CHAPTER 46

THE MATERIAL CELLPHONE

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> Mobile phones have become affective technologies. That is, objects which mediate the expression, display, experience and communication of feelings and emotions.…They are an extension of the human body…building and maintaining…groups and communities. (Lasén 2004)
>
> G[race] K[hunou]: A cell phone is the best accessory ever. Those without disposable income find ways of owning one and having airtime. A lot of the hip guys do not leave their cell phones in their cars or put them in their pockets. They hold them in their hands.…Another thing they have to be seen as having are the smallest cell phones. You lose points if you are seen with a heavy and big cell phone.…Cell phones are also very much a female accessory. For some women, having accessories such as these are a reason for having multiple boyfriends, whom they refer to as 'ministers'—that is, different boyfriends to provide for their different needs.
>
> N[sizwa] D[lamini]: It is considered degrading to give someone a landline phone number, as it suggests that one does not have a cell phone. Even those who have one are not off the hook, as their phones have to be tiny, lighter, and look good.…Bigger ones are given names such as a 'brick'. (Mbembe et al. 2004: 504)
>
> The increasingly faster and more versatile computers, appealing mobile phones, high-definition TVs, Internet, tiny music players, ingenious photo cameras, entertaining games consoles and even electronic pets give us the idea of a developed, pioneering and modern world. It is indeed a new era for many; but the dark side of this prosperous world reveals a very different reality, that far from taking us to the future, takes us back to a darker past. (Centro de Reflexión y Acción Laboral 2006)
>
> [T]he woman came back carrying a small cardboard box. She went directly to Bosch and handed it to him, then bowed as she backed away. Harry opened it and found the remains of a melted and burnt cell phone.
>
> While the woman gave Sun an explanation, Bosch pulled his own cell phone and compared it to the burned phone. Despite the damage, it was clear the phone the woman retrieved from her ash can was a match.
>
> 'She said Peng was burning that,' Sun said. 'It made a very foul smell that would be displeasing to the ghosts so she removed it' (Connelly 2009: 243)

We are not archaeologists. Our backgrounds are in history, political science, philosophy, sociology, and communication studies. Our methods derive from the application of

precepts from political economy and cultural studies, so we are concerned with the material relations of meaning and the interplay of subjectivity and power, emphasizing the materiality of discourse and the discursivity of materials. This cultural materialism refuses the notions that objects lack meaning or meanings exist independently of objects and the practices that bring them into the world. It is also profoundly connected to the fundamental question '*cui bono*?' when discussing the allocation, utilization, and impact of resources. As such, the following examination of the cellphone[1] blends rather than juxtaposes political economy and cultural studies. In the past, our research has explored the relation of Hollywood's worldwide textual dominance to the international division of cultural labour upon which such textual power depends. Here we are also concerned with the workers who bring media into the world, emphasizing the material environmental impact of production and consumption of media technology as exemplified by the cellphone. Labour and environmental research takes us from the purely discursive life of the technology to the environmental and biophysical evidence it leaves in its wake. To get us there, we draw on an eclectic set of procedures: archival work, epidemiology, public policy, corporate accounts, science, and science studies.

The first two epigrams we quoted above are comforting. One speaks in universal terms about the phenomenology of the cellphone: everyone is embraced by and embracing what seems to be a natural extension of our very selves! The cellphone is soothing, helpful, special—an elemental force that has become part of us. The other quotation is more localized. It refers to life in Soweto after liberation from apartheid, where the cellphone's gift of commercial freedom has adapted to local gendered circumstances and *mores*. At the same time, this epigram, too, is universal in claiming the phone's centrality to everyday life.

By contrast with the nurturing common sense of their predecessors, the second two epigrams are quite shocking. One comes from an account of the putrid, dangerous creation of cellphones in the electronics industry, which delivers the products that Sowetans and the rest of us own. The other references Hong Kong customs and the putrid, dangerous afterlife of cellphones once their cuddly qualities have become obsolete and they must be exterminated.

These differences should come as no surprise, given the provenance of the epigrams. The first derives from scholarship and publication funded by Vodafone, a major supplier of the objects that are so thoroughly humanized by its 'academic staff'. The second is written by humanities experts interpreting the life they see around them, but ignoring the fact that raw materials for cellphones are tearing huge swathes of their continent apart. By contrast, the third epigram was generated by a non-governmental organization that seeks to protect and expand workers' rights in Mexican *maquiladoras*. And the source of the fourth is crime fiction, drawing on hard-boiled, code-driven detection to observe horror wherever it is found, almost without commentary.

[1] We wrote this chapter while living in the US and Mexico respectively, where the terms 'cellphone' and 'celular' respectively are the nomenclature. We'll therefore use 'cell' in our 'own' prose in this chapter, while recognizing that linguistic variations on 'mobile phone' or 'movil' are common elsewhere and in much academic writing.

The key to bridging the gap between these quotations is a materialist one. A recent contribution from archaeology offers this contextualization:

> The phone has much in common with the portable artifacts of a more traditional archaeology, like flint hand-axes or pottery vessels.…an object scaled to fit the human world.…shaped to fit the hand and fingers, and has action capabilities…orientated towards other parts of the body. (Edgeworth 2010: 143)

Archaeology encourages us to track the life of this commodity as both a sign and a physical artefact. That means attending to dominant as well as latent meanings inscribed in the cellphone while acknowledging its discontinuity with the portable artefacts of antiquity because of its industrial provenance and environmental impact.

Cultural materialism holds in tension utopic and dystopic accounts of the cellphone, defining the key modes of conscious expression surrounding it. The former anchor the cellphone's historical time to a high capitalist consumerism that is said to deliver happiness, development, and revolution. They pay attention to personal and social rather than psychological and biological aspects. They love cellphones.

Dystopic accounts, by contrast, see the cellphone era as one of social fragmentation: managerial and administrative command and control demands lead workers and others on a frantic, alienated search for connectedness, leaving little time or inclination to ponder political-economic arrangements and alternatives. This dystopian perspective criticizes the quasi-religious nature of utopian discourse. It emphasizes protests (see Badcock and Johnston, this volume and Dixon, this volume) and studies that expose the harms that cellphones cause in the service of profit and bureaucracy—most significantly to workers and environment.

This chapter starts with a positive case for welcoming the cellphone as a transformative, even revolutionary, technology, then points towards crucial evidence that transcends the binary of utopian versus dystopian consciousness to chemico-mechanical materiality and environmental impact.

46.1 The Utopian Record: Cellphones Make You Free

Ninety-four per cent of cell users aged 12–17 agree that cellphones give them more freedom because they can reach their parents no matter where they are.…

Teens who have multipurpose phones are avid users of those extra features. The most popular are taking and sharing pictures and playing music:

83% use their phones to take pictures.
64% share pictures with others.
60% play music on their phones.
46% play games on their phones.
32% exchange videos on their phones.
31% exchange instant messages on their phones.

27% go online for general purposes on their phones.
23% access social network sites on their phones.
21% use email on their phones.
11% purchase things via their phones. (Lenhart et al. 2010: 5)

Cellphones are ubiquitous: they are utilized by half the world's population and technologically available to 90%, up from 145 million in 1996 to over five billion in 2010, including 85% of the US public. By the end of 2010, three-quarters of the world's cellphone accounts, about 4 billion, were held in the Global South. In Kenya, cellphone banking amounts to US$1 billion transactions a month. Of the 83% of US adults who own cellphones, three quarters use text messaging, 41.5 times on a typical day. In China, 73% of people aged 15–24 regularly access the Internet by phone, compared with under 50% in the US and the UK and less than 25% across Europe. The use of messaging is feminized, apart from Italy, Saudi Arabia, and China (International Telecommunication Union 2009; NielsenWire 2011; Pew Research Center 2011; Smith 2010; Voigt 2011).

The right adores such data. Manuel Castells, a renowned lapsed Marxist whose work has shifted from critical European urbanism to mainstream US communication studies, is one of the leading scholars forwarding utopian ideas about cellphones. In a 2007 study, he cited many positive features: cellphones broaden channels of communication, secure personal safety, integrate family life, improve peer groups, speed up rendezvous, and allow users to produce content, create their own language, and make personal statements in their choice of exterior design—i.e. they make users feel important (Castells et al. 2007: 246–58). He also claims that the device is politically transformative:

> The spread of instant political mobilizations by using mobile phones, supported by the Internet, is changing the landscape of politics. It becomes increasingly difficult for governments to hide or manipulate information. The manipulation plots are immediately picked up and challenged by a myriad of 'eye balls,' as debate and mobilization are called upon by thousands of people, without central coordination, but with a shared purpose, often focusing on asking or forcing the resignation of governments or government officials. (Castells 2007: 251)[2]

Using the same discourse, neo-classical economists and their *bourgeois* masters in business form a vanguard of institutional boosters. They promote cellphones as crucial to democracy, efficiency, pleasure, and development in the Global South (Hanna and Qiang 2010; Houghton 2009; International Telecommunication Union 2009: 2, 5 and 2008: 67–84; Jones 2008; Prahalad and Hart 2008; Sachs 2008). Industry magazines such as *Advertising Age* positively salivate over the prediction that by 2013, there will be 4.5 billion users, well over half the world's population, as the absence of conventional telecommunications and financial

[2] In a similar vein, Ulrich Beck (2002), noted for his work on risk society, says that the cellphone has altered 'sociological categories of time, space, place, proximity and distance' as it 'makes those who are absent present, always and everywhere' (2002: 31). Such observations reinforce Castells's theories of 'timeless time' and 'space of flows'—imagine being in conversation with someone who abruptly takes an incoming cellphone call; they are no longer 'with you' but have entered into the network's timeless time and space of flows. For Castells, this is the fundamental materiality of communicating subjects in the network society.

infrastructure is overcome thanks to digital wallets and micro-payment systems (Shapiro 2010).

This happy state of affairs finds the world's leading media ratings company, Nielsen, publishing an unimaginably crass account that begins 'Africa is in the midst of a technological revolution, and nothing illustrates that fact [more] than the proliferation of mobile phones,' then notes casually that 'more Africans have access to mobile phones than to clean drinking water' (Hutton 2011).

It should not surprise us that private-sector idolatry and commercial targeting can claim that communications technology has priority over potable water in development policy. But this perspective is widespread. Credulous academics tell us that cellphones reduce poverty and corruption by empowering individuals and fostering the complete elimination of waste (Jensen 2007; Bailard 2009). Scholarly devotees to the utopian idea of the cellphone are captivated by a Schumpeterian wet dream in which cellphone consumers rise up and rebel against capital, even as they renew it in a bizarre alliance with entrepreneurs against corporate domination and closed markets:

> Our case studies range over several emergent industries based about consumer cocreation in digital media. Each has been made possible by new digital information and communication technologies centred about the Internet as a universal platform for social networks and business models, and about new digital consumer goods and services.…the value-creation proposition about which business models are adopted and adapted is premised on the provision of content emanating from a distributed network of consumers or users operating in partnership with producers and, equally importantly, from the self-organization of the community protocols that coordinate such flows. This cultural and technological dynamic is both inducing new creative activities (e.g. MMOGs, video and photo-sharing) as well as displacing and disrupting extant industries (e.g. media journalism and music). (Potts et al. 2008: 465)

The New Right of cultural studies invests in such things with unparalleled zest. It's never seen a smart-phone application it didn't like, or a socialist idea it did. This is reminiscent of the Cold-warrior social scientist Ithiel de Sola Pool's account of landlines' potential:

> The company president located himself at the place where most of his most critical communications took place. Before the telephone, he had to be near the production line to give his instructions about the quantities, pace, and process of production. Once the telephone network existed, however, he could convey those authoritative commands to his employees at the plant and could locate himself at the place where the much more uncertain bargaining with customers, bankers, and suppliers took place. (de Sola Pool 1980: 3)

But almost a century ago, Weber understood the role of the phone in fictive capital:

> The 'arbitrager' seeks a profit in that he simultaneously sells a good at a place where it is, at that moment, able to be sold at a higher price, while he buys it at a place where it is to be had more cheaply. His business is therefore a pure example of calculating the numbers. He sits at a telephone…and, as soon as he notices the possibility of, for example, making a profit from buying Russian notes or notes of exchange drawn on Russia available in London and then selling them in Paris, he places his orders. (2000: 344)

That encourages us to look to a less sanguine account of this technology.

46.2 The Dystopian Record: Cellphones Make Others Unfree

> [I]t is now necessary to impose silence in restaurants and places of worship or concert halls. One day, following the example of the campaign to combat nicotine addiction, it may well be necessary to put up signs of the 'Silence Hospital' variety at the entrance to museums and exhibition halls to get all those 'communication machines' to shut up and put an end to the all too numerous cultural exercises in SOUND and LIGHT. (Virilio 2004: 76)

More critical analyses point out that cellphones are surveillance tools of state control and corporate management. Jack Qiu offers telling examples from Malaysia, Britain, Australia, and China, where 'an industrial complex has emerged since 2000 to serve the control needs of the power elite' via cell monitoring (Qiu 2007; also see Andrejevic 2006; Baruh 2004; Turow 2005). The World Privacy Forum proposes that we are in a *One-Way Mirror Society*, where power accretes to corporations through the supposedly even-handed tool of interactivity (Dixon 2010).[3] This is a continuation of older dystopian assessments of communication, command, and control, famously fictionalized in Yevgeny Zamyatin's *We* (1924), Aldous Huxley's *Brave New World* (1932), and George Orwell's *Nineteen Eighty-Four* (1949).

Andrew Keen, a lapsarian prophet of the Internet, argues that the new landscape is abuzz with noise and ignorance rather than subtlety and knowledge (2007: 12). He sees a dreary world where constant clatter and frenzied imagery denature aesthetics in favour of uninterrupted stimulus. Media historian Dan Schiller challenges cellphone enthusiasts by demonstrating that social stresses fuel consumer needs, as people rush to buy inferior phone services at high cost. This is particularly the case in the US, where the decline in governmental oversight of telecommunication industries since the Second World War has diminished quality and regulation of competition (see Cubitt, this volume). Companies exploit social needs for connectedness in times of social fragmentation (Schiller 2007: chapter 8). Schiller describes the experience of displacement and deracination of modern life into a mode of sociality in which individuation (separateness and privacy) combines with mobility (transport and access). He argues that political-economic arrangements allow mobile telephony to emerge in a form befitting divided societies.[4] The cellphone is a very odd thing when seen in this light—built upon the stressful fragmentation of social life, corporate control, divisions between rich and poor, and the false promises of consumerism.

[3] Surveillance has long been a central strut of modernity, supposedly to make populations secure, content, and productive. With the expansion of state authority into the everyday, into all corners of life, the *quid pro quo* for the security afforded by governments became knowing everyone's identities and practices. The equivalent expansion of corporations into those everyday corners had as its *quid pro quo* for the provision of goods and services that they, too, know more and more about us.

[4] Perhaps the dystopian record should include Benjamin's Proustian lament for the loss of aura (1992: 184) thanks to a new technology that looks back at us and carries our images and statements into a reciprocal loop. How ironic that the supposed depersonalization of modern Parisian life was both exemplified and countered by the advent of the telephone as a commercial apparatus in the 1870s, simultaneously rendering the public private and the private public (Attali and Stourdze 1977: 97–8; Innis 1991: 60).

46.3 The Material Record: Cellphones Harm the Earth and its Inhabitants

> I work like a machine and my brain is rusted—19-year old female worker from Guangxi at the Compeq printed circuit board factory in Huizhou City, China. (quoted in Chan and Ho 2008: 22)

The spread of cellphones ahead of drinking water in Africa is only one environmental issue they pose. Cellphone design, production, and distribution have significantly augmented toxic elements in the biosphere: lead, mercury, chromium, nickel, beryllium, antimony, and arsenic as well as valuable metals, such as gold, silver, palladium, and platinum, tantalum (the mining of which has caused social and environmental harm in Africa) and flame retardants made of polybrominated diphenyl ethers. All cellphones need batteries, which contain poisonous components. As one environmental health scientist warned: 'In a phone that you hold in the palm of your hand, you now have more than 200 chemical compounds. To try to separate them out and study what health effects may be associated with burning or sinking it in water—that's a lifetime of work for a toxicologist' (quoted in Mooallem 2008: 42).

The companies whose names appear on cellphones subcontract their dirty work to miners, cottage assemblers, and manufacturers. The latter have grown in number since the 1990s and undertake approximately 60% of cellphone production (makeITfair and GoodElectronics 2009: 19–20). Both the environment and workers are vulnerable to harm throughout this supply chain. Investigations into Apple's Chinese suppliers, for example, found children assembling its gadgets, workers exposed to chemical poisoning, and searing workplace conditions that led to 17 suicides in the first eight months of 2010 at a Foxconn factory making iPhones. When the iPad was launched outside the US that year, protesters in Hong Kong responded to the deaths by ritually burning photographs of iPhones. Similar conditions exist in India, Mexico, and other offshore assembly sites (Barboza 2010; Maxwell and Miller 2012: ch. 4; Students and Scholars Against Corporate Misbehaviour 2010).

The semiconductor, the heart of all electronic equipment, is produced by hundreds of companies around the world for a market dominated by Intel, Samsung Electronics, Toshiba Electronics, Texas Instruments, Qualcomm, and ADM. A single semiconductor facility may require 832 million cubic feet of bulk gases, 5.72 million cubic feet of hazardous gases, 591 million gallons of deionized water, 5.2 million pounds of chemicals, including acids and solvents, and 8.8 million kilowatt hours of electrical power. Semiconductor workers are potentially exposed to skin irritants, acids that harm mucous and pulmonary tissue, and chemicals that can cause cancer, reproductive complications, and debilitating illnesses. The durable half-life of toxic waste emitted into the soil from semiconductor plants leaves groundwater and land unusable or highly dangerous for populations who live atop them long after culpable firms have departed. Entire communities like Endicott, New York—the original home of IBM—have seen their aquifer and soil cursed with such carcinogenic compounds as trichloroethylene (a solvent) that will remain active for decades (Grossman 2006: 109–11).

Raw material extraction and processing—the source of chemicals and minerals in cellphones—are responsible for lasting biophysical harm. Data from the Norwegian silicon-carbide industry's smelters indicate elevated risks of stomach and lung cancer by contrast with the wider population as a consequence of exposure to crystalline silica, dust fibres, and silicon carbide particles (Romundstad et al. 2001). In Democratic Republic of Congo, which has a third of the world's columbite-tantalite (coltan), over 90% of eastern mines are controlled by militias, who use threats, intimidation, murder, rape, and mutilation to enslave women and children and use their profits to buy weapons. Over five million people have perished in the civil war over the past decade. Congolese 'conflict' metals and minerals, such as coltan, are exported for smelting in China then mixed with the overall global supply and sold on the international commodities market as tantalum, a core component in capacitors that end up in phones and other electronic equipment (Cox 2009; Global Witness 2009; Maxwell and Miller 2012; Montague 2002).[5]

Together with their electronic cousins, cellphones amplify residential electricity consumption at unprecedented rates: they accounted for about 15% of global residential electricity consumption in 2009. At current levels, energy use by electronic cultural and communications equipment will amount to 30% of the global demand for power by 2022 and 45% by 2030, thanks to server farms (data centres with servers, storage machines, network gadgetry, power supplies, and cooling technology) and the increasing time people around the world spend staring at screens (Maxwell and Miller 2009: ch. 29).

By 2009, radiation from cellphones and other wireless electronic equipment became the focus of further documentation. Scientific studies have linked long-term exposure to cellphone radiation to two types of brain cancer (glioma and acoustic neuroma), salivary gland tumours, migraines, vertigo, and behavioural problems (Environmental Working Group 2009). This research has led European health agencies to issue warnings about cellphone radiation exposure and prompted lawmakers to consider legislation to reduce radiation from such devices. Regulators in several countries have recommended caution to adult users and extreme caution for children, pending ongoing research. The French Senate has proposed legislation to ban cellphone use by children under six and advertising directed to children under the age of twelve (Sénat français 2009). The European Parliament's resolution on health concerns associated with electromagnetic fields (INI/2008/2211) affirmed potential risks from a range of wireless electronic devices, including Wi-Fi/WiMAX, Bluetooth, and cordless landline phones and called for campaigns to educate citizens in the safe use of electronics and avoiding transmission towers and high-voltage power lines.

The International Commission on Non-Ionizing Radiation Protection has appealed for public policy to set limits on 'simultaneous exposure' to multiple electronic devices. The European Environment Agency followed up a major scientific review by the Bioinitiative Working Group of radiation from Wi-Fi, cellphones, and their masts by announcing in 2007 that immediate action was needed lest the latest fad end up as damned for its health impact

[5] Two remarkable documentaries illuminate these horrors: *Blood Coltan* (Patrick Forestier, 2008) <http://topdocumentaryfilms.com/blood-coltan> and *Blood in the Mobile* (Frank Piasecki Poulsen, 2010) <http://bloodinthemobile.org/categories/p/videos>, in addition to a more recent video report on cellphones and coltan <http://www.guardian.co.uk/world/video/2011/sep/02/congo-blood-gold-mobile-phones-video>.

Table 46.1 Global personal computer market by territory, second quarter 2011 and forecast 2011 and 2012

Territory	2Q11% Share	2011% Share	2012% Share
China	22.0	20.3	21.8
US	21.0	20.6	19.6
Others	57.1	59.1	58.5

Source: http://www.idc.com/getdoc.jsp?containerId=prUS22997711&pageType=PRINTFRIENDLY

as lead and tobacco in the previous century. In the US, however, regulators all but ignored evidence that long-term cellphone use may be risky Environmental Working Group 2009: 18–22, 28, 3–4; Lean 2008; Organisation for Economic Co-operation and Development 2007).

About 130 million cellphones are trashed each year in the US alone, where people purchase annual replacements. Once discarded, they generate further toxicity. As a growing part of the global electronic waste business (e-waste), cellphone salvage and recycling pose serious health and safety risks for workers: brain damage, headaches, vertigo, nausea, diseases of the bones, stomach, lungs, and other vital organs, and birth defects and disrupted biological development in children (Grossman 2006: 18–20, 44–45, and ch. 5 *passim*; Crosby 2007; Hardell et al. 2009; Rydh 2003; Sadetzki et al. 2007). These conditions result from exposure to heavy metals (lead, cadmium, and mercury, among others), dioxin emitted by burning wires insulated with polyvinylchloride, flame retardants in circuit boards and plastic casings containing polychlorinated biphenyls or newer brominated compounds, and poisonous fumes emitted while melting electronic parts for precious metals such as copper and gold. Cellphones can be found in this dangerous discarded state throughout the traditional sites selected by the wealthy to dispose of their detritus: Latin America, Africa, and Asia (Ha et al. 2010; Inform 2008; Leung et al. 2008; Ray et al. 2004; Secretaría Federal de Asuntos Económicos 2008; Wong et al. 2007).[6]

This North–South asymmetry is changing as India and China generate their own detritus. In terms of computer purchase, for example, the trends at mid-2011 are laid out in Table 46.1.

So-called emergent markets have startling e-waste implications in their mimesis and expansion of Yanqui excess: India, for instance, rings in its newfound wealth with eight to ten million new cellphone subscriptions a month, drawing on diesel-fuelled power sources to compensate for the absence of a functioning national grid (Greenpeace 2011: 13). We do not suggest that it is wrong for the Global South to participate in the same plenitude as the Global North. Rather, we wish to highlight the unsustainability of consumer practices pioneered by the latter and turbocharged by the former.

[6] These issues are graphically illustrated in *Panorama*'s programme on illegal e-waste recycling in West Africa, where 77% of British e-waste goes <http://news.bbc.co.uk/panorama/hi/front_page/newsid_9481000/9481923.stm> or *60 Minutes*'s harrowing account from China <http://www.cbsnews.com/stories/2008/11/06/60minutes/main4579229.shtml>.

Cellphones are also perilous to wildlife. Phone masts kill tens of millions of birds annually in the US, affecting over 200 species, and erode animals' natural defences, health, reproduction, and habitat. Between 1990 and 2000, the number of cell towers and antennae in the US grew to 130,000; 40,000 towers were 200 feet tall, and many reached a thousand feet (Avatar Environmental 2004; Balmori 2009; Broad 2007; Center for Responsible Nanotechnology <crnano.org>; Krasnow and Solomon 2008: 50, 62–3; Ornithological Council 1999; Pourlis 2009; Schoenfeld 2007; United States Fish and Wildlife Service 1999; Wikle 2002: 46). This may look like a domestic US matter, but birds are the most experienced and determined of globalizers, with boundaries set by geography rather than sovereignty.

46.4 Conclusion

> She hung up before he could say goodbye. Stood there with her arm cocked, phone at ear-level, suddenly aware of the iconic nature of her unconscious pose. Some very considerable part of the gestural language of public places, that had once belonged to cigarettes, now belonged to phones. Human figures, a block down the street, in postures utterly familiar, were no longer smoking. (Gibson 2010: 103)

The cellphone generates affect, money, detritus, and disease. It appears to consumers as a discrete object of material culture, but through its life causes harm to far-flung natural and biophysical environments as its by-products travel the Earth via an international division of labour comprised of miners, smelters, assembly and transport workers, consumers, salvage, and recycling. Human and non-human organisms endure similar burdens to those that were caused by older industrial products and processes—from smokestacks and chemico-mechanical methods dependent on abundant sources of electrical energy to the spreading sediment of poisonous waste.

This chapter has deployed cultural materialism via political economy and cultural studies to follow the life of the cellphone. Due to the heavy, heady environmental implications of this deadly yet playful apparatus, cultural-materialist method has been especially inflected with environmental studies. The record exposes contradictory interpretations of the cellphone's meaning and value. The utopian love affair with this latest wonder of communication technology evokes ancestral cries for community, progress, and freedom. Dystopian perspectives resonate with past techno-critical scepticism and research, focusing on the dangers of social fragmentation and intensified command and control functions created by machines that have become emblematic of twenty-first century modernity. Recognizing the multi-sided material paradoxes and contradictions posed by these newest of toys is a crucial task for our present and future.

References

Andrejevic, Mark. 2006. Total Information Awareness: The Media Version. *Flow* 4(8). Available at: <http://flowtv.org/2006/07/total-information-awareness-the-media-version> (accessed 1 March 2012).

Attali, Jacques and Stourdze, Yves. 1977. The Birth of the Telephone and Economic Crisis: The Slow Death of Monologue in French Society. In *The Social Impact of the Telephone*, ed. Ithiel de Sola Pool, pp. 97–111. Cambridge, MA: MIT Press.

Avatar Environmental. 2004. Avian/Communication Tower Collisions. Prepared for Federal Communications Commission, 30 September. West Chester, PA: Avatar Environmental, LLC.

Bailard, Catie Snow. 2009. Mobile Phone Diffusion and Corruption in Africa. *Political Communication* 26(3): 333–53.

Balmori, Alfonso. 2009. Electromagnetic Pollution from Phone Masts: Effects on Wildlife. *Pathophysiology* 16(2–3): 191–9.

Barboza, David. 2010. Supply Chain for iPhone Highlights Costs in China. *New York Times*, 5 July. Available at: <http://www.nytimes.com/2010/07/06/technology/06iphone.html?pagewanted=all> (accessed 1 March 2012).

Baruh, Lemi. 2004. Anonymous Reading in Interactive Media. *Knowledge, Technology, & Policy* 17(1): 59–73.

Beck, Ulrich. 2002. The Cosmopolitan Society. *Theory, Culture & Society* 19(1–2): 17–44.

Benjamin, Walter. 1992. *Illuminations*, tr. Harry Zohn, ed. Hannah Arendt. London: Fontana.

Broad, William J. 2007. NASA Forced to Steer Clear of Junk in Cluttered Space. *New York Times*, 31 July: F4.

Castells, Manuel. 2007. Communication, Power and Counter-Power in the Network Society. *International Journal of Communication* 1: 238–66.

Castells, Manuel, Fernández-Ardèvol, Mireia, Linchuan Qiu, Jack, and Sey, Arab. 2007. *Mobile Communication and Society: A Global Perspective*. Cambridge, MA: MIT Press.

Centro de Reflexión y Acción Laboral. 2006. New Technology Workers: Report on Working Conditions in the Mexican Electronics Industry. Available at: <http://sjsocial.org/fomento/proyectos/plantilla.php?texto=cereal_m> (accessed 1 March 2012).

Chan, J. and Ho, C. 2008. *The Dark Side of Cyberspace.* Berlin: World Economy, Ecology & Development.

Connelly, Michael. 2009. *Nine Dragons: A Novel*. New York: Little, Brown and Company.

Cox, Stan. 2009. Cell Phones Generate Particularly Dangerous E-Waste. In *What is the Impact of E-Waste?*, ed. Cynthia A. Bily, pp. 18–26. Detroit: Greenhaven.

Crosby, Jackie. 2007. The Mania Over Apple's Latest Product Could Translate into an Avalanche of Electronic Waste. *Star Tribune*, 29 June: 1D.

de Sola Pool, Ithiel. 1980. Communications Technology and Land Use. *Annals of the American Academy of Political and Social Science* 451: 1–12.

Dixon, Pam. 2010. *The One-Way Mirror Society: Privacy Implications of the New Digital Signage Networks*. World Privacy Forum. Available at: <http://www.worldprivacyforum.org/pdf/onewaymirrorsocietyfs.pdf> (accessed 1 March 2012).

Edgeworth, Matt. 2010. Beyond Human Proportions: Archaeology of the Mega and the Nano. *Archaeologies: Journal of the World Archaeological Congress* 6(1): 138–49.

Environmental Working Group. 2009. *Cell Phone Radiation: Science Review on Cancer Risks and Children's Health.* Washington, DC: Environmental Working Group. Available at: <http://ewg.org/cellphoneradiation/fullreport> (accessed 1 March 2012).

Gibson, William. 2010. *Zero History*. New York: Putnam.

Global Witness. 2009. *Faced with a Gun, What Can You Do? War and the Militarization of Mining in Eastern Congo*. London: Global Witness.

Greenpeace. 2011. *How Dirty is Your Data? A Look at the Energy Choices that Power Cloud Computing*. Amsterdam: Greenpeace.

Grossman, Elizabeth. 2006. *High Tech Trash: Digital Devices, Hidden Toxics, and Human Health*. Washington, DC: Island Press.

Ha, Vinh Hung, Lee, Jae-Chun, Jeong, Jinki, Trung Hai, Huynh, and Jha, Manis K. 2010. Thiosulfate Leaching of Gold from Waste Mobile Phones. *Journal of Hazardous Materials* 178(2–3): 1115–19.

Hanna, Nagy K. and Qiang, Christine Zhen-Wei. 2010. China's Emerging Informatization Strategy. *Journal of the Knowledge Economy* 1(2): 128–64.

Hardell, Lennart, Carlberg, Michael, and Mild, Kjell Hansson. 2009. Epidemiological Evidence for an Association Between Use of Wireless Phones and Tumor Diseases. *Pathophysiology* 16(2–3): 113–22.

Houghton, John. 2009. ICT and the Environment in Developing Countries: Opportunities and Developments. Paper prepared for the Organisation for Economic Co-operation and Development. Available at: <http://www.oecd.org/dataoecd/40/25/43631894.pdf> (accessed 1 March 2012).

—— 2011. Mobile Phones Dominate in South Africa. *Nielsen Wire*. Available at: <http://blog.nielsen.com/nielsenwire/global/mobile-phones-dominate-in-south-africa> (accessed 1 March 2012).

Inform. 2008. *The Secret Life of Paper*. Video available at: <informinc.org/pages/media/the-secret-life-series/the-secret-life-of-paper.html> (accessed 1 March 2012).

Innis, Harold A. 1991. *The Bias of Communication*. Toronto: University of Toronto Press.

International Telecommunication Union 2008. *ICTs for Environment: Guidelines for Developing Countries, with a Focus on Climate Change*. Geneva: ICT Applications and Cybersecurity Division Policies and Strategies Department ITU Telecommunication Development Sector.

—— 2009. ITU Symposium on ICTs and Climate Change Hosted by CTIC, Quito, Ecuador, 8–10 July, ITU Background Report.

Jensen, Robert. 2007. The Digital Provide: Information Technology, Market Performance, and Welfare in the South Indian Fisheries Sector. *Quarterly Journal of Economics* 122(3): 879–924.

Jones, Van. 2008. *The Green-Collar Economy: How One Solution Can Fix Our Two Biggest Problems*. New York: HarperOne.

Keen, Andrew. 2007. *The Cult of the Amateur: How Today's Internet is Killing Our Culture and Assaulting Our Economy*. London: Nicholas Brealey Publishing.

Krasnow, Erwin G. and Solomon, Henry A. 2008. Communication Towers: Increased Demand Coupled with Increased Regulation. *Media Law & Policy* 18(1): 45–68. Available at: <http://www.nyls.edu/centers/projects/media_center/media_law_and_policy/archives> (accessed 1 March 2012).

Lasén, Amparo. 2004. Affective Technologies—Emotions and Mobile Phones. *Receiver* 11. Available at: <http://www.receiver.vodafone.com/11/articles/index03.html (no longer online), http://tinyurl.com/77vesy6> (accessed 1 March 2012).

Lean, Geoffrey. 2008. Mobile Phones 'More Dangerous Than Smoking'. *Independent*, 30 March. Available at: <http://independent.co.uk/life-style/health-and-wellbeing/health-news> (accessed 1 March 2012).

Lenhart, Amanda, Ling, Rich, Campbell, Scott, and Purcell, Kristen. 2010. *Teens and Mobile Phones*. Washington, DC: Pew Internet & American Life Project.

Leung, Anna, Nurdan, O. W., Duzgoren-Aydin, S., Cheung, K. C., and Wong, Ming H. 2008. Heavy Metals Concentrations of Surface Dust from E-Waste Recycling and its Human Health Implications in Southeast China. *Environmental Science and Technology* 42(7): 2674–80.

makeITfair and GoodElectronics. 2009. Improving Labour Standards in the Global Electronics Industry: Defining Strategies that Work. Round Table for the Electronics Industry and Civil Society Organisations, May, Amsterdam. Available at: <http://good-electronics.org/publications-en/Publication_3116> (accessed 1 March 2012).

Maxwell, Richard and Miller, Toby. 2009. The Environment and Global Media and Communication Policy. In *The Handbook of Global Media and Communication Policy*, ed. Robin Mansell and Marc Raboy, pp. 467–85. Oxford: Blackwell.

—— 2012. *Greening the Media*. Oxford: Oxford University Press.

Mbembe, Achille, Dlamini, Nsizwa, and Khunou, Grace. 2004. Soweto Now. *Public Culture* 16(3): 499–506.

Montague, Dena. 2002. Stolen Goods: Coltan and Conflict in the Democratic Republic of Congo. *SAIS Review* 22(1): 103–18.

Mooallem, Jon. 2008. The Afterlife of Cellphones. *New York Times*, 13 January: 38–43.

NielsenWire. 2011. Cellphones and Global Youth: Mobile Internet and Messaging Trends. Available at: <http://blog.nielsen.com/nielsenwire/online_mobile/cellphones-and-global-youth-mobile-internet-and-messaging-trends> (accessed 1 March 2012).

Organisation for Economic Co-operation and Development. 2007. *Extended Producer Responsibility*. Paris: OECD.

Ornithological Council. 1999. Deadly Spires in the Night: The Impact of Communications Towers on Migratory Birds. *Issue Brief from the Ornithological Council* 1(8). Available at: <http://nmnh.si.edu/BIRDNET/OC/issues/OCBv1n8.html> (accessed 1 March 2012).

Pew Research Center. 2011. Americans and Text Messaging. Available at: <http://pewresearch.org/databank/dailynumber/?NumberID=1324> (accessed 1 March 2012).

Potts, Jason, Hartley, John, Banks, John, Burgess, Jean, Cobcroft, Rachel, Cunningham, Stuart, and Montgomery, Lucy. 2008. Consumer Co-Creation and Situated Creativity. *Industry & Innovation* 15(5): 459–74.

Pourlis, Aris F. 2009. Reproductive and Developmental Effects of EMF in Vertebrate Animal Models. *Pathophysiology* 16(2–3): 179–89.

Prahalad, Coimbatore Krishnarao and Hart, Stuart L. 2008. The Fortune at the Bottom of the Pyramid. *Revista Electrônica de Estratégia & Negócios* 1(2). Available at: <http://portaldeperiodicos.unisul.br/index.php/EeN/article/viewArticle/39> (accessed 1 March 2012).

Qiu, Jack Linchuan. 2007. Mobile Messaging Service as a Means of Control. *International Journal of Communication* 1: 74–91.

Ray, Manas Ranjan, Mukherjee, Gopeshwar, Roychowdhury, Sanghita, and Lahiri, Twisha. 2004. Respiratory and General Health Impairments of Ragpickers in India: A Study in Delhi. *International Archives of Occupational and Environmental Health* 77(8): 595–8.

Romundstad, Pål, Andersen, Aage, and Haldorsen, Tor. 2001. Cancer Incidence among Workers in the Norwegian Silicon Carbide Industry. *American Journal of Epidemiology* 153(10): 978–86.

Rydh, Carl Johan. 2003. Environmental Assessment of Battery Systems: Critical Issues for Established and Emerging Technologies. Ph.D. dissertation, Department of Environmental Systems Analysis, Chalmers University of Technology, Göteborg.

Sachs, Jeffrey. 2008. The Digital War on Poverty. *Guardian*, 21 August. Available at: <http://guardian.co.uk/commentisfree/2008/aug/21/digitalmedia.mobilephones> (accessed 1 March 2012).

Sadetzki, Siegal, Chetrit, Angela, Jarus-Hakak, Avital, Cardis, Elisabeth, Deutch, Yonit, Duvdevani, Shay, Zultan, Ahuva, Freedman, Laurence, and Wolf, Michael. 2007. Cellular

Phone Use and Risk of Benign and Malignant Parotid Gland Tumors: A Nationwide Case-Control Study. *American Journal of Epidemiology* 167(4): 457–67.

Schiller, Dan. 2007. *How to Think About Information*. Urbana: University of Illinois Press.

Schoenfeld, Amy. 2007. Everyday Items, Complex Chemistry. *New York Times*, 22 December: C9.

Secretaría Federal de Asuntos Económicos. 2008. *Gestión de Residuos Electrónicos en Colombia Diagnóstico de Computadores y Teléfonos Celulares Informe Final*. Secretaría Federal de Asuntos Económicos, Cámara Colombiana de Informática y Telecomunicaciones, Ministerio de Ambiente, Vivienda y Desarrollo Territorial, Computadores para Educar, Universidad de los Andes, Bogotá.

Sénat français. 2009. *Projet de Loi Portant Engagement National pour L'Environnement.* Paris: Sénat français.

Shapiro, Judy. 2010. Why Mobile Technology is Still Going to Save the World. *Advertising Age*. Available at: <http://adage.com/article/digitalnext/mobile-technology-save-world/145084> (accessed 1 March 2012).

Smith, Aaron. 2010. *Gadget Ownership.* Washington, DC: Pew Research Center.

Students and Scholars Against Corporate Misbehaviour. 2010. Workers as Machines: Military Management in Foxconn. Available at:<http://sacom.hk/archives/740> (accessed 1 March 2012).

Turow, Joseph. 2005. Audience Construction and Culture Production: Marketing Surveillance in the Digital Age. *Annals of the American Academy of Political and Social Science* 597: 103–21.

United States Fish and Wildlife Service. 1999. *Bird Kills at Towers and Other Human-Made Structures: An Annotated Partial Bibliography (1960–1998)*. Washington, DC: Office of Migratory Bird Management.

Virilio, Paul. 2004. *Art and Fear*, tr. Julie Rose. New York: Continuum, New York.

Voigt, Kevin. 2011. Mobile Phone: Weapon Against Global Poverty. *CNN*, 9 October. Available at: <http://www.cnn.com/2011/10/09/tech/mobile/mobile-phone-poverty/index.html> (accessed 1 March 2012).

Weber, Max. 2000. Commerce on the Stock and Commodity Exchanges. *Theory and Society* 29(3): 339–71.

Wikle, Thomas A. 2002. Cellular Tower Proliferation in the United States. *Geographical Review* 92(1): 45–62.

Wong, Coby S. C., Wu, S. C., Duzgoren-Aydin, Nurdan S., Aydin, Adnan, and Wong, Ming H. 2007. Trace Metal Contamination of Sediments in an E-Waste Processing Village in China. *Environmental Pollution* 145(2): 434–42.