can find them (Adan and Bateman, 2015).

Ultimately there is an ambivalence to lateral agency: while offering 'respite … [it] does not necessarily alter or permanently redress the myriad vicissitudes of neoliberalism' (p. 108). To frame researchers' encounters with the atmospheres of science as being through lateral agency is thus both to celebrate their ability to craft livable atmospheres for themselves amidst what were framed as profound pressures, and to acknowledge their frequent criticism of the inequities that may be nurtured through the equivalence of excellence with mobility (Davies, 2019). Such a framing is *careful* of the fact that interviewees very rarely represented themselves as despairing or lacking agency: Mobility, and life in science generally, always had its pleasures as well as its limitations and anxieties, and interviewees saw themselves as having to chosen to engage in it. But they were also largely clear that they were living in a non-ideal system, one that, as Iris said, rather frequently 'fucked people over'.

To note how scientists craft liveable atmospheres from their situations, reconfigure the atmospheric threads of global dynamics, or resist the staging of particular atmospheres should not, therefore, detract from growing concern about the forms of life that are being produced by the conditions of contemporary academia (Ackers, 2008; Müller and Kenney, 2014; Zippel, 2017). Indeed, this analysis allows us to become attuned to some of the affective qualities of science, and in particular to the ubiquitous and seemingly inextricable twinning of anxiety or frustration with satisfaction and pleasure, shot through with stories of luck or happenstance. However real and satisfying the positive affects of scientific mobility are – from experiencing new places to finally having the resources to do one's science – they are unstable; similarly, where researchers have agency it is to work within a wider system of expectations and rewards, not to transform it. In this context it is perhaps telling that narratives of the difficulty of a good life in science increasingly circulate in public as well as scholarly media. In 2016 the *Guardian* newspaper ran a series of articles on casualized academic labour in the UK, including a story of one part-time lecturer who had had to find additional work as a rubbish collector (Chakrabortty, 2016), and in 2017 the acknowledgements section of a physics paper hit social media because of its dedication to a colleague, including a note that the author was 'firmly of the conviction that the psychological brutality of the postdoctoral system played a strong underlying role in [that colleague's] death' by suicide (Roll, 2017). From such discussion, and from this interview material, it seems clear that the atmospheres of science are in many ways deeply unwholesome for those who live within them. To argue that researchers are highly skilled managers of their situations should not negate this.

Conclusion: Thinking with atmospheres

In this article I have used notions of the atmospheric to devise 'apparatuses of attunement' to scientists' experiences of international mobility. I have tried to reflect upon the mobility stories of natural scientists in a manner that does not flatten the tensions and non-coherences of those stories, but that still captures the ways in which (these) scientists craft lives within science. Overall, the account has perhaps been more impressionistic than thematic (Atkinson-Graham et al., 2015). My aim has been to convey something of the affects and affordances of these scientists' situations, giving a sense of the atmospheres in which those who work in contemporary science are entangled, and how they

navigate these. In this respect the atmospheric might be compared with Law's (2007) notion of the pinboard as device for thinking and telling about research: In using a logic of juxtaposition rather than a clear linearity, one can hold together different ways of thinking, different enactments of reality. The goal is to produce an impression of what it is to exist within a specific situation, with its (inevitably) multiple logics and meanings.

'It matters what stories tell stories', writes Haraway (2016: 35). Atmosphere, in both its lay and academic usages, is always multiple, and thereby lends itself to telling stories that do not entirely cohere. In thinking with atmospheres – and more specifically with some of the different ways that atmospheres have been thought – I have been able to develop 'apparatuses of attunement' to capture elusive aspects of life in science, and specifically of international mobility. In representing some of the atmospheres of science I hope I have offered some small tools and devices for others to use, in their own studies of the atmospheric.

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