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Introduction: Technology and Ethics

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Abstract

The authors in this special issue present case studies of socio-cultural responses to technologies in terms of their relationships with 'ethics' and 'politics,' to ecologies, and to the ways in which those technological processes are framed as empowering, alienating, dispossessing, transformative or destructive. This introduction elaborates some connections between the papers, focusing on the ways that technology both creates, and becomes part of, ethical and political struggles over visions of the future. Technology is frequently used to increase the extent and range of control, and to impose a politicised order upon others in villages, towns, environments and landscapes, although this control cannot be guaranteed. Technology can also become part of the rhetoric used to persuade people of the inevitability, validity and desirability of imagined futures, while leaving other factors to be ignored. Technology, ethics and politics are not always separable, and the results of their interaction may not always be predictable.

Introduction

The basic theme of these papers is that ethical decision making and ethical process is revealed in 'political' struggles over imagined futures including ecological futures. The struggles described in this issue involve the established power relations of the economy or state. Hence, while victory may usually reside with the "bigger" powers, there is always the possibility (however unlikely) that the struggle might destabilize those relations and start something new. Technology, as a material way of influencing what is possible in, and what can be imagined of, the future (desired or otherwise by different groups), can become part of these wider struggles. Although technology often seems expected to function as a mode of control of both people and ecologies, that control cannot always be guaranteed, and its use may have complex, beneficial or deleterious, effects on humans and ecologies. While people cannot live without a working ecology, in 'modern' life, ecology is often subsumed by the economy, which makes struggles and difficulties even more likely. While our authors clearly have ethical sympathies, they primarily provide a description of these ethical, political, technical and ecological struggles between groups in action, and do not make any prescriptions for a hopeful new technical-ecological ethics, as per Stengers (2005, 2017), or Pols (2023). In that sense the papers are more anthropological than philosophical. However, while this collec-

tion crosses a number of disciplinary boundaries within the humanities and social sciences, it is centred in both science and technology studies and the anthropology of technology.

The papers use case studies from sites in Australia (Askland, Bowden, this issue) and Indonesia (Bräuchler, this issue), and are based in ethnographic and qualitative social research carried out in villages, regional municipalities, and the media respectively. The authors seek to provide concrete examples of ethical struggles in action primarily around technologies, and their relations to ecologies. They demonstrate how technologies simultaneously become ethical, political and instrumental actors in both events and different imaginings of futures. Ethical processes are treated as politically based disputes between different groups aiming at different imagined, and cosmologically plausible, futures which they think of as being beneficial, although in Bowden's paper the ethical struggle is implied by the social ignoring of problems and the implicit possibility of opposition.

In order to give the reader a better idea of the theoretical connections between the events described in the papers, the introduction begins with a short account of those papers and then shows how they work together to contribute to our understandings of relations between technology, ethics and ecology. We then move onto discussions of the importance of 'imagining' for this discussion, and the connection between technology, ethics and politics.

The papers

Each article describes conflictual configurations of technology, people, ethics, ecologies, and group goals for the future. This is the authors' way of paying more attention to the "noncanonical means of ethical will formation" (Bennett, 2010: xii), and in showing how these processes play out in everyday life, and the way 'spaces' for ethical actions arise, rather than reducing technology and futures to matters for experts, or ethics to good intentions (Silvast et al., 2013; Schick and Winthereik, 2013). This allows our authors to explore how the technology becomes constructed "as a public problem in specific imaginative spaces of opportunity and closure" (Schick and Winthereik, 2013: 82), or indeed how the problems can become private or largely ignored. The case studies begin with stories about coal (Askland, Bowden), as coal and its extraction is still a central technology for imagining a future of development and material prosperity in the contemporary world. Ideas of 'development' are recurring parts of the struggles described.

Hedda Askland shows how the ethical imperatives of both coal-based energy and development can dismantle communities like Wollar in NSW Australia, as open-cut coal mining advances, destroying local ecologies, dispossessing people or leaving them in misery with no communally imaginable 'good' future. Looking at both social and environmental ecologies, she analyses how corporately and nationally imagined coal-centred futures and progress are phrased (or not phrased to 'avoid' dispute) as an accepted and enforced ethical and political position, and the psychological devastation that arises to match with the slowly destroyed landscape for those being displaced from an imaginable good future. These processes are tied to the technological advancement of open-cut mining which has enabled the rapid and destructive spread of coal mines within rural spaces, significantly increasing disruption to local modes of being, while defending the technological background of development which has so-far demanded coal for its futures. The destruction means that a place that once carried an ambience of 'home,' for locals, has become a non-place of transience, anonymity, insignificance for others, and harmful (but officially ignored), change. It is no longer a place which supports residential identity, relationship or psychological, imaginal and social development (Augé, 1995). Askland argues that the idea of 'home' is related to an imagined future over which a person has influence, ethical and practical, but with the destruction of the ecology, and the breakdown of local trust in, and useful interaction with, the companies and the governments, there is no longer a sense of imaginable influence: it is no longer a 'home', but as stated before a non-place. Within this struggle, technological 'objectivity', and concerns for developmentalist ideas of human welfare and security have been used

as ethical tools to dismiss the experience and presence of those being sacrificed. Their existence, their emotional rootedness, suffering and possibility are not accepted as being ethically relevant when compared to imagined development elsewhere. They are effectively kept out of public discourse, in an unequal struggle with the might of coal corporations and their political confluence with the State. Askland concludes her paper by distinguishing three useful ways of thinking about psychological senses of loss of place in general: *nostalgia* (a longing or melancholy towards an imagined past which is no longer accessible), *solastalgia* (a sense of homesickness a person feels while still at their home) and *eritalgia* (distress in response to experiences of environmental change that distorts, disrupts or displaces an individual's sense of an imaginable future self in place).

Vanessa Bowden adds to our understanding of the processes described by Askland, by describing the wider context and showing how the ethics underlying economic and developmental politics and profit have disrupted the possibilities of any discussion of climate change, local suffering or a move away from coal in the nearby Hunter Valley region. Discussing debates over carbon-pricing and the uncertainty of low-carbon futures, in the mid 2010s, Bowden details the ethical arguments put forward by regionally-based businesses advocating for continued and largely uninterrupted coal mining in the region. Business people reinforced this position by tending to imagine a future without coal as uncertain and economically ambiguous for them and hence "bad." On the other hand, coal is imagined as part of the fixed "nature" of the Hunter Valley and therefore it is only right to take advantage of it to continue the region's economy. Local business leaders also positioned themselves as part of a broader business community, largely part of coal-based industry, and hence reinforced commitment to a coal based developmentalist future, helping the world and supposedly providing certain economic growth. As Bowden quotes a local person in her title "Coal exists and therefore it must be dug up," while the corporate slogan "Life, Brought to you by coal" implies that life itself can be taken away if coal's dominance is challenged. Hence, the arguments for continuing and even expanding mining in the area. This imagining of coal-based prosperity (encouraged by the coal industry), comes with an almost compulsory ignoring of the continuing and expanding damage being done to the region's ecology, and to agriculture, by that mining. The over-riding 'good' of development again distracts from consideration of those who have suffered through coal. This cosmological logic, based on understandings of how the world works and how benefit is allocated, denies the more confused debates on the potential risk, versus the potential gain, of climate policy discussions. The choice for coal, and incidental suppression of discussion, might also eventually lead to uncertainty for business as it encourages them to become vulnerable to a decline in the use of coal and changes in the economy.

We then move into a related, but perhaps wider conflict between development and more traditional ways of relating to an ecology in a dispute over both the development and preservation of Benoa Bay in Bali. Focusing on different imaginings of developmental futures, Birgit Bräuchler details a conflict between residents and corporate based development in Bali, all based in ideas of protecting a degrading environment. In this dispute, there are a plurality of ecologies and actors and different relationships between humans, nature, ethics and technology. This multiplicity expresses potential social orders but also challenges them. Bräuchler shows how these struggles play out through different media technologies and in political, and religious struggles over ways of relating to the ecology that makes the Bay. The regional government and the investors appear to take the view that the environment can be 'managed' (through technology, and the technological 'objectivity' similar to that described earlier), and saved by the 'universal moralities' of development – with their power-based allocation of profit and sacrifice and hoped for futures. Other participants point to more traditional ways of relating to land via the ritual experience of spirits and gods, while simultaneously noting that scientific idea that the proposed development adds to the waste-strain already despoiling the bay. Youth resistance comes through social media, and an apparently new more hybrid approach to culture. Bräuchler notes that ethical and political actions

are connected to imagined cosmological orders, partly because cosmology informs people of how the world works, and what the likely consequences of actions are likely to be, just as the coal company cosmology of development tells people coal is essentially necessary and beneficial for world progress and prosperity. However, Bräuchler also implies that technologies are highly ambivalent, as they contain contradictory forces and can be simultaneously 'good' and 'evil' in their use, and hard to check ethically because of their unknown consequences in the complexity of ecologies.

Since the paper was written Benoa Bay has been 'saved' from development, and then opened for sand mining, and an expanded airport and harbour. This 'opening' seems to have been protected from open consultation with people. There is a sense in which development morality does not give up its disruption of ecologies, even if the forms may perish.

Imagining the future and imagining in ethics

The verb 'imagining' plays an important part in this introduction, especially in terms of the importance to ethics, politics and technologies of imagining futures and consequences. Acting on the future involves imagining that future socially (Castoriadis, 1987). The future cannot be observed until it occurs, and comes into being in the interlinkage between complex social, technological and ecological systems. Even if futures are determined, humans seem bad at predicting them or agreeing on them, so the futures people imagine and discuss in the present are fictions with relative degrees of plausibility to their audiences. Present versions of possible futures are always *imaginary* visions of possible, preferable, feared, potential, desired or undesired outcomes. These imaginings, can have considerable material effects, as they orient peoples' behaviours in different ways (cf Bryant and Knight, 2019). Ethics and politics involve arguments over the 'best' futures that can be generated whether individual or collective (Candy as described in Dunne and Raby, 2013; Connor and Marshall, 2016). Technology becomes part of these ethical and political disputes when it is salient for some group's imagining of their future, and that will vary with the challenges recognised, the situation and the different groups involved. In Wollar because of the existing suffering connected to coal mining and its ignoring, in the Hunter Valley as part of maintaining business stability and camaraderie, and in Benoa Bay over the likely impact of development, building and sewage on the Bay, in terms of eco, spiritual and cultural disruption. This ethical imagining of possible results also requires some common cosmologies amongst each side's participants which informs those participants of how the world works, so that the imagining has a degree of plausibility and lays out a course of action or resignation. Not every imagining can work as a persuasive rhetoric about the future. Futures imagined by one group can appear undesirable or destructive to another, and become classified as unethical or destructive. In this sense, imaginings of the future may be thought of as being akin to dystopias and utopias; either political warnings or encouragements of action, or both. In this kind of framework, ethics, rhetoric and technology become a form of 'magic' attempting to create, or avoid, a new world by changing, diminishing or intensifying, struggles. The imagining may be disrupted by the real actions of technology, as when the home of a place is removed by coal mining technology, and not dealt with. Imagining may also be important in most forms of ethics as it helps people to empathise with others, and to perceive (or ignore) other interests than one's own. Humans may even have evolved imagination as part of their social, symbolic and anticipatory equipment that helps cultural adaptation (Fuentes, 2020). In these contexts, technologies (apart from their real effects) can act as "wishful enactments of a desired [or feared] future" (Borup et al., 2006: 286). Due to the limited predictability present in complex systems, futures rarely eventuate precisely as imagined, which then may propel further ethical/political/technological struggles.

As shown in the papers these imaginings of futures involve arguments, and counter-positions, so that social imaginings of the future are co-productive, if disputed (Jasanoff, 2015). As already stated, Askland suggests that the lack of villagers being able to imagine a resolution, in their place of residence, or to imagine being able

to leave that place, makes part of their 'eritalgic' suffering. Due to established power relations and 'technological objectivity', coal companies (in effect) do not have to imagine the consequences for villagers or feel empathy towards them, and this breaks possibilities of resolution. It would for example, probably cost the companies very little of their profit to help to move people and provide them with new homes in a similar area. Imaginaries of universal development seem to be able to overwhelm empathy for those being displaced by that development, or of different ways of relating to developed and disrupted ecologies. In the Hunter Valley it appears that imagining coal as the only and natural way of development and prosperity, strips many businesses of any potential capacity for quick adaptation to changing circumstances, or to perceive cumulative harm. In Bali, again, developmental imaginaries, seem to dilute regard for relationships to both people and place, and to non-developmentalist ways of interacting with environments. However, while development appears to have 'won' in the long term, it was temporarily turned back by another imagining of the bay. In Bali the conflict may not yet be resolved completely in favour of the ecological passivity of the Bay to development. Ethics and politics, as socially aiming for the best result (however that is defined, even improving one's own virtue) as some collective imagines it, necessarily involve imagining of consequences and futures, in interaction with others (conflictual or otherwise).

Imagining, also, often uses technologies as models for cosmologies, or for the way the world works. For example, after Newtonian physics, it was common to imagine, or model, the cosmos as a machine. This implied: the world could be controlled and used; fortified possibilities of comprehending human and animal functioning as mechanical and relatively non-complicated; and supported ideas that worlds (ecologies) could be controlled, destroyed, reconstructed and improved, like clocks or other machines. This kind of cosmology likely reinforced imaginings of the ethical and technological 'rightness' of developmentalist extraction as actions and events would proceed mechanically with little surprise. Both Askland and Bowden further suggest that coal gains some of its cultural 'pull' because it has become symbolic of modernity, progress, prosperity, comfort and improvement. Such a dominant symbolic and imaginative role for coal may both direct attention to coal's virtues and help suppress awareness of coal's drawbacks; helping to render the pain of Wollar's people less noticeable, or render thinking about climate change 'impractical' or even unnatural. Likewise, tourist development in Bali, may serve a similar symbolic role for developers, as tourism is the primary source of the island's imagining of extracting material prosperity, profit and jobs from overseas visitors.

Many theorists such as Feenberg (2002), Pfaffenberger (1988), Castells (1996, 1997), Ingold (2000), Jasanoff and Kim (2013), and Latour (2005) have described the ways power relations can be inscribed into technology, or technology becomes a part of processes of organization, structuring and governance (who does the work, how users can use it, what information it gives them etc). However, imaginings of technology can also play a role in power relations, when they are used as a rhetorical 'magic,' or model, to persuade people how the world works, and how to create, or avoid, a new world. Imagined technologies, can be used to persuade people to aim at particular imagined futures in which this technology exists and works as posited. For example, it is often implied that when carbon capture and storage technology is used, as it 'inevitably' will be, emissions problems will be solved, so there is little need to cut emissions now, and fossil fuels can continue to be sold and burnt. The apparent fact that Carbon Capture is expensive and does not work very well is irrelevant when compared to its imaginary futures (Marshall, 2016). The rhetoric of a technology can also be used to hide its real effects, as when the real pollution and destruction involved in coal mining and burning, is sidelined by assertions that coal is essential for prosperity, modernity, and even life itself (Askland; Bowden).

Imagining seems central to the use and effects of technology, but its processes also seem undertheorised in both anthropology and STS (McNeil et al., 2017).

Technologies and ethics

Our authors accept and illustrate how the agency that emerges from, around, and in technology, is embedded in socio-cultural systems of power relations, economic dominance, cosmology, rhetoric, exclusion and politics. The papers further show how technology's ethical positionality within existing and changing social relations plays an integral role in the creation of recognized and unrecognized ethical subjects. The papers demonstrate links between technology and governmental schemes, innovation, political conflicts, developmental projects, everyday lives, and struggles over imaginings of the future. The papers also assume and demonstrate that the politics of existing social groupings, conflicts and victories are important to both the trajectory of ethics and technology, as has also been done elsewhere (Shweder and Menon, 2014; Lederman, 2008).

Our authors agree from the outset that ethics is a form of action and that it, at the least, involves conflict, potential conflict, decision-making or persuasion, aiming at a preferred imagined future which can be defined as 'good' by those involved, in a complex not entirely predictable world. The authors do not assume ethics are unchanging, but processual; part of an arising social practice and embedded in the politics, economics and conflicts of everyday life, and concerns over possible futures and how people should live in them. Central to this view of ethics, as Ingold suggests, is the question of "[h]ow should we live?" (Ingold, 2018:1).

> [H]uman ways of life… are not handed down on a plate; they are not pre-ordained, nor are they ever finally settled. Living is a matter of deciding how to live, and harbours at every moment the potential to branch in different directions (Ingold, 2018: 1).

While Ingold does not explicitly mention ethics (perhaps to avoid arguments over definitions and universality), the passage strongly implies decision-making processes about how to live, and its underlying ethics, are ongoing and vital for social life. Thus, everyday life can be assumed to involve an inherent ethical dynamic that becomes most visible in conflict and fraught power relations.

Clearly each arising situation has unique features which affects the struggle. While groups may present ethical practices as codified to allocate themselves or others a certain authority (as in Bräuchler's Balinese example), even codified laws generate different interpretations as to their appropriate applications and meanings (Bowden), given the uncertainties, differences and similarities between situations, and the different people and struggles involved (Askland). Ethics and politics are related as they both struggle over imaginings of the future and the manifestation of 'good' consequences, which can involve technologies. Variation is vital to the course of the processes, and as Fredrik Barth (1993: 4) argues, "[v]ariation should emerge as a necessity from our analysis". A focus on ethical struggles, as in these papers, rather than on 'correct' ethical behavior, can make this clear.

Bräuchler usefully notes that Pfaffenberger defines technology as "a set of social behaviours and a system of meanings" and as "a total social phenomenon" (Pfaffenberger, 1988: 236), as it is social, ethical, political and symbolic all at the same time. The 'social behaviours' part of this definition is important. Forms of social organisation, say for military action, building pyramids, or making money, are often forms of technology which apply and coordinate human energy. 'Physical' technology can then add to the technology of organisation, both transforming the social organisation and being transformed by it, and adding to the ethical/political struggles. Or as Bowden and Askland imply, organisation of resistance may be disrupted by the organisation of dominance, thus making the what is ethical question for some people appear to disappear. In any case technology is part of an existing organisational system, which will aim to continue, or improve its reach or power, but which risks being disrupted. Few now will probably argue for the radical, freeing, open information, aspect of the Internet, as it has been disciplined by established groups and has led to informational disorder as fundamental to 'information society' (Marshall et al., 2015), however Bräuchler shows that social media was still useful in Bali to build new alliances and propagate information which disrupted the tourist development.

All of these papers illustrate that technologies do not exist alone. In all the cases presented in this special issue, the boundaries of technology seem unclear in productive or disruptive ways, as they interact with other participants human or ecological. As Dear and Jasanoff mention it can be important to ask "[w]hen are they [people] drawing boundaries around science or technology, and thereby making or reinforcing them?" (Dear and Jasanoff, 2010: 762). Hughes (2004) makes a similar point, technology is "messy and complex. It is difficult to define and to understand. In its variety, it is full of contradictions, laden with human folly, saved by occasional benign deeds, and rich with unintended consequences" (Hughes, 2004: 1). Technologies are, at least embedded in, and affecting of: economic actions; the circumstances of manufacture, results arising from connection to previous technologies; political actions and political reach; the kind of social orders being sought, as with the organization of work or informal use; design; energy supply; distribution of information and misinformation; extraction and consumption of materials; pollution and other disruptive or reparative effects on ecologies. Technologies, while perhaps intended to simplify events and add control, add links and unexpected consequences to the systems they are being installed within. This uncertainty compounds moral and imaginal problems, and uncertainty is something that actors can be aware of. For example, Bräuchler describes how imagined unintended effects (such as waste pollution, and disharmony with gods and spirits) become a focus for organised resistance. Villagers in Wollar did not expect mining processes to change so drastically and harmfully for them. Similarly, industrialisation promoted the growth of unions and the power of ordinary workers, while post-industrialisation seems partly designed to weaken the unities amongst working people and further the 'upwards' flow of capital, and this itself may then threaten the organisation of that distribution in different ways. More dynamically, autonomist theorists have suggested that there is a constant struggle over the use of technology between workers and bosses, as each 'side' seeks to gain advantage (Tronti, 1965).

> [I]t is often the failure of a given technology to serve its intended purpose of social control which gives rise on the part of capitalist managers to the demand for the development of new technologies and the funnelling of resources into the appropriate fields (Cleaver, 1981: 263).

It seems especially important, nowadays to be aware of technology's relationship with ecologies both natural and the human. The use, and protection, of polluting fossil fuel, and agricultural technologies, seem to be the main causes of climate change. As seen, technology can enable people to be dispossessed, rendered homeless within their homes and without voice (Askland), help them to fight back (Bräuchler) or possibly limit decisions via existing infrastructures of action, decision-making and power (Bowden).

As suggested previously, ethical processes around technology can come into play when the technology is salient to peoples' imagining of their futures, or presents, and when a future proposed by one group appears unwanted, or destructive, to another group's imagined future, as with: coal mining companies vs residents; traditionalists with religious views of ecology vs developers with profit driven views; people recognising psychological and climate complexity vs those attached to developmentalism; and so on. In some cases one 'side' may appear to refuse to recognise the other and its claims, so they may struggle to shut down ethical process. We also see from the papers that rendering an ethical process 'technical' (Bräuchler), 'innovative,' 'future-oriented' (Askland), or 'institutional' (Bowden) can express some of these attempts at suppressing disputed ethical,political and disruptive aspects of technology, while supporting a particular political and economic order in the process.

However, it is not only in the varied imaginings of the future and potential differential advantage, that the ethics of technology can upset relations. Groups may be distributed within, or by, the techno-political-economic system, and thus have different relationships to specific technologies. For example, the relationship of managers to workers in the use of industrial machines involves not only the use of specific and often deskilling machines, but an organisation of labour, danger, remuneration and ethical conflict which justifies both these

organisations and disruptions. Likewise, 'development' can powerfully alter or destroy a populations' way of life, often in unintended ways, or ways which can be ignored because of power relations. Likewise, unforeseen consequences can affect the course of both events and ethical arguments.

Ethical disputes, involving technology, are perhaps inevitable, as even in the best of circumstances, disputes over technologies are likely to arise, as technologies can be framed by different groups in different ways, partly because it may affect them in different ways, as can the ethics of events, showing what Pinch and Bijker (1984) have called 'interpretative flexibility'. Various technology can be perceived by these groups as empowering, alienating, transformative or destructive and so on. By providing new links, feedbacks, and actions in complex systems, technologies can have unintended consequences beneficial or otherwise. For example, as Pols (2012) suggests, medical telecare can be aimed at helping people self-manage sickness independently (and save medical practices money), but it also threatens to increase the discomfort of separation from others, or it can lead to lead unexpectedly to increased contact with staff and less fatal independence. The situation is complexified as it is not always clear cut what good and ethical health care might involve. Likewise, coal mining technologies can be perceived and experienced as necessary or devastating, depending on a person's position in the 'coal chain' or in the production of harm and benefit. Similarly, tourist development can be seen as a way of reclamation and prosperity or destruction. As Bräuchler argues in her case study, all the actors involved claim to be aiming "towards a prosperous Bali" and at "protecting a degrading environment" but the notions of good results, prosperity, environmental protection and the appropriate technologies for these aims differ. The same is true of the Wollar villagers deprived of 'home' and prosperity, or the business people of Newcastle who were being discouraged from economic experimentation by their own political and economic accommodation with the coal establishment and other businesses. Ambiguity is not surprising as 'development' can powerfully alter or destroy a population's way of life. However as Russell (1986) notes, realising that different groups frame different technologies differently, and bring different ethical positions to it, does not have to leave analysts always unable to make judgements as to the plausibility of ethical arguments in the situation.

These papers, along with other STS researchers show the presence of ethical bias in the organization and use of technology, the social organization in and around it, its relations to power hierarchies (supporting or undermining), its mobilisation in disputes, and the struggles to modify it beneficially for some (Friedman and Nissenbaum, 1996; boyd and Crawford, 2012; Benjamin, 2019; Costanza-Chock, 2018; Cupitt, 2017). Other studies show this bias can originate at the point of origin (the human ethical codes and moral views inscribed in them by their designers or owners), from cultural ways of thinking, social conflicts, and the design processes of technologies (Winner, 1986; Bijker, Hughes and Pinch, 1987; Feenberg, 2002; Amrute, 2016; Benjamin, 2019). Amrute (2019: 174) points out that formal technological ethics can be framed by the owners and controllers "as a series of mandates from the top" and can be considered an instance of bias against those being affected by technology. However, sometimes technologies can also become unintended manifestations of disruptive or 'anti-ethical positions,' as with the aggressive and apparently racist responses learnt by Microsoft's Twitter Bot 'Tay', as described by Neff & Nagy (2016).

These essential conflicts coming from different social positions with different framings, different experiences and different intentions, suggest that it is unlikely that there exist external or general 'Archimedean ethical points' which can be used to resolve all ethical and political disputes. The interests of the ruler and ruled, boss and worker, rich and poor, or between different departments in the same university, are often dissimilar, and the impacts of the technology can also differ. There seems no possibility of managing the problems to the moral satisfaction of all (Zuiderent-Jerak, 2016), so that, again, struggles over technology are largely inevitable.

Conclusion

Through a reading of this special issue's contributions, ethical processes can be said to be revealed in dispute, as ethical positions congeal or disperse in debate and disagreement and exercises of power. As part of political and power relations, ethical processes do not always produce harmony between groups, and may drive further conflicts as the subjective (socially positioned, 'flexible') nature of ethical interpretation and the consequences of the technology's use come into play. These papers show how ethical disputes over technology play out in everyday life, rather than reduce technology and futures to matters for experts (Silvast et al., 2013; Schick and Winthereik, 2013). This allows them to explore how the technology becomes constructed "as a public problem in specific imaginative spaces of opportunity and closure" (Schick and Winthereik, 2013: 82). They suggest that technology's use will often involve ethical dispute, because of the functions of that use, and the unintended consequences that are likely to result.

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Lost Futures: Eritalgia, Sacrifice and Suffering at the New South Wales Coal Frontier

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Abstract

Embedded within large-scale resource extraction projects is a tension between the immobility of the resource and the mobility of the people who inhabit the surface over which the resource is found. The limited ability to negotiate the place of extraction, and the destruction of prior ecologies, can generate significant hardship to local populations and pose particular ethical dilemmas, as in the small village of Wollar located at the New South Wales coal frontier. Here, the supposed ethical imperatives of coal-based power and energy have dismantled and sacrificed communities as the coal mining industry has advanced and intensified its operations. Looking at both social and environmental ecologies, the paper analyses how imagined coal-centred futures, and progress, is phrased (or not phrased) as an ethical and political issue, and the consequences of that coal-based future, psychologically, emotionally, imaginally and cosmologically on those who live near the mines. What once carried a felt ambience of being home has, through technological and political deployment, become a *non-place* of transience, anonymity, and change. In this unbalanced political conflict, a natural environment and lived ecology are subject to developmentalist and technological ecologies in ethical-political dispute with a diminishing sense of home, and produce suffering because of unequal power relations which derive from the success of the destructive technologies. Searching for a language to capture the sense of sacrifice and suffering that happens in the shadow of large-scale mining, I propose a new concept: 'eritalgia'. Eritalgia expands the existing duad of nostalgia and solastalgia, capturing the sense of lost future self in place, emphasising the role of power and discursive hegemony in shaping experiences of and well-being in place.

Keywords: Coal, Extraction, Sacrifice Zone, Place, Displacement, Eritalgia.

Introduction

Subsequent to the move to open-cut mining and the intensification of coal mining in the coal-rich fields of the Australian eastern seaboard towards the end of the 1990s, a distinct ethical dilemma emerged at the coal frontier.[1] This dilemma is closely connected to technology and ecology; it relates to the ways in which technological advancements have enabled new conquests within rural and remote spaces, subsequently disrupting localised ecologies. As technology changed mining practice and facilitated an expansion of the industry, mining moved from sharing in the production of place, to producing, in Augé's (1995) sense, 'non-places'. As Augé (1995:

85) suggests, a non-place is where the purpose of place becomes one of facilitating movement, so much so that there is too little time to grasp it as a place. Transient, non-places become characterised by anonymity, furtiveness and change. Whilst most people will have a transitory engagement with mines—a feature that in itself creates the non-place character of the place—others relate to these places on an everyday basis, either through employment or residence. For some, the anonymous, mobile and dynamic character of the reborn (non-)place is unproblematic; it resonates with ontological and ethical notions of self and community in which mobility and movement are signs of hope, prosperity and advancement. For them, the mine as a (non-)place may convey a sense of consistency, a social logic and an ethical code, and as such, meaning may exist. For others, however, it creates a sense of disjuncture, disruption, and dissonance. It unsettles their notion and experience of time and place, displacing the meaning of landscapes, disrupting local economies, and dis-embedding localised notions of sociality and temporality. Thus, whilst extractive industries and their associated infrastructure are a symbol of prosperity and future advancement for some, for others these make visible disruption and loss.

In this paper, I will explore this contradiction and the ways in which it transforms into distinct zones of sacrifice where notions of home and futures are unsettled.[2] Throughout the discussion, I illustrate how a story of technological advancement, as it relates to coal, gains moral impetus from ideas of home and home making, and how it retains a central position in the affective economies (Ahmed, 2004) that coal mining are linked to, even formative of. I aim to illustrate how the interconnection between state discourses, planning frameworks and industry advancement has colonised ideas of home and place, and bestowed new notions of 'productivity' on previously agricultural farmland and bushland. In this process, a zone of sacrifice has been established in which notions and experiences of place as home have been altered and the inscription of past histories and imagined futures in contemporary landscapes have been challenged.[3] The extractive frontier, as a sacrifice zone, transforms landscape and place into commodities for exchange and de-valorises the hidden, quiet worlds of human and non-human multiplicity (Gómez-Barris, 2017: 5). It becomes a location of grievance and loss in which "the health and way of life of communities—often low-income or minority—[are] sacrificed for some other interest" (Holified and Day, 2017: 269). The sense of sacrifice and re-organisation of place that has happened in the shadow of extractivism is at the centre of this article.

In the first section of the article, I offer a description of how coal mining has expanded through the Hunter region in NSW and the displacement of the small village of Wollar in the Mid-Western Region. I illustrate how coal was central to the initial establishment of the Hunter Valley as a place, with coal central to the expansion of British settlement. I do not offer an account of the dispossession of the Wiradjuri people, the traditional owners of the land, but simply provide a brief overview of how coal forms part of the regional history of European settlement.[4] The article draws on data collected as part of an ongoing long-term ethnographic study of Wollar, which started in 2015.[5] The analysis is centred specifically on the three year period from 2015-2018 during which there was a heightened mobilisation and angst amongst the residents due to a proposal to expand the mine nearest to the village. I argue that Wollar became a non-place and its long-term residents displaced in place, homeless whilst still at home. This sense of displacement is not only a condition that has emerged from technologically induced ecological change but one that is closely tied to the affective economies surrounding coal mining (cf. Ramsay and Askland, 2020), and that fuels a sense of abandonment and dispossession. Thus, in the second part of the article, I explore the dominant ethical discourse of coal as it has been advanced by those in power, with the intention, in the subsequent sections, to illustrate how such 'ethical' scripts disempower, dispossess and displace through the sense of abandonment and temporal dissonance that they create. Seeking to advance a language to capture the sense of sacrifice and loss, I advance an analysis of dispossession and propose a new concept – 'eritalgia' – as a term to capture the sense of temporal disjuncture and a

form of displacement in place that emerges from the sense of lost future self in place.

Emplacement and encroachment: Coal river and the village at the end of the coal chain

Approximately 160km north of Sydney lies the city of Newcastle. The city, first named Coal River and later renamed after England's famous coal port, originated in 1804. Since then, coal has been central to the town and the Hunter Valley region, of which it is part. Coal is intimately tied to the economic and social life of the city, its politics, landscapes, scenery and sounds. Successive, expanding rings of coal mining have shaped the suburban layout and transformed Newcastle and the Hunter from a convict settlement dedicated to primitive mining and shipment of coal to a centre for international energy demands. Newcastle is the centre of the Hunter Valley Coal Chain, one of the largest coal supply chains in the world which spans over 450km and involves about 40 mines. It facilitates more than 20,000 train trips, loads 1,600 vessels per year, and exports more than 80 types of coking and thermal coal (Port Waratah Coal Services, 2018: np).

Initially, small in scale and underground, mining was a locally-based enterprise that contributed to the prosperity of local communities. Today, however, coal operations are no longer underground but large open-cut structures, with ownership of coal mines and exploration leases mainly held by multi-national corporations. Mining activity has exploded, growing from 11 million tonnes (Mt) of coal used for domestic electricity production and the manufacture of iron and steel by the end of the 1940s, to 260Mt at the height of the coal boom in 2014 (Connor, 2016: 104; Denniss et al., 2021: 3). Whilst production has peaked, the legacy of the boom remains in approvals and consideration of new projects, which could, according to Denniss, Campbell and Littleton (2021: 3), see 165Mt produced in 2030. In 2022, the mines in the Mid-Western region, Hunter Valley and Newcastle produced 173.8Mt

Figure 1. The Hunter Valley's lunar landscape © Hedda Haugen Askland

of raw coal (Coal Services, nd). The mines primarily produce for export, with the largest mines extending across thousands of hectares of land and each producing between 10 and 20 Mtpa (Connor, 2016: 104). Past and current production have changed the landscape of the region, leaving a lunar-like landscape hidden from the roads but visible from the air.

With the explosion of mining, relationships between industry and community changed (e.g. Albrecht, 2005; Askland, 2018; Askland and Bunn, 2018a, 2018b; Connor, 2016; McManus et al., 2014; Drinan, 2022), and coal has become highly contested. The environmental and social consequences of coal mining, including climate change and impacts on ground water, have seen opposition to mining transpire throughout the region. Yet, a different battle has unfolded at the coal frontier. Here, the expansion of mining interests has unsettled communities, disrupted temporal connections and dislocated visions of the future. It has left communities and their ecologies barren and exposed to impacts of noise, vibration, dust and light. The battle for these communities concerns questions of place and belonging. It is personal and intimate. It is about questions of home and the possibility of home as a site of belonging and of future-oriented projects.

Wollar: the sleeping village

The small village of Wollar, approximately 230km north-west of Newcastle, is the final remaining village on the west-going section of the Hunter Valley Coal Chain. It borders the Goulburn River National Park, approximately 50km northeast of the regional centre, Mudgee, and is situated within what is known as the Western Coalfields. Wollar is surrounded by three open cut coal mines, each owned by multi-national companies: Glencore's Ulan Coal Mines, Yancoal's Moolarben Coal and Peabody's Wilpinjong Coal Mine.

The colonial history of the area around Wollar can be traced back to 1822 when English explorer and pastoralist, William Lawson (1774-1850) made the first mention of the Goulburn River in his journal entry. Wollar grew up around a handful of settler families who worked the land. From the 1970s, the area became a destination for people seeking to escape city pressures and the capitalist project. Cheap property prices in a naturally beautiful, peaceful, and isolated area attracted individuals seeking to lead an alternative lifestyle. Young families settled and the community grew. By the 1980s, there were between 3-400 people living in the area, with 30 pupils and two permanent teachers at the local school. Most of the people living in Wollar made money through small to medium-sized agricultural businesses, lived off a pension, or formed part of the local rural economy (with some travelling to Mudgee for work).

As with so many of the small villages across the Hunter, Wollar's story is tied to coal mining. The first of the three operating mines, Ulan Coal, was established already in the 1920s (Glencore, 2023). Underground, located about 30km from the village, the mine and community coexisted peacefully. Mining was seen as an industry that offered local opportunities for employment and economic diversification. During the 1980s, however, technological ecologies started to change, and the main Ulan expanded its operations, establishing an open cut mine and constructing a coal preparation plant and rail loading facility, as well as augmenting their underground operations (Glencore, 2023). Simultaneously, exploration licences were established for the areas now known as Moolarben and Wilpinjong, with the two mines subsequently gaining extraction licences. Wilpinjong was approved first and on the 1 February 2006 it opened as the first 21st century green-field mine in NSW.

For the Wollar population, the approval and subsequent operation of the Wilpinjong mine turned out to be particularly detrimental. The mine obtained a 21-year operation license, from 2006 to 2027, and was given approval to extract 9.5Mtpa. It operates 24 hours per day, seven days per week, employing 505 people (Peabody, 2018). In contrast to many other mines in the region, which produce coal for overseas markets, the primary purpose of the Wilpinjong mine was to supply domestic coal to the local power station. Today, the Wilpinjong mine also produces high quality thermal coal for export (approximately 75% raw domestic thermal coal and 25% washed export thermal coal). Since the original approval, the mine has submitted, and had approved, six

modifications and one extension application, enhancing the rate of production, increasing train activity and expanding the footprint of the mine. The latest expansion proposal was approved by the NSW State Government in April 2017. This extension will prolong the mine's operations until 2033, expand the existing open cut pits over approximately 500 hectares and develop a new 300 hectares pit that will bring the mine boundary only 1.5km from the village itself. As of 2023, the local residents who remain in the area are mobilising for yet another fight as Peabody has been granted a new exploration licence that could open up a new coal field over grazing and cropping country, creeks and bushland no more than 500m from the village.

Based on their experience with Ulan, people in the village did not foresee the impacts the mine would have on their community and life. "We were naïve", Paul explained to me during one of our many conversations, referring to how the locals had trusted the company's narrative about environmental and social impacts being limited and manageable, and in light of promises of social benefits and economic growth. However, noise, dust, light, traffic and visual impacts soon started to mark everyday life with the locals feeling increasingly invisible and insignificant given the mine management's responses to their complaints. As Elizabeth told me when I saw her outside her house one Spring morning:

> "It was a bad night...And I have already had to call them; they are digging in Pit 3. They know that it gets noisy and they know the limit they have to stay under; yet, they don't stop until we call". She looks exhausted, gives me a faint smile. "At least they stop when we call. It takes a few hours for it all to quiet down, but at least they comply when we call and make them check their monitors." Elizabeth is angry; she is frustrated and sad. "I called today, but often I won't call", she tells me. "It just brings forward all the bad stuff, it marks my day and then I can't think about anything else. It shouldn't have to be like this!"

The constant delays in dealing with complaints and the seeming reluctance to address their concerns, not only in a proactive manner but also at the time of impact, make the locals confident that their wellbeing is secondary to that of the mine's operation and profits. Numerous times, the locals have commented on how "it is cheaper for the mine to buy out properties than shutting operation to manage impacts" (Lee), leaving those who are not offered acquisition, or who do not want to leave, exposed to the capitalist ethics. They are left with the sense that they are simply in the way, with continual contestation of their lived experiences of mine impacts. Indeed, in the Environmental Impact Assessment (EIA) process conducted as per NSW Government requirements, the technical knowledge generated through modelling and scientific methods has been prioritised. The scientific knowledge regime has gained value as what generates measurements of "real impact", ethically displacing locals' experiences and perspectives through notions of "technological objectivity".[6] The lived experience is, subsequently, undermined, with local knowledge and experience of ecologies dismissed. The dispossession of the locals through this knowledge regime and their concerns and suffering are not considered in the assessment of social impact. Yet the impact mining has on people's sense of place, home, and self is significant. All the locals I have spoken with during my years of engagement with the community self-report variations of emotional distress, anxiety, sleeplessness, and depression.

The distress that the locals endure is further compounded by what is recognised within the EIA as "real" social impact. Since Wilpinjong opened, there has been a gradual loss of services, the local mechanics have moved away and the local shop—previously a centre for social activity—has been closed after offering only basic, expensive goods for a few years after it was purchased by Peabody. The local primary school and the two churches have been closed, the local fire brigade has been amalgamated with the bush fire brigade 50km away, and the village itself is desolated with the last pre-Wilpinjong local passing away in 2022. Today, none of the pre-mining population live in the village and less than 10% are left in the area, the majority of residents having been bought out by the mine or left because of its impact. Over the past few years, more and more houses in the village have been barricaded or demolished as

they fail to meet the standards of the mine and cannot be leased out as workers' accommodation.

As people have left, village life has changed and those who remain have become increasingly isolated. Life has become harder and people are aware of increasing risks and more concerned about their safety. Operating and maintaining farms is difficult and increasingly more expensive, with the shared rural economy dissipated due to the loss of community members. As is illustrated in the following vignette, those who remain have become confined, stranded.

> Ann was sitting in the lounge, clutching her cup of coffee. We could hear Jim coughing from the bedroom. Ann had explained as I arrived that Jim was in a bad state and would not be able to meet me today. We were talking about the community's response to the latest expansion application. Ann's large, powerful figure seemed small as she reflected on the situation. 'How do you imagine your future', I asked her. 'I don't tend to think too much about [the future] these days', she explained. 'I just go day to day. I mean our future, when I dare think about it, is bleak. If we can't sell the property there's our retirement plans gone. Our health is not great. I've had a heart attack. Jim's got PTSD. He's broken his back, he's got a fractured pelvis. He's on that much medication if you shake him he'll rattle […] Our future is...I don't know, I really don't know what's going to happen in our future. Whether we're just going to walk off and leave it, which we can't afford to do, or whether we're just going to try and last it out and die out here. Who knows? It's all up in the air at the moment, because all our plans have been...Our retirement plans and everything have just been smashed.'

This vignette displays strong emotions and also triggers an emotional reaction. It should be read in the context of government-level decision-making on mining in the region. Despite submissions of concerns, complaints and protests, local and state governments have continued to rule in favour of the mine and the powerful corporations running it, leaving the locals with the feeling that nobody in power cares. Even so, the community has mobilised their responses to the mine's operational impacts and proposals for modifications and expansions through the Wollar Progress Association and their representatives on the mine's Coal Community Consultative (CCC) Committee. They have received occasional support from Lock the Gate (a national community action group with strong representation in the Hunter region) and the Environmental Defenders Office (EDO), as well as local green politicians and environmental groups. Most of the time, however, their struggle is one that has not gain the attention beyond the extractive zone and their fight is one of everyday resistance (cf. Fletcher, 2001) and stubborn refusal.

Whilst recognising the role of intermediaries and supporters (such as Lock the Gate, EDO and others) in bolstering community voices at critical points in the mines' development and operation, there is little relief offered to those living at the coal frontier. The sense of Wollar having become a sacrificed zone and those who call it their home as part of the sacrifice, is evident in the absent presences and the present absences of the village, as well as in the words of those who remain. "We are the sacrificial lambs," Lee once expressed as she was reflecting on how Wollar features within the region's visions of progress and development. "Maybe they can remove the steak knives from our backs when they've finished?" Tim stated, driving home the sense of being slaughtered for the sake of others' consumption. "We are treated as roadkill," Paul said, pointing to the many dead kangaroos, wallabies, and wombats along the country roads, heavily trafficked by mining vehicles, that have been left to rot and eaten by the crows. The feelings of unfairness and violation that the people of Wollar experience are, on the one hand, related to the desecration of an ethical code of distributional equity and, on the other, part of an ethical discourse used to justify the violation of their community, well-being, homes, and lives. These failures to recognise the ethical code and the overarching discourses undermine—or, more precisely, make invisible—their sacrifice and suffering. The experiences of the long-term residents in and around Wollar exemplify the way neo-liberal globalisation fuels processes of dispossession and displacement. It illustrates how physical and social landscapes become 'matters of concerns' or ecological spaces to be sacrificed in the pursuit for economic gain (Holifield and Day, 2017; Hedges and Sacco, 2012; Shade, 2015), and how this emerges through a

discursive space in which their sacrifice is framed, circulated and affirmed as a matter of necessity or prudence. This discourse of justification functions, as I will investigate below, like a technology that establishes points of adherence and coherence, exclusion and elimination.

It's an amazing thing: Scripts of magic and hope, prosperity and ethics

> "This can provide endless possibilities," the husky female voiceover narrates, "it can create light and jobs. Delivering six billion in wages for Australians, it produces steel and powers our homes, as well as our economy, injecting 40 billion dollars each year ... It's coal. Isn't it amazing what this little black rock can do?" (Minerals Council of Australia, 2015).

This story line was first presented on Australian television in 2015 as part of an eye-catching advertisement campaign launched by the Australian Minerals Council that sought to highlight the central role of Australian coal in providing jobs, steel and, not least, cheap electricity. The campaign gained significant negative responses and was widely mocked (e.g. A Rational Fear, 2015; Becker, 2015; Hudson, 2015; Ker, 2015; Miletic, 2015). Despite criticisms and claims that the promotion of coal not only ignored health and climate risks but could also be seen as a threat to the Australian democracy due to its entanglement with the politics of development and progress, the Federal and NSW governments remained silent. The silence forms part of the discursive pattern of these governments (cf. McManus and Connor, 2013), which emphasises the economic and social benefit of coal whilst downplaying its environmental and social impacts. Statistics that reinforce the importance of the industry due to its contribution to local, state and national economy are forwarded, with narratives focussing on employment, state royalties and regional economic growth. Today, coal continues to be hailed as a benefit to "all Australians through its contribution to exports, wages, investment and tax revenue" (Minerals Council of Australia, nd: 5). Coal, government and industry discourses proclaim, represents "Australia's comparative advantage" and, as a country, "Australia is fortunate to be richly endowed with a commodity that is indispensable to modern life" (Minerals Council of Australia, nd: 5).

Although the Australian Government is party to the 2015 Paris agreement (UN, nd) and has committed to reduce emissions by 43% from 2005 levels by 2030 (Australian Government, 2023), coal retains its discursive power and, in parallel with plans to move towards renewable energy and mine closure, applications for new and modified coal mines are forwarded and approved (Askland, 2022; Denniss et al., 2021). The coal script outlined above is, thus, important as is present a conviction of necessity for commodification. In this script, coal becomes the source to future well-being and prosperity for *all* Australians, making the question of extraction an ethical question of national significance, shifting the scale and locus of sacrifice from that of the coal frontier to the greater public good as measured by economic variables. The issue for government in this instance can become a matter of technological management and innovation rather than a readjustment of economic priorities and reorganisation of territory for ecological preservation and restoration.

Emotional ecologies: Becoming isolated, insignificant and invisible

Industry and government scripts entail a distinct ethical component speaking to the promotion of human welfare and security, which functions as a technology that establishes boundaries of belonging. These scripts sketch future scenarios of well-being and prosperity that are closely intertwined with commitments to distinct technologies and ecologies. As Marshall (2016) contends, these imaginings evoke, or are based in, ontologies that posit particular notions of being and meaning. They are influenced by theories and myths, as well as by the power relations underpinning, social groups.[7] Through the scripts, imaginings become enacted and the future becomes present. This future is, however, exclusive; it comes with a sacrifice.

In the case study considered here, this sacrifice is the lives and imaginings of the local people at the coal frontier who are written out of the collective "We".[8] The order that the ethics of

the script generates forms a framing in which the local residents, their lives and imaginings, become invisible. This, then, clearly illustrates how ethics form part of politics, social struggles and group rivalries and that ethical actions are intertwined with group identification, group conflict and power relations. Ethics is, as such, not only technical or functional in establishing modes of control (over current and future ecologies) but also highly emotional. The scripts generate emotional responses that symbolise *adherence* and *coherence* as well as suppressing the recognition of dispossession in some others. I use the words 'adherence' and 'coherence' in line with Ahmed (2004), who explains how "emotions *do things*, they align individuals with communities—or bodily space with social space—through the very intensity of their attachment" (Ahmed, 2004: 119, emphasis in original).

Returning to Wollar, my observation is that the local residents at the coal frontier experience a distinct sense of dispossession and displacement, which relates to temporal and affective dimensions as much as to the social disruption and material dispossession that have happened over the past 15 years. During the first year of my fieldwork, what stood out was the intensely felt emotions that people conveyed when speaking about their future and what was happening to their village. The experience of mining and the impact of the mine were not exclusively related to tangible, material measures that could be observed in the present, but rather to an intangible absence that spoke to a dismantlement of temporal constructs shaping experiences of 'home'.

> I just don't know what to do; where can I go? This cannot be bought…it's my life. I planted these golden gums and watched them grow…how can I leave? (Damien)

> You put yourself on hold, like I've done, right after my parents passed away in Sydney and I inherited some money, I would have done that house up, painted it and used that money, but now I'm too scared to. I haven't even dug new gardens. You put yourself on hold for all this time. (Elizabeth)

What stands out in these quotes is the sense that there is no future nor a present; there is no longer a "sense of possibility" (Hage, 1997) embedded in Wollar as a place. As the mines have come closer, the local people have lost the authority over their own destiny or the space of security, familiarity and community; that is, their home. The intense emotions of loss, sadness, anger and destitution articulated by the local residents are also strongly connected to a sense of lost future, of ethical violation and unfairness, of being silenced and invisible, of being excluded and minimised.

The remaining local residents of Wollar convey a sense of homelessness although, still living in their houses, this experience is not material but affective. This is, of course, closely intertwined with the destruction of their local community and loss of social services, as well as with environmental impacts related to noise, dust, combustion, traffic, light pollution and so on. It is, however, the sense of invisibility, of being forgotten—or, perhaps more correctly put, not mattering—that is at the core of their suffering. The dominant script writes them out of the collective ethos and, regardless of how loud they scream, there seems to be no one listening. There is a sense of abandonment resonating in their stories; an abandonment that leads to an ordinary form of suffering. The sacrifice at the coal frontier emerges through a process of slow violence (Nixon, 2011); it is not catastrophic and crisis-laden but, rather, in the words of Povinelli (2011: 13), it is a 'quasi-event', a form of suffering, enduring and experiencing that is "ordinary, chronic, and cruddy". Removed from the sacrifice zone and the lived experience at the coal frontier, the uneventfulness of the suffering and its status as a quasi-event allow for its endurance as it "never quite achieve the status of having occurred or taken place" (Povinelli, 2011: 13).

The sense of abandonment and desperation that the residents felt is illustrated in a distinct event that took place on 12 April 2017, at the peak of the assessment process of the latest expansion of the Wilpinjong mine. On this day, as a last effort to get the attention of the decision makers and to make themselves visible, the local residents of Wollar staged a direct action outside the Wilpinjong mine. The decision to move to direct action

and the protest outside the mine can be seen as an effort by the local residents to break out of the state of destitution by generating an event within the quasi-event. At the break of dawn, about 30 local residents and their supporters gathered in front of the main gate, hindering the mine workers leaving and entering the mine at the change of shift (Maguire and Askland, 2017).

Facing potential criminal charges for their peaceful protest, including up to seven years in jail, the local residents hoped that the act would attract the attention of politicians and the public to the desperate situation they found themselves in. As Bruce, one of the local Wollarians, said: "I don't really want to do this but I have to. It's my home", with his fellow community member, Bev, stating: "we are here to say enough is enough. We have lost our rights!" The protest was a political protest — an ethical struggle — aiming to show how deeply they felt about the issues and the injustice they experience. The protest was triggered by the sense of having no voice, of not being listened to. It was a last effort to jolt the dominant script and illustrate how they are a group of people whose lives have become annulled.

Making this argument, I draw on scholarship on emotions and, more specifically, the notion of "emotional geographies", which speaks to the question of to what extent "the human world is constructed and lived through the emotions'" (Anderson and Smith, 2001: 7). Emotions are, Anderson and Smith contend, "an intensely political issue" (Anderson and Smith, 2001: 7) and, as such, arguably ethical (Ahmed, 2004). They are part of how we comprehend and make sense of the world, representing a powerful force in establishing relationships to both the human and nonhuman entities that create the world in which we live (Duffy et al., 2021). McManus, Albrecht and Graham (2014) argue that in order to understand the impact of mining, concepts that incorporate the emotional bond that people have with their environment, with the implications of mining on this bond, are required. This could incorporate identity and home, with both home and identity being concepts that relate to

Figure 2. Protesters outside the gate of the Wilpinjong Mine, April 2017 © Hedda Haugen Askland

the affective dimension of place (Askland, 2018; Pearson, 2017). This argument is completely absent in the discourse about coal outlined earlier, which takes a rationalist, technocratic approach to benefit and impact based upon an understanding of 'place' as material and a matter of the present. This reduces place to its biophysical form and ignores how place is a mosaic of biophysical, social and ontological characteristics that exist in and through relationships between self and other (human and non-human) and that comes into existence through lived experienced of being, or situatedness (Casey, 1997, 2018) in the world (Vanclay, 2004; Askland, 2018). It transforms place into a non-place where the movement of workers and minerals take precedence over the affective domain and alternative ecologies, ontologies and logics, subsequently stripping nature of all context and value beyond it being the source of a distinct resource. This is an ethical proposition that disregards not only emotions but also the *meaning* of place, which is central to people's attachment to and identification with place, and intertwined with people's personal and collective identities (Askland, 2018; Farrugia et al., 2018; Pearson, 2017). Indeed, it hides a central part of resource conflicts, which is, as Cheng et al. (2003: 98) contend, "as much about a contest over place meanings as it is a competition over the allocation and distribution of scarce resources amongst interest groups" and disregards the lived experience of a place, or the impacts on people and their identities and lives.

To understand the devastation that has engulfed Wollar, it is necessary to look beyond the material manifestation of displacement and resettlement. Whilst the depopulation of the area and the loss of services, increased cost of living and heightened isolation are central to people's sense of dispossession, another measure of impact lingers in their narratives. This relates to the threat that the mines have had on Wollar as a place and its transformation to what, for them, is increasingly experienced as a non-place. I have made the argument elsewhere (Askland, 2018), that the people of Wollar have become displaced in place. I contend that displacement is not limited to movement of people across socio-spatial boundaries but is an existential experience that can occur through ruptures in place. These ruptures may relate to the bio-physical, social or ontological dimensions of place and will be related to temporal experiences of a place, as a 'Significant Other'. The sense of displacement manifests in statements such as:

> I don't have a life here but I am living. Life has become a living hell. Everything has changed […] yet I'm stuck, I can't get out of here! (Paul).

Rather than being triggered by their own mobility, locals, such as Paul, have become stranded in a non-place, brought to life by the mobility of others and the movement of coal. The sense of strandedness that they articulate goes hand in hand with experiences of fragmentation, loss and discontinuity; it refers to an experience of powerlessness against an all-encompassing and external moral imperative.

Making this argument, I draw on work that has emerged from human geography and emotional geographies; more specifically, Professor Glenn Albrecht's notion of 'solastalgia' and his theory about 'psychoterratic' distress. Albrecht calls this sense of distress, solastalgia (lat: *solus* and *desolare* – abandonment and loneliness; *algia* – longing, sickness, suffering, pain). Solastalgia refers to a sense of homesickness one feels while still at one's home. It derives from the notion of 'nostalgia' (lat: *nostos* – return to home or native land; *algia* – longing), where one feels a longing or melancholy towards past places, which are no longer accessible. Importantly, places (of past and present) can be sources of solace, or comfort. It is when these places become inaccessible—either through movement in space and time, or through environmental transformation—that nostalgic and solastalgic distress can emerge. Central to a sense of self and home is the sense of being part of an ecology, as this relates to biophysical, social, ontological—and, by inference of the argument presented above—ethical variables.

Expanding on Albrecht's work, I go beyond the dyad nostalgia-solastalgia, which incorporates the future as a temporal reality shaping the present, by introducing a third concept: 'eritalgia' (lat: *erit* – he/she/it will be; third person singular future active verb; *algia* – pain, sickness). I have discussed elsewhere with colleague, Matthew Bunn (Askland

and Bunn, 2018a), how the concept of solastalgia as presented by Albrecht emphasises the environment through the notion of ecosystem health and how this underestimates the deep relational and ontological dimension of place. As we argue, whilst "Albrecht draws a line to the relationship between environment and social condition, the role of both sociality and temporality in relation to place and place-based distress remain relatively under-explored in his work" (Askland and Bunn, 2018a: 19). It is not only the ecological damage that a mine brings that can lead to distress but also the sense of temporal rupture, the feeling of deception and betrayal (Askland and Bunn, 2018a: 19-21). I seek to capture this temporal dimension with the expansion of the dyad of -algia, bringing in the future as a dominant figure in experiences of environmental distress and (in)justice.

Eritalgia can be explained as the distress endured in response to lived experiences of significant environmental change that distorts, disrupts or displaces an individual's sense of a future self in place. It points to the dis-ease that emerges when the connection between lived realities and an imagined future self (in place) is broken. This break can be triggered by changes in, or challenges to, the biophysical, social or ontological components of place; it is a break marked by ego's (as individual or group) loss of authority, authorship and voice in the intimate spheres of home as bounded in the imagining of future connection to place. The three concepts—nostalgia, solastalgia and eritalgia—are nested and have a cumulative character where the severity of dis-ease builds as the temporal dimensions are reduced. Each of them points to a loss of regenerative potential, in which time becomes increasingly compartmentalised and the ability to reproduce the embodied experience of time—as past, present and future—is (at least temporarily) felt as lost. Each of the three concepts present a distinct sense of loss: nostalgia points to the loss of past home, or homelessness; solastalgia is tied to loss of agency, or powerlessness; and, eritalgia embodies the loss of hope, or hopelessness.

Displaced in place: Dispossession, muting and an ethics of benevolence

Loss of place can manifest within biophysical, social and ontological realms. In the case of Wollar, it is evident how the physicality of space has changed (e.g. mine void; water flows; noise; built environment etc.); the sociality of space has changed (people moving away; increased community tension; changing modes of interaction; politicisation of space and relations etc.); and the meaning of the place has change (the purpose bestowed upon the landscape; the scripts of the place; the contest between capitalist and environmentalist discourses as it is embedded in the landscape). The local residents express a deep sense of distress related to this loss of place, and its transformation into non-place. People commonly speak about sleeplessness, anxiety and stress, as well as future-oriented angst: "It is a nightmare whichever way you go; if we go or not, we are between a rock and a hard place" (Alistair); "we are the victims of a silent war" (Lee); "life has become a living hell" (Paul).

The dis-ease they articulate reflects nostalgic longings with references to 'the golden era' when the community thrived. Melancholic allusions are often made to the one-stop-shop-mechanic-post-office-bottle store that used to be a centre for social activities, cricket matches and bush dances, and to a time when the community was vibrant and cohesive. Similarly, they articulate a sense of solastalgic distress, where the present depletion of community, destruction of social networks, loss of friends and neighbours, dilapidation of houses, changing sounds and disrupted nights represent environmental changes that create unease. Expressing a deep level of eritalgia, residents often point to the inability to imagine their future self in place. As Elizabeth stated during one of our many conversations: "There is nobody left, there is nothing here. There is no future".

Wollar has become a non-place; a place marked by transience, anonymity and inconspicuousness. Ghost-like and depleted it, on the one hand, stands out as having been frozen in time—as its residents and the village have become stranded in a time of the past, stripped of its regenerative potential and future—yet, on the other hand, it

is this very character that facilitates movement (of coal, energy and capital). This movement is, however, embedded in an ethics, and facilitated by a technology, that is exogamous to the long-term local residents and their notions of place. There is no space for their conception of place within this non-place. Co-existence, here, is a false myth. The only way the mine can operate is by displacing those in its way through resettlement (*physical movement*, which may take place either through mine acquisition or individual landholders making the decision to leave), or through muting local voices (*discursive movement*). The two are intertwined. Through the mine's acquisition of properties and subsequent resettlement of local residents, the few who remain have become displaced in place. Even if they want to leave, they cannot move (e.g. Askland and Bunn, 2018b). The mine has become the primary landowner in the area, and the locals' assets have become worthless as the only possible buyer is the mine. The mine is under no legal obligation to buy them out as those who remain are not within the acquisition zone and not recognised as negatively affected. By imposing an ethics of benevolence and necessity that places the boundaries of adherence and coherence beyond the coal face, or that turns the area into a non-place, the mine's operations are endorsed, promoted, even celebrated, by those in power. This can, however, only be done by muting the scripts and voices of those at the coal frontier through discursive relocation of "the local" to a place where the ethics of benevolence resonates. Scripted out of a collective future and stranded in an eritalgic space (where the individual no longer has a sense of future self in place), the locals have become displaced in place.

Conclusion

According to Jansen (2009a: 57), for a place to be home, a sense of hope is required. Hope is connected to the ability to imagine a positive future where dreams and realities compound as one. The sense of homelessness observed at the coal face relates to the loss of hope and the dismantlement of future imaginings. This sense of homelessness is not related to material loss of home, as people remain in place, and continue to dwell in the site they have been calling home. Rather, the sense of homelessness or displacement is related to the dissonance created in temporal constructs, by which the individuals have lost the authority to define or imagine their future self in place. This is what I call 'eritalgia'. Eritalgia is an experience of temporal dissonance caused by the sense of lost authorship of one's own future in place; it is caused by a 'temporal highjacking' and a silencing of concerns by those in positions of power. Corporate and governmental political, discursive and material practice make destitute alternative futures in place. This sense of homelessness and lack of hope for the future connects with experiences of displacement, disempowerment and dispossession. It relates not only to the dispossession of sociality and place through extractive activities but also to the sense of discursive hegemony in which alternative futures are muted.

I have shown through sharing Wollarian concerns and putting them in relation to corporate and institutional scripts on coal futures, that social disruption and depletion, ecological dissonance and dominant scripts founded on a humanist ethics that draws up boundaries of adherence and coherence that effect a sense of displacement—an existential condition in place—that has come to mark the lives of the people in Wollar. Home, infused with a sense of hope, is a place that is seen to go elsewhere. For the people of Wollar, futures have become blurred and the alignment between self and place disjointed. Stranded, they have become displaced in place. There are lessons embedded in this story about the relationship between regions, between the poor and the non-poor, communities and the state, that speak to experiences beyond the coal frontier. The process of "slow letting die" (Povinelli, 2011) and the politics of abandonment that this story accounts is one that holds relevance for the general debate about extractivism and one that requires urgent attention as the world embarks on a new extractive boom under the heading of a just transition and green capitalism.

The new imagined futures that will drive the transition to lower-carbon energy sources are not necessarily all encompassing and inclusive, despite the discourse of "leaving no one behind" (UN, 2023: np; see also, for example, Carley and

Konisky, 2020; Canelas and Carvalho, 2023). Rather, these imagined futures could equally entail a potential sacrifice of those at the green extractive frontier and the conceptual triad of nostalgia, solastalgia and eritalgia discussed in this paper offer conceptual tools which draw attention to the sacrifices that are occurring when imagined futures conflict.

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Notes

1 I adopt an approach to 'frontier' similar to that of Domingues and Sauer (2022: 1), assuming it as "a conceptual category for capturing the complexity of actors, actions and articulations in disputes over land, nature and territories, that are subject of appropriation by different political projects."

2 I adopt a notion of home that is intimately tied to lived experiences of temporality – as the space in which past and future self come together in present everyday practice, hope and longing. Home is not simply about property or dwelling, nor is it solely about being within a space that offers security, familiarity, wealth or freedom. Home, as I approach it here, refers to a sense of belonging and an embodied object of longing in which the self attains a sense of harmony between, and autonomy over, material elements, ontological constructs and temporal imaginings. Home is a space bound by hope and future-oriented dispositions (Jovanović, 2018); it is the place where individuals have the power to invest in a dimension of future (Jansen, 2009a, 2009b), envisage the possibilities of place, and control and relate to those possibilities.

3 The term 'sacrifice zones' attains key attributes and dimensions of place and place relations by which landscapes change and negative impacts of large scale extractive projects, other infrastructure, and development projects are emphasised. I apply the term in this paper both as it indicates the analytical conversation with the growing scholarship on the topic (e.g. Cottle, 2013; de Souza, 2020; Gómez-Barris, 2017; Holifield and Day, 2017; Lerner, 2010; Scott and Smith, 2017; Shade, 2015), and as a reference to experiences articulated by the research participants, and the key argument of the article.

4 For further information about the dispossession of the Wiradjuri, please see: Brayshaw, 1987; Macdonald, 1998; Read, 1969, 1984.

5 The is approved by the University of Newcastle's Human Research Ethics Committee, approval number: H-2015-0279.

6 For a discussion about knowledge regimes and extractive industries, see, for example: Espig, 2018; Eriksen and Schober, 2017; Threadgold et al., 2018.

7 I use 'myth' in line with Connor and Marshall (2016: 5), who use the term as a reference to world-views. In line with them, I see myths as dominant stories circulating within social groups, which speak to the nature of being.

8 It could be argued that another, linked, sacrifice is the imagining of those outside the dominant 'cultural complex' (Marshall, 2016) whose perspectives, from within the dominant complex, are seen as a challenge to the moral order of being. This is, however, beyond the scope of this article and further analysis about the alignment between egos and institutions of the non-dominant cultural complex must be reserved for another publication.

Coal Exists, Therefore it Must be dug up: The Non-Imagining of Socio-Technical Change in the Hunter Valley, NSW, Australia

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Abstract

As one of the world's largest exporters of coal, Australia has been notoriously reticent to facilitate the technological transitions required to alleviate climate change. The influence of the mining lobby has been well documented, as have the machinations of successive governments, who have had little success in overcoming this influence, or determination to do so. Yet communities in coal mining regions of the Hunter Valley are increasingly, and actively, questioning the morality of the industry. From conflicts over land use, to the impacts that burning coal has on climate change, the coal industry is aware of the tenuous nature of its social license to operate. In response it has invested in campaigns which emphasise the role of the industry in building the local ecology: not only of the local regional economy, but also in building historical and cultural value, in an attempt to 'lock-in' mining's particular values and ethics. As the pressure on coal from international forces increases, this restrictive view is challenged, with the nation committed to the technologies of the past and left behind as others move towards cleaner sources of energy. Power and ethics shape not only visions of the future, but the capacity to engage with the likely social and physical outcomes of those actions.

Keywords: Climate Change, Risk Society, Socio-Technical Change, Imaginary, Australia

Introduction

Whether one is observing international negotiations, following domestic politics, or more localised initiatives, debates over climate change policy seem indomitable. Tensions arise over the imposition of restraints on greenhouse gas intensive production, attempts to increase costs for polluting activities, and even developments of cleaner, renewable, sources of energy. At the same time, annual reports such as those from the World Meteorological Organisation (2021) show ongoing increases in global temperature trends, intense weather patterns, and the beginnings of what are known as tipping points. These tipping points are of particular concern as they indicate worsening trends and are somewhat difficult to model. While uncertainties are inherent in a complex system such as the Earth's climate, the indications are increasingly dire; the time for humanity to adjust the greenhouse intensity of our economy is running out.

A key question of concern is how it got to this point. We know that the long history of climate

negotiations has been countered with industry denial – for example, the first World Climate Conference was held as far back as 1979, around the same time that it's now known Exxon Mobil had been hiding evidence of its knowledge of climate change and mobilising industries against potential regulation (Supran and Oreskes, 2020; World Meteorological Organization, 1979). As these international debates were successfully slowed by industry, in Australia, where this research was carried out, the key industry to campaign against action on climate change has been the coal industry, which was revealed to have been drafting government policies in the 1990s (Pearse, 2007). While many of the debates about the veracity of climate science have since been subdued, how to respond to the increasing urgency of the issue is yet to be resolved (Wright et al., 2021). Using data collected at the height of what is now known as the first wave of climate policy debates in Australia, this paper reflects on the positioning of industry within the public discourse on climate responses. I argue that the industry representatives articulated a moral and technical position which obscures the ability to reimagine the future, carbon-constrained world required to respond to climate change.

The research presented here was carried out between 2010 and 2011, a period of intense debate over the implementation of a price on carbon. Attempts to implement the policy were controversial from the start, with the first proposed emissions trading scheme being rejected by the Australian parliament in 2009. The second scheme was in place for only two years before being repealed in July 2014, alongside a wide range of other government initiatives aimed at reducing Australia's greenhouse gases (Chan, 2012). A primary driver of resistance to both policies came from business – in particular those which are greenhouse intensive, and therefore were likely to be pushed to change practices or suffer economic consequences. Precisely because of its emissions intensity, the coal industry had been the focus of both environmental campaigns and government policies aimed at curbing greenhouse gases. It is, of course, this fact which landed the industry at the centre of the debates around implementing a price on carbon in Australia. Supported by the broader business community, these industries – primarily coal and aluminium – engaged in intense lobbying and public relations campaigns to argue that, because they were trade exposed, they would unfairly have to bear the cost of a price on carbon (Drape, 2011; AAP, 2009). Relying on a moral position of the need to maintain the comforts that have come to be expected in rich, Western nations through continued economic growth (Dahlgren, 2021), the industry set much of the terms of the debates which are yet to be resolved (Wright et al., 2021; Hamilton et al., 2023).

Following the arguments of industry leaders reveals an epistemological position which emphasises the complexities and uncertainties of responding to climate change, sometimes to the point of denial (Norgaard, 2011). These tensions over the level of certainty required in order to be able to calculate the risks of climate change play out in the ethical positioning of the debate, with the fossil fuel industry arguing that any limitations on its use will result in dire economic consequences. As Daggett (2019: 11) has shown, these assumptions – of an inherent linkage between economic growth, "the comforts and pleasures of modern life", and productivity – have a historical and ideological basis in the dominance of Western trade and industry. Understood through the lens of the Protestant work ethic, the use of fossil fuels to produce energy is seen in light of God's beneficence – to leave them in ground, as some environmentalists might have one do, would be a waste (Daggett, 2019). These positions play out in climate policy discussions ad nauseam — a dynamic which leads to public fatigue and policy initiatives remaining in limbo. In this regard, the debates reveal a lack of both a shared imagination of the future and of a moral cosmology; a vast space of difference which undoubtedly needs to be overcome in order to avoid the worst consequences of climate change.

While the neoliberal program appears to have become established consensus among Western nation leaders, risks such as climate change threaten to challenge many of the moral and technical assumptions within this way of thinking. As outlined by Beck (1992; 2009), the processes of industrialisation, assisted and sped up within the

context of neoliberalism, have been so successful as to create what he called the 'risk society':

> One can virtually say that the constellations of risk society are produced because the certitudes of industrial society (the consensus for progress or the abstraction of ecological effects and hazards) dominate the thought and action of people and institutions in industrial society.… Cumulatively and latently, [autonomised modernisation processes] produce threats which call into question and eventually destroy the foundations of industrial society. (Beck, 1994: 5)

Beck argues that climate change signals a need for a green modernity that "will have to include a new vision of prosperity which will not be the economic growth held by those worshipping at the altar of the market" (Beck, 2010a: 262) and that "the dynamic of the world risk society must count as a historical refutation of the neoliberal conception of the minimal state" (Beck, 2009: 63). At the same time, however, Beck and proponents of ecological modernisation (Mol and Spaargaren, 2000) argue that it is possible to decouple economic growth from environmentally damaging practices; a moral positioning which suggests that it is only the kind of consumption and production which needs to change, rather than economic growth per se. Through this conception, then, the possibility for socio-technical change becomes a key focus.

Imagining sociotechnical change in Australia: competing conceptions of risk

A key part of the framework for the transition to a low-carbon economy involves the creation of new 'sociotechnical energy imaginaries' – a term which describes "collective visions of desirable and feasible (technoscientific) futures" (Ballo, 2015: 9). These imaginaries are embedded in national history, culture, politics and technological structures (Ballo, 2015; Jasanoff and Kim, 2013). The difficulties of such transitions are well recognised. They relate not only to the technical, physical infrastructure – which itself is just as enmeshed in landscapes and the social imagination as it is in the physical requirements of energy generation and distribution (Urry, 2014). Sociotechnical energy imaginaries also present the potential of changes to everyday patterns of economic and social life. These changes, argue Jasanoff and Kim (2013: 189), involve a reconfiguration of the "physical deep structures of civilisation [and our] social infrastructures", and become enmeshed in political and ethical struggles. In Australia, these struggles have involved a challenge to the prominent – and dominating – coal industry. The industry is so deeply enmeshed in the energy imaginary of the nation that competing views have been fiercely contested by both the industry as well as conservative politicians (Brett, 2020). These power relations have ultimately brought Australia's climate policy to a ten year impasse, with even the smallest changes and support for renewables fiercely resisted (Crowley, 2017; Crowley, 2021).

There is little doubt that any moves towards a low-carbon society require a shared vision of the future of energy generation in which coal plays a minimal and steadily decreasing role. Numerous environmental organisations, academics, and left-leaning think tanks have produced models intended to show that this is possible. The general pattern is a slow downwards trajectory for coal, often with gas as a transitional source of electricity, while renewable energy, energy efficiency measures and the required technical changes to the electricity grid are rolled out to eventually replace coal (Garnaut, 2008; Teske et al., 2016; Spratt and Sutton, 2008). These models overwhelmingly argue that the economic benefits of following such a program are clear – primarily pointing out that there are more jobs in renewable energy per kilowatt of electricity produced, and that the costs of climate change impacts will become worse the longer the issue is ignored. These arguments are framed to counter concerns about the economy under a new electricity regime, providing what is seen (by the proposers) to be a rational voice in an attempt to shift the framings of the environment movement (which is often accused of being overly emotive and dystopian). Perhaps with the exception of *Climate Code Red* (Spratt and Sutton, 2008), which argued for an 'emergency response' from government, the overall narrative of these models is a steady,

gradual and measured change which will have minimum impact on people's everyday lives.

These contrasting narratives within the environment movement reveal the moral imperatives within climate change, whereby some feel a need to reconcile environmental hazards with existing expectations of the economy, while others see the two as fundamentally opposed. One aspect of this may be that the notion that the transition to a low-carbon economy will be as painless and smooth as sometimes claimed is often contested, even from those concerned about climate change (see, for instance Trainer, 2007; Leahy, 2008). In this way, these sections of the environment movement support the moral stance put forward by business – that the avoidance of any 'pain' involved in mitigating climate change is not worth the trouble. However, the winding back of climate mitigation legislation in Australia suggests that neither argument has been successful in engaging the kinds of leadership necessary for even a small step towards this change.

The difficulty may be that while some parts of the environment movement maintain that climate change can be mitigated without impacting on the lifestyle expectations within rich, Western nations, powerful sections of business and industry have historically suggested that it cannot. This view has been heavily promoted by the coal industry, with advertising campaigns which imply that even the everyday basics of survival in Western societies are not possible without coal. For instance, campaign slogans over the past decade have included; 'Life. Brought to you by coal' emphasising the ways in which every day appliances make use of coal fired electricity (Frew, 2007), "Coal. It's an amazing thing" attempting to link coal to jobs, the economy and the future by claiming it is becoming more efficient (Milman, 2015) – and later in 2017 "Coal: Making the future possible" (Remeikis, 2018). This discourse, combined with any level of doubt about the science of climate change, situates the decisions of leaders – and those who vote for them – within a moral conundrum; it argues that people are likely to suffer if we make changes, that those suffering most will be the worst off, and, importantly, that this suffering may, in fact, be for no reason at all. As former Australian prime minister (then Opposition leader) Tony Abbott said, the price on carbon is "a so-called market in the non-delivery of an invisible substance to no-one" (in Cubby, 2013).

These debates are inherently linked to broader conceptions of justice, risk and technology, with differential outcomes dependent on these. For instance, as Jasanoff and Kim argue, in US government policy, risks are perceived as manageable, while "technology's benefits are seen as unbounded" (Jasanoff and Kim, 2013: 190) while the transition in Germany – which has been much faster – was steeped in a stronger risk aversion discourse that saw climate change as increasingly dangerous (Jasanoff and Kim, 2013: 192). It is the latter perception of risk which led Ulrich Beck to argue that modernity is turning on itself, with climate change being one of the more insidious outcomes (2009; 2010a; 2010b). This perception, of course, is also reflected in environmental concerns. Yet Beck appears to have underestimated another perception of risk – the risk of losing a comfortable lifestyle and the possibility of a painful transition – which manifests, with participants in this research at least – in a strong defence of the (destructive) coal industry. This position inevitably emphasises short term, social (economic) comfort and fairness over the longer term aims of protecting the environment. These kinds of statements are used to frame a moral position of 'energy justice' (Mundaca et al., 2018) – suggesting that the historical reliance on coal must continue in order to allow everyone access to energy, while on the other hand relying on the uncertainties of climate change to delay mitigation policies.

A fossil fuelled nation

The argument that Australia's economic prosperity is linked to coal is not something which has happened by accident; rather, it is a cornerstone of the industry's promotional strategy (Bowden, 2018). Australia is among the world's largest exporters of coal, a statistic made great use of by the industry to argue that the "coal industry plays a vital role in Australia's economy, energy security and community…", noting the "tens of millions of dollars" it contributes "annually

to fund community social infrastructure" (Minerals Council of Australia, n.d.) – despite the fact that the industry is also heavily subsidized (Parry et al., 2021). The coupling of the coal economy with community and social infrastructure is a strategy often deployed by mining industries to build community support for their social licence to operate and to build trust within the regions in which they operate.

In addition to investment in community projects, industry funded campaigns have sought to argue that the lifestyles people have come to expect in rich Western nations is dependent on coal ('Life. Brought to you by Coal'), reframe coal as a modern technology ('Coal: Making the future possible') and perhaps most interestingly that '#coalisamazing' (Milman, 2015). While the latter was pilloried on social media, the success of these strategies is evident in the ways in which coal is romanticised, not only by the industry itself, but by mainstream media, political leaders, unions and often workers (Pearse et al., 2013). Arguably, Australia's response as the international community began to try and respond to the challenges of global climate change, was a prime example of the industry's ability to intervene in the social and political landscape to make coal appear both inevitable and ethical (Bowden and Leahy, 2014; Bowden, 2018). The coal economy depends on political intervention and struggle.

In line with international negotiations, advocacy in defence of the Australian coal industry started in earnest under then Prime Minister John Howard, who argued that signing the Kyoto agreement was against the economic interests of the nation (Bulkeley, 2001). More recently, a number of politicians have revealed their preference for coal, sometimes in dramatic ways. In early 2017 the Federal treasurer (and now also former Prime Minister), Scott Morrison, gave a speech in parliament holding a lacquered lump of Hunter Valley coal (so he would not get coal dust over his hands and suit) and taunting his political opponents to not 'fear' it (Murphy, 2017a). Earlier the same year, Environment and Energy Minister Josh Frydenberg mounted a significant discursive campaign around the phrase 'technology-neutral' as means of shifting policy priorities away from renewable energy and back towards coal (Murphy, 2017b). This support for the industry can also be seen in the push from some conservatives for government support to build a new coal-fired power station (Clennell, 2017; Benson et al., 2018), and fierce opposition to the closing of existing ones for economic reasons (Crowe, 2017). These debates suggest that investment of the industry's economic capital, in not only public relations and advertising, but also political donations and 'social infrastructure', has permeated the public and political discourse to the extent that imagining life without coal is seemingly impossible – it is in the 'nature' of the Australian national economy and its politics. The success of such strategies can be seen in the ongoing lack of effective climate policy in Australia.

This article uses a case study of business leaders in the carbon intensive region of the Hunter Valley, New South Wales, Australia to outline the key discourses engaged by the business community to resist action on climate change. It finds a strong, ingrained resistance to moving away from coal, which goes beyond articulations about the need for sociotechnical change and towards a nostalgic view of the burning of coal as essential to the well-being of the nation, the economy and beyond.

Methodology

Making use of interviews with business leaders in the Hunter Valley, New South Wales, Australia, the research identifies key discourses in relation to climate change, climate mitigation, politics, and environmentalists. The Hunter Valley is a large coal-producing region which, in Australia, has been at the forefront of these debates. The region has a prominent, well–organised and varied environment movement while at the same time many workers and local businesses have links to the coal and aluminium industries. The aim of the study was to involve a representative sample of business leaders from various industries that are likely to have different priorities in relation to how climate change may affect their business practices. 31 business leaders were interviewed, including representatives from carbon intensive industries (including coal and aluminium); representatives from renewable industries or those seen as 'at risk' from the impacts of climate change

(water, insurance, wine growers, farmers); and other locally prominent business sectors which might be seen as neutral in relation to climate change (health, education, service industries). Participants were identified through regional business associations, submissions to government processes, involvement in government programs around sustainability and coverage in local and national media. This meant that a number of participants knew each other, and some spoke openly about their engagement in lobbying the Federal government. Participants have been given pseudonyms in order to prevent them being identified.

Participants were asked about their views in relation to climate change, including the science and policy responses. Inevitably, these discussions turned to coal, which is both a major export product of the region and nation, as well as Australia's primary source of electricity generation. On the other hand, the coal industry has also marked the land making what is often described as a 'moonscape' of active and abandoned mines, as well as impacting the agriculture industry (Cottle and Keys, 2014). Indeed, over the past decade, the industry has faced resistance from the wine and horse-breeding industries, as well as local residents concerned about the ongoing encroachment of the industry for the development of new and expanded coal mines. These conflicts bring to light the moral choices being made about not only the approval of individual mining projects (or extensions to existing ones), but the broader policy context of climate change in which these ethical decisions occur. That is, on the one hand, an argument for a diversified economy, while on the other an argument for 'business as usual', or an economy dominated by the coal industry.

A prominent feature of participant interviews was this emphasis on the economy, which seemed to be particularly guided by the fact that interviews were specifically identified as being about climate change. This is clearly in part a result of the surrounding policy debates about the carbon tax, as this too was a dominating topic of conversation. Participants regularly expressed concern about the need to balance the economy and environment in a way that, more often than not, favoured the growth economy, supported by a neoliberal framework. That is, participants took the moral position that the economy was more important than the environment. These arguments were framed in a number of narratives, outlined below: that the region's abundance of coal was an important part of its historical and social fabric; that there were questions about the science of climate change which meant that the minimal response was preferred; and that the economy was intrinsically linked to coal, resulting in a moral imperative to continue to exploit the resource.

"A carbon challenged area"

The Hunter Valley region has a strong connection with the coal industry and an accompanying historical narrative which reaches back to colonisation. When European colonists first arrived in Australia, coal was a prominent feature of the landscape. Newcastle itself was named after England's major coal producing town and the nearby Hunter River was then known as Coal River (Baer, 2008; Connor et al., 2008). Coal mining began not long after colonisation, and Newcastle is well known as "Australia's first industrial town" (Minerals Council of Australia n.d.-b). It was not long after colonisation, in 1799, that the first international export of coal left Newcastle, headed for Bengal (NSW Minerals Council Ltd., 2013).

Enmeshed in these practices are colonial logics of paternalism, evoking the idea that 'others' – in this case, Aboriginal Australians – are not only different, but inferior and needed to be guided or ignored. The notion of land as a resource, and that of 'terra nullius' on which the theft, commodification and destruction of the land was based, underpins the practice of destroying the natural environment – and landscape – for profit (Neale and Vincent, 2017). The proliferation of mining and commodification of the environment is but one important aspect of the moral choices made in this process; the imposition of colonial power also imposed a utilitarian view of the landscape, legitimising the concurrent destruction of place, culture and pre-existing social systems of Aboriginal Australians (Evans, 2008; Baer, 2008). While there is little doubt that voices of resistance remain – and arguably are primed to be revived

by current environmental demands – these logics are still dominant. For instance, the regional port, the Port of Newcastle is promoted as the 'world's largest coal port' – a reputation which is, perhaps not surprisingly, noted with both pride and anxiety (Sydney Morning Herald, 2017).

These narratives play out in discussions of both the history and potential futures available to the region. As the history of coal development is seen as intrinsically (and, often, uncritically) linked to notions of progress and the success of the nation, the region's narrative becomes increasingly locked in to both the past and the present. This is articulated even by those who support change in the region and are aware of the social processes by which coal has become so central:

> I guess years ago when I was going to school in the valley – they're all dairy farmers, right? Then the power generation industry came, and that came because the coal was here to fire up the Bayswater and Liddell power stations and the power stations there around Lake Macquarie. So the fact that the power stations were here, that attracted the aluminium industry, because it needed enormous amounts of power. And then the world wanted coal, and the coal was here and that grew and then the steel industry cut back, but the economy of the others still grew. And so here we are sitting today, and we have such an imbalance focus of our original economy on coal, I'd suggest. It does attract a lot of servicing, but the core business is really coal. – James, renewable energy consultant

As a renewable energy advocate, James is not uncritical of the coal industry. His description is a retelling of the European history of the region which, while factually correct, is ensconced in a range of cultural and ethical assumptions. It entails a 'logical progression' from the very existence of coal, to the development of power stations, to aluminium, and eventually coal exports. The narrative is linear, aligned with the story of modernity itself, the result of the ever-developing ability of humanity to ethically change and make use of our 'natural resources', extend our mastery of both machine and environment. It aligns, too, with the spread of the globalised economic system – 'the world wanted coal' – and, because it is here, we are obliged to 'give'. Interestingly, however, the narrative ends abruptly at coal. As James notes, we are now stuck with an 'imbalance focus of our original economy on coal' which seems both inevitable and difficult to change, even if morally dubious.

James' explanation of the development of the coal industry sits well alongside what has been described as the Australian "state/coal industry nexus" (Baer 2016) – a historical narrative which began with the European invasion of the nation and which, over time, has solidified to the extent that successive governments are unable to decouple their hold on power from acquiescing to industry demands (McKnight and Hobbs, 2013; Pearse, 2007).

> We have a challenge in the region – that's, that we're a carbon challenged area, a lot of the industry we're involved with is related to coal mining, to power production, aluminium smelting and related industries, so if there is risk here, that these industries will change, there is a risk to our members and to the industry that work will change, industries will go away etc. I think our competitive advantage is more the niche, the support products, the technology and so forth and that's related to coal, and it's related to clean coal, and we've got to make the most out of that. – Mack, business advocacy

Mack here turns to what is often seen as the 'win-win' scenario – the idea that technological developments will allow the continued use of 'clean' low polluting coal. A key and longstanding argument of the industry in response to this challenge has been the idea of 'clean coal', usually in the form of geo-sequestration – which has no to-scale commercial operations, raises concerns about leakage, and can only be used in very specific geological formations (Marshall, 2016). For this reason, Marshall (2016) argues that 'clean coal' is a fantasy, defensive solution to the issue, designed to avoid the problematic impacts of using coal for electricity.

In addition to the concerns about climate change, the coal industry has also been opposed for its intensive use of land and water resources, pollution of aquifers, as well as dust and noise impacts from mining (Connor, 2012; see also Askland , 2024; Connor, 2016). In the Hunter Valley,

there has been a strong focus on whether the industry can be maintained alongside the wine and horse-breeding industries which make up another important part of the regional economy (Connor, 2016). Dennis, as a representative of the horse-breeding industry shows an awareness of this attitude, but was cautious about being seen to be 'anti-coal':

> We've said it right from the start and we mean it, we're not against coal mining, you know we're not fighting the coal miners per se, we're just asking for a bit of reason, a bit of thought. It's been going on for 20, 30 years, their sort of escalating encroachment, it's to the point where we're at now where towns like Muswellbrook are just completely enveloped in mines. – Dennis, thoroughbred industry

While there is a growing view in the community that the industry has gone too far, and is impacting on other businesses, there is a clear division being made by Dennis between his stance as a representative of the horse breeding industry and that of environmentalists – he goes to some pains to outline this. These comments show a level of solidarity with the coal industry – an acknowledgement that, as a large industry in the region, the coal industry's voice is important and, perhaps even more important than others – with the others being those who really are against the coal industry (environmentalists). In this way, participants might make minor criticisms of specific actions of the coal industry, but avoid fracturing the ethical framework – as business leaders – under which they all operate.

Some participant comments resonate as moral empathy for the situation in which the coal industry finds itself – related not only to climate change, but to conflicts over land use. Ryan goes as far to say that the coal industry is 'picked on':

> …you've got to think about the different countries and economies. And that's like a lot of these issues around – let's pick on coal. You know, there's a whole, and you think about it just in that one issue, there's just so much stuff going on, so – what's the price who's going to pay what in terms of taxes or whatever it happens to be. – Ryan, aviation

Such an argument was also being advanced by the industry itself in the media at the time over the carbon tax as the coal industry tried to seek exemptions, with claims such as those from the Queensland Resources Council that the industry is "being singled out for an unjustifiable tax grab with significant, long-term implications" (Roche, 2009: 82). Ryan's discussion of this viewpoint is embedded in the broader context of the impacts of national – versus global – action. That is, if other countries are not moving forward then why should Australia – action is not fair or just. This notion of what is 'fair' is often supported with claims that it is the 'average consumer', in this scenario, who will suffer. In making these arguments then, participants not only legitimize the coal industry's complaints – the government (and others) should not be interfering with the right to carry on business and needs to consider compensating or other measures for any moves it might make that will impact on profits and general comfort and wellbeing. This emphasis carries strong moral weight prominent in neoliberal (Harvey, 2007) doctrine – that national, capitalist economies should be prioritized over changes to the environment and (problematic) global welfare.

Climate v change

To some extent then, it is to be expected that climate mitigation policies would raise concerns about the economic future of the region. It is worth noting, however, that this is not only a regional issue, and much of the national debate has reflected this concern (Bowden, 2018). At the time of the research, while the Labor government had been elected in part because it had promised to take action on climate change, the public debates were extremely heated (Crowley, 2013). This was reflected in participant comments, which were often sceptical about the science of climate change. It was commonplace for participants to express literal, interpretive and implicatory denial (Norgaard, 2011). That is, they would either outright refute the science (*literal*), question the details of the science (*interpretive*), or dispute proposals about how it should be responded to (*implicatory*). In this framing, participants

emphasised their concerns (and interests) that the economy should take ethical priority.

In the first case – participants commonly invoked the uncertainties around the science of climate change, claiming that scientists were just trying to make money off the issue, and that those who disagreed were silenced. This is an attempt to discredit opponents through ethics. Anthony, for instance, argues that the majority of the scientists who support claims that climate change is cause for concern, are just taking up their own moral position as 'believers':

> I'm a sceptic and I'm a sceptic for sound – for technically scientifically trained reasons. … if you start analysing these hundreds of thousands of scientists – who believe in all this – if you start looking at them and peeling them away one by one, you'll find that none of them have actually done any work in this space, they're all believing it and all passing on, saying 'Oh I believe in it, and I'm a scientist' but they haven't actually partaken in the research, they don't actually understand the non-linear mathematics involved in these computer models. – Anthony, consultancy

Anthony's comments are interesting in light of the moral positioning which was occurring within the media debate at the time, where environmentalists were often accused of following emotional rhetoric and 'believing' in climate change (see, for example Bolt, 2009; Devine, 2008). Such claims-making positions those who are sceptical of climate change as the more reasonable, informed and cautious participants in the debate.

More common was the view that there were flaws in the interpretations of climate science. This was often expressed in terms of questioning not whether climate change is happening, but the extent to which human activity is the cause:

> I believe in anthropogenic um climate change, it's whether it's the five percent of the fringe of climate change or whether it's the 90 percent driver is where I disagree with people I guess. My view is it's at the fringe. – Steven, coal

Here Steven was not necessarily denying the existence of climate change, but the interpretation of the science explaining the cause. Importantly, however, his suggestion that 'it's at the fringe' diminishes the idea that humans are responsible. Such a view is a common manifestation of interpretive denial, whereby perceptions of various flaws or uncertainties in the voracity of climate science function to avoid making any changes (Connor, 2016: 65-86).

The final position, one which is arguably more amenable to the science, but disputes how it should be responded to, is that of implicatory denial. That is, participants would agree that climate change is happening, and that it is caused by human activity, but they would dispute what should be done. Simon brought the issue to the fore:

> Personally, and this is from a – certainly I know [company] has the same view that – the science is pretty clear to me. That there's a manmade contribution to the issue; that the CO_2 emissions will need to be abated. It's how we do it that's the issue of course, and the complexity of the issue. It's one of those issues that you start paying the price now for a return in a generation plus. Plus, it requires very strong collaboration across the globe between different nations with those facets, humans have demonstrated to date that they're not particularly good at. – Simon, aluminium industry

Simon, then, was not taking a literal stance against the notion that climate change is happening – rather, he was suggesting that there is little that can be done without a broad international agreement and that the Australian government should not lead on the issue.

To differing extents, the vast majority of participants in the research took up one or more of these positions, thus setting up the moral framework within which they understood risk. Each position functions to minimize the risks which are outlined by climate science. The first, literal denial, is to argue that the science is entirely wrong and unethical. Interpretive denial argues that the ways in which the information is interpreted is wrong. All three forms cast levels of doubt over the climate science, and therefore the risks and ethical challenges that climate change might impose. To that end, these levels of doubt provides justification for inaction on

climate change in favour of the ethical priority of economic growth.

The 'nature' of our economy?

The notion of being locked in to coal mining is inherently linked with a perceived need for economic growth as an ethical good. Within this framework, participants argue it is impossible to maintain economic growth without using coal for both electricity and export. This discourse comes from an a priori position which states: 1. The globalised economy is beyond any nation states' control; 2. A certain level of economic growth is necessary and, finally, 3. That this level of growth is not possible without coal. While the first two points have been the focus of debate for a long time by environmental and social justice advocates, for the purposes of this discussion it is this final point which is of particular interest. That is, there is an uncritical leap towards the notion of an intrinsic connection between economic growth, virtue, and the coal industry, which is advocated in opposition to environmentalist and scientific calls to mitigate climate change. This idea is clearly put forward by Natalie, who is an advocate for the industry:

> Australia's actually a country that does produce – that is actually quite emissions intensive *because that's what we export, that's the nature of our economy*, and then so I think the problem's just a lot more complicated. – Natalie, industry advocate

Leaving aside the fact that national emissions do not actually include those from coal which is exported, Natalie's claim – that being emissions intensive is 'the nature of our economy' recalls, again, the proposition of the impossibility of anything being different, and hence the current position as not only ethically acceptable, but one in which the notion of *not* making use of the resource as non-sensical.

This discourse is picked up not only by participants who represent emissions intensive industry, but those who are concerned about climate change. Jonathon is a partner in a prominent local law firm. He surfs, rides his bike to work, and is generally concerned with sustainability, including climate change.

> I do think that the coal industry, whether we like it or not, is a major economic player in terms of our living standards, in terms of you know as a sustainable economic place, the coal industry plays an important part of that. And that's just a feature of the fact that we've got those resources on our doorstep. – Jonathon, lawyer

Jonathon's comments – much like Natalie's combined use of 'nature/economy' – incorporate a curious telling coupling of the terms 'sustainability/economy' again implying the economy is more important and ethical than the environment. These layers, whether deliberate or not, are multiple. For Jonathon, sustainability, usually used by environmental advocates to describe the need to slow down our use of resources, becomes about maintaining our current economy in the long term. For Natalie, the 'nature' of the economy cannot be changed; it locks us in to the burning and export of coal. These discursive couplings reveal a framing of the economy as inevitably and unchangeably bound to the coal industry, a moral cosmology which is set in opposition to the arguments of intergenerational or environmental responsibility emphasised by those concerned about climate change (Daggett, 2019).

Participants commonly identify the globalised economy as part of the problem with putting a price on carbon. These arguments range from the issue of 'carbon leakage' – whereby it's put forward that greenhouse intensive industries will just move operations overseas – to statements about the rights of people in other nations to develop and use as much energy as those in richer, Western nations. In this way, the issue is framed as a social justice concern, albeit with tones of ethnocentrism. Simon, for instance, argues that the production of coal for exports will help alleviate poverty and disease in Africa:

> Africa for example … is a huge issue for mankind [sic] I think – and the poverty and the disease – going forward … and part of that's going to have giving them energy too, and where that's going to come from? – Simon, aluminium industry

While Australian coal is not actually exported to Africa, Simon's comments reflect the resonance of the reputation of coal as a key driver of

industrialisation, and prosperity. Such statements dramatically underplay the risks of climate change and can be seen as particularly problematic as they ignore the impacts that climate change is having on those with fewer resources. In this way the moral position being advocated is an extension of the paternalism under which Australia was colonised.

The notion that coal is needed to maintain a particular prosperous lifestyle have been a strong argument for supporting the industry. As Dahlgren (2021: 28) found with coal lobbyists, it is "precisely the integration of the moral and ethical concerns of their work into their every-day lives as they responded to moral accusations that produced and reinforced their complicity with anthropogenic climate change". A similar dynamic can be observed here, where those involved with the industry construct it as central to prosperity. The reach and efficacy of such narratives is evident among participants. For example, Luke is an advocate for renewable energy, working as a consultant in the industry. His comments echo the industry's 2007 'Life. Brought to you by Coal' campaign:

> I don't think we'll stop mining or exporting coal for a long, long time – the world needs coal, there's no doubt about it, we cannot stop the coal train tomorrow and expect life to go on as normal, we're going to need substantial amounts of coal, there will be a viable coal mining industry for a long, long time. – Luke, consultant

Luke's comments refer to a key tension around the issue of climate change, outlined above and related to the frame of risk – whether or not one can 'expect life to go on as normal'. The levels of risk to be concerned about are not only in relation to the danger of climate change, but the corresponding risk of having to lessen current levels of consumption. For Luke, the difficulty inherent in this debate means that we will be mining coal 'for a long, long time'. This is not only about the requirements of the national economy – in fact, Luke argues that 'the world needs coal'. Yet research shows that 90% of the world's coal will need to be left in the ground in order to have even a 50% chance at limiting climate change to an increase of 1.5 degrees (Welsby et al., 2021). Here, it seems then, Luke's concern about climate change is countered by his view of the coal; by coal's very existence as a cheap form of power, which will assist ever expanding economic growth, there is no other ethical option but to make use of it – our current levels of comfort demand that this continue.

Given the prominence of the industry in the region, it is certainly possible that participants who are more concerned about climate change are simply resigned to the idea that the coal industry will continue. Indeed, there are some participants (in industries like research, shipping, small businesses) who benefit indirectly from the industry. Yet these narratives are not endemic to the Hunter region; they have been a major factor in debates about climate change from conservative columnists, and politicians from both of the major political parties. In opposition to the environmental and social consequences of climate change, then, participants emphasise the importance of coal to the national economy, as well as to the ability of other nations to develop in the same way – indeed with the same technology – as Australia. In this, participants shut down any alternative visions of technological change. Rather, they argue that because Australia's economy has been built on coal fired power, so too should others. What was good here in the past is good for everyone.

Imagining a world without coal…

This research suggests, then, that a large part of the challenge to a low-carbon future is the ways in which coal itself is perceived as intrinsic to the success of the nation and the nation's economy. With a few exceptions, participants argue that the history and development of the region has come from coal, that current economic prosperity is linked to coal and the future of the region is coal. There is very little suggestion from any that this will change.

Between the competing versions of risk identified by participants – an economy in which the coal industry is significantly smaller, versus the risk of climate change – the coal industry is seen as immutable and good. Hesitations, doubts and outright scepticism of climate change provide a

moral framework in which economic growth, seen to be fundamentally linked to the coal industry, is ethically more important than environment. Here, it seems that the risks opened up by climate change, rather than bringing about a 'new modernity' à la Beck (2010a), are minimised, if not outright dismissed.

This perceived intrinsic link of the economy with the coal industry speaks clearly to the success of those industries in perpetuating their own mythology and can be seen clearly in the interview data. In their resistance to finding alternative forms of investment in the region and considering the development of a diversified economy, these participants held tightly to coal, rather than imagining socio-technical change. Participants mobilise a moral position in which the comforts offered within rich, Western nations, depends upon economic growth and coal. In doing so they deny both the observation that even within a nation such as Australia, these so-called comforts are not, indeed, shared by all and that climate change itself may well take these away.

It is important to point out that, as business leaders in the region, participants are not only reflecting their personal views. Rather, they are actively perpetuating the notion that the region – and nation – is not able to transform its energy mix, or export portfolio without negative consequences. These views border on the reification of coal. Embedded in a fantasy of misrepresentation of the industry (Marshall, 2016), the ways in which participants speak of coal being 'picked on', needed by the rest of the world, or even, as some comments imply, necessarily used simply because it exists, forecloses on the possibility of a low-carbon future. In doing so, the social imaginary is shut off, trapped in time at the beginning of colonisation. The potential for science and technology is admitted – but only if it is to involve coal.

While Beck (1994) foresaw a potentially exciting transition to a green modernity, where risk society functioned to undermine existing power structures, such a change requires the *recognition* of risk as he conceives it. Beck argues that risks such as climate change are both incalculable and yet increasingly urgent to act upon; these dynamics are played out within the relations of definition – the ways in which risks are defined and socially constructed (Beck, 2009: 194-195). Such risks will, he argues, force society to become radically self-critical. It is worth noting, however, that Beck's framework, although strongly worded, suggests that current comforts can continue – we need only implement a new type of modernity. As can be seen above, this claim is rejected by many participants in this research, and the recognition of climate change as serious, incalculable risk has not occurred in any meaningful way. Rather, participants minimize the risks of climate change and attempt to frame the issue within existing logics and ethics of economic growth and rationalism. Whether this is, as Beck (1992; 2009) would have it, an example of our current institutional inability to respond to risk, or a revelation which casts doubt over the idea of the risk society as a whole is part of the remainder of the story which is yet to be seen.

Conclusion

In June of 2023, Australia's key gas lobby – the Australian Petroleum Production & Exploration Association (APPEA) – released an advertising campaign titled 'Natural Gas – Keeping the Country Running' emphasising the need for gas to fuel the lifestyles that Australians have come to expect. It includes a television ad which highlights a diverse workforce, industry support for communities, and the centrality of gas to the manufacturing. It shows a worker saying that "as Australia shuts down coal, gas is picking up the load" (APPEA, 2023). Indeed, in the decade since this research was initially carried out, a number of coal-fired power stations have closed (Burke et al., 2019). The accompanying materials for the APPEA campaign go on to talk about how devastating it would be if the nation did not have access to gas. These events tell us two important things about the ongoing state of climate change in Australia. The first is that the unimaginable decline of coal is happening. It might be happening slowly, but there is now an acceptance that it will eventually occur. The second is that the linkage between fossil fuels, energy use, and continued economic growth and prosperity, at the expense of the

climate, is still being reinforced by those in industry – it is only that now, it appears that the gas industry is taking up that call.

Discussing climate change, Urry claimed "the future has arrived" (Urry, 2017: 42); that the impacts of a changing climate were here and apparent. He also noted, though, that economic and social changes are rarely linear – the changes depend on the interaction of unpredictable complex systems. These observations highlight the urgency and problematic dynamics of climate change. The failure to recognise, or act upon, the risks of climate change is a moral position which prioritises the wealthy, who have more resources to manage climate change, greater access to technology, increased ability to move, and, who are overwhelmingly more responsible for climate change itself. This moral choice, in Australia at least, has been influenced by the coal industry, which has been able to convince many of the participants in this research, that it is central to the economy.

Even in the face of conflicting moralities, whereby business leaders show concern for sustainability and climate change, the participants in this research appear unable or unwilling to take initiative in creating a new socio-technical imaginary. Rather, participants emphasise the threat of socio-technical change to the economy and the uncertainties of climate science. This epistemological standpoint leads them to a moral position whereby it is near impossible to support anything but gradual, small-scale changes. Yet even mildest predictions of climate science suggest this will not be enough and we may, indeed, need an ethics that is more able to navigate the uncertainties in a way that builds towards a much stronger socio-technical imaginary. While Daggett (2019: 12) has argued, "that which is bound can be picked apart, untied, set free", it seems that the leadership needed for the kinds of transformation necessary will need to come from elsewhere; from those who are less bound to old industrial technologies, more willing to sacrifice economic advantage and more able to envision a low-carbon society.

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Technologies of Ecological Mediation: Ethical Conflicts Over Environment and Imagined Future in Bali

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Abstract

Different world views and ontologies require different technologies to deal with environmental issues. Land reclamation plans in Bali's south, meant to open up new space for tourist development, triggered strong but varied responses in the Balinese population, from rejection to enthusiasm. All actors claim to aim towards a prosperous Bali, and at the protection of a degrading environment, but notions of prosperity and protections and the means and technologies used differ tremendously which leads to ethical conflicts. This paper identifies three actor groups based on the technologies they use to mediate relationships in the ecologies they inhabit. Drawing on modern interventionist technology and development and implied universal moralities, scientists aim to manage environment and normalize ecologies for economic benefits or environmental protection. In contrast, religious Balinese actors, for whom environments are dwelling places of spirits and gods, make use of their bodies as means of mediation to communicate with the non-human and restore the balance between environment, humans and god. A third kind of technology used in the reclamation case is a broad mix of media, from traditional theatre to new social media, that are meant to mediate between locally rooted ontologies and global activism, communicate resistance to a broad public, and thus save a (sacred) environment and Bali. In the Bali case, technologies appear ambivalent as they contain contradictory forces and their relationship with the environment is highly complex, which makes consequences quite unpredictable and ethics quite diverse.

Keywords: Technology, Environment, Ethics, Media, Activism, Religion, Adat, Indonesia, Bali

Introduction

Different worldviews and ethics require different technologies to deal with environmental issues. Land reclamation plans in Bali's south triggered various responses in the Balinese population, from outright rejection to enthusiastic embrace. No matter whether they support or reject reclamation, all actors claim to aim towards a prosperous Bali and at protecting a degrading environment. All stakeholders have explicit "moral visions of the good" (High, 2022: 614), but notions of prosperity, protection and the technologies to be used to 'do good' differ , due to the different "moral choices" (Hamelink, 2000: 1) these stakeholders make and the different futures they imagine. As anthropological research constantly reminds us, the world's ethical diversity does not allow for the

simple universalisation and homogenisation of a culture's or group's values and morality, including the allegedly universal and objective culture of human rights (Goodale, 2006: 25).[1] Questions of morality and ethics are always embedded in "the substance of the social" (Fassin, 2012: 4) and the various political, religious, economic, ecological and cultural entanglements that come along with it.

This article differentiates actor groups with regard to the different "contextualized ethical systems" (Goodale, 2006: 28) they draw on, and the techniques and technologies they use to mediate relationships in the ecologies they inhabit. It analyses "registers and regimes of … moral reasoning" (Douglas-Jones et al., 2022: 519) around the reclamation plans in Bali's south. Drawing on modern interventionist technology and its ethics, (natural) scientists and developers want to manage environment and normalise ecologies for economic benefits or environmental protection. In contrast, religious Balinese actors, for whom the environment includes the dwelling places of spirits and gods, make use of their bodies as means of mediation to communicate with the nonhuman and restore the balance between environment, humans and gods. A third kind of technology used in the reclamation case is a broad mix of media, from traditional theatre to social media, that are meant to mediate between locally rooted ontologies and global activism and thus save a (sacred) environment. This article first reflects on diverging conceptualisations of the relationship between technology, ethics, society and environment, before it introduces the Bali reclamation plans, some main actor groups involved in their promotion or rejection and their ethical frameworks. In a next step, it analyses the different positions and the emerging tensions and ambivalences based on ethically informed and diverging conceptualisations of environment, nature, culture and technology. This article extends the notion of technology by including social media as well as the human body, and zooms in on the intricate relations between diverging moral ecologies and technologies in a country of the Global South. It thus fills a gap in protest studies that "has hitherto given little attention to moral ecology" (Griffin et al., 2019: 5) and contributes to environmental science and technology studies that investigate the relationship between science, technology, society and the natural world and engages "questions about the material environment, environmental movements, and environmental knowledge" (Frickel and Arancibia, 2021: 458).

Methodologically the analysis draws on ethnographic research done between 2015 and 2017. I conducted participant observation offline in Bali and online in digital spaces created by relevant stakeholders and their followers; more than hundred informal and semi-structured interviews with different stakeholders; qualitative social media analysis; and analysis of material produced by stakeholders such as policy papers, scientific analysis, maps, flyers and songs. Such long-term immersion is the only way to explore the moral worlds that the stakeholder groups construct or live in, from the bottom up, and to get a sense of the interwovenness of human and nonhuman actors and the various translation processes involved (Kouw and Petersen, 2018: 57; Latour, 2005: 106-109). Due to closeness and trust that the researcher builds with specific groups and actors, it is tricky to immerse oneself equally in all settings. In this case, more in-depth immersion took place among those resisting the reclamation plans, where a Science and Technology Studies perspective enabled me to analyse the networking, collective organisation and action of a diverse group of people, including villagers, students, scientists, activists and religious authorities (cf. Frickel and Arancibia, 2021: 469).

Conceptual framework: technology, environment, media

Diverging worldviews, ontologies and moralities of different groups of people cause the emergence of a plurality of ecologies with different sets of actors and different kinds of relationships between what is commonly called humans, nature and technology. Following Eriksen (2015: 252), technology literally means "knowledge about technics" (or techniques) and generally "consists of the systematised acquired skills and man-made material implements humans reproduce and apply in their dealings with nature", including the

organisation of relations with other humans. Scientific and technical knowledge is often seen by its proponents as objective and universally applicable (Sismondo, 2010: 203-204). It is seen to exert control over nature, through effectively exploiting natural resources or through alleged environmental protection. In this view, scientific knowledge is considered to embody a universal ethics and produce true facts, independent of any social and cultural specificities and dynamics (Niewöhner et al., 2012). This assumes a dichotomy between technology and society or culture (see also Hamelink, 2000: 6) and ignores the moral appropriations of technical knowledge once it leaves "the protected space of experimentation to be applied in the real world" (Fassin, 2012: 12).

The challenge of viewing "technology as a culture-internal phenomenon" (Sørensen, 2012: 128, translation BB) implies that any technology does "not simply arise fully-formed to present ethical dilemmas about their use. Instead, they are shaped by both material factors and the interests and perspectives of social actors involved in the processes of technological creation, regulation and use" (Morrison, 2015: 7). This point is clearly substantiated by STS research on the antidemocratic nature of technological development (Feenberg, 2002: 3) and biased technologies, for instance through the racialisation of technology design and functioning (Bartram et al., 2022; Benjamin, 2019; Noble, 2018). According to Feenberg, it is combinations of ideology and technique that "control human beings and resources" (Feenberg, 2002: 15). And they do so in ways that resonate with what I conceptualise as moral ecologies below.

Scholars of anthropology and Science and Technology Studies (STS), have argued against universalistic notions of technology and against technological determinism (Feenberg, 2002; Morrison, 2015). Culture and technology are co-constitutive. This implies that technologies and techniques are "cultural products which form part of ongoing processes in society and can therefore not be studied separately from those relationships" and vice versa (Eriksen, 2015: 253). Ignoring such situatedness of technical knowledge and its embeddedness in specific ethical and political frameworks can limit "its applicability in concrete situations" (Sismondo, 2010: 203). If technology is socially constructed in specific cultural contexts, drawing on and making specific moral assumptions, it is far from 'neutral' (Niewöhner et al., 2012: 23-24; Pfaffenberger, 1988: 240). As we will see later, such social and moral constructions can involve humans and nonhumans, technical as well as ritual techniques and cosmological knowledge. Pfaffenberger redefines technology as "a set of social behaviours and a system of meanings" – "a total social phenomenon" – that is material, social and symbolic at the same time (Pfaffenberger, 1988: 236). An anthropologically informed approach looks at the interlinkage of science, technology and society or culture in everyday life and analyses how different knowledge systems, technologies and techniques "compete for interpretive authority and efficacy (*Deutungshoheit und Wirkmacht*)" and thus challenge or reproduce specific power constellations (Niewöhner et al., 2012: 9, 24) and environmental relations. It can help us better understand how claims about the future-orientedness of certain technologies are developed and provide legitimacy for their use (Morrison, 2015: 13-14), be it technologies that control the flow of water or trance techniques that enable the medium to tap into the knowledge of a transcendental world.

As a contribution to environmental STS, this article investigates technological practices and knowledge production "concerned with the dynamics of natural systems, with social intervention and impacts on the natural world" (Frickel and Arancibia, 2021: 459). A concern in this field is "epistemic inequality, or how scientific knowledge production is implicated in altering or reinforcing power imbalances and social hierarchies among different groups", fostering the "production of ignorance" and denial of (environmental) knowledge that is not in line with scientific solutions (Frickel and Arancibia, 2021: 464) and certain business interests. This article studies how different knowledge systems and related moral ecologies clash in the reclamation case on Bali, Indonesia, where I not only investigate institutionalised forms of acknowledging the critical role of environment in STS such as environmental impact assessments, but also go beyond the "construct of 'nature' as a baseline condition" (Yearley, 2007:

922) and look at the dynamics of human-environment relations and the agency of nonhuman and civil society actors.

Scholars like Ingold (2000), Descola and Pálsson (1996) argue against the dominant dichotomy between nature (or environment) and society (or culture). All these concepts are social constructs and relational terms that form part of broader ecologies (Ingold, 2000: 20). Human-environment relations are integral to society. They range from exploitative to protective modes to "the rejection of any radical distinction between nature and society and between science and practical knowledge" (Ingold, 2000: 16). The latter is exemplified by Balinese ethics and trance techniques that appear to integrate humans, nonhumans and nature on equal terms into their moral ecology. These dichotomies also inhibit "an adequate understanding of local forms of ecological knowledge and technical know-how, as these tend to be objectified according to western standards" (Ingold, 2000: 4), which is an ethical action itself.

While ecologies in the plural imply the lived relationships between humans and nonhumans, *moral ecologies* concern the ethics and moralities tied to different understandings and enactments of these relations (Scaramelli, 2021; Sprenger and Großmann, 2018). Moral ecologies have also been described as forms of resistance (Cortesi et al., 2017), informed by diverging ideologies of resource use (Dove and Kammen, 1997) and diverging notions of just human-nonhuman relations (Scaramelli, 2019). Without wanting to essentialise the stakeholder groups involved in the Bali case,[2] each group relies on a different "ethical system" (Goodale, 2006: 28) and the techniques and technologies they use to mediate, transform, or maintain relationships in the ecologies they belong to differ (Bräuchler, 2020; Sismondo, 2010).

Ironically, as Castells argues, it is the objective of the environmental movement that emerged in the late 1960s around the globe, as a new ethical framework, "to reconstruct nature as an ideal cultural form" (Castells, 2010b: 508). This was a reaction to the disastrous effects of environmental degradation, largely through technological advancements, expanding economic markets and the increasing commercialisation and privatisation of environment and nature (Descola and Pálsson, 1996: 13). Environmental responsibility and concern for 'nature' thus became global affairs, without freeing local actors from their responsibilities. The relationship between environment or nature and technology is thus highly ambivalent and complex. Technology and science are used for both exploitative and protective purposes, by governmental institutions or businesses and environmental movements (Frickel and Arancibia, 2021: 467-468; Sørensen, 2012:132). Moreover, information technologies such as social media are increasingly used to mobilise people against (or for) environmental destruction. This clearly illustrates that such technology, while not determining societal change, opens up new spaces for action, transformation and imagined futures. Users of new information technologies are consumers and producers of information and technology at the same time. This does not imply, however, that these users are always in control of the outcome (see also Hamelink, 2000: 4, 52).

Couldry and Curran (2003: 4, italics in original) have identified media as "*an emergent form of social power* in complex societies whose basic infrastructure depends increasingly on the fast circulation of information and images"; obtaining media power, they continue, is one means to gain "relative control over society's representational resources". As Postill (2016: 160) explains, "it is the coming together of everyday people, technology nerds and other political actors via social media, mainstream media and in physical settings such as streets and squares that drives processes of change". Only through the combination of new and old, alternative and mainstream media, local rootedness, face-to-face gatherings and collective actions in physical space do movements, such as the Balinese resistance movement, become effective. They can mobilise a broad variety of media users, gain public legitimacy, political force and increasing numbers of followers through the establishment of trust and network solidarity that are meant to contest inequality, injustice or autocracy in nonviolent ways (see e.g. Gerbaudo, 2012; Juris, 2012). New media can bridge the gaps between an activist core and mass publics, user-generated content and mainstream mass media, and local struggles and international attention

(Aday et al., 2012: 5-6), thus trying to address issues of participation and representation.

Indonesia and Bali

For decades, the Indonesian government's autocratic politics and ethics led to the imposition of development projects without any prior informed consent or involvement of affected local communities. This continues even in the decentralisation era after President Suharto's step down in 1998. Environmental impact analyses are required by law for any business that wants to open up, for instance, plantations, mining or logging sites, and society is required to be involved in the environmental protection, management and decision-making processes. However, throughout Indonesia, assessments are often reduced to technical environmental impact analyses, without considering social and cultural impacts as this would require time for in-depth analyses that go beyond calculating science formula. This prompts environmental and human rights activists to stand up for the (cultural) rights of those local communities and the protection of their environment and resources. In fact, the environmental movement is closely connected with the struggle for democracy in Indonesia; it emerged in the late 1980s and 1990s despite Suharto's iron fist, simultaneously promoting conservation, democracy, the rights of marginal people and justice (Tsing, 2005: xii).

Bali is the main tourist destination in Indonesia and its population is largely Hindu, in a majority Muslim country. Religion in Bali is closely intertwined with *adat*, that is local tradition and customary law. *Adat* refers both to "an immutable divine cosmic order and to the social order instituted accordingly by their ancestors" (Picard, 1999: 31). In Bali, as Lambek (2012: 345) argues with Durkheim, "religion or ritual forms the foundation for ethics and ethics is foundational for, or intrinsic to, society or social life". The unity of religion, *adat* and culture is important for Balinese identity and participating in religious rites is a customary obligation as it positions each individual in a local community and a descent group (Picard, 1999: 17). It is suggested that religion allows humans to not only become better people (Lambek, 2012: 346), but also make morally rightful decisions, as in the reclamation case presented in this article. Both human and nonhuman, visible (*sekala*) and invisible (*niskala*) play important roles in Balinese cosmologies. But culture is also the island's most valuable economic resource and tourist attraction, which induces Balinese to invest in and preserve their culture, torn between reification and invention (Picard, 1999: 16).

Due to its economic value, the government, and most Balinese themselves, want to maintain the image of a harmonious and beautiful island. However, massive developments from the 1980s have multiplied tourist numbers and caused severe environmental degradation, pollution, water scarcity, land expropriation and the endangerment of the very culture and environment that is key to Bali's success in tourism. To make things worse (or better, depending on one's point of view) Bali–Nusa Tenggara has been identified as one of six growth centres in the government's Masterplan for Acceleration and Expansion of Indonesia's Economic Development (MP3EI), an ambitious plan to support Indonesia's transformation into a developed country by 2025. Balinese people for a long time complied with such policies. However, alongside the democratisation movement, some of them started to articulate their protest against external threats and thus re-articulated dominant Balinese ethics. They set a counterpoint to the generally apolitical orientation of Balinese society (Hough, 2008: 122; Warren, 1998: 245) and the government's amoral policies, asking for their rights and promoting spiritual revitalisation and cultural restrengthening.

During Suharto's repressive regime, media were severely restricted to cut off any dissenting voices and the coverage of any possible tensions or conflicts in the country. After his step-down, press freedom was granted as part of democratisation. Media are now increasingly being used by different groups to push through their political and economic interests. At the same time, media have become important means for anti-establishment politics, empowering the marginalised, and fostering resistance against the government. Internet access increased exponentially, mobile phone subscriptions outnumber population numbers and Indonesians are world leading social media users. However, due to new

media laws designed to restrain independent media, Indonesia is still not ranked very favourably in the world's press freedom index (placed 124 out of 180 in 2017, Reporters without Borders 2017). It was against this political, cultural and media backdrop that the regional government in Bali granted an investor, PT Tirta Wahana Bali Internasional or PT TWBI (TWBI in the following), owned by one of Indonesia's biggest tycoons Tomy Winarta, a license to conduct environmental feasibility studies for a land reclamation project in Benoa Bay in Bali's south. This triggered enormous resistance among the Balinese, including environmental and human rights activists as well as spiritual and *adat* leaders.

Environmental ethics and their technologies

In my ethnographic research, I looked at the confluence of media, technology and the environment and how they formed distinct but overlapping moral ecologies. In the following, I analyse the strategies of three stakeholder categories against the backdrop of earlier conceptual reflections: 1) investor and government, 2) *adat* and religion, 3) activists and youth. These are main actors in a much more complex actor landscape, with a lot of heterogeneity within the respective groups. However, in order to carve out the argumentation within the space of this article, a certain simplification is necessary. Actors, their moral ecologies, their strategies and motivations to protect the environment, differ radically and are here expressed through an account of their diverging positions and actions in relation to the land reclamation issue. The analysis refers to positions in the environment-technology debate as sketched above and aims to uncover the intricacies of such relationships. Each actor-group uses technologies and techniques according to their respective morality to make 'nature' well-disposed towards them and make it fit their worldview, interests and imagined future.

Government and investor: managing environment

The regional government and the investor clearly take the view that the environment can be managed, regulated and thus saved by a universal human technology with its implied universal morality. Their claims and interventions remind of colonial policies and their continuation in national park policies, where governments claim that nature can only be preserved through the removal of the destructive 'human', ignoring the fact that often indigenous people contributed to the creation and maintenance of that 'nature' (Griffin et al., 2019: 2-4). Related notions of sustainability and morality differ widely from those held by people inhabiting the area (Griffin et al., 2019: 10, 14).

Through the creation of 700 hectares of artificial islands in Benoa Bay that are supposed to accommodate resorts, residential clusters, entertainment and Balinese theme parks, government and investor not only claim to revitalise a polluted ecosystem but also to open up thousands of jobs, turn Benoa Bay into a new trademark and introduce high-end quality tourism that offers water sports and nature, luxury and exotic culture, entertainment and tranquility, connectivity and sustainability. They claim to do all this in an ethically sound and environmentally friendly manner, while valuing Bali's customs and culture (see also nusabenoa.com, last accessed, 17.11.2023). They hubristically assume that there is societal consensus about what the 'common good' is, which is usually defined to be in harmony with the aims of the most powerful groups in society (Hamelink, 2000: 4), thus revealing the close link between ethics and power. Equally 'rational' considerations led to the choice of site:

> Located at the Southern side of Bali, Benoa Bay is considered as the heart of the island, as the bay is surrounded by the beautiful mangrove forest. It also happens to be near Bali's most popular tourism site, namely Nusa Dua, Sanur and Kuta. More importantly, the bay is located right between the Ngurah Rai International Airport and Benoa International Harbour, also the newly-operated Bali Mandara Toll Road that lies across the Bay. (TWBI, n.d.)

The toll road is carried by hundreds of pillars and stretches right across Benoa Bay. It connects the city of Denpasar, Nusa Dua and Bali's airport and was built in 2011 as part of the MP3EI, to mitigate

traffic congestion. As some activists I spoke to found out later, the constructor had also built two provisional turnoffs that could easily connect the road to the artificial islands. As marine space and as an area of strategic national interest, the provincial and central governments are in charge of Benoa Bay. In order to allow and open up space for reclamation, the government adapted its legislation. Ignoring Presidential Decree No. 45/2011 that declared Benoa Bay to be a conservation area, Bali's governor, I Made Mangku Pastika, issued the license for TWBI to conduct a feasibility study in Benoa Bay. Later, Presidential Decree No. 11/2014 changed Benoa Bay into a cultivation area of which a maximum of 700 hectares can be reclaimed. All these decisions were made without seeking consent of the residents of the area and thus broke Indonesian environmental laws.

Putting their values and moral ecology centre stage, as the only 'sustainable' solution, government and investor ignore local knowledge systems and pay mere lip service to cultural values through shiny videos and plans to add new temples on the artificial island to enrich Bali's cultural landscape. As Schick and Winthereik (2013) explain for the development of smart grid, it is such top-down design and planning, problem-posing and problem-solving, that is problematic as it does not take into account the affected people, those allegedly benefitting from the intervention and their perceptions, which often renders these projects exclusive, ineffective or failures. Schick and Winthereik (2013: 93, italics in original) aptly describe such approaches as "an imaginative space of opportunity *and closure*".

When contacted, members of organisations founded by TWBI on Bali emphasised that their intention is to strengthen Bali and its people through 'green development', revolutionary projects and a neoliberal economy. They kept reiterating that they want the Balinese 'to jointly prosper'. The building contractors and architects among them will probably get more than a fair share of such new prosperity. They tend to argue that all environmental problems have technical solutions. Such "rendering technical" (Li, 2007: 7), "confirms expertise and constitutes the boundary between those who are positioned as trustees, with the capacity to diagnose deficiencies in others, and those who are subject to expert direction". It legitimises power and proclaims ethical righteousness at the same time.

Not only did the government tailor the law to fit the investment plans, but when scientists from Bali's Udayana University declared the reclamation project was 'not reasonable' mainly for environmental and sociocultural reasons in September 2013, the investor found support from other Indonesian scientists. All this explains how TWBI spent over a trillion Indonesian Rupiah before beginning work on the reclamation. In response to the emerging protest, the investor changed the project motto from 'reclamation' to 'revitalisation'. Along with pro-reclamation scientists, they consider the mangroves to be dead (needing revitalisation) but still one of the main selling points. To 'greenwash' the project and offer tourists a 'pristine mangrove forest view', the investor founded and funds organisations such as the Mangrove Care Forum and installed football star Cristiano Ronaldo as 'Mangrove Ambassador'. To seek the Benoa Bay residents' support and connect to an international social justice discourse, TWBI approached politicians, security forces, village heads and religious leaders and organised free welfare and health programs; making 'corporate social responsibility' according to the project's website. They claim that "the well-being of the people in Nusa Benoa is priority" and quote the UN Secretary-General, Ban Ki Moon, thus allegedly complying with another powerful global ethical framework:

> Sustainable development is the pathway to the future we want for all. It offers a framework to generate economic growth, achieve social justice, exercise environmental stewardship and strengthen governance.

In its efforts to sound culturally and environmentally friendly, the investor also adopts the Balinese philosophy of *tri hita karana*. that is to "uphold the harmonious relationships between God, fellow human beings and the environment" (see e.g. TWBI, n.d., b).

Religion and adat*: cosmological balance*

The *tri hita karana* philosophy encloses the balanced relationship between environment, humans and god and gives expression to the close interlinkage of environment, culture and religion on Bali. For the Balinese, the philosophy is closely tied to its historical, religious, ethical and cultural foundations.[3] Both *adat* and religious figures in Bali and ancient inscriptions reveal that the Balinese owe *tri hita karana* and their traditional village system (*desa pakraman*) to the Hindu Priest Mpu Kuturan who was called to Bali in the late tenth/early eleventh century to help settle tensions between different religious denominations. The concept was strengthened in the 1960s in efforts to have Balinese religion acknowledged as one of Indonesia's official religions, i.e. Hinduism (Ramstedt, 2014b: 64). In the decentralisation era it was revitalised for the juridification of local customary law (Ramstedt, 2014b: 69) and reinvented as an ideological, scientific and policy concept (Roth and Sedana, 2015: 159). In 2012, *subak*, the traditional irrigation system on Bali, was put on the world heritage list as a manifestation of *tri hita karana* (UNESCO, 2012). No matter whether *tri hita karana* is a political construct or not, it is interesting to see how it "is used to give meaning to wider social and political processes, for what purposes and with what consequences" (Roth and Sedana, 2015: 169). In the current reclamation case the philosophy was given even more leverage as it provides those rejecting reclamation an ethical concept that is easily translatable into both the parlance and ethics of activism and an international environmental and cultural rights language.

There is also a very physical presence of *adat* and religion in the Benoa case. Mpu Kuturan and another legendary Hindu priest called Dang Hyang Nirartha, the ancestor of all Brahmana in Bali, are said to have founded Sakenan Temple, one of Bali's major temples located at Benoa Bay. It involves kinship groups from Bali's south who have their shrines there and several villages around Benoa Bay are in charge of the temple management (see also Hauser-Schäublin, 1997: 184-222). Its temple festivals attract large crowds of people from all over Bali. Due to its important role for Benoa Bay and Balinese cosmology, activists and *adat* figures involved in the resistance movement variously visited the temple.

Next to the close interlinkage of environment and culture or religion, Balinese tradition also dissolves the dichotomy between technology and culture. In Bali, technology is highly interlinked with religion, ritual and cosmology, from irrigation systems to temple architecture, ritual technology and the amplification of rituals through media technologies in the current resistance movement. As Lansing (2007) analysed in detail, temples govern the complicated irrigation system that had made Bali such a rich and fertile space. The system is just recovering from the introduction of the 'green revolution', another allegedly universally applicable technology with which the government wanted to spur agricultural production and economy, but which has instead threatened the region's elaborate irrigation system and the Balinese ecosystem. Each individual in Bali belongs to a temple that is highly interlinked with others and all social units possess their own altar or temple. The irrigation system creates and strengthens social interdependencies but is now threatened by the tourism industry and its greed for water and land (cf. Warren, 1998: 237). Such interlinkages and mutual dependencies illustrate the absurdity of scientists' distinction between ritual and, in this case, "the material technology of traditional farming" (Lansing, 2007: 6).

The Balinese way to reject reclamation consists of efforts to restore cosmological order between the visible (*sekala*) and the invisible (*niskala*) and involves praying, mediation and rituals as specific kinds of technology. Even major interruptions such as the Bali bombing in 2002 did not provoke revenge acts, but led to the search for imbalances within Balinese society (Hornbacher, 2009). As anthropological theory accentuates, "rituals are rule-bound public events which … thematise the relationship between the earthly and the spiritual realms"; they synthesise "several important levels of social reality: the symbolic and the social, the individual and the collective; and it usually brings out, and tries to resolve – at a symbolic level – contradictions in society" (Eriksen, 2015: 272-273). Due to the multivocality of rituals and symbols (Turner, 1967) they are able to unite a broad variety of people; no matter what age or political

background, profession or social engagement; they are still Balinese and Hindu and need to fight the endangerment of their culture and livelihoods through, in our case, land reclamation.

The sacred sites in Benoa Bay are frequented for various reasons, such as ritual and spiritual cleansing, cremation ceremonies, the handing over of ashes to the sea, and offerings of worship to the god of the sea. Some of these sites also play a role during Sakenan Temple festivals. Spiritual figures and priests visit these places in Benoa Bay to communicate with the other world via spirit possession and trance. They make use of their bodies as means of mediation to communicate with the nonhuman, asking spirits and gods for advice regarding the reclamation issue. As various religious figures confirmed, spirits and gods strongly reject such intrusion into their dwelling places. Spirit possession, as Lambek (2012: 353-354) argues, allows for the cultivation of ethical dispositions and the expression and possibly satisfaction of ethical concerns, whereas ritual sanctifies the criteria leading to ethical judgements.

Several village leaders told me they are also aware about the environmental and economic harm the project will cause. They have learnt from a reclamation project on neighbouring Serangan Island in the 1990s that destroyed coral reefs and led to erosion in many places, greatly changing the religious and cultural landscape of Sakenan Temple. Villagers are worried that once high-end tourist resorts open on the artificial islands, this space will be closed for both daily Hindu rituals and villagers' fishing activities. In order to be heard by the government, the investor and the outside world, the religiously and spiritually-inspired 'silent protest' (as opposed to the youth's clamorous taking to the streets) needed to be strategically amplified and translated into national and international contexts to attract further support and make visible the incompatibility of diverging ecological perspectives. An activist network (see next section) facilitated this coming out and helped to better organise resistance from below. Among other actions, they facilitated a research team putting together a map including more than 70 sacred sites in and around Benoa Bay. This visualisation of sacredness became an important means of legitimation for the resistance and a tool to mobilise other villages. Motivated by the activists' support, traditional villages opposing reclamation took over the movement concerning all *adat*-related matters and came up with substantial energy and resources to be at the forefront of future action and resistance. As of early 2017, thirty-nine *adat* villages had officially joined the movement, including those around Benoa Bay, thus mobilising thousands of people against reclamation.

Activism and youth: mediatised resistance

Out of networks fighting for democratisation, human rights and environmental protection in Bali and Indonesia, a well-versed activist forum emerged that loudly and aggressively fought the reclamation plans, thus complementing and giving a voice to the more spiritual-oriented silent struggle (for more details see Bräuchler, 2020). Those activists, mostly Balinese themselves but some also from outside the area, mediate between different worlds, the world of neoliberal economy, international human rights, global activism and local culture; they help to translate between different legal systems and power structures (cf. Bremen, 2017). They are thus in a quite challenging position, negotiating and translating between different cultures, worldviews, ethics and moralities, generations and ways to express protest; combining conservation, empowerment and creativity; connecting global protest aesthetics and local tradition; and facing strong opposition by the government, investor and their supporters. As indicated earlier, the human rights they appeal to, just like scientific knowledge, are often misleadingly depicted as universal and objective. As the Bali case shows, human rights are, on the one hand, "inscribed in a common moral Western tradition" (Fassin, 2012: 13) and "the moral language of neoliberalism" (Goodale, 2012: 469) that aggravates the situation of those whom human rights are supposed to protect. On the other hand, they can be an important complement to more local techniques for marginalised, disadvantaged and discriminated people to fight for their rights.

Through strenuous and long-lasting efforts to mobilise a large base and establish relationships of trust between youth, villagers, advocacy groups

and religious or *adat* figures, the protest grew from a few individuals into a mass movement of several thousand people that was able to attract national and international support. At its core is the Balinese Forum Against Reclamation, or ForBali (Forum Rakyat Bali Tolak Reklamasi), founded in 2013. ForBali is an alliance of students, NGOs, musicians, artists, environmentalists, lawyers and village representatives. Through the language of music, solidarity and resistance they were able to bring youth from all over Bali together – a youth that was fed up with the older generation's passivity, apoliticism and the government's sales policy, as I was told by movement members. The movement's main slogan calls for revocation of the new presidential decree that opens up space for reclamation. As legal means turned out to be weak, the group refocused on arguments tied to environmental protection. Learning from the failed reclamation on Serangan Island and drawing on academic research and the knowledge of environmental and advocacy NGOs such as WALHI and Conservation International, ForBali designed a leaflet with thirteen reasons to reject reclamation in 2013. Rather technical in character it was circulated online and offline. The reasons included: the destruction of a delicate ecological balance (as Benoa Bay is a water catchment area for five major rivers); the changing of flows and destruction of mangroves leading to erosion, flooding, ruined fishing grounds and negative impact on other marine resources. More resorts would enhance water scarcity, increase waste, pollution and traffic; it would cause an enormous economic imbalance and neglect any consideration of its wider societal and cultural impact. Here again it becomes obvious that seemingly neutral and scientific knowledge about an ecosystem and related technology can be used for both the promotion and the rejection of reclamation.

Both sides claim to want to restore and protect Benoa Bay but the investor, PT TWBI had more lasting resources to commission feasibility studies that would generate the wished-for results. Activists thus had to shift focus again and push those who are in charge of culture and religion in Bali to the front. Taking on board *adat* proved to be crucial to turning resistance into a mass movement. It required an ethical perspective that went beyond an analytical outsider's view, a perspective from those affected by reclamation that also provides a moral framework to protect nature and environment. This fits into a broader trend, in which marginalised people increasingly draw on *adat* to fight for their rights, and easily connects to an international discourse on cultural rights and environmental activism. Those activists thus needed to engage in a difficult balancing act between different ecologies, changing alliances and the merging of different moralities into a new ethical framework.

Reminiscent of contemporary global protest aesthetics, strategies and their ethical underpinnings, the anti-reclamation movement makes extensive use of a broad variety of media to express non-violent resistance that people with diverging backgrounds can identify with: T-Shirts, songs, posters, traditional theatre and dance, music and modern art, new and old media. Activists also received support from *adat* and religious figures to add spiritual mediation practices to its repertoire. The movement has its own social media team and a huge following online. Musicians and artists are at the forefront and share their concerns with their enormous following. Prominent poster artists and punk rock concerts attract thousands of youths, but ForBali organisers also include traditional arts in these mass events in order to speak to the older generation. They include traditional music and performances, letting the narrative circle around the impact of environmental degradation and land reclamation, to give expression to their main objective: the protection and continued prosperity of Balinese culture and society. ForBali activists organise large-scale demonstrations, but also make use of traditional or religious processions to spread its message such as the parade on the night before the lunar New Year. Whereas social media use allows for widespread mobilisation, the coordination of action, real time documentation, to extend the movement's reach, foster global engagement, expression of solidarity and the countering of mainstream media, offline networks and gatherings in the streets allow for the embodiment of protest and visibility beyond the circle of social media users. Diverse technologies help unify large numbers of diverse people under the banner of a shared cause.

Due to these strong networks of solidarity in Bali and beyond, the movement has been able to prevent reclamation up until today. It required a convincing movement identity that drew on international human rights and environmental rhetoric as well as local cultural resources and morality, which, in turn, requires expertise in international and national law as well as in local cultural codes and new and old media; it requires an unprecedented joining of hands, where different ethics intersect, collide and reform. Above all, it requires substantive amounts of energy and time to allow for bottom-up and consensus-led decision-making processes in the villages and the involvement of spirits and gods.

Ambivalent technologies and regimes of ethics

All parties (government and investor, environmentalists and activists, religious and *adat* figures) claim that they want to protect Benoa Bay for environmental, cultural and religious reasons. They acknowledge in some way the existing environmental problems in the area. However, the envisaged consequences and means to solve these are very different depending on the ethical frameworks in place. The reclamation party (investor and government) blames common Balinese people for using Benoa Bay as garbage dump, which requires outside intervention (i.e. reclamation). The anti-reclamation party asks the government to develop long-term and sustainable management plans for sewage, garbage and water in Bali before any further development projects are considered. Both sides draw on scientific proof and their own observations and technologies to support their positions.

Different "regimes of ethics" (High, 2022: 609) require a closer look at the different moral worlds in place, as described and analysed above. Hegemonic ideas of technical solutions to environmental problems, for example, build on the illusion of a unified science as neutral ground. However, neither is science the only valid knowledge system, nor is science a unified field or a neutral ground (Yearley, 2007: 925-927). Whereas corporate social responsibility have become integral part of capitalist interventions and business, ethics has "become a battleground where corporations and critics uphold the kind of flourishing that they believe should be brought into being" (High, 2022: 607), which is often not in line with other stakeholder groups' perceptions. But also internally, different 'regimes of ethics' are in place as High explains for her example of oil and gas companies: a specific kind of language and practice of ethics and of doing good, professional codes, and individual professional decision-making and morals. This explains why there are both scientists who support and who reject the reclamation plans on Bali, but it is also an invitation to take a closer look at the construction of regimes of ethics within stakeholder groups.

The language of environmentalism seems to provide common ground for those opposing reclamation. Such alliances work, as activists, religious and *adat* figures want the same thing, in this case to stop reclamation, save Bali's nature and empower Balinese people. The investors make use of similar language, but their moral conceptualisation of environment (or nature) is very different. Whereas it is the seat of spirits and gods for one side, it is a visible ecosystem with fixed rules that can be manipulated and managed through technology for the other. The latter assumes the clear dichotomies outlined in the conceptual framework of technology vs society, culture vs nature, and ignores the constructedness and the social and cultural embeddedness of technology and environment. It also ignores the consequences of technology, assuming everything is controllable and easy to fix (including people). It very much resonates with Indonesian development policies that impose outside models on local contexts and opt for quantity (in terms of turnover and tourist numbers) rather than quality (in terms of local people's livelihood choices).

The government's argument is not very convincing given its past policies. No sustainable water, sewage and trash policy has yet been developed for Bali, despite exponentially rising tourist numbers, and in spite of the availability of scientific technology and knowledge able to overcome such problems. Garbage is not processed, but simply deposited in a 40 hectares waste depository at the northern end of Benoa Bay. Bali is at or beyond its limits. How can the

government expect the Balinese to believe that a new mega development project can sustainably rescue or protect environment (and Balinese culture)? As a professor of Udayana's Center for Sustainable Development told me, he and his colleagues were already involved in a variety of environmental studies in and around Benoa Bay, ranging from a World Bank study on strategic environmental planning for Bali in 2000, to projects analysing the water crisis, to a waste-water treatment project supported by Japan in 2005. Bali has also hosted a couple of sustainability and climate change conferences and trainings, but these have had no direct effect on the island itself.

Diverging conceptualisations of the sacred also give expression to diverging ecologies. Most people, pro or contra reclamation, accept that Benoa Bay or certain parts of it are believed to be sacred. Ideas on how to protect this sacredness differ though. Spirituality – often taken as an antonym of the rational – is a prominent means to substantiate claims of holiness and to involve nonhuman actors in decision-making. For religious figures, restoring cosmological balance requires the safeguarding of nature and environment, the dwelling places of spirits and gods that need worship to make sure they continue providing livelihoods to the people. For the pro-reclamation people I spoke to, in contrast, sacredness is tantamount to cleanliness. For them, a polluted bay, dead mangroves or bacteria contaminated water sources cannot be sacred; rather, sacredness needs to be restored through environmental management and land reclamation. They claim this to be their moral responsibility. Besides, a cultural centre and a new temple would be built on a restored Pulau Pudut, a sacred island in Benoa Bay that has almost disappeared due to erosion, to satisfy religious needs. Reducing sacredness to cleanliness and a new temple is in line with the government's mechanistic use of scientific technologies to manage environment. It also aligns with a scientific argument in which sacredness and religious feelings can be measured and standardised and artificial islands positioned in between sacred spots, thus ignoring their interconnectedness, their unmeasurable aura and the way the visible and the invisible communicate.

The Hindu Dharma Council as the official representative body for Hindu religious affairs tried to mediate such diverging interpretations of sacredness with a decree passed in 1994 that declares mountains, hills, springs, beaches, lakes, the sea, and the confluence of rivers or river and sea to be sacred, each with its specific holiness radius. The government willingly translated it into regional regulations. Critics claim that such regulations aim to quantify sacredness, simplify the concept of the holy and rationalise religious feelings, and thus allow for better control by the government (Ramstedt, 2014b: 60; Ramstedt, 2014a: 73-74; Wardana, 2015: 115). The pro-party accuses individuals and NGOs such as WALHI of manipulating local people and making use of 'sacredness' to secure projects and funding. For villagers at Benoa Bay, Sakenan Temple and others, specific spots of land in Benoa Bay that only appear at certain times, so-called *muntig*, are sacred land and knowledge about their position and meaning is handed down from generation to generation; they cannot be created by human hand. For scientists, capitalists and adherents of a rationalised religion, they are simply the result of sedimentation and bad environmental management – another set of diverging ethical interpretations.

Social movement activists, draw on yet another kind of technology, traditional and social media, to mediate their concerns to a broader local and global public. Here, a couple of emerging concerns need to be addressed that, in fact, also apply to the other technologies: issues of access, participation and representation. It is not sufficient to provide a platform to express one's voice; voices also need to be respected and listened to, as Nick Couldry (2015) rightly argues. Media activists need to have time and draw on economic, social and cultural capital which is not readily available to all people (Couldry, 2003: 47; Juris et al., 2012: 436). They also have to have the infrastructural resources. As a consequence, participation is not only a matter of mobilisation (Atton, 2015: 7), but of resources and skills, which hints at yet another kind of morality as it is the state's responsibility to provide for these. Often, only some key activists or a group's spokespersons have the necessary skills and resources to shape the nature of movements but are not necessarily representative of the wider majority (cf. Juris, 2012).

Activists use media for their struggle that were produced by the very same enemy that they fight, corporate capitalism. It is the same media used for surveillance, control and for counteraction (Couldry and Curran, 2003: 8; Lovink, 2011). However, as Barassi (2015: 2) showed in her study on web activism, at least some political activists are very well aware of the fact that they are part of the capitalist system, and view this as enabling them to criticise 'capitalism from within'. The diverse and large numbers of social media users in the Benoa Bay case also lead to issues of representation and fragmentation. Convergence strategies, as outlined above, are meant to partly resolve such issues. The interlinkage of old and new media, way beyond the convergence strategies of Indonesia's big media conglomerates (Tapsell, 2015: 193), offers great potential as the synthesis of various kinds of media allows for a broader variety of media strategies, users and a much more diversified audience. Different people have different access to different media that each has a different reach, be it street art, social media, traditional art, video production, newspapers or online forums. As this analysis of the reclamation case shows, solidarity and a lot of strategic planning are needed to overcome such limits or draw on such potential, which, again, requires a substantive amount of knowledge of the local, national and international contexts and moralities on top of organisational skills.

Concluding reflections

The parties involved in the Benoa Bay reclamation case use technology in ways that stem from the underlying moral beliefs of their ontologies and understandings of society, motivations and interests – be it government, investor, activists, *adat* or religious figures. Technologies are thus never merely material or technical, but social phenomenon (Pfaffenberger, 1988: 236). Their usage is, at the same time, closely entangled with and influenced by local, national and international contexts and ethics in which the material and the symbolic aspects of Benoa Bay are embedded. The analysis of the actor and technology landscape and their respective ecologies reveals commonalities, contradictions and ambivalences that ask for the dissolution of the often-times imagined clear-cut divides between spheres such as technology, nature, culture or society. Technologies are highly ambivalent as they contain contradictory forces and are simultaneously 'good' and 'evil'. Depending on the moral ecologies in which they are embedded, technologies are used to either exploit or protect the environment, to manage it or to mediate between the various actor groups. Both investor and activists use scientific analyses to substantiate their claims, with different motivations and results. Religious and *adat* figures oppose technological supremacy, but make use of modern technology to amplify their ethical and group struggle against imperial injustice. They need to make strategic decisions that might look contradictory to their worldviews at first glance, but are mainly pragmatic (cf. von Bremen's analysis of seemingly contradictory indigenous strategies with regards to imposed developmentalism in Latin America 2017). Being part of diverging ecologies (Bräuchler, 2018), religious and *adat* people are aware of their involvement in and dependence on the tourism industry, but they want to have more control over use and benefit of cultural and environmental resources and development (see Reuter, 2009; Warren, 1998). For them, the moral reasons to reject reclamation are twofold, involving both *sekala* and *niskala*, the rational/visible and the spiritual/invisible. This underlines a dilemma Castells (2010a: 184) outlined for the environmental movement more generally, where he found both a "profound distrust of the goodness of advanced technology" and that the movement is keen on "gathering, analyzing, interpreting, and diffusing scientific information about the interaction between man-made artifacts and the environment". Such information helps them to go beyond "shortsighted strategies geared toward the satisfaction of basic instincts" and to promote "intergenerational solidarity" (Castells, 2010a: 184) as well as the restoration of the harmonious relationship between humans and nonhumans, *sekala* and *niskala*. The translatability and connectivity of local ethical concepts such as *tri hita karana* to international environmental discourses and rhetoric give these *adat* and religious figures a strong standing.

In analysing such complex cases, the notion of 'neutral' technology or of a simple choosing between the use or rejection of technology makes no sense. Technologies are not to be mistaken for the new possibilities they bring with them, but we need to analyse whether, how and why people capitalise on those possibilities (Pfaffenberger, 1988: 240), which depends on the various contextual levels and moralities we have looked at. Technology (and its use) needs defining as a 'total social phenomenon' including rituals and religious beliefs as well as the performative adoption of, for example, media. We need to look at the practices that are, one way or the other, related to technologies, and how actors pull things together surrounding such practices (cf. discussion on media-related practices in Bräuchler and Postill, 2010). Such an approach reveals the ethical relativity of any conceptualisation of technology, society or culture and the multiple relations, dependencies and embeddings between them. As Niewöhner and colleagues note, knowledge and technology "do not exist outside of practice and therefore can only be studied as part of practice" (Niewöhner et al., 2012: 40-41) and, I would add, as part of power politics and moralities, involving human and nonhuman agency that are always embedded in concrete historical, social and cultural contexts. STS research and anthropologically informed approaches can help to investigate the ethical relationships between technology, the human and the nonhuman. They can help to carve out spaces for dialogue and diplomacy, needed to negotiate inclusive solutions for differently articulated environmental problems and modes of existence (Kouw and Petersen, 2018; Latour, 2013; Feenberg, 2002: 22). This article opens up such a space for the Bali case and similar ones.

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Notes

1 In this article, I use the terms 'ethics' and 'morality' interchangeably. For a discussion on possible relationships between the terms see Fassin (2012).

2 For an analysis of the internal differences within stakeholder groups involved in another case in Indonesia see, for example, Bräuchler (2023).

3 For more details on the *adat*/religion rationale in the reclamation case, see Bräuchler (2020).

Thinking Like a Machine: Alan Turing, Computation and the Praxeological Foundations of AI

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Abstract

As part of ongoing research bridging ethnomethodology and computer science, in this article we offer an alternate reading of Alan Turing's 1936 paper, "On Computable Numbers". Following through Turing's machinic respecification of computation, we hope to contribute to a deflationary position on AI by showing that the activities attributed to AIs are achieved in the course of methodic hands-on work with computational systems and not in isolation by them. Turing's major innovation was a demonstration that mathematical and logical operations could be broken down into elementary, mechanically executable operations, devoid of intellectual content. Drawing out lessons from a re-enactment of Turing's methods as a means of reflecting on contemporary artificial intelligence (AI), including the way those methods disappear into the technology, we will suggest the interesting question raised in "On Computable Numbers" is less about the possibilities of designing machines that "can think" (cf. Turing, 1950), but the practical work we do, and which is made possible, when we ourselves set out to think like machines.

Keywords: Turing Machine, Computation, Artificial Intelligence, Ethnomethodology, Re-enactment

Introduction

The foundations of Turing's 'thinking machines' (Turing, 1950)—and by extension the aspirational research programme(s) of 'artificial intelligence' (AI) and core assumptions about the *computational* character of 'intelligence' that AI mobilises—are built upon Turing's earlier work on computability and Turing Machines (Turing, 1936). In this paper we want to examine the overlooked praxeology of Turing Machines (TMs) as an imagined—and widely claimed—precursor for AI.

By attempting to create a simple TM as part of a course of "technical self-instruction" (Sormani, 2016), we reveal *how instructions come to constitute machines that do things 'on their own'*—and in doing so advance an ethnomethodologically-informed corrective to what we think are lingering reifications of 'machine autonomy' in AI. Our core argument is that the circumstances in which machines are brought off as 'autonomous', as demonstrating 'artificial intelligence', can be traced back to the same kinds of underexamined practical work revealed when we attempt to piece together TMs for ourselves: familiar activities to any Computer Science undergraduate, but largely unremarked in any explicit fashion by Turing himself and others since.

Partnered with what we could call Turing's 'disappearing act'—the dematerialisation of the practical construction of TMs into the TMs themselves—is a conflation of *human* computation with *machine* computation as a way of conceiving of the machine in the first place[1]. This starts with Turing's original focus, namely, human computers doing computations, being seamlessly transformed into machines doing computations in what are presented as equivalent ways. That originating conflation is stubborn and has underpinned misunderstandings about the capabilities of machines and humans in discussions of AI ever since (cf. Collins, 1990; Brooker et al., 2019a). What we seek to provide here is a praxeologically-oriented corrective to that conflation, a corrective which at the same time will make Turing's work visible again. We will do so via an account of 'getting the TM to compute', which displays just how machine computation rests on human activity (e.g., on the production and delivery of machine instructions), in every case, at all points. Though these machines can be used to do profoundly impressive things, they do not set up or operate themselves, and focussing on the practicalities of what must be done (by people) to get the machines to work affords some clarity to a set of fields where distortingly inflationary discourses can tend to prevail (cf. Elish and boyd, 2018; Brooker et al., 2019a; Campolo and Crawford, 2020; Mair et al., 2021).

Modern computational technologies are, of course, far more sophisticated than Turing's original examples, but, as with Turing's machines, we will continue to misunderstand their capabilities if we insist on recasting them as somehow either directly mirroring human practices or as working 'on their own' (cf. Suchman, 2006; Holton and Boyd, 2021). While many regard attempts to define AI as a fools' errand—part of the phenomenon not a means of bringing it into view (e.g., Seaver, 2019) —we believe the only serious means of addressing AI is to get a more precise handle on what these technologies do and how. This is why we use this paper to develop an "alternate" (Garfinkel, 2002: 72-73) reading of Turing's 1936 paper, "On Computable Numbers, with an Application to the *Entscheidungsproblem*", a return to Turing that helps us recover what is involved in building a machine that, allegedly, and at its most foundational level, 'does things for itself'.

More specifically, by drawing out lessons from a re-enactment of Turing's methods as a site which opens up the praxeological "foundations" of AI in under-appreciated ways (Lynch et al., 1983: 208; Garfinkel 2022: 182), we will suggest the interesting question raised in "On Computable Numbers" is less about the possibilities of designing machines that "can think" (Turing, 1950), but the practical work we do, and which is made possible, when *we ourselves* set out to think like machines, i.e., when we are devising instructions and frameworks for instructing machines to performs tasks such as calculating.

Turing's contribution in "On Computable Numbers"—an imaginative as well as formal one that cut across logic, mathematics, engineering, philosophy and psychology—was a demonstration that mathematical and logical operations could be broken down into elementary, mechanically executable operations that are devoid of intellectual content and can be implemented without understanding. If we follow Turing's computational methods, these are operations which can be carried out by machines; Turing Machines, as they have since come to be known. Indeed, by respecifying the doing of mathematics and logic in the particular ways that he did, i.e., as strings of elementary non-intellectual processes, Turing showed machines could

be constructed which could in principle carry out any operation capable of being computed whatsoever[2], depending only on the ingenuity, accuracy and precision of the instructions they were supplied with, becoming in the process what he termed "universal machines" (Turing, 1936: 242; Turing, 2005[1945]: 371-372), conceptual counterparts to contemporary digital computers (see, e.g., Piccinini, 2003: 28). The question remains, however, as to how instructions for such machines are to be formulated in any actual case. In dialogue with a growing literature on data, algorithms, automation, machine learning, artificial intelligence and programming (e.g., Agar, 2003, 2017; Benbouzid, 2019; Brock, 2016; Brooker et al., 2019b; Burrell, 2016; Burrell and Fourcade, 2021; Elish and boyd, 2018; Fazi, 2016, 2018; Jaton, 2020; Lee, 2020; Mackenzie, 2017; Rieder, 2020; Seaver, 2019; Smith, 2019; Ziewitz, 2016), we seek to open up features of the work involved; work which cannot be recovered from the machine through cognitive analogies or models of thought or mind, but only by attending to the practical activities through which it is accomplished (Lynch et al., 1983; Garfinkel, 2022). Based on our re-enactment of the work of instruction in Turing's paper as a "tutorial problem" (Garfinkel, 2002: 145), we argue that acquainting ourselves with ways of thinking with and through the kinds of methods found in Turing's work helps us recover the computational foundations of AI via an understanding of the practices involved in its achievement. Seen thus, as we shall argue in conclusion, AI, as "engineered design" (Garfinkel, 2002: 268), emerges as a reproducibly instructable phenomenon (Lynch and Lindwall, forthcoming). Following Turing's machinic respecification of computation through and clarifying its grounds, we hope to contribute to a more consistently deflationary position on AI, dispelling AI's "magic" (Elish and boyd, 2017; Campolo and Crawford, 2020) and defusing its "drama" (Ziewitz, 2016) by showing the activities attributed to AIs are achieved in the course of methodic hands-on work with computational systems and not exclusively *by* them. If we are to recover the work practices through which AI systems are crafted, however, we need to be alive to the ways in which those practices are made to disappear into those systems once built. Understanding how Turing first formalised that 'disappearing act', we argue, provides important lessons for anyone seeking to unpick its contemporary equivalents in the field of AI, something we tease out in the discussion with reference to AlphaGo and its successor algorithms but which is an issue with broader relevance still.

Conceptualising computation: two ways of thinking about Turing's work

Whether or not Turing's work had any significant bearing on the construction of modern computers is a contested issue (see, e.g., Sloman, 2002 on Turing's "irrelevance" there). Indeed, Agar (2003, 2017) has argued, "On Computable Numbers" looked less to the future and the digital computer than back to the general purpose 'machinery' of government and the bureaucratic reorganisation of clerical work within it into simplified tasks arranged in both serial and parallel orders as part of a procedural, we might even say algorithmic, division of epistemic labour. Nonetheless, Shanker's (1995) notes in his reflection on "Computing Machinery and Intelligence" (Turing, 1950), Agar's (2003) 'governmental' reading and 'Turing realists' like Sloman share common ground. All agree Turing's early work (a) did influence those involved in building the first generation of computers, such as von Neumann, by offering them an initial logical model (see Gandy, 1988), and (b) retrospectively played a pivotal role in the formation of AI as a field in the 1950s by figures such as McCarthy, McCulloch, Minsky and Simon, as it provided them with a clear sense of what the phrase "Artificial Intelligence" could be taken to mean when rendered computationally. In this sense, "On Computable Numbers" represents a pivotal move because in it Turing effects a logical refutation of the proposal that computation could be treated as part of analytic philosophy, i.e., as aprioristic, deductive and strictly logically derived. In refuting that proposal, he instead relocated computation to a domain of practical, empirical, trial and error work – comput*ing*, in the active sense – involving the construction of devices for stabilising and testing computability as a contingent matter (cf. Fazi, 2018). The paper crucially, therefore, worked as a ground clearing exercise that helped establish space for subsequent developments in comput-

ing *and* what would come to be called AI. Central to Turing's contribution in this regard as the earliest published breakthrough in formulating potential bases for specifying 'machine intelligence' were what Shanker terms his "two questions": "the philosophical question …: Can machines think? … and the psychological question: Do thinkers compute?" (Shanker, 1995: 52). For Shanker (1995),

> These two questions belong to very different traditions. The former was a central concern of English mathematicians in the nineteenth century (e.g., Babbage, Jevons and Marquand); the latter a mainstay of empiricist psychology in Germany, England, and America. But Turing not only regarded these two questions as intimately connected: in fact, he thought they were internally related—that in answering one you would *ipso facto* be answering the other. The result was a remarkable synthesis. (p. 53)

This intended synthesis had many strands and we do not have space to fully set out Shanker's detailed examination of them here, though we would encourage readers to consult Shanker's work for themselves (e.g., 1987, 1995, 2002). However, we do want to offer an outline of one aspect of Turing's work in "On Computable Numbers" as part of rethinking how we might approach the second question in particular.

That said, offering an easily-digestible exegesis of even a small part "On Computable Numbers" is a far from straightforward task. For one thing, ten of its eleven sections plus the introduction and the 1937 appendix are given over almost entirely to working through what for lay readers are formidably complex problems of mathematical logic—without the requisite background in mathematics and mathematical logic, a background which Turing could reasonably assume his contemporary readers had, these sections are opaque to say the least (though see Petzold, 2008 for a helpful line-by-line discussion as well as, e.g., Agar, 2003, 2017, Fazi, 2016, 2018 and Gandy, 1988 for more wide-ranging and differently oriented accounts). For another, the work Turing does within the paper is transgressive; grounded in mathematical logic but crossing into philosophy, speculative engineering and psychology in an idiosyncratic fashion. Nonetheless, despite—indeed, because of—these difficulties, the paper contains valuable lessons. It occupies an important place in Turing's intellectual programme because it is there where Turing formalises his respecification of computation with reference to the activities of *human* computers, that is, *individuals* undertaking the work of calculation. This is part of the framing of the paper in §1— "We may compare a man in the process of computing a real number to a machine" (1936: 231)—and the focus of §9, more specifically Turing's "appeal to intuition" (1936: 249), which elaborates on the basis of that comparison. It is from there, following Shanker, that we take the argument up.

The first point to note is that during the time Turing was writing his 1936 paper, (i.e., prior to the introduction of machines to do the work), human computers were employed in government and industry to perform long and time-consuming mathematical operations based on instructions issued to them (see Agar, 2006). In a context where calculative operations had already been rendered increasingly 'mindless' through an atomising clerical division of labour driven by large corporations and governments over decades if not a century or more (Agar, 2003, 2017)[3], Turing sought to reduce their work even further to its behavioural minima. In Turing's analysis, while the outcomes of that work could be highly sophisticated, the individual tasks these human computers performed seemed simple and did not appear to have to be treated as involving any deep, complex mathematical reasoning beyond writing down symbols one after another according to a prescribed series of steps accessed by looking up input tables and logbooks. As Shanker puts it, Turing was reimagining a typical human computer "performing the most routine of calculating tasks in order to … break calculation down into its elementary … units" (1995: 74). As those units, those behavioural minima, could be shown to be "devoid of intelligence" and mechanistic in their operations, Turing notes we "may now construct a machine to do the work of this computer" (Turing, 1936: 251). Such machines came to be dubbed "Turing Machines" and proved influential as Turing showed that they could be used for computation on a formal and thus provably rigorous, logical and mathematical basis. With this machinic respecification of the problem of computability in hand, Turing could argue that "the machine's 'behaviour' … satisfies

our criteria for saying that it is 'calculating' because its internal operations are isomorphic with those guiding the human computer" (Shanker, 1995: 80). The equivalence is established on this basis: bracketing the material and situational differences between them, machines can be said to be calculating, on Turing's analysis, because they are doing what human computers do when they 'compute', i.e., working through 'recursive functions', algorithmic chains of elementary operations; and when human computers calculate they are doing what computing machines do, i.e., working through the same recursive algorithmic functions composed of simple steps albeit at the time in lengthier and more complex combinations. In Davis's (1978) summary,

> Turing based his precise definition of computation on an analysis of what a human being actually does when he computes. Such a person is following a set of rules which must be carried out in a completely mechanical manner. Ingenuity may well be involved in setting up these rules so that a computation may be carried out efficiently, but once the rules are laid down, they must be carried out in a mercilessly exact way. (as cited in Shanker, 1995: 73)

In Turing's work, exactly the same parameters were to be applied to computing machines as to human computers because their operations were designed to "include all those which are used in the computation of a number [by the former]" (1936: 118; see also Gandy, 1988; Piccinini, 2003; Sieg, 2009).

Shanker goes on to critically deconstruct Turing's account with respect to the drawing of that equivalence, "question[ing] the whole basis of Turing's interpretation of the logical relation in which algorithms stand to inferring, reasoning, calculating, and thinking" (1995: 81-82). He does so, with reference to Wittgenstein, by showing that our practices of calculation are not the same as the operations of the computing machine (see also Collins, 1990 for related arguments). Shanker's response to Turing's second question is consequently a negative one: humans do not compute in the same terms machines do. However, while we endorse Shanker's analysis, we want to take the discussion in a somewhat different direction, picking up on matters Shanker and others have left unremarked. Those matters are foreshadowed in Davis's gloss above, "Ingenuity may well be involved in setting up … rules so that a computation may be carried out …" and take us to Turing's stated objective of "construct[ing] a machine to do the work of … [a] computer" (again, as cited in Shanker, 1995: 73) and not just one capable of handling single computations but whole classes of them – Turing's "universal computing machine" (1936: 241). Just what is this ingenuity and just how is to be embodied in the construction of such a machine? Insofar as Turing is presenting a conceptual blueprint for that machine and *was thus himself engaged in computing work*, what was *he* doing and *how*? Finally, how might that work be recovered from Turing's published accounts of it?

Just as with the work of the human computer it is said to derive from, the work of the machine as it computes is entirely unlike the (human) work that goes into setting it up to do so. Yet while distinct, in this case the two *are* intertwined. Indeed, and in an important sense, 'the machine', such as it is, can be seen *as* being constituted by its tables of instructions and thus the work that has gone into formulating them (Turing, 1936: 243). Here then, contra Shanker, we do have an internal relation. However, when we start to look within Turing's paper for the work of devising those instructions, of thinking in mechanical terms about computation for the purposes of building an instructed and instructable machine, we find we can locate the machine easily enough but the instructive work that constitutes it proves much more elusive.

In his later 1945 report on the construction of the Automatic Computing Engine or ACE, *Proposed Electronic Calculator* (reproduced in Copeland, 2005), Turing (2005) notes

> It is evident that if the machine is to do all that is done by the normal human operator it must be provided with the analogues of three things, viz. firstly, the computing paper on which the computer writes down his results and his rough workings; secondly, the *instructions as to what processes are to be applied*; … thirdly, the function tables used by the computer must be *available in appropriate form to the machine*. (p. 371, emphasis added)

He (Turing, 2005) goes on:

> It is intended that the setting up of the machine for new problems shall be virtually *only a matter of paper work*. Besides the paper work nothing will have to be done except to prepare a pack of … [punch] cards in accordance with this paperwork, and to pass them through a card reader connected with the machine. There will positively be no internal alterations to be made even if we wish suddenly to switch from calculating the energy levels of the neon atom to the enumeration of groups of order 720. It may appear somewhat puzzling that this can be done. How can one expect a machine to do all this multitudinous variety of things? The answer is that we should consider the machine as doing something quite simple, namely *carrying out orders given to it in a standard form* which it is able to understand. (p. 372, emphasis again added)

The phrases "instructions as to what processes are to be applied … available in appropriate form"/ "orders given … in a standard form" make it clear that Turing was seeking to devise a framework—a set of reproducible methods—for working through the instructions these machines were to be given as the basis of that "standard form". Turing's machines could do all manner of things if instructed in the right way but, as we can see, that hinged on working out the instructions, exercising the "ingenuity" Davis points to along the way. Put differently, there is lots of relevant action—i.e., the careful design of instructions that can be supplied to and carried out by a machine, yet which will have some meaningful purpose resulting from their execution (i.e., will be able to be made sense of and thus made relevant in a specific social context)—bracketed off here as "only a matter of paper work". Yet nowhere is it made clear just how that "paper work" is to be done. While this unspecified set of activities is almost entirely glossed over by Turing, we argue it sits at the foundations of AI then and now, foundations we attempt to excavate praxeologically in what follows.

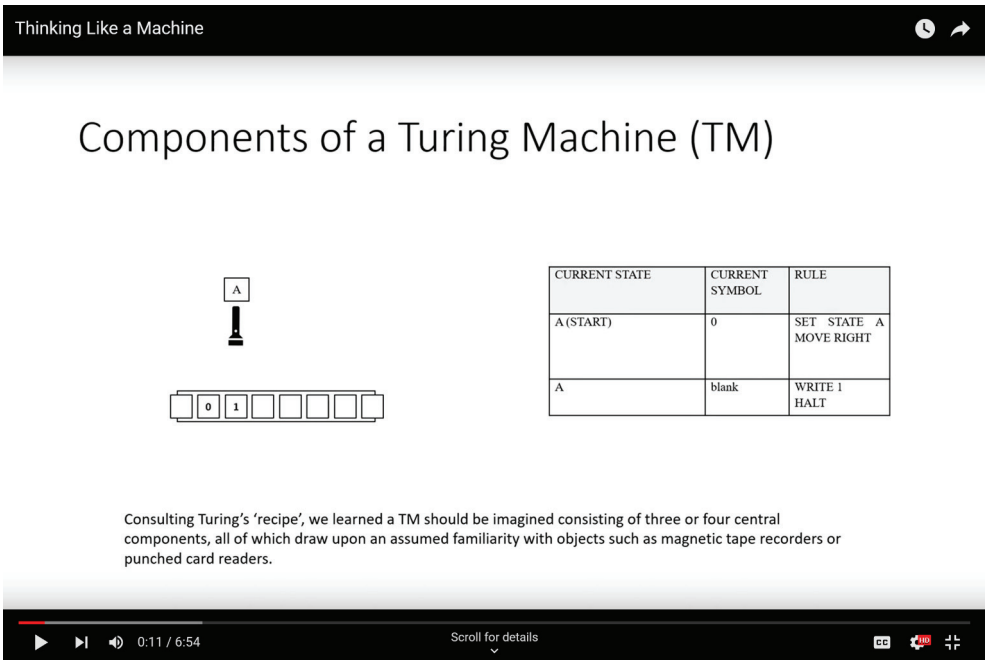
Human-machine asymmetries as a tutorial problem

As we have begun to explore in a preliminary way above, it is not exactly the case that Turing's model treats humans and machines as engaged in the same activities—the very articulation of the mechanisms of a Turing Machine by Turing himself shows us otherwise. There is, instead, a 'pairing' here, i.e., the framing of the instructions and the instructed operations of the machine, but they are not reducible to one another, and their internal relations are alternately *a*symmetric as Garfinkel (2002: 114) puts it. That is, it is possible to get from the first to the second (indeed the instructions, which are often materially encoded in the case of digital computers, define 'the machine') — *but not the other way round*. Reading Turing's 1936 paper, however, as we have noted above, provides little sense of how *he* constructed the machine at least explicitly[4]. Nor can the work which went into figuring out those instructions and putting them into a "standard form" be recovered by looking at the inputs and outputs of the machine alone. The practical work of "making a universal machine" (Jaton, 2020: 103) is thus missing from the picture, and while that is not problematic for all purposes, it does highlight a praxeological gap for those seeking to understand 'autonomous' machines more generally, not least because a consideration of Turing's own methods shows us the two cannot be meaningfully separated out.

One way to recover Turing's prototype methods could be via a detailed examination of "On Computable Numbers", working through what Turing was doing in its successive stages as part of a critical textual hermeneutics of computation (cf. Fazi, 2018). However, following Garfinkel's later work (e.g., 2002, 2022) and the example of studies by the likes of Livingston (1986), Bjelić (1996), Sormani (2016), Sharrock and Ikeya (2000), and others (e.g., Brooker and Mair, 2022), we want to instead proceed somewhat differently and "misread" Turing's 1936 paper, treating it not as an established logico-mathematical proof but an instructional guide for "construct[ing] a [Turing] machine" that we ourselves can attempt to follow as part of a course of "technical self-instruction" (Sormani, 2016: 102-136) in the foundations of AI. In this, the text of the paper furnishes "clues" (Bjelić, 2003: 133-136). While we would certainly not suggest Turing's methods are the *only* way of constructing them, our misreading provides an occasion for a pedagogic tutorial in the work

of making 'computing machines' via a consideration of their instructed character. Through that tutorial, we want to consider the lessons that might be learned from gaining a first-hand appreciation of their constitution. In this case we will use different diagrams as part of a re-enactment designed to demonstrate the workings of a paper TM assembled from scratch for a particular computational purpose. These diagrams are not part of Turing's paper but intended as pedagogical devices to guide readers through the machinery of TMs and make them instructably observable, in Garfinkel's phrase (2002: 136), in relation to the specific courses of specific action and reasoning that machinery is coupled to. It is with this in mind that we invite readers to draw out their own TM, as per the instructions below, and follow along with the operation of those instructions to see the praxeological sense they have first-hand. For those who might benefit from a further talk-through of our TM, see Clip 1 below. Voiced by a machinic narrator, the choppy, robotic delivery is fitting given our subject matter.

Our approach here is novel in the sense that most analyses of Turing's work take up its implications for two domains. On the one hand, its implications for philosophy, logic, mathematics and formal theories of computation and AI (as in, e.g., Fazi's (2018) work); and on the other hand, for the practical construction of digital computers and 'artificially intelligent' systems and the economic, social, political and cultural developments, positive and negative, both have shaped but have also been shaped by (as in, e.g., Agar's 2003, 2017 work). As a result, Turing's machinic respecification of 'intelligence' as a practically reproducible matter of computational engineering, has not been traced through in relation to the situated courses of methodic work in and through which Turing developed it. This 'missing' element in treatments of Turing's work, how it might be opened up and what it might reveal is something we came to notice on the basis of reading Turing alongside prior ethnomethodological studies of scientific and technical practice, including Ziewitz's (2017) "experiments with the ethnomethods of the algorithm". In circumstances where the original courses of practical activity being explored are inaccessible, as is the case in relation to Galileo's demonstrations (Garfinkel, 2002; Bjelić, 1996, 2003; Livingston, 1995b) or Goethe's experiments with colour (Bjelic and Lynch, 1992), through re-enactments of demonstrations and experiments, ethnomethodologists have sought to make at least some of the contingent specificities of the practices involved available again, "for

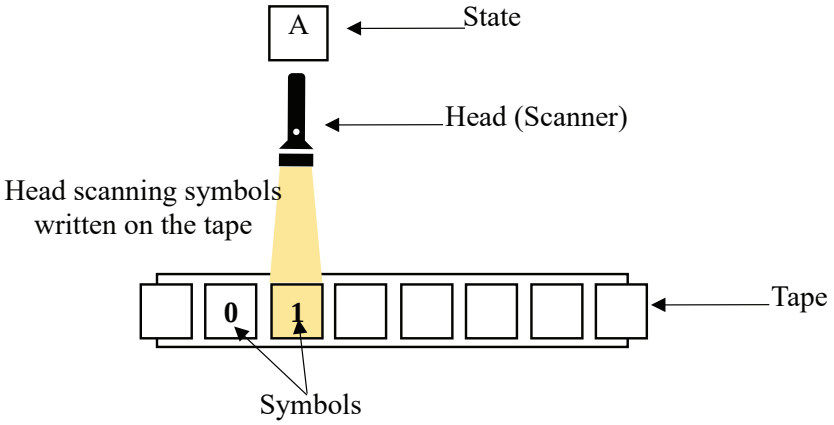


Clip 1. Video: "A machinic talk-through of a Turing Machine". This video is available at: https://www.youtube.com/watch?v=Ln_WC9pARoE

another next first time" (Garfinkel, 2002: 98, 216). Since re-enactments are by their nature subject matter specific, this study is, thus, a contribution to, rather than an application of, a growing body of work in ethnomethodology that mobilises re-enactments in engagements with science and technology. At the same time, it is also a contribution to debates about diversifying methodological repertoires within STS (Lippert and Mewes, 2021; Silvast and Virtanen, 2023). On the latter, ethnomethodological re-enactments can profitably be read alongside related work being developed in other areas of STS (see, e.g., Kirksey et al., 2021). While the ethnomethodological character of studies such as ours is distinctive, we also view such studies as sites for productive dialogue in STS, as our own engagement with the work of Agar, Jaton, Fazi and others goes some way to demonstrating.

Re-enacting Turing: "On Computable Numbers" as a site of technical self-instruction

An important initial question for any such endeavour, as Bjelić notes (2003: 133), is; where to start? Before we could begin to construct our own TM, our initial engagement with Turing's text made it clear we needed to familiarise ourselves with its constituents. Consulting Turing's 'recipe', we learned a TM should be imagined consisting of three or four central components, all of which draw upon an assumed familiarity with objects such as magnetic tape recorders or punched card readers, key technologies of Turing's day. First, a 'tape' which is divided into equal-sized blocks where each block can contain a single symbol at most (see Figure 1). Second, a 'head' or a scanner which can move either left or right to scan the symbols written on the tape, with the machine also having the capacity to erase an existing symbol or write a new symbol on the tape. At any given time, Turing tells us, the machine is in a particular 'state'—therefore, a means of recording and identifying the current 'state' of the machine is required too. That identifiable machine 'state', i.e., what at any moment it is set up to do, is the third component of a TM. Based on the state and the symbol currently being scanned, a TM determines which instruction is to be carried out next. These instructions are to be represented in a table-like format (see Figure 1) akin to the tables



CURRENT STATE	CURRENT SYMBOL	RULE
A (START)	0	SET STATE A MOVE RIGHT
A	blank	WRITE 1 HALT

Instruction Table

Figure 1. Components of a Turing Machine

human computers would follow. This 'instruction table'—Turing calls them 'configuration tables' because they constitute structural arrangements of the machine—is the fourth and final component of a TM. While the third and fourth components can be combined, it made sense to us to keep them separate as it allowed us to more easily track and make explicit the logic of the machine's parts in terms of their respective functions, particularly important given our machine was to be used as a demonstration device. Moving from the formal recipe to a working version of the diagrammed schematic depicted in Figure 1 helped us in that regard but it remained a preliminary step. We still needed to work through a set of operations which would enable us to both explore and elaborate how we could animate the machinery, putting it to computational work, and for that we needed a concrete application, something the TM could process and in as clearly followable a form as possible.

For our present purposes, we decided to take a simple arithmetic operation as our "tutorial problem" (Garfinkel, 2002: 145) so we set out to build a TM based on our schematic that could check if a number is divisible by three. The first issue we faced was this: how would we use the "engineered design" (Garfinkel, 2002: 268) Turing bequeathed us and which we had just familiarised ourselves with to determine divisibility by three? We needed something that could be sequentially processed through elementary non-intellectual steps and which could operate in line with the components listed above. We thus had to formalise the problem. We settled on finding the remainder left when we divide a number by three as it allowed us to introduce a binary logic to the machine's operations. That is, if the machine indicated that a remainder was zero, we could then conclude the number was divisible by three. If the machine gave us back any number other than zero, we could conclude the reverse. This way of finding remainders is called a 'modulo operation' in computing. While modulo operations can be performed with any two numbers, to keep our TM as simple as possible we restricted the divisor to 3. However, the dividend in this case had to be extended to any possible natural number if our TM was to do its projected job. In setting the TM up, we were, then, directing it to work through how many times the divisor would go into the dividend—whatever number that might happen to be—and we were to call that number the quotient, and whatever was left over we were to call the remainder. For example, if we divide 7 by 3, we get 2 as the quotient (as 3 goes twice into 7) and 1 as the remainder ($7-(3*2)=7-6=1$). If we were able to set our TM up effectively, it should indicate the remainder is not zero in this case, enabling us to conclude that 7 is not divisible by 3.

From many examples like this one, we can derive the following formalisation/formula:

$$remainder = dividend - (divisor * quotient)$$

It was this formula we generalised into a method for finding remainders that we wanted to implement using a TM. To simplify our local specification of Turing's design further, reducing the parameters of the problem operationally, we realised we should restrict the symbols on our TM's input tape to 0, 1, 2 and 'blank'—for 'do nothing else' or 'halt'—as the only symbols which could be scanned, thus limiting the number of instructions we would have to write for it. On top of this, informed by the way digital electronics offers simpler implementation for binary systems, we would opt to use binary numbers to represent the dividend as part of reducing the number of symbols required to represent it. If we were to opt instead for the decimal system, we would need a set of 10 symbols (0, 1, 2, 3, 4, 5, 6, 7, 8 and 9) and a much more complex set of accompanying instructions by extension. Using the binary system to codify the dividend, by contrast, meant we would only need to use two symbols (0 and 1) to represent any natural number. This would also reduce the number of configurations required to perform the computation. These choices had a neat symmetry: our TM would only need to be able to read and write 0, 1 and 2 as we could use 0 and 1 to represent every possible dividend from a given input sequence; and we could also use all three of them for our output sequence with 0, 1 and 2 as the only possible remainders when we divide a number by three. The 'blank' symbol would be there to instruct the TM to stop. Finally, to further simplify our TM in comparison to those in Turing's

paper, we disallowed backtracking and instead restricted the TM to moves in one direction. That is, our TM would not go backwards and forwards along the tape selectively, but instead 'dumbly' proceed through the symbols it was presented with one by one in linear sequential order.

Our strategy from there in implementing this 'solution', as such things are called, was to start at the simplest possible point, at first working on and testing instructions we'd need to set out for checking the three-divisibility of an 'easy' number that would have 0 as the dividend. Then we wanted to gradually increase that number with every subsequent step so as to ensure our TM would not skip potentially relevant cases and help us to see what we would need to do to get the TM to handle *any* number. For each of those steps we would write down the tabular instructions—the machine configuration—required to perform the computation in that step, a way of "reverse engineering" the computational mechanisms we needed the TM to be built around step-by-step in parallel with the unfolding logic of the solution we were seeking to develop via the TM (see Brooker and Mair, 2022). In other words, rather than work out the instructions in advance, we would specify them *as we went along* to give us the results we expected in relation to the computational problem at hand (an approach we might characterise as central to programming's work more generally).

Understanding the components and having a plan is one thing, however, putting both into action another. How to get the TM going? As we learnt from Turing, a TM can be started with an input string—a sequence of symbols written somewhere on the tape—as long as we specify all the states at which the machine can start scanning that input string. However, the machine can only have a finite number of states so some of these states need to be denoted as 'START' states. Similarly, we also needed 'END' states to instruct the machine when to halt its operations i.e., at the end of computation. In any given state, a TM can find any possible symbol accepted by the machine, and thus, we needed to write *all* the possible combinations of states and symbols in the instruction table so as to avoid our TM encountering trouble in the form of missing instructions. This way a TM instructably moves from a START

CURRENT STATE	CURRENT SYMBOL	RULE
A (START)	0	SET STATE A MOVE RIGHT

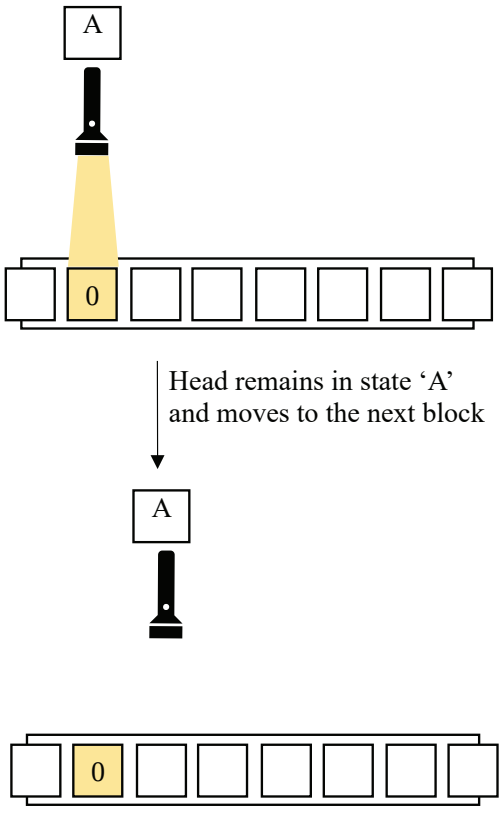


Figure 2. Three-divisibility of '0'

CURRENT STATE	CURRENT SYMBOL	RULE
A (START)	0	SET STATE A MOVE RIGHT
A (END)	blank	WRITE 0 HALT

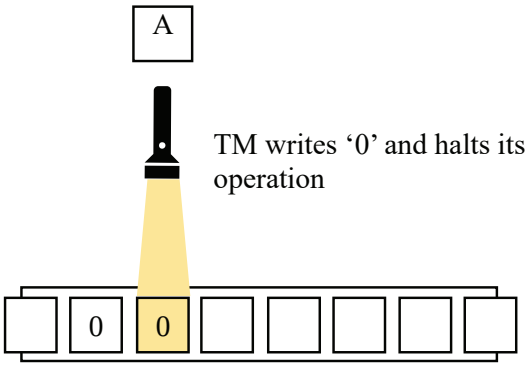


Figure 3. Three-divisibility of '0' (contd.)

state to an END state to perform a given computation.

With all that covered and retracing the ground of our re-enactment, let us start by checking the three-divisibility of 0: as 3 is not contained within 0, both the quotient and the remainder $(0-(3*0)=0)$ are 0 in this case. The binary representation of 0 is also 0 and we write it down on the tape (see Figure 2). So, in this case, at the beginning of the computation, the TM will find 0 on the tape. Following Turing's instructions more or less, this is the 'START' state of the machine and we represent it as 'A'. So, the current symbol at the current state 'A' is 0. When the machine is in this situation, we instruct it to remain in state A and move the scanner to the right. We write down this instruction under the 'RULE' column of our instruction table. At this stage, our instruction table looks like Figure 2.

As instructed, the TM's scanner moves to the next block, and it finds a 'blank', an empty block that does not contain any symbol (see Figure 2).

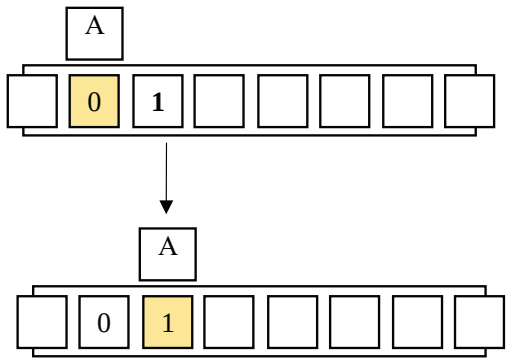
CURRENT STATE	CURRENT SYMBOL	RULE
A (START)	0	SET STATE A MOVE RIGHT
A	blank	WRITE 0 HALT
A	1	SET STATE B MOVE RIGHT

Figure 4. Three-divisibility of '01'

So, currently the state is A, and the symbol is blank. In this case we already know that the remainder should be 0. So, we instruct the machine to write down the output 0 at the current empty block and halt the computation (Figure 3). This particular state where the TM halts its operations is one 'END' state of the machine. This way for input 0, we can find the correct output 0 as the remainder, with zero being divisible by any integer.

Next, we move from considering the three-divisibility of 0 to considering that of 1, which is 01 in binary. So, instead of a blank, imagine that our scanner encounters a 1 in its place in the last step (i.e., the sequence becomes 01 (see Figure 4)). However, in this case, the machine needs to be moved into a new state because our instruction table does not yet contain any instructions to address the case when the remainder is 1 ($1-(3*0)=1$). We will call this state 'B'.

As instructed, the TM will move its scanner to the next block, and it will find another blank there. Where the current symbol is a 'blank' and



CURRENT STATE	CURRENT SYMBOL	RULE
A (START)	0	SET STATE A MOVE RIGHT
A (END)	blank	WRITE 0 HALT
A (START)	1	SET STATE B MOVE RIGHT
B (END)	blank	WRITE 1 HALT

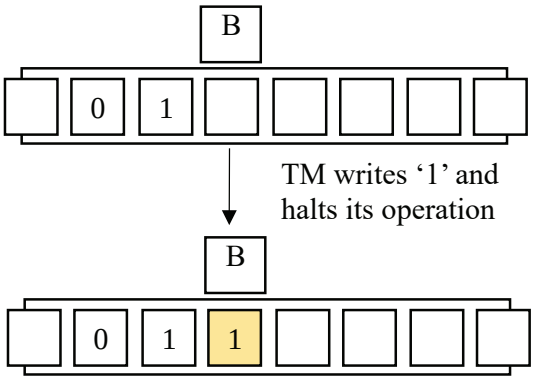


Figure 5. Three-divisibility of '01'

the current state is 'B' (see Figure 5) we have a new situation for our machine, and it needs to be represented in the configuration table. As we know the remainder in this case is 1, we will instruct the machine to write 1 before halting its operations as per the updated instruction table n Figure 5. In terms of how we progressively built our learning into the instructions we were developing as we moved along, because we were representing our dividend in binary, at the beginning of a computation, i.e., in the TM's START state, our TM could encounter either 0 or 1.

CURRENT STATE	CURRENT SYMBOL	RULE
A (START)	0	SET STATE A MOVE RIGHT
A (END)	blank	WRITE 0 HALT
A (START)	1	SET STATE B MOVE RIGHT
B (END)	blank	WRITE 1 HALT
B	0	SET STATE C MOVE RIGHT

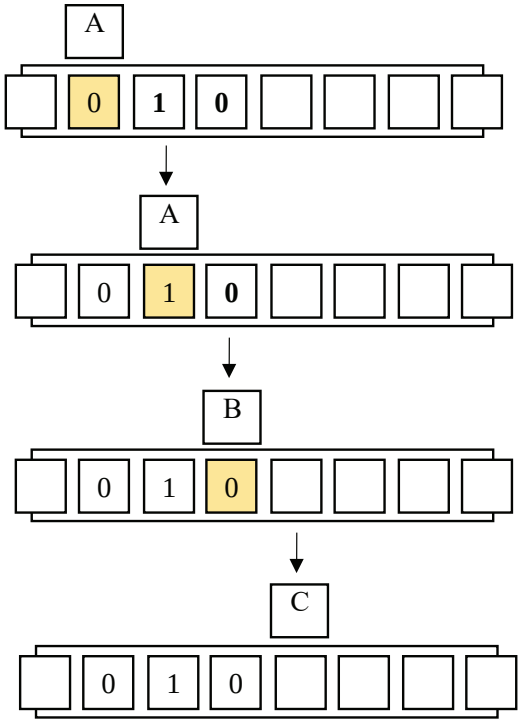


Figure 6. Three-divisibility of '010'

We had just worked through the situation where our TM encountered 0 in its START state (Figure 3) and thus, to incorporate that, we also needed to add the '(A, 1)' configuration to the table in Figure 5 as another possible START state. In this way, our list of instructions started to grow and feed into one another.

Now, if the sequence did not end there and the scanner finds 0 instead of blank in the last step, the sequence now becomes 010 (see Figure 6) which equals 2 in the decimal system. In this case, the remainder should be 2 ($2-(3*0)=2$). This is *again* a new situation, so we again need to instruct the machine as to what should be done in this case.

First, following Turing again, we will call this state 'C'. After scanning 0, 1 and 0 respectively, as the machine is in state C, if it finds a blank in the next block, we need to instruct the machine to write 2 as the remainder in this place before halting the operation (see Figure 7). This is another possible END state where the machine could terminate its operations. As even a small number of initial cases makes clear, we could continue the same kind of procedure for all the subsequent numbers, devising instructions for different scanned sequences as we go.

Knowing a priori that mathematically there cannot be a remainder larger than two, we now anticipate that when applying these instructions to numbers larger than two we will see a pattern in the output where 0, 1 and 2 keep appearing as outputs in an orderly manner as we add digits at the end of our sequence. It is also notable that we have developed three categories of states to deal with three-divisibility through the step-by-step work we outlined above. We capture this pattern in our final instruction table (see Figure 8) where all the potential outcomes are accounted for and it is in that way that we determine whether it is possible to find the remainder when we divide a number by 3 using our TM. We can therefore now test our TM with a binary sequence like 1001 to find out if it can correctly find the remainder and check if our intuition about the pattern in our sequences is correct. 1001 equals 9 and the remainder in this

CURRENT STATE	CURRENT SYMBOL	RULE
A (START)	0	SET STATE A MOVE RIGHT
A (END)	blank	WRITE 0 HALT
A (START)	1	SET STATE B MOVE RIGHT
B (END)	blank	WRITE 1 HALT
B	0	SET STATE C MOVE RIGHT
C (END)	blank	WRITE 2 HALT

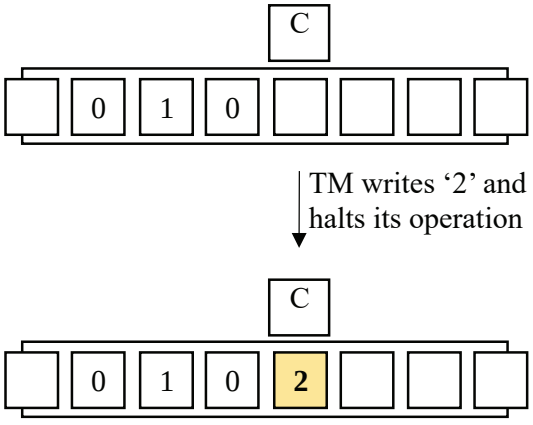


Figure 7. Three-divisibility of '010' (contd.)

case is 0. If we follow the instruction table in the following order, the machine will eventually write 0 as output. We again invite readers to verify our TM's instruction table by working through their own test inputs at this point.

The diagrammed demonstrations above prove that the instruction table we have devised works for any possible natural number: this TM can solve not just a problem but a "class of problems" (Livingston, 1995a: 113). Our solution thus constitutes an 'effective procedure', i.e., a mathematically sound algorithm, because it is a generalised solution to the computational problem we set ourselves where the solution is reached by following a finite set of instructions. The process by which we have determined divisibility by 3 is effective in these terms because it adequately captures elementary, mechanisable and thus 'computable' steps in Turing's sense adequate to undertaking the task as specified (i.e., ascertaining the three-divisibility of any natural number).

The divisibility problem in our demonstration is described in terms of the observable and observed constituents of the problem's arithmetic properties as they became computationally relevant in the context of building our TM; "normal troubles"

CURRENT STATE	CURRENT SYMBOL	RULE
A (START)	0	SET STATE A MOVE RIGHT
A (END)	blank	WRITE 0 HALT
A (START)	1	SET STATE B MOVE RIGHT
B (END)	blank	WRITE 1 HALT
B	0	SET STATE C MOVE RIGHT
B	1	SET STATE A MOVE RIGHT
C (END)	blank	WRITE 2 HALT
C	0	SET STATE B MOVE RIGHT
C	1	SET STATE C MOVE RIGHT

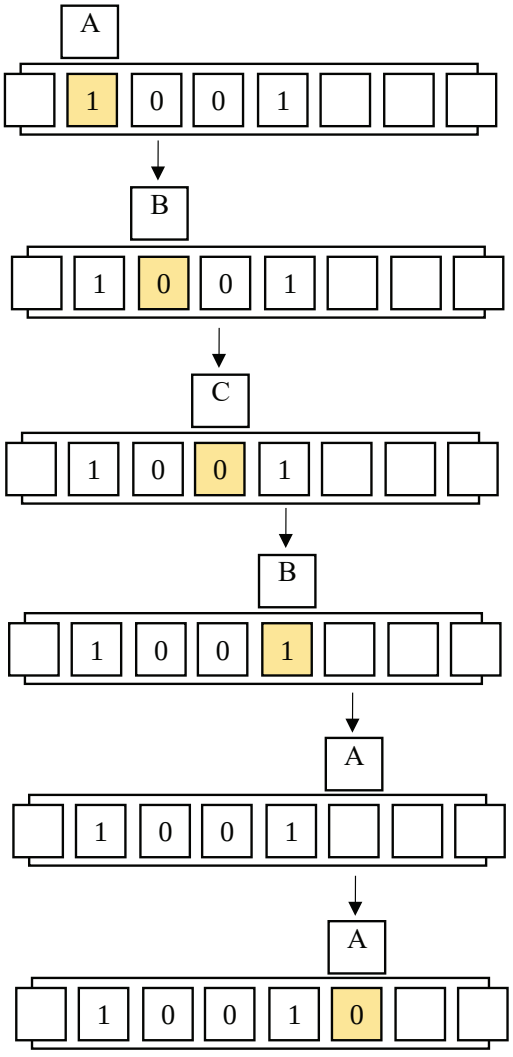


Figure 8. Three-divisibility of '1001'

(Garfinkel, 1967) of getting the machine to work, as and when we encountered them. If we were to set out to solve this problem using a modern programming language like Python or Java, we would not have to build a TM at all—indeed, such languages are often dubbed 'high level' precisely because their operations are rarefied far beyond the mechanical aspects of transistors switching between binary states. However, each time programmers write a program to solve a mathematical or logical problem like this, regardless of their language of choice, they have to engage in a process of mapping that problem into processes that can be handled within the computational systems they are working with, just as we have here. The formal possibility of so doing is exactly what Turing demonstrated in his paper.

Discussion

Turing wanted to make his machines "automatic", dependent only on a set of pre-defined configurations for their operation. These machines run "automatically" in the sense that once initialised, "external operators" are only needed when the computation cannot move forward without further inputs from them (Turing, 1936: 232). As a consequence, the role of human workers (allegedly) ends in designing and implementing the instruction table, and once it has been implemented, as long as all outcomes have been anticipated and are handled accordingly, the machine should be able to carry out the instructions in the prescribed order. Hence, as we have seen first-hand by virtue of undertaking this exercise, mechanising a computational procedure also includes *eliminating* the work that went into devising that procedure in the first place. Once it was complete, we no longer appeared in the TM's running, in spite of the TM's operations sense and meaning *only* being furnished by reservoirs of practical, mundane reasoning about problem decomposition that we had to engage in, through and as part of the TM's very construction. Our situated courses of practical reasoning in assembling our TM were progressively 'enchained', to adapt a phrase from some of Garfinkel's (2022: 189) recently published work, *in* the TM's operations.

This leads us back to the computing work Turing was doing in the 1936 paper. Seen in a praxeological light, Turing's paper furnishes a logico-mathematical or conceptual programme—a set of methods—for assembling a computing machine, with the sections offering instructions as to what goes into their assembly and how they are to be engineered to execute calculations. We showed that this involved putting the operations of the Turing Machine centre stage while backgrounding the methodic work Turing did in setting out the instructions it could be capable of following. What makes the latter difficult to recover—and what necessitated the re-enactment—is the intentional elision of the operations of the machine and the methods for instructing it, with the latter seemingly written 'into' the arrangements of the machine (the sense of which, albeit, can *only* ever be recovered via further practices of local reasoning). This is, therefore, a phenomenon that consists of two irreducible parts and so is 'paired' in ways that Garfinkel (2007) as well as Livingston (1986) and Bjelić (2003) sought to elaborate in their work from the 1970s on. That is, we have the formalisation of the computation in the form of the TM itself, on the one hand, and the practical work of composing the instructions that constitute it, on the other, and the two are inextricably linked.

In our attempt to solve an arithmetic problem using a TM built 'from scratch', the computational work involved became recognisable in and through the steps of ordering the instructions to it. That is, the solution's generality became evident in the followable character of those constitutive instructions from within the process of implementing that solution via the specifics of the TM's engineered design. In the course of that computational work, when those instructions were followed in a 'mechanical' fashion, we arrived at something that could be worked through as a solution to our problem, which in turn proved that an effective procedure or algorithm exists that solves an entire class of arithmetic problems, however limited those problems might have been. In other words, the formal construction of our abstract machine *through* the composition of instructions was what yielded an effective procedure or algorithm, albeit an unwieldy one.

The formal representation of our efforts—the instruction table—does not, however, make the situated and contingent character of the work that has informed it evident. This is precisely why we sought to specify the practices that informed the TM's computational workings. The practical 'details' of our computing work do not have to be and are *not* made explicit in the process of achieving such things as formalisation, generalisation and reduction, just as they are not made explicit in Turing's (1936) original demonstration. In our case, it was the instruction table which made our abstract machine 'automatic' in Turing's terms, while we found the work of formalisation, generalisation and reduction as its "shopfloor problem" constituents, i.e., practical problems we had to solve to get going with the building of a working machine (Garfinkel, 2002). These constituents can only be accessed in and through the 'lived work' of computation, be it on paper while building TMs or on screen while writing computer programs. In the case of programming, it is the computer programs that make those constituents recognisable in the work of writing them. As such, thinking like a machine emerges as *the* praxeological supplement to 'the thinking machine'; this 'thinking machine', then, is silently supported by the wealth of underlying reasoning practices and hands-on work by and through which it is produced.

Turing's practice shows us, therefore, that methods of writing instructions in machine executable terms are constitutive of the machines so instructed. While we have applied rather than rediscovered Turing's design, our tutorial problem has supplied us with important practical lessons in that regard. To adapt Bjelić's (2003) work on Galileo to Turing,

> When … [Turing] proposed the specifications for the … [machine], he unintentionally left a set of practical contingencies for … practitioners to find and resolve according to the specific local conditions of their work … [The] structures and their descriptions of the discovery of … [effective algorithmic procedures using those machines] are available only where the discovery is reproduced. (Bjelić, 2003: 135)

For instance, our capacity to produce a TM-based solution to an arithmetical problem depended on such things as: our choice of problem, an elementary mathematical and hence potentially culturally more accessible one (including, for instance, unstated assumptions around the significance and utility of operations such as determining divisibility); the formatting of inputs to the device as part of the 'language of instruction'; and the way in which we built the TM around (and in line with) equally elementary computational steps undertaken in a sequence which we established as we worked through it. Major issues Turing's paper did not help us settle but which we had to resolve by 'best guess' included: just how many components can be said to be minimally involved in the construction of a TM, three or four, and what might formalising that either way make visible? And how does 'the tape' being scanned come to us? Are numbers already printed or are we to conceive of ourselves as writing it as we go for demonstration and testing purposes? The way we developed our procedure, the latter was more accurate even though that meant the TM could ultimately handle the former too. Our TM calculates remainders as part of mechanically determining divisibility by 3; it does so 'on its own', but we now have a much better sense of how this 'on its own' is foundationally reliant upon a scaffold of elided, reasoned activities. What we have come to see, by virtue of our course of instruction in the TM's specific mode of operation, is that the relation and categorical shift between humans and machines is something we are *diverted* from seeing—no different to the case for many new AIs—not because we lack an understanding of intelligence, the brain or mind but because of the very practices through which computing machines are produced.

Now, our TM does things for sure, but not in the ways we ordinarily do nor even in the ways we specifically did in working its design through; it runs its operations on binary, for example, and we worked them out that way, but we *chose* binary over a decimal system, where the point (at least on this particular aspect) is that *we* saw the sense in which working with binary would be a useful thing to do in this domain in just the same way that the designers of contemporary AI systems do, even those described as 'autonomously intel-

ligent'. How the machines work is not a surprise, in other words, but the outcome of a process of practically stipulating parameters in pursuit of a working model. Most importantly, as in Turing's work but as is also the case in programming work more generally, all the choices and decisions we made assumed and traded upon an open-textured background of shared practices and understandings against which an activity of this sort acquired whatever cultural intelligibility it may be taken to have. This is a lesson learned that may lead us to take a more cautious approach to claims made on behalf of new AI technologies which (some have claimed, as outlined above) comprise AI's much heralded 'autonomous systems' that 'do things for themselves'. Take AlphaGo; one of the headlines grabbing AI systems of the past five years. Our re-enactment of Turing's methods furnishes insights into how we might approach such technologies. How so? We return to Jaton :

> I shall … temporally define computer programming as the situated activity of inscribing numbered lists of instructions that can be executed by computer processors to organize the movement of bits and to modify given data in desired ways … If I place emphasis on the practical and situated aspect of computer programming in my operational definition, it is because important historical events have progressively set it aside … [Once] computer systems started to be presented as input-output instruments controlled by a central unit – following the successful dissemination of the so-called von Neumann architecture – the entangled sociotechnical relationships required to make these objects operate in meaningful ways had begun to be placed in the background. If electronic computing systems were, in practice, intricate and highly problematic sociotechnical processes, von Neumann's modelization made them appear as functional devices transforming inputs into outputs. The noninclusion of practices – hence their *invisibilization* – in the accounts of electronic computers … led to serious issues. (Jaton, 2020: 93)

While von Neumann's formalisation of the computer was a significant achievement, in other words, it involved a specific kind of disappearing act; that is, it problematically disappeared the practical work of "making a universal machine" (Jaton, 2020: 103) as well as the people who made critical contributions to that work, engineers and *computers*, many of whom were not, contra to the received histories, white and male as Jaton points out. But if von Neumann effected a disappearing act of this kind, we believe it depended on a prior one initiated by Turing who in his 1936 paper succeeded in disappearing *himself*. As we have shown above, a non-praxeological reading of Turing is liable to direct us away from the point that even before hardware is built and ways to operate that hardware to perform meaningful tasks are designed, the work of computation (e.g., mathematics) has to be *done*; it will not do itself. Hence, we must be alive to the contemporary versions of Turing's self-disappearing act if we are to properly get the measure of computation, especially for "the new AI" (Fuchs and Reichert, 2018) where the accompanying sales pitches and commentary often obfuscate rather than illuminate just how these systems work and have come into being (cf. Holton and Boyd, 2021).

Even those with an otherwise deep understanding of the issues can still fall foul of these problems when it comes to assessing these technologies. In a reflection on AlphaGo Zero, a much more powerful successor to the AlphaGo algorithm (created by Google DeepMind) which beat the human world Go champion, Lee Sedol, in 2016, Fazi (2021) makes allusions to a machine operating purely autonomously from human involvement:

> While much of computer programming has historically consisted in making human abstraction significant and operative within the instrumental remit of algorithmic machines, with deep learning we face the opposite case: the abstractions and consequent instructions the machine gives itself now require interpretation for them to be significant and operative for humans. The modes of organisation, categorisation and classification that belong to the abstractive operations of these computational cognitive agents are indeed incommensurable. Maintaining a theoretical focus on the nature and possibilities of abstraction as the balance moves between autonomy and automation within AI thus involves acknowledging and working with the prospect of modes of abstracting that might arise within calculation but also surpass the boundaries of human

> cognitive representation … [The] 'autonomy of automation' … regarding abstractive operations is demonstrated by a deep learning system producing internal representations independently from the phenomenological or experiential ground of the human programmer … [In the] example of AlphaGo Zero, such an autonomy is doubled: not only the outputs but also the training inputs are somewhat independent from human knowledge. (Fazi, 2021: 15)

We take very seriously Fazi's point that we need to avoid conflating the operations of new AIs with our practices, an incommensurability argument which parallels that of Shanker's, and share her scepticism with respect to totalising systems. However, Fazi has also here succumbed to Google DeepMind's successful disappearing act in hinting at 'independence'. For what is entirely missing here is any account of how the researchers involved got from AlphaGo to the successor algorithm and the work that went into *it* as an "engineered design"—where to illuminate this and recover the ways in which AIs are woven both out of and into practices, an approach of the kind we have outlined above is required. While Turing's machines are certainly unwieldy when judged by contemporary standards—for instance, our 'three-divisibility' algorithm could be optimised further rather than sequentially proceed through numbers one by one *ad infinitum*—it is worth noting that with enough time, patience and "ingenuity", to return to Davis, we could simulate AlphaGo Zero using Turing's components. The resulting TM programme would be extremely complicated, however, extending far beyond the instruction table sketched above. That alone should alert us to the dangers of any claim that automation has been 'automated' or that an AI has achieved 'independence' in this domain: AIs cannot produce themselves, any more than any computational system can, and we lose sight of that point—and by corollary, the practices and material set ups that do such important enabling work in the realm of these machines—at our conceptual and methodological peril.

Conclusion: grappling with Turing's 'disappearing act'

As the burgeoning literature attests, the social sciences and humanities, like much of the rest of the world, are in the process of getting to grips with the disparate technologies which comprise the contemporary field of artificial intelligence (AI) and which underpin its rapid and often highly problematic advances over the last decade and more. Real strides have undoubtedly been made along that path—as interested publics, we all understand a great deal more than we did even a few years ago—but, we would contend, erasures and misunderstandings persist. Here in particular, and precisely because they have been designed that way, it is all too easy to accept claims regarding the agentic status of the new AI's signature systems without looking any further. In that context and building on important work already conducted on that front, we have tried to open up the praxeological foundations of machine computation as a corrective to lingering reifications of the 'thinking machine' (Garfinkel, 2002). Reading Turing alternately, to draw on Garfinkel a final time, we have argued that the construction of such machines as a formal accomplishment constitutes a paired phenomenon connecting the execution of a function with the writing of instructions which enable that function to be so executed while working within a particular computational architecture. On this basis, we have argued that the work of instruction represents an irreducible praxeological supplement to the construction of 'the autonomous machine' and while they are asymmetrically related, they are mutually dependent and mutually informative. Jones-Imhotep (2020) has recently argued that machine autonomy is a carefully crafted performance on a stage set for an audience with specifically cultivated sensibilities who are primed to see the machine in quite particular ways, i.e., as operating without external intervention. If Jones-Imhotep is right, we need to understand what goes into stabilising such performances in the field of contemporary AI, including the various disappearing acts performed along the way, if we are to arrive at a more consistently deflationary rather than inflationary view of contemporary AI's actual achievements. It is only by proceeding in that way that we will be in

a viable position to show in any particular case, as we hope to have done via our re-enactment, what computers can do and how we help them to do it

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Notes

1 Our approach in this regard diverges sharply from that of what might seem to be a related recent work by Yu-cheng (2022), whose study, we would suggest, takes this conflation as an unproblematic starting point.

2 That this applies only to operations capable of being computed is an important qualification here because, as Turing also showed following Gödel's lead, there will always be operations that cannot be rendered computationally, that cannot be computed, with all computational systems incorporating 'undecidable', that is computationally unresolvable, functions. What is more, one cannot tell until one tries whether any given operation will be computable or not. Fazi (2018), in her thoughtful work on "contingent computation", describes this in terms of the constitutive indeterminacy of computability, an indeterminacy – will x compute? – only resolvable in actual contexts of application. We would only add that when it comes to real-world computation, this is not the obstacle it may seem: people try lots of things in code and while much of it comes off, some of it won't, meaning other ways of proceeding must be found.

3 We would like to thank two of our anonymous reviewers for highlighting the salience of these points vis-a-vis Turing's methods as well as Agar's wider work in relation to them.

4 That is, although Turing's methods are not made available as such, the audience to whom the paper was addressed would have been perfectly well equipped to see what Turing was doing in setting things out as he did, something the paper's favourable reception alone provides ample evidence of.

Ermoshina Ksenia and Musiani Francesca (2022) Concealing for Freedom: The making of Encryption, Secure Messaging and Digital Liberties. Manchester: Mattering Press

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Whereas Governance scholars have always been committed to the analysis of policy issues, political institutions and regulation processes, the growing digitalization of society has turned the table greatly. The cyberspace is now submitted to a variety of national jurisdictions and the local and the global are inherently intertwined. Under these circumstances, social actors are no longer able to exert direct control over the digital flow of information. Power struggles are thus relocated at the material level, and Internet Governance needs to learn STS: the technical components of the digital infrastructures have become more political than ever. In their book, *Concealing for Freedom: The making of Encryption, Secure Messaging and Digital Liberties*, Ksenia Ermoshina and Francesca Musiani maintain that, since the Snowden revelations, encryption is among the most political features of digital technology, and its comprehension needs to come along its socio-cultural situalization. Based on the empirical analysis of the end-to-end encrypted mailing and messaging applications (i.e., Signal, LEAP/Pixelated and Briar), this work represents the "the first book-length endeavour" (p. 35) dealing with encryption as a political matter from an STS perspective. The concrete output is "an analytical portrait of the field of encrypted secure messaging" (p. 60). Yet, in terms of social sciences, this work is a much-needed theoretical and methodological contextualization of how controversies take place in the digital age.

After a sixty-page introduction, the first chapter problematizes the concepts of threat, considering that users perceive to be spied by different antagonists. Depending on the adversary, different aspects of their identity are jeopardized: "users perceive themselves […] as possessing a set of 'profiles' or 'personas'" (p. 66). In the online domain, risk and security are relational concepts. By interviewing digital security trainers, Ermoshina and Musiani deliver a detailed exploration on the use they make of threat modelling and risk assessment. While the former "enables development teams to examine the application 'through the eyes of a potential adversary' to identify major security risks", the latter is used "in order to analyze the chance of a threat being realized" (p. 70). This allowed trainers to organize their sessions in the light of the assumed threat. Furthermore, users are categorized based on their likelihood to be exposed to danger, and then the threat is identified.

The first chapter is followed by what the authors call an 'analytical triptych', whose aim is "to provide an analysis of different architectural choices and their impact on the configuration – social and economic as well as technical – of encrypted messaging tools" (p. 89). The first case study is the Signal protocol, paradigmatic example of a centralized architectural model. The analysis is an opportunity to frame centralization as a form of "control by design" (p. 90), because it allows developers to respond

to technical challenges, needs of updates and uncertainty quicklier and without outsourcing the function to third-party developers. The following analysis is instead devoted to the peer-to-peer model. Discussing the case of Briar, peer-to-peer, i.e., the deployment of a technical architecture made up of distributed networks, seems to promise a softer degree of both governmental and corporate control. Great interest for such an implementation is shown by users and developers from high-risk countries, e.g., Russia. Nevertheless, while de-centralization remains a widely contested concept, and many definitory attempts diverge, its application to encrypted messaging has been greatly overlooked. The chapter argues that the causal relation between de-centralized architecture and horizontal modes of governance has been too rapidly assumed: according to the authors, this is heavily linked with the diverging definitions which different social groups attach to the notion of de-centralization. The triptych ends with federative models of construction by reconstructing the historical debate around the concept. After providing an in-depth consideration of the technical advantages (i.e., alleviating personal responsibility of developers by enabling the users to choose among a variety of options, spreading interoperability, promoting localism and resilience) and disadvantages (i.e., the difficult harmonization and updating of all the different implementations), the authors make clear how federated protocols are framed as both architectural choices and social experiment (p. 62).

After a hundred pages covering different architectural solutions in messaging and emails, the fifth chapter tries to make some order by addressing the issue of categorization. Drawing on the Star and Bowker's (1999) well-known book on classification, the authors are aware that categorization takes up political, ethical and cultural significance when applied to technologies that are under the way of stabilization. Case study for this purpose is the 2014 Secure Messaging Scorecard (SMS) released by the Electronic Frontier Foundation, through which different messaging and mailing applications have been evaluated in terms of security. Of particular interest in the debated sparked around such a classification: because the notions of security and privacy are contested even within apparently like-minded communities, attempts of classification emerge as process of negotiation of meanings resulting in an action which co-shapes the system it tries to make sense of.

The book is concluded with some developments of the considerations advanced throughout the long introduction. The idea of encryption as infrastructural site of socio-political struggle is remarked, and the authors draw a line between two narratives and two distinguished evolutions: as encryption is linked with both civil liberties and terrorism, its massive implementation has been pursued for restoring trust in digital technologies as well as for opportunistic purposes (p. 205). The chapter is closed by exposing some implementing solutions for digital security, connecting it with supranational legislative framework, e.g., the General Data Protection Regulation (GDPR), and with the very same architectural choices.

Although the book's contribution is devoted to Internet Governance, it collaterally enriches the STS debate. While bringing the political into the technical, conceptualizing encryption as a site of struggle, it conversely implies the reverse connection between those two dimensions. How does the 'cryptographic turn' (p. 210) re-shape political and economic trials between state and non-state actors? As it is now well-established in the STS research tradition, technology is deemed to be embedded in the social texture, and it cannot be understood in terms of causal dependence: when political struggles re-frame the purposes of encryption, encryption re-shape the forms of political struggles, and the final part of the book re-conceptualizes the most urgent social and political issues in the light of the discussed breakthroughs.

In terms of limitations, the readers should be aware that the book does not provide any particularly revolutionary concepts to the STS field of study, as it is rather aimed at applying the STS theoretical background to re-shape the field of Internet Governance. This virtuous mixture is oriented to, as the authors themselves declare, the ongoing discussion around "several pressing Internet Governance issues" (p. 19): approaching this work from an STS point of view is less fruitful in terms of theoretical production, while it is rather

suitable to explore a particularly cogent field of interrelation between two academic traditions. Future research starting from the same background may address technical features other than encryption and attempt to unfold its encoded sociomaterial implications. *Concealing for Freedom* is then also a toolkit for those new scholars who are willing to dive into the infrastructural turn in the Internet governance, as this contribution offers a precise blueprint of how to conduct an infrastructural analysis from a sociomaterial perspective with the objective of rendering its inherent complexity.

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Caton James Lee (ed) (2022) The Economics of Blockchain and Cryptocurrency: A Transaction Costs Revolution. Cheltenham: Edward Elgar Publishing

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James Lee Caton's edited volume investigates a specific, yet under-explored aspect of blockchain and cryptocurrencies that has the potential to significantly impact our society over the long term. The technology was first introduced in 2008 by the enigmatic Satoshi Nakamoto (2008), as the underlying mechanism of the Bitcoin. Bitcoin is a purely peer-to-peer electronic cash system that operates without the need for a trusted intermediary like a bank. This is because the ledger, called the blockchain, is distributed among all system users. As a result, the blockchain is immutable and open to examination by anyone, ensuring transparency and security in transactions.

These technological characteristics raised expectations among various groups (Borup et al., 2006; Brown and Michael, 2003; Robinson et al., 2021). Introduced in the aftermath of the financial crisis in 2008, Bitcoin has been seen by technology savvy and libertarians as a means to bypass governments and financial institutions (Nabben, 2023). The general public began to recognize the value of cryptocurrencies as alternative investments, which has been reinforced by the Covid-19 pandemic (Corbet et al., 2020). This facet of cryptocurrencies and blockchain development has sparked considerable hype, scrutiny, and market volatility over the past decade. However, attention is increasingly turning to other potential impacts of blockchain, particularly its promise as an institutional tool for reducing the costs of trust-building (Becker and Bodó, 2021). An increasing body of academic work is shedding light on this blockchain dimension, often referred to as crypto-economics, an area to which this edited book makes a valuable contribution.

In the introduction, contrary to popular belief, Caton contends that the most notable promise of blockchain does not concern its financial aspect, but rather its institutional aspect. Cryptocurrency and blockchain, with their immutable and transparent ledger system, effectively reduce uncertainties stemming from human opportunism and the unpredictable nature of the future, which constitutes "a prime source of transaction costs" (p. xii). Additionally, recently developed features, particularly smart contracts that execute automatically when predefined conditions are met, significantly increase the likelihood of planned outcomes occurring. According to Caton, these factors potentially lead to enhanced prosperity. Thus, Caton states, "The blockchain revolution is a transaction costs revolution" (p. xiii).

This book offers a thorough examination of the 'transaction costs revolution' via the perspectives of cryptocurrency and blockchain technology, structured into three distinct parts. In the first section (Chapters 1-4), the focus is on blockchain's capacity to transform economic coordination mechanisms. The argument here is that the significant innovation of blockchain is not cryptocurrencies per se but its ability to reduce uncertainties linked to human opportunism, thus lessening dependency on conventional institutions such as

firms or governments. This part explores cryptocurrencies' potential as a universal medium of exchange, their sustained value absent inherent commodity worth, and their capacity to rival fiat currencies, particularly where central bank trust is minimal. The second part (Chapters 5-8) is dedicated to empirical analyses of blockchain applications across various sectors. It examines how blockchain can mitigate inflation and transaction costs in African nations, improve traceability and efficiency in the agriculture industry, and be utilized by companies for quicker and more transparent dealings. Additionally, this part delves into the legal dimensions of blockchain, including its code-based law-like properties, smart contracts, and the regulatory examination of Initial Coin Offerings, especially by the US SEC. The final part (Chapters 9-10) discusses the emergence of V-form organizations — decentralized structures that utilize blockchain to foster 'industrialized trust'. This section proposes a move towards transparent global cooperation and competitive advantages over traditional conglomerate methods. It underscores blockchain's ability to manage internal transactions within these entities, circumventing conventional tax and regulatory frameworks, and thereby introducing a novel approach to organizational and economic structures.

Overall, this book serves as a comprehensive gateway to not only the technical aspects of blockchain but also the significant expectation of social transformations that the technology could catalyze. Firstly, this volume can serve as a guide to crypto-economics. Even though the emerging field has gradually pivoted from cryptocurrency to blockchain, transitioning from new investments to new institutional technology, its definition and visibility have not kept up with the attention that the technology itself has attracted. In this sense, the primary value of the book lies in its characterization of the 'transaction costs revolution', which extends debates beyond the simple costs of value exchanges, such as transferring money with reduced fees, to the establishment and maintenance of trust. The interplay between the technology and its implementation invites readers to discern emerging organizational patterns. Despite the fact that this topic has been scrutinized by other authors, this volume enriches the literature by offering both theoretical insights and empirical case studies.

Furthermore, this volume may be perceived by STS scholars as a manifestation of technological solutionism, especially amid the escalating popularity of cryptocurrency and blockchain technologies. With public services and financial sectors exhibiting substantial interest in these innovations, there's a call for STS scholars to engage more deeply in nuanced and critical investigations of their implications (Semenzin, 2023). The recognition of crypto-economics as a new field by legal scholars and economists, a process this volume illuminates, further highlights the need for in-depth exploration.

Questions arise: how have these technologies managed to maintain their hype over the past decade, despite experiencing several significant setbacks? What expectations have they generated, and what rhetorical strategies have their proponents utilized to achieve this? Somewhat ironically, the rich discussion within this volume about the promises of blockchain paves the way for critiques of the optimistic narratives surrounding these technologies. For instance, what important societal values are overlooked in the narratives that focus primarily on cost-effectiveness in transforming society? If the concept of global governance or public services is reduced to a sum of transaction costs by the discourses and underpinning technologies, where could social equity stand in this framework? The presence of blockchain technology, and its consequential implications, seem to be an enduring reality. Therefore, it demands rigorous examination. This volume can effectively act as a guide, illuminating both the ideological and technological commitments of blockchain, as well as providing a roadmap to the emerging landscape of crypto-economics.

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