

Ethnography in and around an Algorithm

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Paper submitted for inclusion in EGOS 2015

*Sub-theme 15: (SWG) Creativity, Reflexivity and Responsibility in Organizational
Ethnography*

Introduction

If ‘headwork’ is “the conceptual work that informs ethnographic fieldwork and its various representational practices” (Van Maanen 2011, p. 222), then this paper is a piece of headwork about what an ethnography in (or around, or of) an algorithm might entail. We begin by situating this question in ethnography’s long tradition of philosophical reflection on method and representation. This reflection has been deep and cutting, and some would argue that it has evacuated ethnography of its essence, identity and value. In the first section we briefly document this withering of ethnography under the burden of this critique. This is important because it contextualizes and frames the second section, ‘whither ethnography’, which maps out how ethnography might be, and is being, reimagined. In the third section, ‘magical algorithms’, we argue that algorithms constitute a vital and interesting frontier worthy of ethnographic study. The fourth section, ‘ethnography in and around’, explains what we mean when we talk about doing an ethnography *in* and *around* an algorithm, and the challenges and possible approaches of such an endeavour. The fifth section, ‘from algorithms to algorithmic assemblages: conceiving of algorithms as objects of social enquiry’, tries to understand the social implications of algorithms by focussing on *algorithms-in-action*. The final section, ‘setting out a research agenda’, considers what might be involved in doing ethnography in-and-around algorithmic assemblages and a possible framework (extending Lacan’s Real, Symbolic and Imaginary orders to a fourth Shambolic order) that could be applicable to—in particular—the ‘magical algorithms’ that distinctively work on ‘big data’.

Wither ethnography

Writing about the (exotic) Other has probably been the defining feature of anthropology's¹ tradition, going back to the writings of the earliest Greek and Roman historians—such as Aristotle, Posidonius, Strabo and Caesar—who wrote about the diverse peoples that they encountered in war, trade and colonising endeavours. The anthropological impulse was partly *political*—to contain and control the alien Other—and partly *epistemological*—to know the Self through knowing the Other. This tradition re-ignited in the late nineteenth century as the ever-expanding British Empire exposed a smorgasbord of exotica for the delectation of Western anthropologists driven by the same twin impulses. But the field of anthropology has always grappled with the problem that only a limited number of *bona fide* ethnographies can be written about any particular culture, especially if the Malinowskian tradition of long-term immersion in the alien culture is seen as mandatory. Thus, as traditional exotica—epitomised by the island cultures of the Pacific—were studied to saturation by the mid-twentieth century, anthropology sought new cultures and forms of life worthy of exploration. Indeed, as colonialism ended, anthropology became more a method of inquiry across the broader social sciences than a discipline.

Given anthropology's political aspect, allied to the expansion of corporations into global entities during the latter part of the twentieth century, it is perhaps unsurprising that the emerging body of management academics found ready use for the anthropological method around that time (which nicely coincided with the proliferation and expansion of business schools in higher education). By the 1980s, culture was a buzzword in management practice, and anthropology held the promise of providing a more sophisticated understanding of new cultures, which had obvious value for the new breed of international manager coping with foreign practices and norms. The method was also used endogenously, within organisations, to study managers, work groups, project teams, and corporations to the point where we now speak easily of 'organisational ethnography'. In this tradition, the Other is nearby—a software development team or a group of biochemists working in a laboratory is perhaps just as unexplored and alien as a remote island community was in the nineteenth century.

Perhaps the most significant publication in anthropology over the last few decades has been Clifford and Marcus's (1986) *Writing Culture* in which the contributors, in various ways,

¹ In this paper, we use the terms anthropology, cultural anthropology and ethnography interchangeably. The word ethnography, for us, refers to the intellectual discipline of cultural anthropology, the method of participant-observation, *and* the textual representation of a society (Van Maanen 1995: 4–5).

articulated a compelling challenge to ethnographic authority. Further dialogue with philosophy, postmodernism, post-structuralism, post-colonial, and feminist thought has only deepened the field's profound and growing anxiety about its purpose and value (Tyler 1986; Tyler 1987; Fox 1991; Hammersley 1991: 135–158; Atkinson 1992; Grimshaw and Hart 1994; Van Maanen 1995). Without reprising the extensive debates, these problems are centred on the following.

First, anthropology at once—and uneasily—advocates both realism *and* relativism. The field's realist tradition is well exemplified by Radcliffe-Brown's belief that the purpose of cultural anthropology is to develop a natural science of society, or by Tyler's (1987) assertion that "Ethnographers most often use some version of 'natural history', tricking out their ethnographies in the form of objective descriptions of natural objects" (p. 91). In contrast, Clifford Geertz's (1973/1993) view that anthropology is "*not* an experimental science in search of law but an interpretive one in search of meaning" (p. 5, emphasis added) is probably the best known relativist position. The problem is that any attempt to present the 'native's point of view' *and* 'real facts' is liable to be seen as a form of epistemic two-timing.

Second, the project of presenting the 'native's' view of the world has severely limited the worldviews that can be represented. For instance, if the natives have PhDs in chemical engineering and worked in industry for decades, how can the ethnographer participate meaningfully in their world? Tellingly, Jay Labinger, one of the few practising scientists to engage in a sustained dialogue with those ethnographers who studied science in action in the laboratories during the 1980s, bluntly states that "the bottom-line picture of how science operates almost always comes out radically different from my own interpretation" (Labinger 1995: 286). One explanation is that, if anthropology is what anthropologists do, then anthropology is perhaps best understood as being about the self-interested advancement of academic careers and has little to do with native perspectives or truthful representations of the world.

This links to the third important critique, which focuses on politics rather than epistemology. Drawing especially on feminist and post-colonial writings, anthropologists criticised their discipline's colonising and domineering dimension and its inexorable consumption of alien cultures. For example, Grimshaw and Hart (1994: 242) claim that "anthropology stands condemned forever in many parts of the world as the intellectual handmaiden of colonial rule", while, in Tyler's (1987: 92) view, ethnographies are part of a Western ideology that "transforms all cultures into objects of exchange and establishes the conditions for their

reduction to objects of scientific scrutiny”. Moreover, the anthropologist is no benign culture-junkie; rather s/he is voyeuristic, selfish, arrogant and an insidious instrument through which one group or society dominates another, and, in particular, is one element underpinning the ascendancy of the Occident (Clifford and Marcus 1986; Fox 1991; Grimshaw and Hart 1994). The upshot of the critique is perhaps best summarised by Harding’s (1987) injunction that “the class, race, culture and gender assumptions, beliefs, and behaviours of the researcher her/himself [must] be placed within the frame of the picture that she/he attempts to paint” (p. 9).

Whither ethnography

Despite this corrosive critique, or perhaps by way of distraction, the search for exotica continued apace, as wannabe ethnographers routinely and rather easily identified new groups, cultures and social phenomenon as potential objects of study.²

One important group in this enterprise was the ‘actor-network theorists’ who used the anthropological method to study the construction of scientific facts inside and outside laboratories (Latour and Woolgar 1979; Latour 1987; Law 1994). A notable feature of these studies was the focus on the agency of non-human actors, and the materiality of the world in which both human and non-human actants were conceptualised as *effects* rather than *a priori* (Latour and Johnson 1988). Indeed actor-network theory problematized the very term ‘anthropology’—from the Greek *anthrōpos* (“man”, latterly “human being”) + *logia* (“study”)—as it disputed both the centrality and essential nature of humans. And it went further than this, questioning the ontological primacy routinely given to humans (versus non-humans) and the social (versus the technical), and highlighted the constructed, if not arbitrary, division between the human and non-human (Latour 1993).

The term post-human or posthuman emerged out of these conversations, and became increasingly popular in the late twentieth and early twenty-first centuries through writings such as Haraway’s (1985) *A Cyborg Manifesto*, her subsequent book *Simians, Cyborgs and Women: The Reinvention of Nature* (Haraway 1991), Peperell’s (1995) *The Post-human Condition*, Hayles’ (1999) *How we Became Posthuman*, and Barad’s (2003) *Posthumanist performativity*. Inspired perhaps by science fiction, and not at all settled as a concept,

² The anthropological method, which had heretofore been the preserve of academics, was increasingly used by journalists and non-academics, often with scant regard for the traditions of long-term immersion, which also raised questions about the distinctive value and sensibilities of academic ethnographies.

posthuman philosophy does mark a distancing from Renaissance humanism, which is critiqued as essentialising the human as a self-contained being, ontologically separate and distinct from animals, machines and the ‘natural’ world. Instead of secure boundaries, the posthuman focuses attention on hybrids, assemblages, entanglements, sociomateriality, performativity, becoming ontologies, and intra-action.

A central claim in posthuman discourse is that agency extends well beyond what we see as ‘human’, a concept that it always problematizes anyway. Rather than seeing software, technologies and the material world as simply tools used by humans, the posthuman perspective emphasises that these constitute—i.e. are active in constructing—‘our’ life. Crucially, relations between beings are constitutive of these beings, a notion that Barad seeks to explain through her neologism, intra-action, which captures the idea that subject and object do not pre-exist and then relate, but rather that “all relations between actual beings are *internal to the becoming (ontology) of such beings*” (Introna 2013, p. 335, emphasis in original). However language—full as it is with nouns, subjects and predicates—doesn’t make it easy to get one’s head around this, nor does it help clarify what ethnography might mean or entail within such a philosophical stance.

This EGOS stream highlights the three challenges of creativity, reflexivity and responsibility facing organizational ethnography. However, what is missing from this trinity is a more explicit recognition of the importance of power and politics in ethnographic work. Reflexivity, as framed in the call, is centred on the researcher’s self-awareness, while responsibility is about being sensitive to the interests of stakeholders. By way of contrast, a power perspective focuses attention on the powerful and powerless, and how ethnographic interventions might potentially impact power imbalances. A power perspective seems especially important if we are engaged with the discourse of posthuman philosophy which is centrally concerned with the shifting power balances between what we might see (albeit provisionally) as human and non-human actants. Actants are actants because, in some sense, we can say that they possess power, albeit always as part and effect of a broader assemblage.

Magical algorithms

In a famous study, Bruno Latour (1988) showed how agency was dynamically distributed between humans and a door closer. His argument, further developed in later work (Akrich and Latour 1992; Latour 1992; 1993), was that sociology was completely missing the point by not recognising that even the most mundane of artefacts possessed agency. And his argument has been compelling, providing much of the intellectual basis for studies and contributions on

‘sociomateriality’ (Orlikowski and Scott 2008; Leonardi 2013). If Latour was interested in mundane artefacts, the recent focus has been on what we might call ‘magical artefacts’ (or ‘magical algorithms’) like TripAdvisor (Scott and Orlikowski 2012) and Turnitin (Introna and Hayes 2011). We say these are magical because they possess a level of agency that humans would previously have seen as a form of sorcery or at least part of the enchanted.³ Dvorsky’s (2014) list of the ‘ten algorithms that dominate our world’ provides one representation of this new pantheon:

1. Google Search
2. Facebook's News Feed
3. OKCupid Date Matching
4. NSA Data Collection, Interpretation, and Encryption
5. "You May Also Enjoy..." (sites like Amazon and Netflix)
6. Google AdWords
7. High Frequency Stock Trading
8. MP3 Compression
9. IBM's CRUSH
10. Auto-Tune

Not only are these algorithms actants,⁴ but they are also *biased* or *prejudiced* in that—by design—they have a tendency to work towards a ‘correct’ or ‘good’ answer, and so reject ‘less good’ answers. However, the complexity, power and autonomy of some contemporary algorithms raises profound ethical questions about the practical working through of these prejudices, as illustrated by recent debates about the use of predictive analytics in policing (Steiner 2012; Newitz 2014; Stroud 2014). At the same time, it is precisely this mix of power, complexity and prejudice that makes magical algorithms so interesting and worthy of study.

Ethnography In and Around

Steve Woolgar (1982) once mused that ethnographies should be considered not as reports on practice, but as occasions for reflexive analysis: “an ethnography of scientific practice should be a study *in* a laboratory not just a study *of* a laboratory” (p. 487, original emphasis). This seems especially apposite to algorithms, which, in line with a posthuman philosophy, are not

³ Magical algorithms are a good contemporary example of Clarke’s Third Law: “Any sufficiently advanced technology is indistinguishable from magic” (Clarke 1962/1973).

⁴ A venture capital firm has recently appointed a computer algorithm to its board of directors. <http://www.bbc.com/news/technology-27426942> Accessed 5 January 2014.

things to be studied, but are best understood as temporary effects associated with particular configurations of cuts and practices in an always becoming world. Thus, our project is an ethnography *in* and *around* an algorithm—rather than *of* an algorithm. We say *in* an algorithm to emphasise that an ethnography is a reflexive practice in a network of effects and influences, which includes what is routinely and pragmatically referred to as an algorithm. We say *around* to highlight the malleable and contingent boundaries for the phenomenon in question. Our interest is in the categories that algorithms create and the political implications that follow on from these categories.

From algorithms to algorithmic assemblages: conceiving of algorithms as objects of social enquiry

By arguing for an enlarged conception of the ‘social’ as ‘more-than-human’ (Whatmore 2006), the ‘posthuman turn’ described above points to the importance of considering algorithms as legitimate objects of social enquiry. The question remains, however, as to how they may be usefully conceived as social phenomena; although algorithms have long been objects of enquiry for computer scientists, they have only relatively recently begun to come to the attention of mainstream social science (see Kitchen 2014 for an overview of some of the debates and challenges).

One of the most prominent and enduring ways of defining algorithms, would have us conceive of them simply as ‘logic + control’ (Kowalski 1979), where ‘logic’ refers to generalised instructions that invoke a specific knowledge of the problem domain, while ‘control’ refers to the conditions under which such instructions are invoked to solve the problem in question (see, for example, Lustig and Nardi 2015). As such, algorithms are seen as abstract entities that provide blueprints for concrete chains of action, which may be represented in static, schematic form as pseudo code.

One approach to understanding the social implications of algorithms, then, is to study these kinds of representations, with a view to grasping their underlying logics and associated politics. While this strategy can offer rich rewards—see, for example, Introna and Nissenbaum’s (2000) study of the politics of Google’s indexing and ranking algorithm—it may be of limited value in many situations. For one thing, the proprietary nature of many important algorithms means that they are not available for public inspection—they are *inscrutable* (Introna and Nissenbaum had to rely on a reverse engineering of the Google algorithm). Moreover, even if the underlying logic of the algorithm can be grasped through

inspection or reverse engineering, this may yield limited understanding of the social dynamics of the algorithm-in-action.

By emphasising this notion of algorithms-in-action, we want to draw attention to a number of important aspects of, what might be termed, the social life of algorithms. First, reflecting an established distinction between ‘espoused technologies’ and ‘technologies-in-use’ that has been made in literatures on technology studies and information systems (IS) (see, for example, Orlikowski and Iacono 2000), we mean to draw attention to the difference between generalised depictions of technology and claims about how they work or are used, and the multiple and dynamic ways in which they may, in practice, be appropriated or become embedded in a variety of specific social/organisational contexts. Thus, we would have to be highly suspicious of claims that the social implications, or algorithmic ‘doings’, of any non-trivial algorithmic system could be ‘read off’ an understanding of its implicit logic and control structures. The understanding of specific algorithmic doings always involves tracing these carefully in empirical settings: if one wishes to understand, one must look and see. This is not to say that the conceptual framing of such empirical work is not a matter of great importance in performatively producing any ethnographic account.

We have long understood that information technologies-in-use are typically complex, embedded, dynamic, and emergent phenomena, whose specific enactments must always be framed within the context of broader constellations of sociomaterial practices in which technology is necessarily embedded. Thus, algorithmic doings, or enactments, may be usefully conceived of as part of the ongoing becoming of heterogeneous algorithmic assemblages. This emphasis on process, or an ontology of becoming, offers a means of attending to the dynamic and ontogenetic nature of algorithmic phenomena (see Introna 2015 for a nice analysis that advocates for, and demonstrates, such an approach), while at the same time resisting any attempt to unbundle ‘technical functionality’ from the sociomaterial practices that performatively enact them and give them form.

Algorithmic assemblages, therefore, might be understood as performative, heterogeneous ensembles of intra-acting (Barad 2007) components that include computers, software, data, people, procedures, etc. But what, if anything, is distinctive about these phenomena, by comparison with the more conventional information systems assemblages that have traditionally been the focus of attention within IS/organisation studies? This is not an easy question to address, in general terms, and will always be an issue that demands empirical

investigation. That said, however, we might speculate as to some of key features that may distinguish such phenomena.

First, there is the nature of the data with which these algorithms typically intra-act. The scale of these data sets may be enormous by conventional standards (Mayer-Schönberger and Cukier 2013), whilst the common openness and lack of structure has led Harford (2014) to describe many such data sets as resembling the “exhaust fumes of the internet”. If conventional information systems could be said to operate largely in comparably ‘domesticated’ environments, then, these new systems might be understood as challenging us to find ways of understanding algorithms ‘in the wild’. Their processing is typically distributed rather than localised. Furthermore, there are the dynamic, emergent effects associated with the complex intra-action of a wide range of different algorithms and data sources, which at the very least deepen their inscrutability, and may point to a radicalisation of the complexity and dynamics of conventional socio-computational processes.

Finally: setting out a research agenda?

We have drawn attention to the complexity, power and autonomy of some contemporary ‘magical’ algorithms-in-action and the ethical questions raised by them. We have tried to articulate the nagging feeling we had that they were somehow distinctively different from more conventional information systems assemblages, by drawing attention to their scale, their technological sophistication, their distributed working on huge (partly) unstructured datasets and their emergent effects. Algorithms may be comprehensible (literally, we can get our heads around them) as blueprint-algorithms (a pinned-down design-time template) but inscrutable as algorithms-in-action (living breathing running programs, that is, run-time “processes”, enmeshed in algorithmic assemblages). As with the laws of physics or a neural network, we may be able to understand the algorithms as rules or laws of how to respond to data, but not how they unfold or develop on a sufficiently large scale.

The complexity and inscrutability of these research phenomena, however, should not discourage attempts to understand algorithmic assemblages in their dynamic becoming ‘in the wild’. What might be involved, therefore, in doing ethnography in-and-around algorithmic assemblages, and what kinds of issues are likely to show up as important? Here, by way of illustration, we point to two important issues: the politics of algorithms and their governance or governmentality (Introna 2015); and the social production of algorithmic authority. How are we to understand ‘algorithmic authority’? According to Shirky (2009), we have come to “regard as authoritative an unmanaged process of extracting value from diverse,

untrustworthy sources”. Lustig and Nardi (2015) extend this by regarding algorithmic authority as “the legitimate power of algorithms to direct human action and to impact which information is considered true”. But whence arises this legitimacy? How is trust produced in that which is beyond our ken, in particular, these inscrutable algorithms-in-action? Can this trust be maintained in the light of algorithms’ filtering what is shown to a given user (Dewey, 2015)? And how are we to handle the non-reducibility of ‘algorithmic agency’ that is implied by the notion of ‘algorithmic authority’? These questions are the basis of our research agenda.

We have already commented that ‘relations between beings are constitutive of these beings, a notion that Barad seeks to explain through her neologism, intra-action ... However language—full as it is with nouns, subjects and predicates—doesn’t make it easy to get one’s head around this, nor does it help clarify what ethnography might mean or entail within such a philosophical stance.’ This disconnect between language and that being represented prompts us to seek a framework that may be useful in our descriptions.

Lacan, in his psychoanalytic work, considered a framework of three overlapping or intertwined orders or registers, the Imaginary, the Symbolic and the Real, together comprising psychical subjectivity. Loosely, the Imaginary is the domain of “specific images [either directly perceived or imagined], which we refer to by the ancient term of *imago*” (Lacan 2001) and includes ideology, fantasy and myth. Among these images is the image of self as a body contained within skin, which Lacan identifies as emerging during the ‘mirror stage’ of infancy (Desmond 2013, p 147).

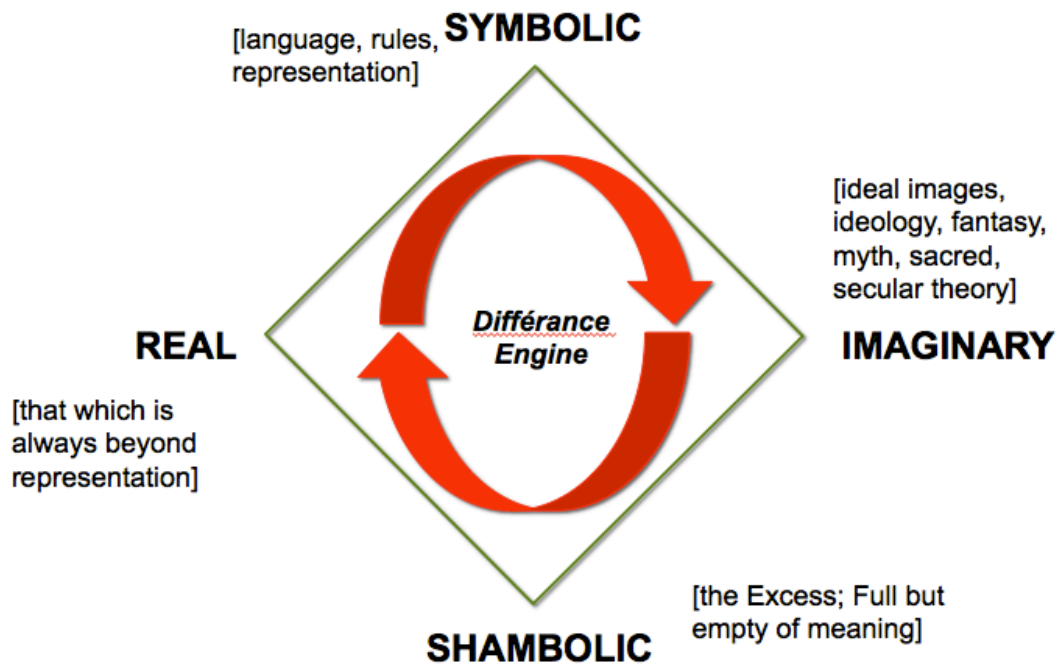
Lacan adapted Saussure’s (1916) focus on the linguistic unit of sign (signifier + signified, whose value is differentially determined by the other signs in the language) by taking the signifier to be primary and producing the signified; the signifiers are “subjected to the double condition of being reducible to ultimate differential elements and of combining according to the laws of a closed order” (Lacan 2001). Building on this, Lacan’s Symbolic Order is an essentially linguistic dimension, the realm of signifiers: it is “the big [O]ther, that is, the other of language, the Names-of-the-Father, signifiers or words [that] ... are public, communal property” (Lacan 2001). Only the Symbolic can distinguish or differentiate the Other. “Lacan argues it is only with the ability to represent her world that one can speak of the subject as being truly human... on entry into the Symbolic system of language we become enmeshed in a total network of symbols that formed a coherent system long before we were borne into it.” (Desmond 2013, p 155). However, the Imaginary also involves a linguistic dimension, since the signified belongs to the Imaginary. Thus, language has aspects of

Symbolic and Imaginary: "words themselves can undergo symbolic lesions and accomplish imaginary acts ... In this way speech may become an imaginary, or even real object" (Lacan 2001).

Lacan's Real is never clearly defined, standing for whatever eludes capture as sets of images and/or Symbolic signifiers: that which is always beyond representation. This could mean material things *an sich*: whatever is beyond phenomenal appearances or sense impressions; or an absolute fullness, lacking nothing but absence. Or it could be quantum reality; for example, Richard Feynman has said 'the "paradox" is only a conflict between reality and your feeling of what reality "ought to be"' (Feynman et al 1965). Or it could be Plato's ideals or Goethe's realm of the mothers. Because of its evasion of description or imagining, its existence might be denied by a behaviourist or by a follower of the Copenhagen interpretation of quantum physics. The Symbolic, which only acquires meaning through differences, is responsible for foisting absences, gaps and lacks onto the Real (see also Žižek 2007).

Beyond these three orders, we propose a fourth, the Shambolic: an excess, an overweening fullness that is empty of meaning. We cannot form an image of it as it contains too much detail to comprehend; we cannot get started on describing it as there is nowhere to begin; but it is not the Real since it certainly contains differences and divisions—they are too many to be accurately imagined or described. It is legion; it contains multitudes. It is beyond our ken not because of an ineffable evasion of representation, but because of its sheer incomprehensible scale.

We argue for the use of these four orders as a framework to understand magical-algorithms-in-action. We propose that these four orders of reality are driven by a *différance engine* leading to constantly mutating meanings of signifiers.



This frame provides a tentative structure for addressing what an ethnography of (or around) an algorithm might be. In some respects we can locate the algorithm in the Symbolic, where our focus is on the set of rules, the language, or the system of difference that is evident when one examines a blueprint or sequence of pseudocode statements. However, the network of actants, comprising a larger whole, also resides in the Imaginary but is dependent on the Symbolic for description. Since relations between beings are constitutive of these beings, intra-action must be Real but is—partially, brokenly, approximately—portrayed by the Imaginary through the Symbolic.

The Shambolic order resonates with the term Big Data: rather than data being precious any more, we are swamped in a deluge of it, and the job of many learning algorithms is to try to extract something useful from a welter of noise. Thus, the magical algorithms-in-action we consider, intra-acting as they do with huge datasets, reside at least partly in the Shambolic.

To carry over an analogy from physics, the algorithm-in-action, data, hardware and humans are entangled like distributed quantum systems (Barad 2007). What term can we use to describe the entangled assemblage of algorithms-in-action, data, hardware and human beings? The whole is complex—indeed, a complex (in the sense of a mathematician’s simplicial complex or a complex of buildings that somehow is more than the sum of its parts) and the number of interacting components (items of data, persons, machines) is too big to comprehend—beyond our ken (psychologists tell us we can grasp about 7 ± 2 concepts

simultaneously). A googol⁵ is the mathematician's term for the number 10^{100} —which wildly exceeds the number of fundamental particles in the known universe—and a googolplex is the number $10^{\text{googol}} = 10^{10^{100}}$: finite yet beyond our comprehension. We suggest the term *googolplex* for the *complex*-assemblage of interacting data, persons, machines and algorithms-in-action: inscrutable because of its closed source, its advanced technology, its distributed nature, its unexpected emergent behaviour and—not least—its sheer size and complexity: beyond our ken because of its scale. This size—this plenitude, full of data but (almost) empty of meaning—this data deluge with a few pearls hidden in a tsunami of noise—places the googolplex both in the Imaginary and Shambolic orders. We feel that study of the googolplex will prove increasingly important.

To take this agenda further into empirical work, which algorithms might make especially good candidates for study? What kinds of criteria might we apply? Such criteria might include large scale, span of influence, transparency, technologically sophisticated and distributed nature of processing, and potential for reusability in multiple distinct applications. For these reasons, we have begun a research effort into the Bitcoin cryptocurrency and its underlying “blockchain” public immutable ledger technology. This topic recently has begun to be examined by researchers, e.g., Lustig and Nardi (2015). We hope to speak to these issues in greater depth in the future.

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⁵ Its homonym Google is a contraction of the injunction “Go ogle”, with connotations of voyeurism.

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