

Accountability at the end of the world

Entangled governance and non-human objects

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Abstract

This paper is concerned with the character of accountability in the context of emerging technologies. What happens to accountability when people are increasingly entangled with artificial intelligence processes? That is, instead of entering into a relationship with some other where one reports; is subject to interrogation and may suffer consequences, accountability will increasingly involve infrastructures defined by detection of patterns in people's 'data exhaust' followed by automated consequences.

Employing an object-oriented ontology perspective on the accountability forum, I examine the ways in which tools are entangled with accountability and from there how new kinds of accountable self might emerge from an increasingly post-human order. I ask whether more ecological metaphors, focused on accountability as a 'technosphere,' may better reflect emerging accountability forms where the accountable self emerges as an object increasingly disaggregated from the experienced self.

1. Introduction

This paper is about how we might imagine accountability to an artificial intelligence process. Accountability is held to be inherently relational. While it is shaped by formal infrastructures, it has the

navigation of human relationships at its heart – at its ‘relational core’ as Bovens¹ puts it. Someone is accountable when they enter “a relationship between an actor and a forum, in which the actor has an obligation to explain and to justify his or her conduct, the forum can pose questions and pass judgement, and the actor may face consequences.”² What of accountability when obligations to inform are replaced by data trails and ‘data exhausts?’ Is accountability possible when justification is no longer solicited? Is a person being ‘held to account’ if they trigger an automated system and consequences are imposed by an automated system?

I argue that the emergence of AI systems herald a profound transformation in how accountability must be conceptualised. Accountability to AI is not the same as accountability to a human interlocutor (or group of human interlocutors). While it has distinctive features and implications, accountability to AI is accountability nonetheless. In order to map such an accountability out I draw on object-oriented ontology (OOO), also known as ‘speculative realism.’ OOO is a perspective that emphasises a ‘flat’ approach to understanding the world, placing human beings in ‘ontological equality’ with other objects and beings. I draw on OOO to focus on the accountability forum’s ‘infrastructuring’ tools and how these ‘entangle’ human beings.

While this paper is conceptual in intent, it is important to recognise that AI *is* actually emerging as an accountability tool across the board: we need not speculate about the tools’ emergence as powerful forces in organising our lives. AI processes manage and control ‘gig’ workers. They detect fraud. They manage worker recruitment and, once hired, performance. And beyond that the very foundations of governance and law are also set to shift in the face of algorithmic innovations. We are entering an accountability ‘technosphere,’ a more local element in the “power, communication, industrial, governmental, military, and other widely distributed and interconnected technological systems on whose function modern civilization and society is based.”³ The accountability technosphere is defined by the detectional properties of algorithms and the human data those algorithms detect.⁴

¹Mark Bovens, Thomas Schillemans and Robert E Goodin, ‘Public Accountability’ in Mark Bovens, Robert E Goodin and Thomas Schillemans (eds), *The Oxford Handbook of Public Accountability* (Oxford University Press 2014).

²Mark Bovens, ‘Analysing and Assessing Accountability: A Conceptual Framework’ (2007) 13 *European Law Journal* 447, 450.

³PK Haff, ‘Technology and Human Purpose: The Problem of Solids Transport on the Earth’s Surface’ (2012) 3 *Earth System Dynamics* 149, 149.

⁴Peter Haff, ‘Humans and Technology in the Anthropocene: Six Rules’ (2014) 1 *The Anthropocene Review* 126; PK Haff, ‘Being Human in the Anthropocene’ (2017) 4 *The Anthropocene Review* 103; Christoph Rosol, Sara Nelson and Jürgen Renn, ‘In the Machine Room of the Anthropocene’ (2017) 4 *The Anthropocene Review* 2; Jan Zalasiewicz and others, ‘Scale and Diversity of the Physical Technosphere: A Geological

The paper is split into four sections. In section 2 I give a brief account of artificial intelligence, its parameters and how we ought to conceptualise its power. Then in section 3 I describe object-oriented ontology and the ways in which it might illuminate our thinking on the accountability forum. Section 4 focuses on the relational accountability forum itself. I am specifically interested in both the space relational accountability makes for dialogue and improvisation and in the ways in which accountability tools ‘infrastructure’ the forum.⁵ While the forum is a metaphor for the ‘entanglement’ of human beings and non-human objects, automation tools have been imagined as displacing rather than transforming accountability. I argue that we should see these tools as transforming the forum rather than displacing it to somewhere else.

In section 5 I address the emergence of an accountability *to* artificial intelligence from an OOO perspective. I give an account of the challenge that AI tools pose for our understanding of accountability: these tools represent a rupture in accountability. They are *qualitatively new*. Having set this out I ask whether interactions with algorithmic actors are accountability at all, and whether the forum metaphor is adequate to describe relational accountability in the context of AI. Can accountability exist absent a (human) accountability relationship? And what metaphors might best cast light on the concept of accountability in an environment defined by detection over dialogue?

2. AI and its limitations

AI refers to computational processes that 1) use large datasets to 2) identify statistical patterns and then 3) autonomously categorise or scores new information on that basis or predict changes in one arena based on incoming data from elsewhere, and finally perhaps 4) enacting some material change as a result. I am interested in how accountability might work where such automated mechanisms do more than arrange information for the use of human interlocutors: between ‘accountors’ giving accounts and ‘accountees’ receiving them. What of accountability in other words where an artificial intelligence system for all practical purposes replaces the human ‘accountor’? Would such a situation constitute accountability or is it something else?

Artificial Intelligence (AI) as a general field of ‘machine learning’ involves “the effort to automate intellectual tasks normally performed

Perspective’ (2017) 4 The Anthropocene Review 9.

⁵Helena Karasti and Jeanette Blomberg, ‘Studying Infrastructuring Ethnographically’ (2018) 27 Computer Supported Cooperative Work (CSCW) 233.

by humans”.⁶ Artificial intelligence processes draw statistical inferences from large datasets and apply those inferences to new data, placing things, events or people into categories, predicting outcomes or assigning scores. Such processes may for instance involve ‘deep learning,’ where ‘layers’ of algorithmic operations are applied to data, most often in ‘neural networks,’ designed to bring about ever closer representations of the data that will get us “closer to the expected output”.⁷ Such processes can identify patterns in images, text or elsewhere without applying preset rules.

In order to illustrate rules-based systems, imagine a chatbot that has been programmed to check for eligibility criteria for a welfare benefit. It transmits a number of questions requesting yes/no responses from users: “are you above the age of 16?”; “are you employed more than 10 hours per week?”; “are you ordinarily resident in this jurisdiction?” etc. Such a system applies and communicates policy decisions about eligibility: it does not *decide* eligibility. Nor does it require data about previous decisions: it simply automates the application of pre-determined rules.

An AI process takes a different approach. It draws on large data in order to identify patterns and then applies those patterns to new data in the same space. Take for instance the detection of fraud or corruption. An algorithm will be written that applies a statistical method to a large dataset of, say, claimants’ demographic data or their interaction data. Past data is labelled: imagine a table of variables per observation (age; address; ethnicity; gender etc), with one column denoting one of the classes ‘fraud identified’ or ‘fraud not identified.’ This data based perhaps on previous audits and investigations.

The algorithm is programmed to identify statistically significant differences across the many variables and observations and returns a probability that any new observation (as in, claimant) belongs to the class ‘fraud identified.’ How precisely this probability is derived might not be easily replicable outside the algorithm’s ‘black box,’ even though the method applied is known. This simply because the computational process is itself the only way to ‘solve’ the data: no human readable method is available. It is noteworthy as well that such approaches are, on the face of it, not theoretical: the algorithm ‘discovers’ a pattern that matches previous labelling without a hypothesis about, say, who is likely to commit welfare fraud etc.

Nonetheless, the process does not take place without human agency. Decisions are made about the statistical methods applied. And human agency is applied to collecting, organising and labelling data

⁶François Chollet, *Deep Learning with Python* (2nd edn, O’Reilly 2022) 2.

⁷Ibid 5.

in the first place. Indeed, as has recurred across these processes, data labelling – arrest patterns; fraud investigations; audit practices – may well contain implicit social theories and hypotheses, unpalatable though they may be: arrest data may read racial bias into the process. Fraud identification may well be a function of policy and policy-‘enthusiasm,’ as the Dutch welfare fraud scandal suggested.⁸

The combination of data biases and the AI ‘black box’ is a matter of deep concern for scholars and others who are concerned with the accountability of AI. Madalina Busuioc for instance writes of the ‘insidious’ emergence of such systems that see “bureaucratic actors losing the ability to understand, scrutinize, and exercise meaningful control”.⁹ So while AI approaches are applicable in far more scenarios and systems than rules-based strategies, they pose new and difficult challenges.

Two other issues are things are worth noting. First, applications of AI are spreading and perhaps the processes are growing in sophistication but the trajectory is not towards *sentience*, whatever outward impressions might hold.¹⁰ AI algorithms need not trend towards some kind of general intelligence in order to be of concern. Our attention ought instead to focus not on AI processes becoming more human in their ‘detectional properties’ but in their becoming *something else*: an ‘alt intelligence’ as Marcus¹¹ has it. Instead of the ‘generalised intelligence’ of humans and other animals where lessons in one sphere are applied elsewhere: AI involves the computational performance of ‘localised generalisations,’ as Chollet has it.¹² AI can be deployed in ways that performs highly efficient pattern matching at speed across a range of activities, providing the process is specified towards available data. It does so in the context of its feeder data alone.

This leads to the second issue note of caution when speaking about AI. AI processes do not necessarily need to ‘work’ in order for it to

⁸Chris Van Dam and Childcare Allowance Parliamentary Inquiry Committee, ‘Ongekend Onrecht (‘Unprecedented Injustice’)’ (House of Representatives of the States General 2020) report to the House of Representatives of the States General 35 510; Tom Mackey, ‘Dutch Childcare Benefit Scandal an Urgent Wake-up Call to Ban Racist Algorithms’ (25 October 2021); Simon Otjes, ‘The Dutch Government Has Been Rocked by Scandal. Why Does Its Leader Remain Untainted?’ (22 January 2021); Saar Alon-Barkat and Madalina Busuioc, ‘Human-AI Interactions in Public Sector Decision Making: “Automation Bias” and “Selective Adherence” to Algorithmic Advice’ (2022) early access Journal of Public Administration Research and Theory 1.

⁹Madalina Busuioc, ‘Accountable Artificial Intelligence: Holding Algorithms to Account’ (2021) 81 Public Administration Review 825, 834.

¹⁰Timnit Gebru and Margaret Mitchell, ‘We Warned Google That People Might Believe AI Was Sentient. Now It’s Happening’ *Washington Post: opinion* (Washington DC, 17 June 2022).

¹¹Gary Marcus, ‘The New Science of Alt Intelligence’ (14 May 2022).

¹²Chollet (n 6) 446.

have an effect. Hype around AI ‘functionality’ is likely misplaced. Quite simply, “many deployed algorithmic products do not work” as Raji et al have it.¹³ To some extent AI is beset by “inflated claims of functionality that the systems cannot meet,”¹⁴ but the well-rehearsed issue of biased data is as concerning, something that is perhaps exposed especially by the AI ‘predict and surveil’ model emerging in criminal justice.¹⁵ AI development largely focuses, as Birhane et al have it, on “performance, generalization, and efficiency,”¹⁶ privileging rapid development over reflection on how data not only reads the world but writes it too.

AI might as such ‘not work’ in the sense of ‘not functioning as compared to a stated aim,’ for instance actually predicting fraud recidivism without encoding racial bias. It may also perform in ways that are neither envisaged nor desirable. AI’s capacity to obscure ambiguity¹⁷ and to extract the consequences of discretionary power, as encoded in data,¹⁸ is also a concern. By deploying ‘large language models’ to build responsive and apparently intelligent chatbots for instance, developers can obscure AI’s limitations or distract from real risks.¹⁹

Indeed, it may be that the technology ‘working’ is not its point, as evidenced by the kinds of digital dragnet involved in facial recognition²⁰. Likewise, ‘Deepfakes’ are an AI ‘success,’ – a technological

¹³Inioluwa Deborah Raji and others, ‘The Fallacy of AI Functionality’, *2022 ACM Conference on Fairness, Accountability, and Transparency* (2022) 1 <<https://arxiv.org/abs/2206.09511>>.

¹⁴Ibid 2.

¹⁵Sarah Brayne, *Predict and Surveil: Data, Discretion, and the Future of Policing* (Oxford University Press 2021); Andrew Guthrie Ferguson, *The Rise of Big Data Policing: Surveillance, Race and the Future of Law Enforcement* (New York University Press 2017); Christopher Slobogin, ‘The Sociology of Big Data Policing’ (26 July 2022); Karen Hao, ‘AI Is Sending People to Jail—and Getting It Wrong’ [2019] *MIT Technology Review*.

¹⁶Abeba Birhane and others, ‘The Values Encoded in Machine Learning Research’ 8 <<https://arxiv.org/abs/2106.15590>>.

¹⁷Abeba Birhane, ‘The Impossibility of Automating Ambiguity’ (2021) 27 *Artificial Life* 44.

¹⁸Sun-ha Hong, ‘Prediction as Extraction of Discretion’, *2022 ACM Conference on Fairness, Accountability, and Transparency* (Association for Computing Machinery 2022).

¹⁹On chatbots see Dimitrios Tsarapatsanis and Nikolaos Aletras, ‘On the Ethical Limits of Natural Language Processing on Legal Text’, *Findings of the Association for Computational Linguistics: ACL-IJCNLP 2021* (Association for Computational Linguistics 2021); Laura Weidinger and others, ‘Ethical and Social Risks of Harm from Language Models’ (2021) <<https://arxiv.org/abs/2112.04359>>; Kris McGuffie and Alex Newhouse, ‘The Radicalization Risks of GPT-3 and Advanced Neural Language Models’ (2020) <<https://arxiv.org/abs/2009.06807>>.

²⁰Madhumita Murgia, ‘Who’s Using Your Face? The Ugly Truth about Facial Recognition’ *Financial Times* (19 April 2019); Joe Purshouse and Liz Campbell, ‘Automated Facial Recognition and Policing: A Bridge Too Far?’ (2022) 42 *Legal Studies* 209.

success – but certainly not a social success.²¹ Such processes do not work, but they work for *someone*. The point may be that they enhance somebody’s power when *applied as they are*.

These limitations do not mean that we ought to diminish how effective AI processes are both at resolving narrow questions and more generally at changing the way governance challenges are addressed in the first place. AI processes, whether employed in fraud detection;²² accessibility of work²³ or credit;²⁴ or performance management²⁵ are already being *put to work*. This however flimsy the evidence for them ‘working’ in the sense of drawing promised inferences from data.

Beyond narrow applications, AI processes are also in effect starting to *rewrite the questions* that a system may ask.²⁶ In extracting from ‘real-time data flows for governance’ may experiment with new governance forms.²⁷ Elsewhere they are being put to work in ways that extend corporate social power over new areas of public discourse and life.²⁸

The discussion below focuses on these dynamics as accountability issues. That is, for instance on the emerging expansion of surveillance technologies into performance management, beyond its origins in the ‘gig’ economy.²⁹ These are accompanied for instance by increased monitoring of ‘outputs’ as accountability tools such as in education and healthcare. Such emerging dynamics reflect an increasing turn not only to a “supercharged the ability to monitor [workplaces], both

²¹Karen Hao, ‘Inside the Strange New World of Being a Deepfake Actor’ [2020] *MIT Technology Review*; Jared Schroeder, ‘Free Expression Rationales and the Problem of Deepfakes Within the E.U. And U.S. Legal Systems’ (2020) 70 *Syracuse Law Review* 1171; David Gray Widder and others, ‘Limits and Possibilities for “Ethical AI” in Open Source: A Study of Deepfakes’ 12.

²²Cansu Safak and James Farrar, ‘Managed by Bots Report: Data-Driven Exploitation in the Gig Economy’ (Worker Info Exchange 2021) Research Report.

²³House of Commons Science and Technology Committee, ‘Algorithms in Decision-Making’ (House of Commons 2018) Fourth Report of Session 2017–19 HC 351 19.

²⁴Frank Pasquale, *The Black Box Society: The Secret Algorithms That Control Money and Information* (Harvard University Press 2015); Danielle Keats Citron and Frank Pasquale, ‘The Scored Society: Due Process for Automated Predictions Essay’ (2014) 89 *Washington Law Review* 1.

²⁵Jane Gunn, Kristy Zwickert and Kathy Hilyard, ‘Reinventing Performance Management in the Public Sector’ in Deborah Blackman, *Handbook on Performance Management in the Public Sector* (Edward Elgar Publishing 2021).

²⁶For instance see John Morison and Adam Harkens, ‘Re-Engineering Justice? Robot Judges, Computerised Courts and (Semi) Automated Legal Decision-Making’ (2019) 39 *Legal Studies* 618.

²⁷Fleur Johns, ‘Governance by Data’ (2021) 17 *Annual Review of Law and Social Science* 53, 58.

²⁸Jennifer Cobbe, ‘Algorithmic Censorship by Social Platforms: Power and Resistance’ (2020) early access *Philosophy & Technology*.

²⁹Antonio Aloisi and Elena Gramano, ‘Artificial Intelligence Is Watching You at Work: Digital Surveillance, Employee Monitoring, and Regulatory Issues in the EU Context Automation, Artificial Intelligence, & Labor Law’ (2019–2021) 41 *Comparative Labor Law & Policy Journal* 95.

in terms of quantity and quality,”³⁰ but to data processing and a reliance on decisions based on it, whether that decision is algorithmic or not. At this level the everyday forums of recruitment or of performance management at the middle and ground levels are re-configured to place AI tools at their heart. More strategic questions around policy evaluation are coming to be amenable to AI tools.³¹ Beyond these administrative futures might even see data-intensive decisions may replace traditional political processes:³² why ask when the data will tell? Such a future, increasingly manifested on the present, means that human accountability relationships will give way to an entanglement with tools.

3. Object-oriented ontology

Given this entanglement between people and their tools, object-oriented ontology (OOO) presents one interesting perspective that can illuminate how objects are and how they shape the world. OOO is a ‘flat’ social ontology³³ in the sense that it rejects any notion of non-human objects’ properties being defined in correspondence with or as a function of human perception: “the point of OOO”, as Graham Harman puts it, “is not to focus on non-human objects instead of human subjects, but to treat of both in a flat ontology that does not view humans as ontologically different in kind from cardboard boxes, atoms, or fictional characters”.³⁴ That is not to deny that human beings have properties unique to them: *all* objects have such specificities. In short:

OOO puts things at the center of being. We humans are elements, but not the sole elements, of philosophical interest. OOO contends that nothing has special status, but that everything exists equally—plumbers, cotton, bonobos, DVD players, and sandstone, for example. In contemporary thought, things are usually taken either as the aggregation of ever smaller bits (scientific naturalism) or as constructions of human behavior and society (social relativism).

³⁰Matthew T Bodie, ‘The Law of Employee Data: Privacy, Property, Governance’ (2022) 97 *Indiana Law Journal* 707, 732.

³¹Noemi Kreif and Karla DiazOrdaz, ‘Machine Learning in Policy Evaluation: New Tools for Causal Inference’ <<https://arxiv.org/abs/1903.00402>>.

³²John Morison, ‘Towards a Democratic Singularity? Algorithmic Governmentality, the Eradication of Politics, and the Possibility of Resistance’ in Simon Deakin and Christopher Markou (eds), *Is Law Computable? Critical Perspectives on Law and Artificial Intelligence* (Hart 2020).

³³Social ontology being “the study of the nature and properties of the social world” Brian Epstein, ‘Social Ontology’ in Edward N Zalta (ed), *The Stanford Encyclopedia of Philosophy* (Winter 2021, Metaphysics Research Lab, Stanford University 2021).

³⁴Graham Harman, *Art and Objects* (Polity 2020) 160.

OOO steers a path between the two, drawing attention to things at all scales (from atoms to alpacas, bits to blinis) and pondering their nature and relations with one another as much with ourselves.³⁵

OOO's concern to avoid 'undermining' and 'overmining' – breaking things into an 'aggregation of ever smaller bits' and treating them as 'constructions of human behavior and society,' as Bogost has it³⁶ – reflects their interest in trying to attend to objects as they are. They do not deny that an object might have components or that it might be socially-constructed. Rather they are concerned to pay attention to the object as something in itself: as something specific beyond its components and as more than any construction that led to its being.

Perspectives such as those articulated in Latour's Actor-Network Theory places human and non-human objects in relationship to each other.³⁷ These relationships bring social realities into being.³⁸ Similarly, Knorr-Cetina's discussion of knowledge-production in laboratories and elsewhere also approaches knowledge production as arising from systems involving both human beings and non-human objects: equipment and scientists; traders and Bloomberg terminals etc.³⁹ What sets OOO apart is that instead of thinking of objects as "chaperoned by human beings" as Harmon says of Knorr-Cetina's work, it places them fundamentally outside human contact.⁴⁰ While ANT focuses on what objects *do*, OOO is primarily interested in what objects *are*.

OOO is deeply concerned with the distinction between an object's 'real' and 'sensual' qualities: between what an object is and the impressions it makes on other objects, including human beings. Some aspects of the real object are always 'withdrawn' from humans and from other objects. We can never access its real qualities: we can only perceive it through its interaction with the senses. Nonetheless, as Harman sees it, we should pay attention to our sense of things, to

³⁵Ian Bogost, *Alien Phenomenology, or, What It's Like to Be a Thing* (University of Minnesota Press 2012) 6.

³⁶Ibid.

³⁷For instance Bruno Latour, *The Pasteurization of France* (Annotated edition, Harvard University Press 1993).

³⁸Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (OUP Oxford 2005); Latour (n 37).

³⁹Karin Knorr Cetina, 'Social Relations in Postsocial Knowledge' (1997) 14 *Theory, Culture & Society* 1; Karin Knorr Cetina, *Epistemic Cultures: How the Sciences Make Knowledge* (Harvard University Press 1999); Karin Knorr-Cetina and Alex Preda, 'The Epistemization of Economic Transactions' (2001) 49 *Current Sociology* 27; Karin Knorr-Cetina and Alex Preda, 'The Temporalization of Financial Markets: From Network to Flow' (2007) 24 *Theory, Culture & Society* 116.

⁴⁰Graham Harman, *Immaterialism: Objects and Social Theory* (John Wiley & Sons 2017) 5.

the “joints and glue, the tenons, pipes, tunnels, and crawl spaces, the copper cable, luminous fibers, and smoke signals that link withdrawn objects to one another despite their permanent seclusion in private vacuum-sealed cells.”⁴¹

People use metaphor, comedy and other strategies to bring glimmerings of the real objects to the fore, never successfully but in ways that can transform their social realities. Metaphors are a ‘useful equipment’⁴² that, as Harman has it, following Ortega y Gasset, present “the inner execution of the things in simulated form.”⁴³ Talk of a cypress tree being “like the ghost of a dead flame”⁴⁴ gives us indications of the tree’s elusive reality, with metaphors being connected both to something essential about their subject and to how it enters the ‘sphere of our lives.’⁴⁵ Metaphors in other words give a sense of an object as we are *entangled* with it. I return to both the use of metaphor and to the concept of entanglement in my discussion of the accountability forum below.

Objects are here not solely immediate physical things. They may include for instance companies, algorithms or ecosystems. Harman’s discussion of the Dutch East India Company highlights the ways that objects can persist, the kinds of events that lead to transformations and the kinds of ‘symbiosis’ they can produce with other objects.⁴⁶ While Harman says that for OOO an object is simply something “that cannot be paraphrased in terms of either its components or its effects,”⁴⁷ it is encountered and defined by its entanglements and so is “more than a rigid structure.”⁴⁸ Objects are therefore *largely* stable but open to transformations in interaction with other objects.

Another useful insight in OOO arises in Morton’s discussion of ‘hyperobjects.’⁴⁹ Hyperobjects are objects that are 1) viscuous in that we are enmeshed in them; 2) nonlocal in that any ‘nearby’ manifestation of them is not directly the object itself; 3) exist beyond human time scales; and 4) can only be detected in the relationships between the aesthetic properties of objects.⁵⁰ Ultra-massive black holes are hyper-

⁴¹Graham Harman, *Guerrilla Metaphysics: Phenomenology and the Carpentry of Things* (Open Court 2005) 76.

⁴²Ibid 102.

⁴³Ibid 107.

⁴⁴Ibid 105.

⁴⁵Ibid 108.

⁴⁶Harman (n 40).

⁴⁷Ibid 3.

⁴⁸Gabriel Yoran, *The Interfact: On Structure and Compatibility in Object-Oriented Ontology* (Open Humanities Press 2021) 40.

⁴⁹Timothy Morton, *Hyperobjects: Philosophy and Ecology After the End of the World* (University of Minnesota Press 2013).

⁵⁰Ibid 1.

objects; as are data; as is the climate; as is a gendered modernism.⁵¹ Hyperobjects will “be our lasting legacy”:

Materials from humble Styrofoam to terrifying plutonium will far outlast current social and biological forms. We are talking about hundreds and thousands of years. Five hundred years from now, polystyrene objects such as cups and takeout boxes will still exist. Ten thousand years ago, Stonehenge didn't exist. Ten thousand years from now, plutonium will still exist.⁵²

Rather than simply displacing human agency, OOO's 'flat' account of human and 'non-chaperoned' non-human objects gives us a sense of how that agency is inescapably entangled in *stuff*. This is crucial for a concept like accountability given its entanglement with objects – with the clocks; databases; cameras; even with pens, sheaves of paper and the tables upon which accountability is played out. OOO also suggests a path to thinking about how metaphor plays a role in organisational thought. The accountability *forum* is not so called arbitrarily: invoking architectural forms; the sensibilities of a classical agonism; and the sense of *attention* between accountant and accountee: all these are key. They give us glimmerings of what an understanding of accountability might be. And Morton's discussion of hyperobjects gives us some sense of how an accountable self might become entangled with accountability: as data; as object; and as both local manifestation of and product of a system's 'detectional properties'. I return to hyperobjects below, especially in the context of the 'technosphere.'⁵³

In the next section I move on to discuss relational accountability. I am interested especially in thinking about how accountability's dialogical foundations and improvisations interact with its objects in infrastructuring a technosphere. Then in the section following I address the challenges that artificial intelligence poses to this perspective. I ask whether relational accountability's conceptual framework can hold as our non-human future comes to pass.

4. Relational accountability

Relational accountability suggests an interplay “between an actor who is accountable to a second person or institution, which is described

⁵¹On the latter see Frenchy Lunning, 'Allure and Abjection: The Possible Potential of Severed Qualities' in Katherine Behar (ed), *Object-oriented feminism* (University of Minnesota Press 2016).

⁵²Timothy Morton, *The Ecological Thought* (Harvard University Press 2012) 130.

⁵³Haff, 'Being Human in the Anthropocene' (n 4).

as the forum, principal, significant other, or audience.”⁵⁴ The process of being accountable is in this perspective disaggregated into: the delivery of a report or provision of information; interrogation or investigation regarding the information provided; and the imposition of consequences for how conduct, as reported, matched up to some set of expectations.⁵⁵

Certainly as Brandsma and Schillemans point out, real world accountability “will often depart from this neat and ordered model, as the three phases may occur simultaneously, happen in reversed order, or skip one of the elements altogether.”⁵⁶ Nonetheless, the ‘Bovens model’⁵⁷ maps accountability in ways that are especially useful not least because it draws key relationships within everyday governance and within the ‘infrastructuring’ of relationships to the fore. Accountability is in this model more than simple reporting or transparency. It emerges as a ‘cultural keyword’⁵⁸ because it describes a “a natural counterbalance” to the forms of discretionary power that emerge in modern governance and administration. It is “an essential means of legitimising and sustaining such power imbalance in the face of potential resistance by those who were subject to it.”⁵⁹

In this section I set out the role that tools – clocks; databases; forms – play in the accountability forum. That is, on mechanisms for measuring; recording; applying; or communicating standards for which people might be held to account. “Am I early or late?” “Did we generate a profit or loss?” “Are you entitled to a benefit?” The forum as imagined in relational accountability relies on these tools;⁶⁰ but that

⁵⁴Thomas Schillemans, ‘Managing Public Accountability: How Public Managers Manage Public Accountability’ (2015) 38 *International Journal of Public Administration* 433, 434.

⁵⁵See Bovens (n 2) 452; also Melvin J Dubnick, ‘Accountability and the Promise of Performance: In Search of the Mechanisms’ (2005) 28 *Public Performance and Management Review* 376; Bovens, Schillemans and Goodin (n 1); Schillemans (n 54); Barbara Romzek and Melvin J Dubnick, ‘Accountability in the Public Sector: Lessons from the Challenger Tragedy’ (1987) 47 *Public Administration Review* 227.

⁵⁶Gijs Jan Brandsma and Thomas Schillemans, ‘The Accountability Cube: Measuring Accountability’ (2013) 23 *Journal of Public Administration Research and Theory* 953, 956.

⁵⁷Ciarán O’Kelly and Melvin J Dubnick, ‘Dissecting the Semantics of Accountability and Its Misuse’ in Hester Paanakker, Adam B Masters and Leo Huberts (eds), *Quality of Governance: Values and Violations* (Palgrave Macmillan 2020) 48ff.

⁵⁸Melvin J Dubnick, ‘The Ontological Challenge’ in Mark Bovens, Robert E Goodin and Thomas Schillemans (eds), *The Oxford Handbook of Public Accountability* (Oxford University Press 2014).

⁵⁹Marc T Moore, ‘The (Neglected) Value of Board Accountability in Corporate Governance’ (2015) 9 *Law and Financial Markets Review* 10, 14.

⁶⁰And their often hidden and gendered labour forces Mar Hicks, *Programmed Inequality: How Britain Discarded Women Technologists and Lost Its Edge in Computing* (MIT Press 2018); also Nathan Ensmenger, ‘The Cloud Is a Factory’ in Thomas S Mullaney and others (eds), *Your Computer Is on Fire* (MIT Press 2021); Sarah Dai, ‘AI

the tools are imagined as serving rather than fundamentally shaping the accountability relationship. This is perhaps the case because relational accountability is *improvisational* at heart, but we should have regard for how the accountability's dialogical agents are *entangled in things*.

The forum metaphor, in an OOO frame, points to a real thing, glimmerings of which the metaphor itself reveals. Metaphor operates as a strategy in the "theater of human consciousness"⁶¹ by giving us glimmerings of things in themselves and how they are entangled with people that apprehend them. For our purposes an accountability forum is an object in itself and in interaction with other objects,⁶² more than simply composed of its parts (even if they are interesting as objects in turn), and should be brought under scrutiny as such.

This especially when we are the *end of the world*, at least as can credibly be understood by granting ontological priority to human beings. The world is becoming stranger, whether by virtue of technological innovation; ecological crisis; or economic ruin. We are ever-more keenly aware of our being entangled in objects that defy immediate human apprehension.⁶³ Reality itself is becoming more of a black box. What is it, then, to be accountable in this 'more than human' world?⁶⁴

As I argue below, technological change, especially the growing role of AI in monitoring and managing people, suggests that a new kind of accountability is emerging, one where interaction with accountability happens through a person's 'data exhaust'⁶⁵ and other statistical traces they emit through their activities; where the forum is 'always on' as a result; and where decisions can seem impenetrable or difficult to access. This continues, I think, to *be* accountability, but our metaphors may need to adjust to new realities and new strategies for giving of accounts. Indeed, in this new accountability, accounts are taken whether they are given or not.

The forum's status as the central metaphor in the Bovens model sees it become "the defining feature of accountability."⁶⁶ The metaphor's power lies in its emphasising the idea that accountability sustains institutional legitimacy as Moore argues.⁶⁷ Institutions rely on processes

Revolution Needs Old-Fashioned Manual Labour - from China' *South China Morning Post: Tech* (8 October 2018).

⁶¹Harman (n 41) 23.

⁶²On this interplay see Yoran (n 48) 40.

⁶³Morton (n 49).

⁶⁴Anna L Tsing and others, *Feral Atlas: The More-Than-Human Anthropocene* (Stanford University Press 2020).

⁶⁵Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* (Profile Books 2019) 68.

⁶⁶O'Kelly and Dubnick (n 57) 52.

⁶⁷Moore (n 59) 14.

for accounts *demande*d and *owed*⁶⁸ and as such the accountability forum is composed of systems that embody accountability's normative content, casting them in procedural form.⁶⁹

Accountability processes are in short instances of 'infrastructuring': that is, "the ongoing and continual processes of creating and enacting information infrastructures."⁷⁰ The Bovens model's profundity lies in how the forum metaphor draws the procedural and the normative together, making clear that democratic administration is both. We should recall from Harman that metaphors are crucial in illuminating our entanglements with things and this is the case here, both with the forum as a thing in itself and to the tangible and intangible things that are employed in defining it.

Accountability from this perspective involves something other than simple prediction or postdiction of an accountee's conduct. It goes beyond establishing what someone *has done* or *may do*. Reporting and interrogation could aim at establishing what an accountee has done or what they might do with consequences imposed in response, but the forum model points to accountability being fundamentally dialogical. Even what Bovens calls the '*forum internum*' of the conscience is posited as a kind of dialogue.⁷¹ The forum must on the face of it do more than generate information: that information must as it stands be formulated *together* in some way. As such, the Bovens model has *improvisation* at its heart.

In her work on improvisation and law Ramshaw argues that we should think of law as fundamentally improvisational rather than being wholly bound by rules and procedures. Improvisation in her view involves attention both to the 'singularity' of a situation and the kinds of invention that can happen *within* a system. An "improvised act . . . can only be analysed or understood through pre-existing or prevailing laws of language and music."⁷² It is "a social practice, one that teaches us how to actively listen to the singularity of a situation and its relationship to context and the surrounding circumstances"⁷³ and

⁶⁸On which see Stephen L Darwall, *The Second-Person Standpoint: Morality, Respect, and Accountability* (Harvard University Press 2006).

⁶⁹Mark Bovens, 'Two Concepts of Accountability: Accountability as a Virtue and as a Mechanism' (2010) 33 *West European Politics* 946; also Melvin J Dubnick and HGeorge Frederickson, 'Introduction' in HGeorge Frederickson and Melvin J Dubnick (eds), *Accountable Governance: Problems and Promises* (ME Sharpe 2011); Bovens (n 2).

⁷⁰Karasti and Blomberg (n 5) 234.

⁷¹Mark Bovens, *The Quest for Responsibility: Accountability and Citizenship in Complex Organisations* (Cambridge University Press 1998) 23; this is intended perhaps to echo Smith's 'cool and impartial spectator.' Adam Smith, *The Theory of Moral Sentiments* (Cambridge University Press 2002) 46.

⁷²Ramshaw, *Justice as Improvisation: The Law of the Extempore* (Routledge 2014) 43.

⁷³Sara Ramshaw, 'Rainbow Family: Machine Listening, Improvisation and Access

is “only made possible through a thorough knowledge of the tradition in which it is taking place, and much practice or dedication is required to learn the skills of the art of improvisation.”⁷⁴

We might think of relational accountability in a similar vein: it requires an improvisational touch, is dialogical and is co-produced between accountor and accountee. Forms and processes provide the relational forum with its infrastructure, but they do not determine it. Relational accountability must include space for and shapes ‘forum drift’ in institutions;⁷⁵ contextual awareness for accountors and accountees;⁷⁶ and negotiation between parties regarding parameters for the account.⁷⁷ While stabilised by rules, sensemaking and by process, space must remain for creativity, invention and evolving norms.⁷⁸ Mechanisms hold forums back from ‘drift’ or contextual change, but not indefinitely. As environments evolve, so mechanisms do too. Accountability has in other words an improvisational core.

Relational accountability, given this, involves people generating accountability *together*: accountability is constructed neither by accountor or accountee alone. This does not mean that parties to an accountability relationship are fully equal. One can impose consequences. The other cannot. Nonetheless the relationship requires patterns of recognition and processes of ‘give-and-take’ in order to generate a functional accountability: otherwise either oversight or discretion would be dispensed with and relational accountability would become meaningless or would disappear.

What role for information-assembling and information-disseminating tools in this relationship? That is, what role for ‘infrastructuring’ technologies in accountability.⁷⁹ At times such tools seem to be imagined as extrinsic to accountability itself. They are held to feed the processes without being constructive of them.

Accountability’s being infrastructured by technology is not simply

to Justice in International Family Law’ in Shane Chalmers and Sundhya Pahuja (eds), *Routledge Handbook of International Law and the Humanities* (Routledge 2021) 447 fn. 4.

⁷⁴Sara Ramshaw and Paul Stapleton, ‘Introduction: Law and Improvisation’ (2017) 12 *Critical Studies in Improvisation / Études critiques en improvisation* 7, 1.

⁷⁵Thomas Schillemans and Madalina Busuioc, ‘Predicting Public Sector Accountability: From Agency Drift to Forum Drift’ (2014) 25 *Journal of Public Administration Research and Theory* 191; also Oz Gore and others, ‘Discretion Drift in Primary Care Commissioning in England: Towards a Conceptualisation of Hybrid Accountability Obligations’ (2020) 98 *Public Administration* 291.

⁷⁶Brandsma and Schillemans (n 56) 964.

⁷⁷Sjors Overman and Thomas Schillemans, ‘Toward a Public Administration Theory of Felt Accountability’ (2021) 82 *Public Administration Review* 12, 18ff.

⁷⁸For one discussion of this see Florian Grisel, *The Limits of Private Governance* (Hart 2021).

⁷⁹Karasti and Blomberg (n 5).

about affordances however: technologies are put to work in asserting the legitimacy of governance.⁸⁰ They provide what Kyle and Volmar⁸¹ describe as a ‘temporal geography’ to people’s activities, setting the pace and sequence of their work. They also both shape and respond to their environment in which people improvise their accountability with each other. In other words they encompass and entangle accountability’s normative perspectives in their use.

Take what might be one of the simplest and most ‘background’ of accountability technologies: the clock and from there its variants: clock-in machines; timetables etc.⁸² In one sense they are to accountability what hammers are to architecture: tools to bring a work into being and perhaps a boundary on what is possible, but not intrinsic to the work itself. Clocks are however always more than simple affordances: they formalised and transmitted social perspectives. The emergence of clocks as regulatory devices happened in parallel to growing disapprobation of irregular modes of work.

“On Monday and Tuesday,” as EP Thompson puts it in his classic account, “according to tradition, the hand-loom went to the slow chant of Plen-ty of Time, Plen-ty of Time: on Thursday and Friday, A day t’lat, A day t’lat.”⁸³ For Thompson this preindustrial approach was displaced when clocks and ‘factory time’ emerged in order to feed the need for regularity required by industrial machines. It was also *fed* by the emergence of the clock as a regular industrial machine.⁸⁴ Over time, and acknowledging the multilayered complexity of time as a social construction,⁸⁵ people came to be entangled with clocks and

⁸⁰See for instance Melvin Dubnick, ‘Seeking Salvation for Accountability’ (2002) on the Domesday book.

⁸¹Kyle Stine and Axel Volmar, ‘Infrastructures of Time: An Introduction to Hardwired Temporalities’ in Axel Volmar and Kyle Stine (eds), *Media Infrastructures and the Politics of Digital Time: Essays on Hardwired Temporalities* (Amsterdam University Press 2021) 10.

⁸²EP Thompson, ‘Time, Work-Discipline, and Industrial Capitalism’ (1967) 38 *Past & Present* 56, 82–3; Mike Esbester, ‘Designing Time: The Design and Use of Nineteenth-Century Transport Timetables’ (2009) 22 *Journal of Design History* 91.

⁸³Or, as one laconic rhyme from 1639 had it:

*You know that Munday is Sundayes brother;
Tuesday is such another;
Wednesday you must go to Church and pray;
Thursday is half-holiday;
On Friday it is too late to begin to spin;
The Saturday is half-holiday agen* (Thompson (n 82) 72).

⁸⁴Ian Hodder, *Entangled: An Archaeology of the Relationships Between Humans and Things* (Wiley-Blackwell 2012) 99.

⁸⁵Paul Glennie and Nigel Thrift, ‘Reworking E. P. Thompson’s “Time, Work-Discipline and Industrial Capitalism”’ (1996) 5 *Time & Society* 275; also Paul Glennie and Nigel Thrift, *Shaping the Day: A History of Timekeeping in England and Wales 1300-1800* (Oxford University Press 2009); Dale Southerton, *Time, Consumption and the Coordination of Everyday Life* (Palgrave Macmillan 2020).

were held to account by the tool's articulating a norm of amenable conduct.⁸⁶ Amenable that is, to the 'accountee.' It did more than postdict: it mapped a zone of appropriate conduct in the accountability relationship.⁸⁷

Entanglement here encompasses "the ways in which humans and things are entwined, involved with each other, dependent on each other, tied together."⁸⁸ For Hodder entanglement denotes a co-dependency between persons and things where each depends on the other but importantly where each is also *its own thing*. Things don't exist in correspondence to human perception or consciousness, but they both lend significance to human perception through their properties and they derive significance from human use. As such the "webs and networks in which humans live are as much symbolic, meaningful, spiritual, religious, conceptual as they are practical and technical, economic and social": they are "seamlessly material and immaterial."⁸⁹ Such entanglements proliferate through our lives, the regulatory infrastructures that shape those lives and the norms that interact with them.⁹⁰

Entanglements between people and objects are not necessarily symmetrical however. It may well be that people become 'entrapped' in relations with things that are neither reciprocated nor helpful. The 'cloud' through which most of our electronic devices work are fundamentally rooted in the drivers of global warming, with one industry-sponsored report predicting that a single Facebook data centre would use "one million tons of coal over the next decade".⁹¹ In this sense

⁸⁶The site of conflict between worker and employers shifted from a "fight, not against time, but about it" as Thompson has it. Thompson (n 82) 85; Although such changes were not met with equanimity. As one worker put it, "I am determined for my part, that if they will invent machines to supersede manual labour, they must find iron boys to mind them." EP Thompson, *The Making of the English Working Class* (Penguin 1963) 307.

⁸⁷Melvin J Dubnick and Jonathan B Justice, 'Barnard's Regret: Zones of Accountability and the Limits of Authority' (2014) 16 *Public Integrity* 141.

⁸⁸Hodder (n 84) 95.

⁸⁹Ibid 97.

⁹⁰"Consider a person who owns a house in USA which was built in 1790 and is a listed building of historic interest," Hodder writes. "The roof needs replacing, which involves getting a specialist roofer and specialist materials. The roof replacement might involve spending (in 2010) about \$55,000 and thus requires the house owner to have a good job, to work hard, to sustain a set of social and economic relationships. It is not just the rotting of the beams in the roof that entraps humans in such entanglements. The entrapment is also caused by the way we have come to value old houses in the USA and by the interactions between decaying roofs and our historic sensitivities. It is these interactions that have resulted in regulations about listing historic buildings and have forced a compliance on us. So it is not just the building itself that entangles us - but also the ways in which we have come to construe and value old buildings." *ibid* 96.

⁹¹Mark P Mills, 'The Cloud Begins with Coal - An Overview of the Electricity Used by the Global Digital Ecosystem' (National Mining Association and the American Coalition for Clean Coal Electricity 2013) report 17.

“there is a dimension of depth in which dark matters, coal and rare earths, entrap us ... [smartphones and Big Data] ... seem to have taken us over; at least our relationship with digital things has become asymmetrical – we need Christmas tree lights and smartphones (or think we do) and depend on them, even if they lead us further towards greater global inequalities”.⁹²

Accountability forums entangle other objects and people. They formalise and create the account by infrastructuring the manner in which accountability is produced through their being inevitably being entangled with human beings and at times through their entrapping people in modes of conduct and discourse. An ‘accountable *how*’ is collocated with ‘accountable *to whom*’ and to ‘accountable *for what*.’ They determine what is rendered legible or what it is to succeed.⁹³ Prediction and postdiction tools are not neutral in determining what accountability might be: they are part of the system that does so. As we see below however, when it comes to AI tools they entrap and entangle in a qualitatively distinct way.

As it is accountability scholars tend to situate *tools* in accountability’s background. They are used to *prepare the account*, but are not inherent in the accountability relationship itself. They sit at a point prior to when accountability is realised. This perhaps because accountability seems fundamentally to be about the dialogue - the accounting *together* is the mechanism, rather than about the metrics and measures that frame the dialogue’s informational foundations.

Bovens and Zouridis for instance pointed to the shift from street-level to system-level bureaucracy, where information and communication technologies led to a shift from administrators applying “professional, legal judgment [to] each individual situation” to “a system-level bureaucracy in which computer networks are maintained, perfected, and intricately linked to one another.” In these situations, “routine cases are handled without human interference [and] expert systems have replaced professional workers.”⁹⁴ The emergence of system-level bureaucracy sees accountability shift away from the individual bureaucrat defending their decisions to more strategic levels. “Ac-

⁹²Ian Hodder, ‘The Entanglements of Humans and Things: A Long-Term View’ (2014) 45 *New Literary History* 19, 27.

⁹³James C Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (Yale University Press 1998); Christopher Hood, ‘Gaming in Targetworld: The Targets Approach to Managing British Public Services’ (2006) 66 *Public Administration Review* 515; Christopher Hood, ‘Public Service Management by Numbers: Why Does It Vary? Where Has It Come from? What Are the Gaps and the Puzzles?’ (2007) 27 *Public Money and Management* 95.

⁹⁴Mark Bovens and Stavros Zouridis, ‘From Street-Level to System-Level Bureaucracies: How Information and Communication Technology Is Transforming Administrative Discretion and Constitutional Control’ (2002) 62 *Public Administration Review* 174, 180.

countability is no longer feasible in each concrete case”⁹⁵ but the systems must be defensible at the political level: *dialogue and improvisation shifts to the political realm*. The tools here have a determinative effect on how accountability might be imagined but the accountability mechanism itself sits elsewhere.

For others the mechanisms are brought into what might be called a ‘middle ground.’ In Schillemans’s discussion of managers managing multiple accountabilities, while interviewees emphasised the value of (presumably discussion-based) ‘informal ways of giving account,’⁹⁶ they also focus on the work involved in completing ‘listings and indicators demanded by the Inspectorate’ or ‘entering data, process information for control and accountability, and crime analysis reports.’⁹⁷ All in all, organisations as ‘information refineries’ require ‘well-stocked databases’ that can produce information as required for specific accounts,⁹⁸ especially given that, as Olsen has it, “ambiguity is the enemy of effective accountability”⁹⁹ Here while conversation is certainly an accountability mechanism, data management processes emerge internally in order to feed formal accountability tools – ‘listings and indicators’ – on the organisation’s edge.

Accountability may be passed back to political systems as Bovens and Zouridis have it, but discretionary power might still infuse the system in the form of “emergent and spontaneous bundles or assemblages of humans and things.”¹⁰⁰ Even relatively simple systems whether involve clocks or the computerised processes Bovens and Zouridis address sit in such structures. Relational accountability in this sense maintains its dialogical form, but within a structure that emerges from the entanglements of humans and things. “It is,” as Hodder says, “the tying together within dependence that produces what we call structure. And this tying together is also the product of and makes possible power and agency.”¹⁰¹

The forum metaphor is employed in relational accountability because it brings both an architectural sensibility to bear – that accountability

⁹⁵Ibid 183.

⁹⁶On felt accountability see Overman and Schillemans (n 77); on informal accountability Kelly LeRoux and others, ‘Informal Accountability in Children’s Service Networks: The Role of Frontline Workers’ (2019) 43 *Human Service Organizations: Management, Leadership & Governance* 188; Barbara S Romzek, Kelly LeRoux and Jeannette M Blackmar, ‘A Preliminary Theory of Informal Accountability Among Network Organizational Actors’ (2012) 72 *Public Administration Review* 442.

⁹⁷Schillemans (n 54) 436.

⁹⁸Ibid 439.

⁹⁹Johan P Olsen, ‘Accountability and Ambiguity’ in Mark Bovens, Robert E Goodin and Thomas Schillemans (eds), *The Oxford Handbook of Public Accountability* (Oxford University Press 2014) 107.

¹⁰⁰Hodder (n 84) 213.

¹⁰¹Ibid.

take place in tangible structures – and because it celebrates accountability’s improvisational core. We can understand this use of metaphor, not as an ephemeral shorthand but as revealing a sense not least of the inadequacy of other more literal descriptors for accountability. Is accountability transparency? Patently it is more than that. It is also more than responsibility; blame; performance or myriad other activities or dispositions.¹⁰²

Any accountability system’s ‘inner life’ is a thing in itself. The forum metaphor gives us a sense of accountability through both the metaphor’s architectural and dialogical implications. From an OOO perspective, metaphors give us glimmerings of how non-human objects might really be and from there of what it is to be a self entangled in those objects.¹⁰³ This matters for the discussion here because it drives us towards relational accountability’s central characteristics: its simultaneous institutionalisation of relationships alongside their necessarily improvisational core.

5. AI, detection and the accountability self

In this section I turn to the revolution in the realm of how accountability interacts with non-human things. That is, the emergence of AI in public and corporate governance. By artificial intelligence I mean computational processes that identify patterns in large datasets; classify or score new data points based on those patterns and make ‘decisions’ based on those classifications.¹⁰⁴ AI systems perform their pattern-matching processes more or less autonomously once authored and they identify patterns according to statistical algorithms as opposed to simpler ‘if-then’ rules-based decisions. In this way they differ from the kinds of system that Bovens and Zouridis had in mind, where systems were simply used to apply pre-conceived and in that sense transparent rules.¹⁰⁵

While much of the literature on AI and accountability has focused on the need to reassert human control over these processes by peeling

¹⁰²On which see Dubnick (n 55).

¹⁰³Bogost’s discussion of metaphors and Nagel’s *What is it like to be a bat?* brings elements of this discussion out. Bogost (n 35) 61ff; Thomas Nagel, ‘What Is It Like to Be a Bat?’ (1974) 83 *The Philosophical Review* 435; see also Steven Shaviro, *The Universe of Things: On Speculative Realism* (University of Minnesota Press 2014) 91ff.

¹⁰⁴For instance Andriy Burkov, *The Hundred-Page Machine Learning Book* (Andriy Burkov 2019); Aurelien Geron, *Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems* (2nd New edition edition, OReilly 2019); Kevin P Murphy, *Probabalistic Machine Learning: An Introduction* (MIT Press 2021).

¹⁰⁵Bovens and Zouridis (n 94).

back the ‘algorithmic veil’¹⁰⁶ or integration of accountable AI frameworks with accountability theory,¹⁰⁷ my focus is on the increasing use of AI decision-making in areas that have traditionally been imagined as locuses for accountability.

Much of the discussion around ‘algorithmic management’ has focused on the platform and ‘gig’ economy. An emerging literature points to the manner in which power is exercised over workers in the platform economy, with attendant impacts on their work. As Karen Levy argues in her study of American truck drivers, autonomy can be eroded through ongoing surveillance.¹⁰⁸ Workers can suffer from conflict within their ‘entangled roles’ under algorithmic power.¹⁰⁹ Such surveillance and the erosion of autonomy, ironically undermining the very pretence of flexibility in gig work,¹¹⁰ can in turn lead to significant long term health impacts.¹¹¹ Algorithmic management, flawed though the surveillance might be can ultimately to an erosion of job security, not least in the face of allegations of fraud and other wrongdoing.¹¹² In more traditional office environments is also emerging as a controlling entity: the phenomenon is not confined to gig work. AI systems can recommend pay rises and promotions.¹¹³ Algorithmic management of performance is in other words so widespread it is becoming a commonplace.¹¹⁴

To an extent the question is: what to do when, as Aloisi and De Stefano put it, ‘your boss is an algorithm’?¹¹⁵ And what to do when the parameters of what it is to govern at all are set by and standards for success are ‘learned’ by and measured by AI processes? Artificial actors write and manage contracts.¹¹⁶ Judicial decision-making is augmented by

¹⁰⁶Lucia M Sommerer, *Self-Imposed Algorithmic Thoughtlessness and the Automation of Crime Control: A Study of Person-Based Predictive Policing and the Algorithmic Turn* (Nomos Verlagsgesellschaft 2022).

¹⁰⁷Maranke Wieringa, ‘What to Account for When Accounting for Algorithms: A Systematic Literature Review on Algorithmic Accountability’, *Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency* (ACM 2020); Busuioc (n 9).

¹⁰⁸Karen EC Levy, ‘The Contexts of Control: Information, Power, and Truck-Driving Work’ (2015) 31 *The Information Society* 160.

¹⁰⁹Monideepa Tarafdar, Xinru Page and Marco Marabelli, ‘Algorithms as Co-Workers: Human Algorithm Role Interactions in Algorithmic Work’ n/a *Information Systems Journal*.

¹¹⁰Aaron Shapiro, ‘Between Autonomy and Control: Strategies of Arbitrage in the “on-Demand” Economy’ (2018) 20 *New Media & Society* 2954.

¹¹¹Mirela Ivanova and others, ‘The App as a Boss? Control and Autonomy in Application-Based Management’ (manuscript 2018).

¹¹²Safak and Farrar (n 22).

¹¹³Anne Fisher, ‘An Algorithm May Decide Your Next Pay Raise’ [2019] *Fortune*.

¹¹⁴Bernard Marr, ‘The Future Of Performance Management: How AI And Big Data Combat Workplace Bias’ [2017] *Forbes*.

¹¹⁵Antonio Aloisi and Valerio De Stefano, *Your Boss Is an Algorithm: Artificial Intelligence, Platform Work and Labour* (Hart 2022).

¹¹⁶Beverly Rich, ‘How AI Is Changing Contracts’ [2018] *Harvard Business Review*;

algorithmic classification processes.¹¹⁷ Policing is increasingly dependent on data processing¹¹⁸ as is migration surveillance.¹¹⁹ AI processes are starting to shape the governance environment, including how policy questions are formulated, how economic life is arranged and who gets to enact policy.¹²⁰ Myriad areas of governance, hitherto imagined as layers of accountability situated in some forum or other, are in other words increasingly governed by machines. No wonder AI is an increasing focus for national strategies, regulations, plans, and institutes.¹²¹

Accountability relationships extend beyond that however across more or less formal relationships and scenarios where people cooperate;¹²² jointly commit to each other;¹²³ and pursue common goals. The key question is: what happens to the accountability forum when we think, not about *us holding the AI* to account, but about the *AI holding us* to account? This especially when AI decision making once designed is left to run on its own: when accountability for the AI is distant – perhaps inaccessible in the kinds of political level Bovens and Zouridis rely on – or functionally absent in its entirety? Is an accountability relationship with an AI accountor an accountability relationship at all?

We are entering an era when accountability will be based, not on

Beverly Rich, 'Automated Contracts and the Lawyers Who Don't Review Them: Motivating Use of Machine Learning Tech' (2021) 2021 Academy of Management Proceedings 11703.

¹¹⁷Morison and Harkens (n 26).

¹¹⁸Slobogin (n 15); Guthrie Ferguson (n 15).

¹¹⁹Lucia Nalbandian, 'An Eye for an "I:" A Critical Assessment of Artificial Intelligence Tools in Migration and Asylum Management' (2022) 10 Comparative Migration Studies 1; also Ana Beduschi, 'International Migration Management in the Age of Artificial Intelligence' (2021) 9 Migration Studies 576; Tuba Bircan and Emre Eren Korkmaz, 'Big Data for Whose Sake? Governing Migration Through Artificial Intelligence' (2021) 8 Nature Humanities and Social Sciences Communications 1.

¹²⁰Morison (n 32); Cobbe (n 28); APPG AI Secretariat, 'The UK Economy: AI Technology in the Post-Covid-19 Recovery' (Big Innovation Centre/All-Party Parliamentary Group on Artificial Intelligence 2020) Parliamentary Brief.

¹²¹GCHQ, 'Pioneering a New National Security: The Ethics of Artificial Intelligence' (GCHQ 2021); European Council, 'Proposal for a Regulation of the European Parliament and of the Council Laying down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act)' (Council of the European Union 2022) 11124/22; Office for Artificial Intelligence, Department for Digital, Culture, Media & Sport and Department for Business, Energy & Industrial Strategy, 'UK National AI Strategy' (Office for Artificial Intelligence 2021); Nigerian National Information Technology Development Agency, 'National Center for Artificial Intelligence and Robotics' (NITDA 2022).

¹²²Romzek, LeRoux and Blackmar (n 96); Barbara Romzek and others, 'Informal Accountability in Multisector Service Delivery Collaborations' (2014) 24 Journal of Public Administration Research and Theory 813.

¹²³Margaret Gilbert, *On Social Facts* (Princeton University Press 1989); Margaret Gilbert, *Joint Commitment: How We Make the Social World* (Oxford University Press 2013).

dialogue with human others in an institutional setting, but on predictions about our conduct based on how our data is categorised by AI algorithms. Certainly at this point, algorithmic practices are expanding across sectors and job-types including in the public sector and law.¹²⁴ In doing so they influence how work is designed.¹²⁵ Claims about algorithms equaling or outperforming human experts abound, whether in legal practice, medicine or elsewhere.¹²⁶ AI tools emerge in education that can assess student learning.¹²⁷ Equally AI tools can measure doctor performance in healthcare settings.¹²⁸ In all these circumstances, the algorithm takes on tasks and roles that were hitherto allocated to some accountability forum or other. Teachers or doctors would be scrutinised by professional bodies; by managers and by peers. Performance management would be qualitative, if rooted in information drawn from data feeds.

While current applications focus on surveillance and control at the ‘ground level,’ replicating and expanding on practices learned and adopted in the gig economy, undoubtedly the very parameters of statecraft are increasingly amenable to the kinds of algorithmic governance that AI processes propt to offer. State and private data collection infrastructures and sensing technologies provide vast data streams for extraction by AI processes and states are primed to avail of the services of AI providers across security, immigration, healthcare, education and elsewhere. Iliadis and Acker, in discussing surveillance firm Palantir, point to how the company promises to produce ‘new knowledge’ for its (governmental) customers: “infrastructuring happens and is afforded by Palantir’s ability to connect and relate different domains of siloed data, producing new levels of association, triangulation, coordination, etc.”¹²⁹. From there the ‘techniques and

¹²⁴Gunn, Zwicker and Hilyard (n 25).

¹²⁵Xavier Parent-Rocheleau and Sharon K Parker, ‘Algorithms as Work Designers: How Algorithmic Management Influences the Design of Jobs’ (2022) 32 *Human Resource Management Review* 100838.

¹²⁶On law see Lawgeex, ‘Comparing the Performance of Artificial Intelligence to Human Lawyers in the Review of Standard Business Contracts’ (Lawgeex 2018); on medicine see Huw Prosser Evans and others, ‘Automated Classification of Primary Care Patient Safety Incident Report Content and Severity Using Supervised Machine Learning (ML) Approaches’ (2020) 26 *Health Informatics Journal* 3123; for a counterpoint see Will Douglas Heaven, ‘Hundreds of AI Tools Have Been Built to Catch Covid. None of Them Helped.’ [2021] *MIT Technology Review*.

¹²⁷Sarah Howard and others, ‘Educational Data Journeys: Where Are We Going, What Are We Taking and Making for AI?’ (2022) 3 *Computers and Education: Artificial Intelligence* 100073; Rose Luckin, ‘Towards Artificial Intelligence-Based Assessment Systems’ (2017) 1 *Nature Human Behaviour* 1.

¹²⁸TO Lim and others, ‘Assessing Doctors’ Competence: Application of CUSUM Technique in Monitoring Doctors’ Performance’ (2002) 14 *International Journal for Quality in Health Care* 251.

¹²⁹Andrew Iliadis and Amelia Acker, ‘The Seer and the Seen: Surveying Palantir’s Surveillance Platform’ (2022) early access *The Information Society* 1, 19.

logics' of governance might be transformed.

Fleur Johns for instance points to how “states of the Global South in particular must contend with a litany of data doubles: digital representations of their polities, and social and economic conditions within their territories, assembled by commercial actors in parallel with, and sometimes in lieu of, national data.”¹³⁰ At the level of the human subject, the emergence of ‘database selves’ or “human components of distributed socio-technical cognitive assemblages”¹³¹ shows us being “invited to view ourselves as longitudinal databases constantly accruing new content” to feed the algorithm.¹³² Following Viljanen for instance, accountability for gender equality is now a process of “feeding information to gender equality cyborgs,”¹³³ not only to algorithms that will categorise and decide whether equality has been achieved but to processes that see equality ‘performed and enacted’ through the data.¹³⁴ Legal accountability in practice becomes a matter of interaction with the algorithm.

When framed in the context of such systems being held to account, the outlook is bleak. As Fourcade and Gordon put it, algorithmic infrastructuring of the state heralds a decline in its accountability. As the ‘dataist state’ emerges, it “becomes more impenetrable, less accountable, possibly triggering a crisis of legitimacy.”¹³⁵ Opportunities to receive comprehensible reports or explanations are reduced and when received may not be helpful.¹³⁶ Opportunities to interrogate are gone. And yet consequences are imposed. Accountability’s dialogical and improvisational dissolve away.

What about when we think of such systems as *holding people to account*: accountability *to* the algorithm as opposed to accountability *of* the algorithm? In these circumstances, the operational question might even be: *is this accountability at all?* Reports are taken but not given; interrogation happens elsewhere through arrangement and scrutiny of data; and yet consequences are imposed. I argue that, rather than seeing something akin to the picture Bovens and Zouridis

¹³⁰Johns (n 27) 58.

¹³¹Mika Viljanen, ‘A Cyborg Turn in Law?’ (2017) 18 *German Law Journal* 1277, 1287.

¹³²Natasha Dow Schüll, ‘Data for Life: Wearable Technology and the Design of Self-Care’ (2016) 11 *BioSocieties* 317, 9.

¹³³Viljanen (n 131) 1289.

¹³⁴*Ibid* 1289ff.

¹³⁵Marion Fourcade and Jeffrey Gordon, ‘Learning Like a State: Statecraft in the Digital Age’ (2020) 1 *Journal of Law and Political Economy* 80; also Marion Fourcade and Kieran Healy, ‘Categories All the Way Down’ (2017) 42 *Historical Social Research / Historische Sozialforschung* 286.

¹³⁶Lilian Edwards and Michael Veale, ‘Slave to the Algorithm? Why a ‘Right to an Explanation’ Is Probably Not the Remedy You Are Looking For’ (2017) 16 *Duke Law & Technology Review* 18.

paint of systems governance, where accountability is displaced, something new and perhaps stranger is emerging.

Algorithms rely on a ‘digital exhaust,’ recreating people as ‘longitudinal databases.’ Not only that, but AI processes are both powerful in extracting patterns; combine corporate and state power in complex ways and are *relentless* in their operation. They are always on, always processing data, and so the ‘reporting to the forum’ is always happening, not potentially but in actuality. This reporting is an account taken, not given, or at least not given through purposeful action on the accountant’s part. Any accountability we can conceptualise here is one entangled with a *detectional* system, not a dialogical one.

Following Bovens and Zouridis’s paper, Busch and Henriksen review the emergence of ‘digital discretion.’ They point to the ways in which “certain aspects of discretionary practices can be taken over by a computer” and how that might transform human discretion and agency rather than necessarily eradicating it.¹³⁷ How the ‘information refinery’¹³⁸ across a range of information provision processes – governance issues, policy performance, financial aspects and their interactions with stakeholders – is influenced by its accountability tools and those of its ‘accountants’ is key. In this emerging governance environment, questions emerge in the system-level bureaucracy “such as how ICT can obscure the discretionary practices of street-level bureaucrats contrary to intended objectives, how street-level bureaucrats may create work arounds for computerized routines, and how discretion can be influenced by ICT without street-level bureaucrats being fully aware of it.”¹³⁹ The ‘middle-grounding’ of information tools accountability mechanisms has not as they see it removed the need to understand how accountability operates under such conditions.

Being held to account by AI does not involve an artificially intelligence interlocutor of some kind, replicating or mirroring human accountability. Rather, being held accountable in this context means that the formal aspects of the forum – report; interrogation; consequences – are functionally controlled in an automated manner by the tool’s data-processing capacities. In terms of a relational accountability, rather than human relationships dominating the foreground, AI sees accountability infrastructured as an *entanglement*. AI’s detectional properties suggest not a flow of information between interlocutors but an *ecosystem* that is entangled with the accountability tool’s

¹³⁷Peter André Busch and Helle Zinner Henriksen, ‘Digital Discretion: A Systematic Literature Review of ICT and Street-Level Discretion’ (2018) 23 *Information Polity* 3, 21.

¹³⁸Nuria Font and Ixchel Pérez-Durán, ‘The Information Phase of Accountability: The Role of Management Boards in European Union Agencies’ (2020) 88 *International Review of Administrative Sciences* 882.

¹³⁹Busch and Henriksen (n 137) 21.

sensory capacities. Thomas E White and others¹⁴⁰

The implicit improvisational and dialogical air in the forum metaphor is key to an interlocutor based relational accountability. A set of more ecological metaphors might help understand an accountability that is based on an infrastructure constructed in the context of computational detection in data streams without denying that relationality continues, albeit in perhaps more surreptitious ways. AI does not make space for a human interlocutor, at least unless the interlocution is rendered as computable data, and it is neither sentient nor capable of applying a generalised understanding to human discretion. It produces as Rouvroy calls it an 'algorithmic governmentality without a subject'¹⁴¹ whose power is profound. Conduct and discretion is now to be measured, relentlessly, in the context of the 'exhaust' it emits. Nonetheless, this still leaves the accountor in an accountability proximity-to by way of a relationship-with the AI.

One way of conceptualising accountability in this context is to think of it as a localised element in the broader 'technosphere.' The technosphere as a whole, the 'earth system'¹⁴² of "widely distributed and interconnected technological systems on whose function modern civilization and society is based,"¹⁴³ extracts "high quality energy from the environment and to do work with that energy to sustain its own existence and that of its parts, including humans."¹⁴⁴

It is characterised as Haff sees it by six 'rules'.¹⁴⁵ They are 1) the rule of inaccessibility, "namely that humans are components of a larger sphere they did not design, do not understand, do not control and from which they cannot escape;"¹⁴⁶ (2) the rule of impotence, reflecting a general insensitivity of large technological systems to human influence or concerns; (3) the rule of control, that while local elements of the technosphere can be subject to human leadership and control, the system as a whole cannot be subject to control; (4) the rule of reciprocity, that localised systems (including human beings as Haff sees it) can only interact directly at their own scale, and not with larger or smaller systems can interact directly only with systems; (5) the rule of performance, that "at least some of the actions of most

¹⁴⁰The Perceptual Similarity of Orb-Spider Prey Lures and Flower Colours' (2017) 31 *Evolutionary Ecology* 1.

¹⁴¹Antoinette Rouvroy, 'The End(s) of Critique: Data Behaviourism Versus Due Process' in Mireille Hildebrandt and Katja de Vries (eds), *Privacy, due process and the computational turn : The philosophy of law meets the philosophy of technology* (Routledge 2013) 146.

¹⁴²Bronislaw Szerszynski, 'Viewing the Technosphere in an Interplanetary Light' (2017) 4 *The Anthropocene Review* 92.

¹⁴³Haff (n 3) 149.

¹⁴⁴Haff, 'Humans and Technology in the Anthropocene' (n 4) 133.

¹⁴⁵Ibid 129-135.

¹⁴⁶Ibid 131.

system parts must support the function of the system to which they belong;¹⁴⁷ and finally (6) the rule of provision, that the technosphere must provide an environment that will sustain human survival and function.

Accountability in an era of AI emerges as a localised component of this technosphere, certainly interacting at this local level with the first four of these 'rules.' Any accountability forum is perhaps characterised by some leadership and control over its infrastructures (and infrastructurings), but this is neither total nor does it alleviate the rules of impotence or inaccessibility etc. More generally, such a localised technosphere should be approached from a point of view of *scale*. Gone is the notion of an accountability forum where we construct my accountable together. Now the accountability system is only partially discernible; in part through metaphor; can only be interacted with indirectly, for instance through 'data exhausts.' And the human role in accountability is now as a 'hyperobject' – perhaps as a kind of 'longitudinal database.' This within the forum as a hyperobject itself, that is manifested at such a different scale that a human actor can only view accountability and their role in it indirectly and obliquely.

That is not to say that agency is entirely absent. For one thing people are proving continue to be capable of forms of improvisation, applying 'weapons of the weak'¹⁴⁸ to their conduct in light of the AI's scrutiny. Informal networks may emerge sharing information about how to navigate the algorithm's limits and stipulations. The accountability forum becomes an environment within which strategies might be adopted either to maximise discretion or avoid scrutiny or simulate compliance.¹⁴⁹ As Burgess et al point out,¹⁵⁰ people have come to adopt a range of strategies towards the algorithms that govern them. Some might foreground algorithmic power by enacting a 'watching from below.'¹⁵¹ Attempts to manipulate data streams in order to produce more amenable outcomes abound, including gig workers seeking better 'gigs', developing 'folk theories' of social media,¹⁵² and the like. The algorithm being the boss produces opportunities, not least to exploit the spaces where the algorithm does not work, unequal though such spaces might be.

¹⁴⁷Ibid 133.

¹⁴⁸James C Scott, *Weapons of the Weak: Everyday Forms of Peasant Resistance* (Yale University Press 2008).

¹⁴⁹See Busch and Henriksen (n 137) for a broader discussion.

¹⁵⁰Jean Burgess and others, *Everyday Data Cultures* (Wiley 2022).

¹⁵¹Jan Fernback, 'Sousveillance: Communities of Resistance to the Surveillance Environment' (2013) 30 *Telematics and Informatics* 11.

¹⁵²Michael Ann DeVito, 'How Transfeminine TikTok Creators Navigate the Algorithmic Trap of Visibility Via Folk Theorization', *Proceedings of the ACM on Human-Computer Interaction* (2022).

While surreptitious behaviour may on seem like a shift away from the markers of accountability as traditionally conceived, adding to a system that is “more impenetrable [and] less accountable,”¹⁵³ it also includes the possibility of ‘informal accountability’ forms emerging as *navigation of an AI environment*.¹⁵⁴ In this sense the accountability is not displaced elsewhere, but is transformed into something more subterranean, at least where gaps open between infrastructures and population norms.¹⁵⁵ What may emerge are new forms of felt accountability in the form of collaborations in the context of and with the non-sentient, alternatively intelligence objects that entangle people

Such collaborations and entanglements require continued, if changed forms of attention and improvisation. Instead of working towards interlocution, improvisation now emerges in accountability towards the environment as a whole: its people and its tools and their entanglement through data exhausts and elsewhere. Accountability is flattened in this sense.

The accountable self that might emerge here is as above perhaps best understood as a kind of ‘hyperobject.’¹⁵⁶ Hyperobjects are, as described above, viscous; nonlocal; beyond human time scales; and only detectable in the relationships between the aesthetic properties of objects.¹⁵⁷ While in OOO the world takes on a ‘weird’¹⁵⁸ or even ‘alien’¹⁵⁹ appearance, so it is with the algorithmically accountable self. The self as longitudinal data feed in an algorithmic governance environment is sticky: it is attached to but is not the experienced self as experienced. It exists at faster timescales than human experience can manage.¹⁶⁰ It is nonlocal: the specific self is not the primary focus of algorithmic attention. And it is only experienced in indications and implications emerging from broader relationships to work; to governance and to law. So here we have accountability as a hyperobject in itself – a localised component in the technosphere – with the human manifested as another hyperobject within that again.

The calculative infrastructures that emerge in algorithmic governance

¹⁵³Fourcade and Gordon (n 135) 80.

¹⁵⁴Romzek, LeRoux and Blackmar (n 96).

¹⁵⁵See Fiona Haines, ‘Regulatory Failures and Regulatory Solutions: A Characteristic Analysis of the Aftermath of Disaster’ (2009/ed) 34 *Law & Social Inquiry* 31.

¹⁵⁶Morton (n 49).

¹⁵⁷*Ibid* 1.

¹⁵⁸Morton (n 52) 44.

¹⁵⁹Bogost (n 35).

¹⁶⁰Geoffrey C Bowker, ‘Life at the Femtosecond’ in Axel Volmar and Kyle Stine (eds), *Media Infrastructures and the Politics of Digital Time: Essays on Hardwired Temporalities* (Amsterdam University Press 2021); also Geoffrey C Bowker and Susan Leigh Star, *Sorting Things Out: Classification and Its Consequences* (MIT Press 1999).

produce a 'classified and sorted self.'¹⁶¹ This self is perhaps the ultimate manifestation of what Hacking calls 'making up people.'¹⁶² As hyperobject, the accountable self becomes an alien and *estranged* object, related to the human subject but not that subject. Rather than delivering accountability through biography for instance,¹⁶³ this self might deliver accountability by managing and manipulating their data object to the best of their abilities, all the while being able to grasp only its aesthetic properties - a sense of it rather than the thing itself.

6. Conclusion

Given this while an accountability that privileges subjecthood is less and less credible. We should not think of a reconfigured balance between infrastructure and improvisation as a departure from relational accountability however. Accountability in an AI era continues to involve an entanglement between human subjects and tools, albeit in strange and different ways. This including if the AI does not 'work' in any functional sense. This paper aims to recast the accountability forum as such an entanglement between people and objects: less a forum; less *built* than an infrastructural ecosystem in which people have to live.

Accountability is organised less and less around human relationships and more and more around a *whole experience* of accountability's subjects redescribed through their *data*: as members of statistical reference classes; as carriers of risk; and as producers of and carriers of markers amenable to algorithmic processing, governance and law. Accountable persons are not simply subject to such mechanisms however: they become *entangled* in them. This matters for our understanding of accountability because agency shifts away from accountability's human or institutional bookends - the 'accountor' and the 'accountee' - and onto the mechanisms instead.

Karasti and Blomberg: space to investigate "how the well-known characteristics of information infrastructures shape the possibilities for an ethnography of infrastructuring. . . the ethnographic investigation of infrastructuring can be guided by attention to a set of dimensions that speak to the ontology of infrastructures."¹⁶⁴ In this sense we need to return to the forum metaphor. In order to develop an 'ontology of

¹⁶¹Martin Kornberger and others (eds), *Thinking Infrastructures* (First edition, Emerald Publishing 2019).

¹⁶²Ian Hacking, 'Making Up People' (2006) 28 *London Review of Books*.

¹⁶³See Eleonora Masiero, 'Accountability by the Accountable Self: The Case of Leone Wollemborg' (2020) 25 *Accounting History* 109.

¹⁶⁴Karasti and Blomberg (n 5) 2355.

infrastructures' we ought to attend to the metaphors we use. The metaphors of technosphere; of infrastructuring and of ecology may point to fruitful paths into accountability as it emerges in the era of AI. Following Tsing in a sense,¹⁶⁵ accountability must be rebuilt in the forum's ruins. It is imperative that we introduce a sense of post-human strangeness to accountability, and in doing so, conversely that we think of how accountability might be improvised again.

¹⁶⁵Anna Lowenhaupt Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton University Press 2015).