

# MEDIA

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## A Transdisciplinary Inquiry

EDITED BY

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## The Poetics and Political Economy of Repair

*Steven J. Jackson and Lara Houston*

What can media scholars learn from and bring to repair, including in the computational sites that increasingly shape and define the field? What would it mean to think repair – and think *media* – as a form of both poetics and political economy?

This chapter is intended as a contribution to the study of media infrastructures advocated and pioneered by scholars such as Susan Leigh Star, Geoffrey Bowker and others. This work names some key features of infrastructure: for example, its embedding in other structures; its frequent transparency (or invisibility) in use; its reach or scope beyond single sites of practice; its formative connection to conventions, standards and communities of practice; its dependence on the installed base of practice, history and material; and its tendency to ‘reappear’ (or return to conscious reflection) upon disruption or breakdown (Star and Ruhleder 1996; Bowker and Star 1999). At its best, this work has learnt to approach infrastructure not purely as *object*, with self-sufficient and delimited ontology (*‘this is infrastructure; this is not’*), but also as a layered, resonant and consequential *thing*, defined in its relational, experiential and affective dimensions.

To be a thing in the world, however, is also to be vulnerable: in the words of the great Nigerian novelist Chinua Achebe, *things fall apart*. Concrete crumbles, bridges collapse and cities and economies fall into ruin. Markets and institutions fail and erode. Habitats and ecologies change and evolve, through reasons and forces related to human action and for others completely separate. These principles are no less true of the media worlds around us, despite our best efforts to ignore them. Screens crack and buttons seize. Firms and industries struggle and fail. Old, but still-functioning, objects fade into obsolescence, planned or otherwise. The world moves on to new expectations and hopes, and pristine clean room dreams and circuits are transformed into sleek and expensive bricks.

But things *also get put back together*, in ways that reflect and engage deep human capacities for imagination, resilience and care. These are the twin forces at the heart of what we have argued for elsewhere (Jackson 2014) as a kind of ‘broken world thinking’: an alternate sensibility or starting point for thinking through our relations with media and technology. Broken world thinking acknowledges the inherent fragility of our systems and infrastructures, and the constant work of maintenance and repair that goes into sustaining them. It recognizes the deep forms of skill and knowledge expressed in such moments (and the need for our stories of technology and innovation to accommodate them). And it argues for the possibility of richer, more creative and more enduring relations of care connecting us to the object worlds around us.

This sets repair apart from a variety of front-end terms that have too often dominated and limited our thinking around questions of media and technology: for example, ‘*design*’ (an increasingly mystified word); ‘*innovation*’ (thinly and narrowly conceived) or ‘*production*’ (which critical scholarship itself has had some hand in reifying). In relation to these terms, repair has certain virtues. It is mundane, enduring and frequently routine. It is humble and modest. It is grounded inescapably in the forms of breakdown from which it arises, making it irreducibly tied (and therefore accountable) to the worlds around it. Above all, repair is *ordinary*, part of the everyday ongoingness by which order is maintained and extended in the world, one frought fix at a time.

This basic stance has led us to a continuing series of empirical studies, unfolded over several years and with many collaborators, that has attempted to ground and connect these ideas to concrete questions across a range of sites and experiences. For example, what role do maintenance and repair (or lack thereof) play in the sustainability (or not) of technology development projects in the global south (Jackson et al. 2011, 2012)? What forms of technical skill and knowledge operate through repair, how is such knowledge shared and learnt and how might this disrupt presumptions around the nature and global distribution of technical expertise (Jackson et al. 2014; Ahmed et al. 2015)? What forms of value and valuation are expressed and extended through repair, from amateur repair in the global north to the livelihood repair sectors of Uganda and Bangladesh (Houston et al. 2016)? How might repair work be reimaged under the language of care, and how could this shift or upend our basic understandings of morality and collective order (Houston and Jackson 2017)? And how might breakdown and repair be refigured as moments not just of failure and restoration but also of imagination and creativity – and what might this reveal about wider processes of collaboration, responsibility and being, in and with the ‘thing-y’ world around us (Jackson and Kang 2014)?

Others have taken these questions further: for example, to the complexity of urban water systems in Mumbai, and the patterns of abjection that follow from their selective and differential failure and repair (Anand 2012); the forms of ordering and care attached to the maintenance of signage in the Paris Metro (Denis and Pontille 2015); the remarkable and incessant labours required to maintain art objects against their material propensities to change, degrade and evolve (Dominguez-Rubio 2016); the intricate linkages between repair, design and waste (Lepawsky 2015; Liboiron 2014; Dew and Rosner 2019); and repair's sometimes troubling role in normalizing risk and power, from transport reform in Santiago, Chile, to flood control in New Orleans (Ureta 2014; Henke 2007). Collectively, this work has helped to found the rapidly growing, generative and multidisciplinary field of repair studies (Houston et al. 2017).

With the development of this work, however, has come a growing awareness of the challenges and complexities of repair, and the myriad ways in which repair work and repair workers are discouraged, marginalized or excluded within wider economies and systems of value. Barriers to repair manifest themselves in myriad ways, from the physical design of objects, to the (mis)application of proprietary control and public law, to the construction of false-cost economies which hide or distort the true costs of consumption, making discard-and-replace, rather than fix-and-maintain, the dominant logic of contemporary high-tech consumerism. The distribution of repair-relevant knowledge and artefacts – from schematics and manuals to operating system and firmware updates – are often carefully and selectively controlled. Fixers (and owners) may be effectively locked out of devices by means ranging from the physical ('glues and screws') to the software-based (SIM locking, etc.). Repair workers may see their work devalued, even when acknowledged as necessary, within wider hierarchies of knowledge that privilege the abstract and the formal over the diagnostic, skill-based and situational.

This chapter addresses these dynamics, but is also meant as an effort to think poetics and political economy together, and to ask what a media studies forged at their junction might look like. Like all forms of scholarship, poetics and political economy mark particular modes of attending, partial (as in: *incomplete*; as in: *interested*) efforts to listen, gather and call forth the world(s) around us. But each attends differently. Poetics draws our gaze to the aesthetic and affective, the signified and the felt, the forms of skill, beauty and meaning, hope and pathos, that constitute and subtend the potentialities of our relations with the world. By contrast, political economy names structure, the emergent and accumulated weight of capital, institutions in their instituting and instituted forms (Weber 2002). It engages the intricacies of law and policy, markets and state, and industrial structure and the strategies of firms, to show how the *could-be-otherwise*ness of the world is limited, emptied and foreclosed by what we will imprecisely (but

unblushingly) call power. If political economy names structure, institution and accumulations of force, poetics names excess, emergence and the coming-into-being of alternate possibilities that press at the limits of structure. If the orienting tone of political economy is one of analysis, demystification and critique, that of poetics is grounded in speculation, curiosity and wonder, an appreciation for the myriad ways in which worlds are gathered and extended and the new and strange continues to flower, even under the compromised conditions of the present. Together these establish the consistencies and holes that constrain and enable action, meaning and experience in our media and wider worlds. Neither has a lock on realism or materiality. Neither is complete without it.

### Poetics

#### Scene 1:

*It is 19 February 2015 and the coldest night of the year. We are on our way to the Proteus Gowanus gallery in Brooklyn, the birthplace and monthly home of the Fixer's Collective, described on the web as 'a social experiment in improvisational fixing and aggressive asset recovery'. When we arrive, the group's main organizer Vincent is still setting up, unpacking tools and materials. This includes broken items (a lamp; a toaster) that Vincent explains he has brought 'just in case' attendance is low, or participants arrive without items to fix. Joe (a retired rabbi) and John (a middle school tech teacher) soon arrive and join in the set-up. They discuss whether indeed anyone will show up due to the cold; but as the minutes pass, people trickle in, and a few minutes into the scheduled start time, the small room is full.*

*The crowd, as Vincent tells me later, is the 'usual mix' and comes and goes throughout the evening. There is a woman in her thirties with an iPhone 5 with a smashed screen. An older woman with a broken mixer and an antique phone. A man in a suit with an old video camera and a Nikon Coolpix camera whose lens will no longer retract. A woman arrives seeking help to replace the frayed plug of her sewing machine pedal. Another man brings in a faulty humidifier.*

*As people arrive with their broken objects, the group breaks up into small clusters around the room's central table. Fixes almost always begin with stories (some sentimental; most mundane and practical) as the owner talks about the object and what is wrong with it. Participants then compare theories of where the problem might lie (some more plausible than others), cell phones come out to search for supporting documentation, screwdrivers and voltmeters appear and objects are systematically dismantled; screws and components set aside in*



*careful order for later reassembly. Evidence of corruption is noted (corroded circuits, visibly broken parts), circuits are tested for flow or short-circuits, parts are lubricated, cleaned and replaced. In some instances, problems are identified and fixed, and functionality restored. In others, problems are diagnosed but not fixed ('you have a bad X – you'll need to call the manufacturer for a replacement'). In still others, the problem goes unsolved, and participants are referred to other resources (e.g. professional repair operations; manufacturer service centres) for further action.*

*As one group works on an electric mixer whose beaters have been falling out (solved after much trial and error by wrapping thread around the stems to create sufficient friction), I follow activities at the other end of the table. A woman in her thirties is working on an iPhone 5 with a shattered screen, with two other fixers observing and providing occasional input; the phone has been dropped, and no longer responds when turned on. With their help, she is following*



FIGURE 17.1: Technology repair at the New York Fixer's Collective (photo credit: Steven J. Jackson 2015).

*instructions from iFixit, an online resource providing manuals, assessments and step-by-step repair instructions widely used among the amateur fixers in our study; Vincent has called up the instructions on his phone and reads out the steps as she moves along. She starts by removing the proprietary pentalobe screws (size: TS1) that secure the housing, using specialized screwdrivers from a kit also supplied by iFixit. After the cover is off and the battery is removed, there is some confusion, as the open phone does not look like the diagram on the site; upon discussion, the group determines that there is an additional layer that also needs to be removed. This step is soon carefully performed and the phone on the table once again resembles the one in the diagram.*

*The fix continues. The woman appears nervous and occasionally impatient, seemingly frustrated by the differing feedback and advice she is getting from the participants around her. But she remains determined, and refuses to relinquish control when, at moments of uncertainty and indecision, one of the more experienced (male) fixers offers to perform a particular step. After visual inspection and further discussion, it is determined that everything now seems to be in order. A new battery is inserted and attached, the cover is repositioned, and the screws are carefully refastened. And now the moment of truth, as the charger cord is attached: the battery registers low but indicates a reading, which is more than it was doing before. Smiles and exhalations all around, and the group moves on to replace the screen. An hour after arriving, the woman leaves with a now-functioning iPhone in hand.*

While every evening and every fix is different, scenes like this one are common at the Fixers Collective, and have been replayed countless times over the course of our many visits with the group. The Fixers Collective is moreover just one instance of a small but growing repair movement in Europe and North America, represented by such like-minded organizations as the Amsterdam Repair Café, the London Restart Project and the San Francisco Fixit Clinic, all with partners and offshoot organizations around the world. As evidenced by interviews with organizers and participants (along with the numerous repair manifestos that dot this space), participants are drawn to such activities for a wide variety of reasons, from the environmental and economic, to the social and educational; as one such manifesto summarizes: ‘Repair saves the planet [...] Repair saves you money [...] Repair teaches engineering’ and ‘If you can’t fix it, you don’t own it’ (iFixit 2015: n.pag.).

Interactions like the ones above suggest in small part the myriad moments of surprise and engagement that played themselves out over the course of our fieldwork. Both observationally and over the course of dozens of interviews, we saw repair in scenes like the one above touch frequently deep reservoirs of imagination and engagement. There were distinct moments when the interest and curiosity of

the group was particularly engaged. One was when covers were removed and the ‘guts’ of devices revealed for the first time. Another was at moments of stalemate or indecision when fixers and participants struggled to determine next steps. We also saw much creativity and play, and the puzzle- or detective-like quality of diagnosis, as the assembled group sought to infer and deduce the problems at hand (‘when was the last time it was working?’; ‘can you recall it getting dropped or bumped in any way?’). While in some instances we saw a methodical and painstaking fidelity to received instruction, in others participants simply tried things out, drawing on general understanding of electrical or mechanical principles to produce kluges and solutions that looked nothing like original design, but could be made to achieve similar effects. While technical in focus, we were struck more often by the social and affective character of repair in such settings: forms of sympathy, cooperation and momentary solidarity expressed through palpable moods of frustration, camaraderie and suspense marked by high-fives and exhalations (or conversely, groans and curses) as power indicators lit up, motors whirred and corporate icons reappeared (or did not).

### Scene 2:

*It is morning rush hour in downtown Kampala on 6 September 2012, and I weave my way through the crowds to visit Airwaves GSM, Jason’s mobile phone repair business. Finding the right shopping arcade, I take the stairs down to a gloomy basement lit with fluorescent lights. This floor of the building largely hosts tire sellers, but I find Airwaves tucked away in a concrete recess that has been kitted out as a repair booth. There are desks and chairs for Jason and his brother William (who works with him as an apprentice) and a stool for visitors. The desk is strewn with screwdrivers, pliers, toothbrushes, tweezers and un-housed phones in the midst of repair.*

*From my vantage point behind the desk, I watch as customers and other technicians seek out Jason and William’s advice. Putting aside on-going repairs, the technicians listen carefully to the circumstances of a phone’s breakdown, and take an initial look at the handset and its circuitry. Based on this inspection they make a provisional diagnosis and quote a price back to the customer, who then (often after lively and colourful bartering) decides if they want to go ahead with the repair. Money is only occasionally provided up front for the purchase of spares; no money is due if the phone cannot be fixed.*

*Emmanuel, a technician from a neighbouring building, arrives to seek Jason’s help with a broken Nokia 6300. He explains that it is ‘fake charging’: the charging icon reads full, yet the phone still runs out of battery. After a cursory look,*

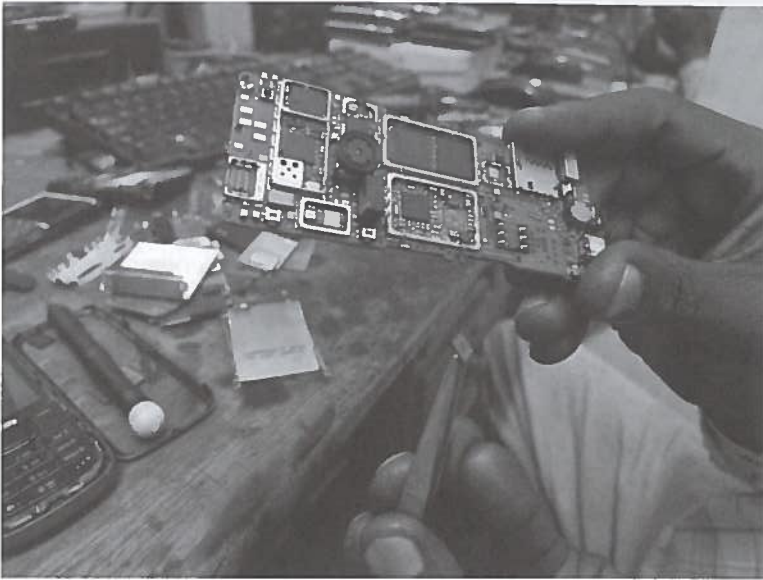


FIGURE 17.2: Mobile phone repair at Airwaves GSM, Kampala (photo credit: Lara Houston 2014).

*Jason explains that he suspects a fault with the integrated chip or 'IC' governing the mobile charging system. He decides to replace it with a cannibalized part taken from his stash of 'dead' handsets. Using a hot air blower to heat the solder connecting the faulty IC to the motherboard, he gently removes it using a pair of tweezers. He then turns to the cannibalized board, cleaning the IC thoroughly before removing the chip. He covers the IC with paste using a screwdriver, adds some solder and runs the tip of his soldering iron over the IC to 'level out the pins'. He shows me the corner marks that indicate exactly where to place the IC, gently sets it in place and finally sets the repaired handset aside to cool down.*

*However, this repair does not go to plan, and when Jason tests the phone it refuses to power on. Undeterred, he decides to repeat the repair with another cannibalized spare. Once again it will not start up. Jason repeats the process for a third time, but the handset still refuses to power on. Jason's consternation (and Emmanuel's stress) is growing, as he prods the replaced IC. Jason's archive of 'dead' handsets is exhausted, so William is swiftly dispatched to find another 'dead' 6300 from technician friends located nearby. When he returns with an unusable part, a frustrated Emmanuel goes out to source a cannibalized spare of his own. As the process is repeated for a fourth time, palpable tension pervades the room as the two technicians look at each other across the booth.*

*Finally, repair and relief all around as the phone boots up. Emmanuel hurries back to his workshop, and Jason turns back to the queue of broken phones awaiting his attention.*

In the scene above we see Jason and Emmanuel's collective determination to achieve a fix. Technicians in informal settings face incredible pressures to piece together each successful repair into a sustainable livelihood that will support them (and their families). The wider pressures here are all too obvious. The insecurity of repair work is a constant source of stress, as working around short-term cash-flow pressures prevents technicians from making longer-term investments in land or housing. Nevertheless, the imperative to save each phone drives a surprising variety of collaborative relationships operating across the cluster of technology micro-enterprises in the downtown area – from friends relying on each other's help, to forms of paid subcontracting between 'junior' and 'senior' technicians and technicians with specialized skills. This is 'people as infrastructure' (Simone 2004) but organized and reproduced around a constant flow of troublesome handsets, where both phones and relationships require the requisite care. This dual labour comes with its own emotional load – encountering the uncertainty of breakdown together provokes endless frustrations as well as the opportunity to earn and enjoy the status of mastery that Jason has certainly achieved. Care is taken too with 'dead' devices beyond repair, which retain possibility as collections of spare parts, demonstrating a material ethics that Kampalan technicians were the first to contrast with western profligacy. Yet there will always be remainders, as the plastic housings trampled into the red mud outside Jason's shop demonstrate.

Scenes like this played out countless times throughout our work in Kampala and parallel field sites in Namibia, Cambodia and Bangladesh. As mobile phones and networks have exploded across the world in recent decades, so have repair infrastructures (Jackson et al. 2012; Houston 2014) dedicated to addressing problems like the one above, together with the million other ways in which phones can fail. This makes any individual fix both absolutely unique and at the same time uncannily familiar, as methods, parts, tools, techniques and online resources (like iFixit or GSM Forum) resurface around the world. So do common challenges and tensions, from specific modes of failure (broken circuits and corrupted files, damage from water and dust) to the intricacies of apprentice relations, all played out against the backdrop of local social settings (e.g. the frequent importance of familial and hometown networks in the organization of the repair sector). Some of these challenges are embedded in the nature of repair work itself: the perpetual uncertainties attending the myriad ways in which technologies break or fail, and the deep and tactile knowledges needed to decode and remediate these failures. Others however are more systemic, and are grounded in forces, interests and

choices made far from the workbenches and meeting places of Brooklyn or Kampala. These require us to look elsewhere, and with a different eye: from *poetics* to *political economy*.

### *Political Economy*

The amateur and livelihood fixers in the scenes above demonstrate often remarkable forms of skill, care and creativity. But they do so on a terrain for the most part set by others. Though electronic media devices have proliferated, hacking, tinkering and repair skills are far from ubiquitous (despite the best efforts of maker and repair movements). For individual users and professional technicians alike, gaining access to spare parts, schematics, diagnostic tools and software files is not easy. Manufacturers often seek to withhold these resources as proprietary products and the basis of commercial advantage. Where share prices and earnings rely predominantly on the sale of new products, the logic of the upgrade crowds out repair in favour of replacement. Emergent security logics play a role too: as digital media devices ship with increasingly sophisticated access control measures, devices built around 'trusted' systems view 'unauthorized' interventions as a threat by default, leaving no exception for repair.

Other barriers are built in through mechanisms of warranty and service contracts, often fulfilled through networks of 'authorized' service centres linked to particular manufacturers. Unlike users or independent businesses, authorized sites are given easy access to schematics and manuals, spare parts, diagnostic tools and replacement software files – an exercise in proprietary control that can support or destroy firms and whole market sectors (e.g. in 2012, when camera manufacturer Nikon stopped selling spare parts to independent camera repair shops, citing the increasing technological sophistication of cameras).

In other cases, firms have exploited the increasingly 'tethered' (Zittrain 2009) nature of media and other consumer devices by using licensing mechanisms and software updates to exercise ongoing control beyond the point of sale. A salient example here is Apple's notorious 'Error 53' bug in 2016, when a routine software update began to mysteriously and permanently disable iPhone 6 devices. During the update, the 'Touch ID' sensor on the home button was prompted to check in. If it did not (e.g. because it had been repaired at a non-Apple authorized workshop), the code sent the phone into a terminal 'recovery' mode which left the device permanently 'bricked'.<sup>1</sup> Two months later, smart home company Nest (owned by Google parent Alphabet) remotely 'killed' the flagship product of recently purchased competitor Revolv's smart home hub, offering Revolv customers a refund only after widespread negative press coverage (Hern 2016).

Other control strategies have followed from (mis)appropriations of public law. Manufacturers from Apple to Toshiba have invoked copyright on manuals and schematics to prevent the sharing of repair-relevant information, launching aggressive infringement suits against often ‘mom-and-pop’ repair sites around the world (e.g. see Cook 2006; Masnick 2012). Other companies have used the controversial anti-circumvention clause of the US Digital Millennium Copyright Act (DMCA) (which prohibits the circumvention of manufacturer-installed ‘Technological Protection Measures’) to shut down non-authorized repair efforts, creating effective aftermarket monopolies.

Such legal stratagems track more basic problems in the organization of the electronics industry, where rapid obsolescence remains a dominant sales and production strategy, exemplified in ever-finer versioning and product cycles in both hardware and software, and accelerated under the rubric of ‘innovation’. At five years of age, for example, Apple products are officially labelled ‘vintage’, and beyond seven they are termed ‘obsolete’ (Apple 2017a). The extent to which obsolescence is ‘planned’ (Packard 1960; Rosner and Ames 2014) by manufacturers is a hotly contested topic. In 2018, Apple and Samsung were fined €5 million each by the Italian competition authority for issuing software updates that deliberately slowed down iPhone models 6 and 7 and the Galaxy note 4; Samsung was subsequently fined a further €5 million for failing to provide information around how to maintain or replace handset batteries. Similar investigations are ongoing in France – the only country in the world to have passed statutes explicitly defining and limiting planned obsolescence (Michel 2017). At the time of writing, multiple class-action lawsuits against Apple in the United States have alleged artificial slowdown as a form of illicit demand stimulation and consumer fraud (Rossignol 2018).

In the face of such material, legal and proprietary barriers, new forms of repair activism have begun to form. In the United States, repair campaigners have sought relief from the more onerous provisions of copyright law through the DMCA exemption process – a triennial rulemaking by the Librarian of Congress that offers limited exemptions to particular classes of circumvention for a period of three years. High-profile campaigns have centred around farming machinery: once an American icon of independence and self-reliance, repair advocates have argued that farmers are increasingly finding themselves locked out of computerized tractors that can be repaired only by authorized dealers (Wiens 2015; Sydell 2015). Following gains achieved by farmers and repair activists under DMCA exemptions in 2015 and 2018, manufacturers have sought to reassert control through the software licensing process, using restrictive end-user licensing agreements (EULAs) to control what consumers do with their products. John Deere for example changed the terms of its EULA in 2016 to stipulate that customers may not ‘reproduce’,

‘modify’, ‘adapt’ or even ‘display’ software code (John Deere 2016): all activities necessary to repair tractors under the DMCA exemption (Bloomberg 2017).

Such partial openings have been echoed by recent decisions in the US courts. On 30 May 2017, the US Supreme Court issued a striking decision in *Impression v. Lexmark*, a case testing the legality of refillable ink cartridges and whether Lexmark’s patent rights could preclude the refilling of ink cartridges by third-party providers. By an 8-0 margin, the court overturned the Federal Circuit to rule in favour of Impression, holding that:

When a patentee chooses to sell an item, that product is no longer within the limits of the monopoly and instead becomes the private, individual property of the purchaser, with the rights and benefits that come along with ownership. A patentee is free to set the price and negotiate contracts with purchasers, but may not, *by virtue of his patent*, control the use or disposition of the product after ownership passes to the purchaser.

(Mann 2017: n.pag., original emphasis)<sup>2</sup>

In 2015, US repair advocates formed the Digital Right to Repair Coalition (subsequently renamed Repair.org) to promote legislative change that would compel manufacturers to support repair by making resources available to independent workshops and consumers under the same terms as ‘authorized’ businesses. Drawing on recent parallels in the auto industry, Repair.org has argued for legislation that protects the rights of consumers and independent repair providers to fair and reasonable access to embedded software, updates, manuals, schematics, diagnostic tools and spare parts through the life of the device; restrictions on unfair and deceptive trade practices, including false or misleading warranty claims and restrictive licensing arrangements; and ‘design for repair’ principles intended to enhance the repairability and long-term sustainability of consumer devices.

Such initiatives appear to be gathering momentum: at the time of writing, twenty US states have introduced versions of right-to-repair legislation, targeting both excessive proprietary restrictions and design. Exemplary here is Bill SHB2279 from Washington, stipulating thus:

Original manufacturers of digital electronic products sold on or after January 1, 2019, in Washington state are prohibited from designing or manufacturing digital electronic products in a such a way as to prevent reasonable diagnostic or repair functions by an independent repair provider. Preventing reasonable diagnostic or repair functions includes permanently affixing a battery in a manner that makes it difficult or impossible to remove.

(State of Washington 2018: n.pag.)



In summer 2019, the US Federal Trade Commission convened its ‘Nixing the Fix’ workshop, designed to gather empirical research and data around questions ranging from ‘the effect of repair restrictions on the repair market in the United States, and the impact manufacturers restrictions have on small and local businesses’ to ‘the relationship between repair restrictions and the sale of extended warranties by manufacturers’ to ‘manufacturers justifications for repair restrictions and the factual basis for such justifications’ (Federal Trade Commission 2019).

Such developments have been paralleled by policy initiatives and regimes elsewhere. A 2019 update to the European Union’s Ecodesign Directive requires manufacturers to design products that are easier to repair (if they want access to the pan-European single market). From 2021, spare parts for certain categories of domestic appliances must be made accessible and replaceable using common tools, and kept in stock by manufacturers for at least seven years. Product manuals must also be made available to professional repairers, though not yet consumers (Restart Project 2019). A 2015 French law has officially prohibited planned obsolescence (defined as ‘the set of techniques designed to deliberately reduce the lifetime of a product to increase its replacement rate’ [Michel 2017: 267]) assigning penalties of up to two years of imprisonment and a €300,000 fine. Countries such as Ireland, the Netherlands and Sweden have introduced cuts in sales tax for common household repairs. In 2017, Sweden also amended its income tax system to make 50 per cent of labour costs for the repair of large household appliances tax deductible (Rreuse 2017). Market-based initiatives meanwhile have sought to harness repair as a feature of sustainable design and ethical consumption: for example, the Netherlands-based Fairphone, which competes on the explicit basis of longevity, ethical sourcing, supply chain transparency and support for independent and end-user repair.

These stories of copyright, tethering and proprietary advantage (and their alternatives) speak to the strength of the economic models by which repair may be foreclosed and marginalized, together with the endless creativity of firms seeking downstream advantage and control of goods, products and the economic practices they enter into. Taken to their extreme, such moves challenge the very possibility of repair, uphold and accelerate cycles of production and waste, estrange users from more intimate and knowledgeable relations with the devices and systems around them, and distort or eviscerate the notion of ownership itself (as in the concluding plank of the iFixit manifesto: ‘If you can’t fix it, you don’t own it’ [iFixit 2015]). These moves are only likely to intensify as firms across a growing range of industries seek to reinvent themselves as service or data companies, replacing an economic relationship structured around the point of sale with one that seeks to extract value and advantage across a widening range of downstream markets

and uses. Such examples point to the true stakes and complexity of the battle over repair, and its place in the media and technology industries and economy more broadly: not as quaint and nostalgic edge case, but at the heart of wider transformations in industry and economy in general.

### *Discussion*

But repair and its affiliated activities will not always have this heroic and hopeful valence.

Ahmed et al. (2015) have documented the physical and social harms borne by Bangladeshi repair workers, noting negative effects on eyesight, breathing and the economic costs of frequent market disruptions. Rifat et al. (2019) have recounted the injuries suffered by the ‘bhangari’ (literally, ‘broken people’) waste-collecting community of Dhaka as they test, probe and dismantle high-tech devices. ‘I feel like I am poisoned’, says one of the workers in their study ‘and this is not only me. Ask anybody who is doing this for a long time. You lose your hand in this profession because there is poison in these machines that you cannot see’.

Such instances remind us of the *pathos* of repair (and media poetics more generally): an attunement to forms of loss, struggle and suffering that must also be accounted for in our accounts of the media infrastructures around us. They speak to a wider world of value and valuation in which life is made cheap, and *certain* technological lives and experiences are made to matter less, differently and perhaps not at all. If repair work is necessary, skilful and creative, it is just as often difficult, dirty and both sporadically and persistently dangerous. Beyond the health hazards attending prolonged exposure to toxins (Caravanos et al. 2011; Grant et al. 2013; Gupta and Hecht 2017), workers in our various study sites have reported concerns ranging from strained and deteriorating eyesight, to recurring headaches and respiratory problems, to what would be diagnosed in western contexts as various kinds of repetitive stress injuries. Per Simmel’s famous ‘tragedy of whomever is lowest’,<sup>3</sup> they are also exposed in rawest form to shocks and dislocations stemming from changes in the global economy – for example, the influx of low-cost handsets (many ‘Chinese’ in origin or cultural attribution) that have squeezed profit margins, shifted the fix-replace calculus (even in places like Bangladesh and Uganda) and led some repairers in our study to abandon the field for other work. Such experiences point to the frequent *precariousness* of repair and other less heralded forms of technological labour, their fragile and unequal integration into wider media economies as well as the intricate links between invisibility, suffering and risk that characterize and shape the technological worlds around us.

Attending to repair – both its poetics and political economy – may help us toward accounts of media more complete and ultimately hopeful in several crucial regards. To begin, they may expand our imagined geographies of technical skill and expertise, recognizing sites and forms of agency (like Jason’s workshop above) that more typical designer-ly and production-centred accounts, whether celebratory or critical, may miss. This correction can help to rebalance global stories and assumptions around technology: from gap or deficit models that ignore or dismiss the range and presence of technical skill (echoing age-old Enlightenment and colonial prejudice) towards a more expansive understanding that acknowledges the true range and plenitude of global technological work. It may also expand our sense of technological agents and agency, showing how stick figure abstractions like ‘users’ and ‘consumers’ may obscure and undermine a much wider and richer range of actions that we might (and do) undertake in our everyday interactions with objects, media and otherwise.

Alongside recent work in media archaeology (Parrika 2015), geography (Edensor 2011) and material culture (DeSilvey 2006), attending to repair may also help account for the deep and specific *materialities* of media, showing how particularities of substance and form may impact both the short-term operation of media objects and the longer-run processes and afterlives by which such objects pass in and out of the field of meaning and function. This may help us in turn to extend and reimagine the temporalities of media at scales from the infinitesimal to the geological. Such understandings may help us toward new appreciations of the ‘finitude’ (Cubitt 2017) of media, and the possibility in turn of richer, more affective and more ethical relations with the media worlds around us.

Finally, as revealed by the legal practices and controversies above, attending to repair may offer new roads into the recognition of media as a legally, institutionally and ethically contested terrain, whose details and complexity media and technology scholars have yet to fully grasp and engage. This terrain remains both unsettled and emergent, as firms seek new forms of advantage and control in the changing media environment (even while deploying older tools and mechanisms, like intellectual property, to achieve it). Such efforts seem only likely to intensify as a growing range of firms and industries seek the long-run returns and flexibilities attached to business strategies built around service, licensing or subscription, and as big data ambitions transform erstwhile manufacturing firms (like John Deere) into data and information companies. In instances where repair itself is orthogonal and separate from such interests, it may nevertheless get in the way, tripping over the kinds of extended relations that new data-driven and service models rely on. In others, repair may connect to or implicate changes in the economy more broadly: an index or prism through which wider transformations and gathering lines of power may be glimpsed, challenged or contested.

### *Conclusion*

Poetics are never innocent; repair is never pure: within the space of media and well beyond, the powerful fix the world too. Nor is political economy without hope, or restricted to rationalities and relationalities purely instrumental or managerial in scope. What would it mean to think poetics and political economy together?

It would mean recognizing the centrality of infrastructure to social form and practice writ large, in its full affective, experiential and not merely functional or structural dimensions. It would mean broadening the terrain of media ethics, beyond questions of meaning and representation (as if signs and data somehow floated free) towards the full depth and richness of our connections with the material world(s) around us. It would mean recognizing the poetic possibilities of infrastructure itself – and in turn the infrastructural grounds and conditions of poetics.

Such steps may help us toward new forms of the empirical in media and technology studies today: practiced in different places, with different things and people, and to different ends and effect. And to step away from pride and pretension to reimagine scholarship itself as an act of repair.

### NOTES

1. When the controversy first broke, Apple defended itself by arguing that ‘this security measure is necessary to protect your device and prevent a fraudulent Touch ID sensor from being used’ (BBC 2016). One month later – following worldwide media coverage and a class-action lawsuit – Apple apologized and issued a software re-release without the killer code, claiming now that the update was actually ‘designed to be a factory test and was not intended to affect customers’ (Baranuik 2016).
2. Beyond its implications for repair, this represented an important defense of the ‘exhaustion’ principle, a patent cousin to copyright’s First Sale doctrine that holds that the rights of intellectual property holders are fulfilled (or ‘exhausted’) at the point of sale, and may not be used to assert post-sale rights of control.
3. ‘Every new pressure and imposition moves along the line of least resistance which, though not in its first stage, usually and eventually runs in a descending direction. This is the tragedy of whomever is lowest [...] he not only has to suffer from the deprivations, efforts, and discriminations, which, taken together, characterize his position; in addition every new pressure on any point whatever in the superordinate layers is, if technically possible at all, transmitted downward and stops only at him’ (Simmel 1950: 236–37, cited in Connolly 2013: 23).

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