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The pleasure and pain of visualising data in times of data power

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Abstract

This paper reflects on the growing urge amongst researchers to visualise large-scale digital data. It argues that the desire to visualise unfolds in the context of a complex entanglement of a) the pragmatics of data visualisation, b) the problematic ideological work that visualisations do, c) the politics of data power and neoliberalism, and d) visualisation pleasures. The paper begins by outlining the considerations that constitute data visualisation design, highlighting the complexity of the process. It then provides an overview of critical debates about the way that visualisations work which are relevant to reflective visualisation practice. Then it turns to the context (of datafication and the neoliberalisation of the university) in which academic researchers contemplate visualisation futures and which simultaneously constrains the realisation of these futures. Finally, the paper acknowledges the cracks in these structures, the pleasure of visualising data, for example in using visualisation for advocacy and social justice.

Keywords

Visualisation; datafication; neoliberalism; pleasure; pain; academic research

1. Positioning: locating visualisation pleasure and pain

This paper reflects on the growing urge amongst researchers to visualise large-scale digital data in order to communicate findings to other scholars, research funders, publics and other stakeholders. These reflections emerged in the context of research we undertook into people's everyday engagements with data visualisations. It draws on our observations, as we presented and discussed our research at various conferences and events, of the growing pressure on researchers to engage with and visualise data in our increasingly datafied times, and of the anxieties that this produces. We argue that these phenomena unfold in a context of neoliberal working conditions which compel academic researchers to shoulder the responsibility of struggling to adapt to ever-changing pressures individually, of which becoming a data visualiser is just one example. We draw on Gill's characterisation of 'the relationship between economic and political shifts, transformations at work, and psychosocial experiences' as 'the hidden injuries of the neoliberal university' (2009, 230) to argue that the current context of the spread of neoliberalism within higher education on the one hand and datafication (Mayer-Schönberger and Cukier 2013) on the other produces the experiences that we discuss. We argue that academic researchers' anxieties about producing good data visualisations are a direct result of the entanglement of big data giddiness and the neoliberal academy.

But this is not the whole story, as it does not account for cracks in structures of data power, the pleasure of visualising data, or uses of visualisation for advocacy and social justice. To make sense of these aspects of data visualisation, and of their relationship with the 'hidden injuries' (Gill, 2009) of datafication and neoliberal working conditions, we turn first to research on creative labour, including Ross's account (2004) of the interplay of passionate commitment and profound anxiety in digital media industries, which helps us make sense of the pleasure and pain of data visualisation. Literature which acknowledges the limitations of neoliberal power, such as Gibson-Graham's (2006) *A Postcapitalist Politics*, is also helpful here, as is scholarship which acknowledges that in the context of the exponential rise of data power, agency, advocacy and pleasure are also possible (Kennedy, Poell, and van Dijck 2015, Ruckenstein 2014). But there is not much scholarship like this, as the emerging field of data studies has been dominated by critiques of the troubling and opaque forms of control that result from data's new powers. Recent work on data hackdays, for example, stresses the

ways in which they produce neoliberal, entrepreneurial subjects aligned with Silicon Valley ideals of good worker subjectivity (Gregg 2015, Irani 2015) – it does not address the pleasures that engagement in such events might invoke or the acts of resistance or advocacy that they might enable. In this sense, our paper makes an important contribution to data studies.

We start by outlining the pragmatic considerations that constitute visualisation design, to highlight the complexity of the data visualisation process and the diversity of skills required. Communicating data through visualisation is not easy; doing it well requires skill, time and practice, and we make this explicit so that it is clear just how much researchers feeling compelled to visualise data have to do. Visualisation does not automatically result in unproblematic understandings of data either, so thinking critically about how data visualisation works is also an important component of good design practice. We therefore provide a brief overview of the critical debates which are relevant to reflective visualisation practice. We then turn to the context in which academic researchers are contemplating visualisation futures, characterised by datafication and the neoliberalisation of the university. We argue that this context shapes and constrains researchers' capacities to acquire data visualisation skills. Finally, we review debates which help us account for the pleasures and possibilities as well as the 'injuries' of datafication and the compulsion to visualise, including scholarship on creative work, data advocacy and data agency. We argue that the urge to visualise data needs to be understood in terms of the complex entanglement of the pragmatics of data visualisation, problematisations of the ideological work that visualisations do, the politics of data power and neoliberalism, and pleasures in / possibilities of visualisation. We conclude by reflecting on the implications of this entanglement.

In the paper, we draw on our experience of being data visualisation researchers – that is, researchers *of* but not *with* data visualisation, as we did not produce our own visualisations as part of our research. We make reference to the empirical material that we gathered on the project, our encounters with data visualisations, with literature on the topic and our own feelings – what Gill refers to as 'affective embodied experiences' (2009, 229). The paper itself does not focus exclusively on our empirical research and for that reason, we do not describe our methods in detail, methods which included focus groups, interviews and diary-keeping with non-experts in the UK (n=46) and interviews with visualisation professionals from Europe and the US (n=13), conducted in 2014. This is just one source on which we draw as we proceed to navigate the pleasure and pain of visualising data.

2. Pragmatics: communicating data with visualisations

Like any creative practice, data visualisation takes time to learn, time that is not easily torn away from the more pressing academic matters of teaching, publishing and grant application writing. Here we outline some of the considerations that constitute the process of making good data visualisations, in order to draw attention to its complexity and the skillset that researchers visualising data need to have. These start with the data: a lot has to happen before a dataset is ready to be visualised. Data need to be gathered, cleaned, smoothed and otherwise handled and transformed before the visualisation process can begin. Clearly this requires expertise, as well as epistemological attentiveness to the ways in which data are made and shaped. At the same time, researchers need to think about which tools they will use to produce visualisations. There are around 300 software tools and applications that can be used in the data visualisation process, so this is not an easy choice. These range from software which specialises in data handling or which is specifically for visualisation, to tools focused on the aesthetic aspects of visualisation and others for programming. Some are web-based, some require software to be purchased, some provide a broad range of support, some are useful for specialist aspects of the visualisation process (see http://www.visualisingdata.com/resources/ for a comprehensive list).

Then a decision needs to be made about which graph and chart types to use. Bar and pie charts predominate, but there are at least 50 named chart types for distinct purposes, such as comparing categories and distributions of quantitative values, or comparing part to whole or other relationships. In *Data Visualisation: a handbook for data driven design* (2016), Andy Kirk categorises these as: categorical chart types; hierarchical chart types; relationship chart types; temporal chart types and spatial data chart types.

The purpose of a visualisation impacts upon how it is put together, and the style and tone of the visualisation should change depending on the intended level of audience interaction and engagement. Kirk (2016) argues that visualisers need to consider whether the visualisation will explain key insights, enable users to interact and explore, thus finding their own insights, or exhibit the data visually with users left to do their own interpretation (he defines these as explanatory, exploratory and exhibitory purposes). A conference presentation, for example, would generally require an explanatory visualisation, whereas a visualisation embedded in a public-facing website lends itself to something more interactive and exploratory, which in turn might help the user to feel engaged with the visualisation.

Colour choice is important: designers often use colour to establish meaning, not to provide decoration. Colour is a powerful sensory cue and an influential visual property which can have an immediate impact on audiences, as colour theorists and visual communications experts have long noted (Kress and Van Leeuwen 2002, Gage 2009). To produce a good data visualisation, researchers therefore ideally need to have some understanding of colour theory. Decisions about axes, scales and graphical symbols (and their related forms and areas) also need to be taken. In professional visualisation, these are similarly driven by the meaning that emerges from the data rather than aesthetic or decorative considerations.

Visualisations are enhanced by good annotation. Alan Smith (2016), data visualisation editor at *The Financial Times* newspaper, claims that people are afraid of writing on graphs . As a result, annotation is often ignored in visualisation production, yet it can be extremely useful in helping users navigate. In our research, visualisations without titles, legends and labels on axes were found to be confusing by non-experts, and participants often desired more explanatory text than was provided. Knowing how much annotation is a 'good' amount is another challenge for would-be data visualisers. Similar issues arise in relation to interactivity. Interactive features usually allow users to adjust the data they are shown or how it is presented, and so can support accessibility. Questions about how much and what kind of interactivity therefore also need to be considered in visualisation design, and incorporating such elements requires programming skills and experience with relevant software.

Some of these issues, like deciding how much annotation and interactivity to include, should be informed by the target users. However, users are often overlooked or decontextualised in studies of data visualisation, not just by researchers wishing the develop visualisation skills, but also in the field of visualisation research. In our research, we found that a range of socio-cultural factors affect engagement with a visualisation, including its subject matter, its original location or media source, users' beliefs and opinions, the time they have at their disposal to explore visualised data, their confidence in their skills to make sense of a visualisation (statistical and visual literacy, language skills, critical thinking skills) and the emotional dimensions of engaging with visualisations (Kennedy et al. submitted). These factors influence whether visualisations can be effective and are challenging for even the most experienced visualisation designers to take into account[1].

Becoming adept at communicating data through visualisations takes time, thought and training and to produce data visualisations, researchers must make many decisions. Professional standards and conventions provide some guidance – but these are not unproblematic, as we discuss below. With

all of this, visualisations still do not communicate data simply and transparently: however much thought and effort are dedicated to encoding meaning, people decoding visualisations are not all the same, and there is no guarantee that they will interpret visualisations in intended ways (Hall 1973). This may seem obvious, but the many times we have heard conference presenters state 'as you can see from the graph' belies a belief that in a visualisation, we can 'see' data directly: 'here they are, uncluttered and clear' (Kennedy et al. 2016, 15).

3. Problematisations: the ideological work that data visualisations do

In addition to the pragmatic considerations discussed above, thinking critically about data visualisation is also an important component of good visualisation practice. Data visualisations are not neutral windows onto data: they privilege certain viewpoints, perpetuate existing power relations and create new ones and, as such, they do ideological work. Examples abound; those discussed in critical studies of visualisations include the US Republican party's visualisation of the Democrats' proposed reforms to healthcare (Valarakis 2014) and the UK newspaper *The Daily Express*'s use of visualisations to communicate an anti-trade union ideology, studied by Dick (2015). Valarakis (2014) describes the former as an over-complicated visualisation which serves to make the proposed reforms seem over-complicated too, and in the latter, Dick (2015) points to the altered scales and misleading positioning of graph points, which he argues skew how the data look and so produce a particular perspective.

Data visualisations are the result of the decisions and priorities of the people and organisations who make them, who influence and shape the design, development, arrangement and implementation of data / visualisations in many ways. Yet despite the subjective processes involved in visualising data, the resulting visualisation often 'pretends to be coherent and tidy' (Ruppert 2014); visualisations and the data within them seem objective, even though they are not. This appearance of objectivity has a number of roots. Visualisations report numbers, historically trusted because they appear universal, impersonal and neutral (Porter 1995) and, as we argue with others, visualisation conventions, established over time, also work to imbue visualisations with the appearance of objectivity, producing the impression that visualisations are 'showing the facts, telling it like it is, offering windows onto data' (Kennedy et al. 2016, 2).

Halpern (2014) argues that data visualisation plays a key role in new forms of governance and control, which she claims are characterised by 'communicative objectivity', a rationality based on the management, analysis and representation of data. Visualisations make visible and operable that which was previously invisible; they make new relationships appear, producing 'new objects and spaces for action and speculation' (2014, 21). They make data valuable and actionable by crafting them 'into the realm of appearances' (2014, 22). Visualisation, she argues, is 'the language for the act of translation between a complex world and a human observer […] making the inhuman, that which is beyond or outside sensory recognition, relatable to the human being' (2014, 22). Drawing on Foucault, she argues that visualisation results in a re-organisation of the senses, which is critical to the tactics of government at any given moment.

Visualisation designers generally do not share the language of critical commentators, yet many are aware of the ways in which visualisation design involves a series of decisions and results in representations of data which privilege certain perspectives and show only some of the available data. This was evident in interviews we carried out with visualisation professionals and is also discussed in the pages of 'how-to' guides. In our interviews, we asked visualisation designers what skills they thought that viewers of visualisations need in order to make sense of them, and many responded that users need to engage critically with visualisations, asking themselves what has been left out, what point of view is privileged over others, as well as having a critical and analytical approach to the data that are represented through visualisations. One interviewee said that in visualisations, some things (numbers) are transformed into other things (visuals), so knowing that a

visualisation is a representation of data, not data themselves, is important. In how-to books like Kirk's (2016), mentioned above, there is extensive discussion of the ways in which visualisation involves decision-making, about what to focus on and prioritise, what to leave out, how to present and represent data, all of which influence how visualisations – and data – look. He argues that in visualisation design, all data treatments and transformations must be noted and shared with users: doing this makes transparent the perspective that has influenced the design. Researchers using and producing data visualisations need to engage in these processes, adhering to conventions which make it possible to 'reveal' the ways in which data have been treated (such as the inclusion of a link to a data source), but also thinking critically about what these processes mean for what data appear to be, the knowledge-production and decision-making processes which follow and the place of visualisation in relationships of data power.

4. Politics: datafication and neoliberalism

In what conditions does all this knowledge and expertise come together in the making of data visualisations? In this section, we highlight two related phenomena which we argue play an important role in producing the compulsion to gather, mine, analyse and visualise large-scale digital data and related anxieties: datafication and neoliberalism.

Mayer-Schönberger and Cukier, who coined the term datafication, describe it like this: 'to datafy a phenomenon is to put it in a quantified format so that it can be tabulated and analysed' (2013, 78). The transformation into data of aspects of life formerly not datafied (relationships, liking things, locations, professional networks, exchanging audio-visual media (Van Dijck 2014)) and related assumptions about what data are and can do is a fact of contemporary life. The problematic consequences of widespread datafication, what is referred to in this special issue as data power, are also well-established. Many writers have argued that the proliferation of data, their mining and analysis open up the possibility of new forms of discrimination, exclusion, privacy invasion, surveillance, control, monetisation and exploitation (see Kennedy 2016 for an extended discussion). Datafication results in a 'data delirium' (van Zoonen 2014), a total faith in data summed up in the widely cited words of *Wired* editor-in-chief Chris Anderson: 'with enough data, the numbers speak for themselves' (2008).

Elsewhere Rosalind Gill has outlined 'the hidden injuries of neo-liberal academia' (2009), characterised by increased casualisation, precarity and marketisation. Hanke and Hearn also argue that neoliberalism has upset the university's 'orientation to knowledge, the state and the market' (2012, 12) and what we see as a result is the rise of the corporate university, through the importing of business models of management into University life, the reformulation of education in terms connected to business (students are now consumers, universities are now service providers), the degradation of pay and working conditions and the casualisation of employment – what they define as 'tenuous-track' rather than 'tenure-track' labour. 'The university now primarily functions as a site of capitalist circulation and accumulation rather than of reasoned argumentation' (2012, 12), they write. Slaughter and Rhoades (2004) call this 'academic capitalism'. Of course, neo-liberalisation is not unique to the academic workplace: neoliberal working conditions are pervasive and have been widely charted, and increased risk, individualisation, insecurity and technological change leading to a need to constantly update and reskill characterises a broad range of workplaces. However, their manifestation in universities is relevant to our argument here about the anxiety that researchers feel in relation to the urge to visualise data.

The pressures of working in these conditions are experienced secretly and silently, argues Gill. They are a taken-for-granted backdrop, the stuff of corridor chat, not conference presentations, journal articles or departmental meetings, despite social scientists' interest in reflexivity, which often stops short of reflecting on our own working conditions. In place of such open discussion, economic and

political change and transformations at work are managed individually – personal shouldering of responsibility and risk are after all characteristics of this new, neoliberal 'spirit of capitalism' (Boltanski and Chiapello 2007). From a Foucauldian perspective, this, like the management of the senses, can be seen as a form of governmentality, in which the self-monitoring 'responsibilised' (Gill 2009, 241) subject manages him or herself as needed, including becoming a data visualiser if required. In these ways, neoliberalism is lived through embodied experiences.

These two phenomena, datafication and neoliberalism, work together to produce what David Beer (2016) calls 'metric power'. Like data power, metric power refers to the growing prevalence of numbers, data and measurement in contemporary forms of governance and control. In his book of that name, Beer traces a trajectory of thinkers who have linked together neoliberalism, capitalism, measurement and data. For example, he cites Nikolas Rose (1991, 691) who wrote that neoliberalism requires 'a numericised environment' in which actors 'govern themselves by numbers'. Thus 'systems of measurement of data extraction might be seen as the means of neoliberalisation,' writes Beer (2016). He also draws on Will Davies' (2014) argument that neoliberalism attempts to replace political judgement with measurement and metrics. Thus in order for neoliberalism to function, metrics and data are a necessity: numerical indicators are crucial to contemporary governance. As Beer puts it, 'we might see this then as being the moment for metrics to flourish as a key component of the functioning and ordering of the social world' (2016, pp). In other words, neoliberalism requires datafication.

Looking specifically at the university as a site of metric power, Burrows (2012) charts a particular way in which datafication and neoliberalism come together in academic work, through forms of 'quantified control' (2012, 355) (for example in metrics, assessments and league tables) which he describes as a new and emerging form of disciplining. Arguably, another place in which they are entangled is within debates about whether the social sciences are in crisis *because of* the spread of new kinds of digital data, which Burrows initiated with Savage. In 'The coming crisis of empirical sociology', Savage and Burrows (2007) argue that social scientific interpretations of social life are threatened by accounts derived from commercial and proprietary access to data produced as a by-product of transactions and other networked activities. Writers involved in these debates argue that the social sciences urgently need to engage with commercial sociology (Burrows and Gane 2006), not only by criticising it, but by collaborating in its production in order to critically assess its epistemological orientations. This argument is also productive of the kinds of data-related anxieties discussed here: to count as a good social scientist, one increasingly feels obliged to 'do' big data.

These two phenomena of datafication and neoliberalism also come together in higher education through a felt pressure to work with and then visualise big data. Institutional giddiness about big data translates into pressure on researchers to engage with them and their visualisation. The compulsion to visualise can be seen as a form of self-monitoring or self-management. In this sense, data visualisation is co-opted into the neoliberalisation of the university, and it can be seen as yet another neoliberal injury. Becoming a data visualiser is working on the self, or self-regulating. It is being a model neoliberal subject, understanding that our failure to be good visualisers reflects on our worth as individuals, not on the failings of academic capitalism.

Furthermore, as universities are increasingly brought into competition with each other (Campaign for the Public University 2016) and shift to prioritise 'competitiveness and profit-seeing' (Harvie and De Angelis 2009, 28), they look more and more like businesses. Against this backdrop, the purposes served by making data visualisations are arguably cause for concern. This is because the desire for data visualisations can be understood as motivated by the need to operate within a market, as visualisations are seen as a means to 'sell' the research capabilities of university departments as they market themselves to external organisations. But if, as Manovich (2011) argues, data visualisations are simplifications, when they become the primary way to communicate research, the rich

complexity of research is reduced and only a partial story is told. In this sense, the data and visualisation delirium can be understood as implicated in the marketisation of research and motivated by concerns about institutional reputation, with troubling consequences for the communication of research findings.

Visualisation's relationship with what is known as 'the impact agenda' in UK higher education – that is, the growing requirement to have an effect on or benefit to society – is also arguably concerning. In her discussion of the ideal academic in the neoliberal academy, Lynch (2010) argues that the combined forces of metrics and impact produce a change of emphasis in research cultures, which she characterises as 'a recipe for self-display and fabrication of image over substance' (p. 55). This might be read as a shift from valorising the content of research to the mere existence of the research in a numerical system. Likewise, the institutional desire for data visualisation could be seen as a desire for images that can be used to publicise the institution. If data visualisation giddiness is about institutional reputation as the logic of this argument suggests, then some researchers may be winners in the visibility stakes, but research findings themselves and publics or organisations who may wish to act upon them are losers.

But the comments above do not paint a complete picture of the power of data visualisation in times of datafication. What is missing is an account of the pleasure of and political motivation in visualising data, as well as what is difficult about it, the pains and the anxieties. In the next section, we turn to these issues.

5. Pleasure, agency and other 'cracks'

Data visualisation is an enjoyable creative process, like other artistic endeavours. For the visualisation professionals we interviewed, their work is pleasurable and fulfilling. Many were trained in visual design and saw their visualisation practice as emerging from their art and design interests. In our interviews, we got a strong sense of the pleasure they gained from their work, as seen in this example:

> I really, really enjoy those kinds of projects, especially this one, I almost had no restrictions except for the colours, which makes sense for a corporate identity, and I was completely free and the dataset was really rich, so yeah, it was just one big adventure and I also liked the results.

Pleasure sometimes derives from the perceived good that visualisers feel they do through producing high quality visualisations that are faithful to the data and pleasing to look at; one participant describes himself as a 'truth and beauty operator'. Belief in the power of data visualisation to promote data transparency and awareness – seen in Stephen Few's words, 'infovis can make the world a better place' (2008) – invokes passionate commitment to the work of visualising data. In these references to visual delight and to 'do[ing] good with data' (the strapline of US visualisation agency Periscopic 2014-2016) through visualisation, we see traces of the pleasures that visualisation production can invoke.

Literature about cultural and creative labour can help to make sense of these pleasures. Ross's *No Collar: the humane workplace and its hidden costs* (2004) and other studies in this field (Banks 2007, Gill 2007, Hesmondhalgh and Baker 2010) identify that a passionate attachment to work sits alongside some of the more troubling conditions discussed in the previous section. Charting this commitment, Ross (2004) identifies how this is a type of work which, to quote one of the participants in his research, 'you just couldn't help doing' (2004, 10). Likewise, Gill's study of Dutch new media workers found an extraordinary degree of enthusiasm for the work amongst research subjects: one of her participants told her that new media work was like 'being paid for your hobby' (Gill 2007, 15). Such pleasures can also be seen amongst data visualisers, as we show above.

Gill notes that academics are equally attached to our labour, often drawing 'no distinction between our work and ourselves' (2009, 240). She draws on Angela McRobbie's argument to propose that in this context, pleasure can act as 'a disciplinary mechanism for tolerating […] uncertainty and self exploitation' (2009, 241). Likewise, Gill suggests that pleasures in academic work, like pleasures in data visualisation, 'bind us more tightly into a neoliberal regime with ever-growing costs, not least to ourselves' (2009, 241). Thus Gill suggests that analyses of cultural work resonate powerfully with 'life in the contemporary Western University' (2009, 230). In other words, they help us to make sense of the experiences of academics as well as creative workers who, in the case of data visualisation, aspire to be one and the same.

While this argument about the governing and self-discipling role of pleasure is important, pleasure does not only function in this way, in relation to data visualisation and other creative work. In *Creative Labour: media work in three cultural industries* (2010), Hesmondhalgh and Baker draw up a model of good and bad work and use it to explore the extent to which it is possible to 'do good work' in the cultural industries. In their model, good work is constituted, amongst other things, of interest and involvement, excellent products and products that contribute to the common good, which all result in different kinds of pleasure. This assessment suggests a different role for pleasure in creative work like data visualisation, and also points to the possibility of worker agency in these domains.

As one of us has written elsewhere, as data acquire new power, a space for agency in relation to data structures opens up (Kennedy, Poell, and van Dijck 2015). This is because data power, neoliberal, capitalist power and other kinds of power are not monolithic, as a number of commentators have pointed out. In one example, Gibson-Graham discuss 'myriad projects of alternative economic activism' (2006, xxi) which they define as both postcapitalist (that is, beyond capitalist power) and ethical, and within which a 'politics of possibility' emerges, as formerly disempowered actors find new ways to exercise power and to establish a 'new political imaginary' (2006, xxi). Gibson-Graham's ideas about how to understand alternative economic models as part of a 'politics of possibility' (2006, xxv) might also be applied to data and visualisation. Alternative ways of visualising data could also be seen in this way, as human actors find new ways to exercise agency in relation to data, thus finding the grounds for a 'new political [data] imaginary'(2006, xxx). Van der Velden argues that where there is an 'unequal distribution of power over data' (2015, 11) which disadvantages populations, technologies that can redress the balance are necessary for those in pursuit of social justice, and visualisation can be understood as one such tool. Examples include visualisation agencies like Periscopic, mentioned above, but also social justice and human rights inspired initiatives around information/visualisation advocacy, such as the Tactical Technology Collective's *Visualising Information for Advocacy* book (2013) and project (nd). In these examples, visualisation is an ethical practice, for the social good. Likewise, and as Gill notes, for many academics, scholarly work is part of larger advocacy and activism agendas, and so harnessing data visualisation as part of this agenda can invoke visualisation as a tool against neoliberal data power, not one that serves it. Accounting for these processes, practices and possibilities produces a more nuanced picture of the contradictions within data power.

6. Conclusion: why this matters

In this article, we point to the ways in which what might seem like a list of unrelated points about data visualisation are entangled. Data visualisation is difficult, and doing it well takes time, skill and commitment. Visualisations are not windows onto data, and an integral part of the process of visualising data is to find ways to make this transparent to users and audiences. It is important to state these facts, so that we know what is at stake when we talk about developing skills in data visualisation. Datafication puts pressures on researchers, to work with data, to gather, mine, analyse and visualise them. Neoliberal working conditions mean that not only do academics have to adapt to datafication, but they need to take responsibility for such adaptation individually, secretly and silently. But as Gill also notes in her discussion of academic work in general, notions of injury and

pain do not account for the whole experience of academic and creative work, and visualising data is an example of both. This labour also has its pleasures, which in part account for our willingness to endure the injuries and pains and in part derive from the possibility of using visualisation against structures of power and in the interests of social justice and other forms of good. This complex entanglement of pragmatics, problematics, politics, pleasure and possibility characterises the urge to visualise research data and the spread of data visualisation in the academy.

One outcome of this entanglement, we have witnessed, is that despite our own growing familiarity with data visualisation, we sometimes find ourselves struggling to make sense of visualisations which form part of conference presentations, as presenters speed through them with a quick 'as you can see from the graph…', as noted above, or in journal articles or blogposts in which axes are unexplained, values are unclear or the data source is not acknowledged. We argue that academic researchers not having the skills to do data visualisations well is a direct result of the combination of big data giddiness and the neoliberal academy, not individual researchers' limited capacities. But nonetheless, this lack of expertise has consequences. Some data visualisations circulating in the social sciences and humanities are not of good quality, and this may lead to confusion, or worse, to misinformation. Moving beyond academic contexts, such visualisations may not communicate research well to non-expert audiences with varying levels of ability to make sense of data visualisations. This is significant in terms of the knowledge claims that are made on the basis of these visualisations and therefore for knowledge itself.

What to do? Institutions could provide good, in-depth visualisation training and the time to engage in it, and such training should include critical thinking about visualisation. Such training might result in greater understanding of the ways in which data come into being, are made and shaped, and made to appear. It might also lead to better visualisations, and therefore better communication of our research. Making space for deeper engagement with visualisation as a politics and a process will almost certainly result in better research. Such fancies are unlikely to come easily, if at all, and of course, these measures do not address the structural problems that we have outlined here – much more is needed to overcome them. For the time being, we start by doing what Gill advocates: breaking the silence, naming the pleasures and pains of data visualisation and their complex entanglement with data power.

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[1] See (Kennedy et al. submitted) for a fuller discussion of the pragmatics discussed here.