

## A Luminous Abstraction: 5G Narratives and Futuring Otherwise

### 1. Introduction

5G is a luminous abstraction.

In August 2020, Ericsson sponsored a musical collaboration between Eva Lazarus and DJ Swindle. The exchange is not a run-of-the-mill ‘collab’ but a whole 5G-powered happening. Lazarus sets camp at a member’s club in Soho and, as she sits down in an opulent drawing room, she warbles some vocals. Swindle, two miles away on a boat docked at the South Bank, samples and mixes the track as he coolly nods his head, clad in oversized sunglasses. A DJ should be able to connect to a singer, anticipate their next move even before they know it so Swindle watches Lazarus, no, connects with her, through Instagram Live. That is the whole point, showcasing just how fast a connection is when you use ultra-low latency 5G. If it’s fast enough for a DJ, it’s fast enough for anyone. The promotional video tells us as much: we see Lazarus walk down Greek Street and step into St Barnabas as she muses ‘I think it could be part of a huge era of collaboration for musicians. I think having the access to 5G is going to put people in touch with each other, like that’, she snaps her fingers for good measure, ‘and that is important because opportunities can pass you so quickly.’<sup>1</sup> It is not clear why Swindle could not walk the distance between the South Bank and Soho to join Lazarus, so he helpfully pipes up: ‘I’ve always wanted to set up a studio on a boat, so I got a bit closer to the dream.’

It is not that the marketing department at Ericsson was having a dry spell when they came up with the idea of using a boat-to-members-club collaboration as a case study for 5G. Huawei boasts that the technology will make it possible to deliver coffee by drone, remotely drive cars, or walk around the city with a VR helmet on. Intel contributes their own fever-pitch dreams. 5G will enable performing surgery (presumably on the tarmac) or monitor the heart rate of a cow in real time. *5G radar*,

a specialised publication, ups the frenzy a notch. Fans will be able to live stream games. We could even connect lightbulbs to the internet.<sup>2</sup> Imagine.

As dreams go, 5G is a recurring one, and it promises the same as every generation of mobile networks in the past. More reliable connections, faster speeds, lower latency, fewer dropouts. 5G is a real technology, but its ability to weave itself into the fabric of everyday life depends on its status as an abstraction. Here, we are interested in analysing the narratives of 5G: the stories told to make sense of the technology. We identify the narratives of promotion, proudly represented by the Ericsson collab, and contrast them with narratives of resistance, ranging from objections to new antennas to health anxieties to conspiracy theories. We see our analysis as a creative problematising of 5G, and the basis to speculate on protocols which are designed around different models of ownership and integration to non-human ecologies. Our argument is that 5G, as any form of infrastructure, is not neutral but imbued with a specific vision of the world and it is these visions, rather than technology itself, that can suggest the way forward to think of infrastructure otherwise.

## **2. The narratives of 5G**

Fifth generation mobile networks, often referred to as 5G, are a set of telecommunications protocols that have prompted expectations of urban hyperconnectivity. As Shannon Mattern reminds us, 5G uses higher frequencies than previous mobile telephony protocols, which makes it capable of delivering faster, low-latency connections, but it also necessitates a more disruptive infrastructure. Higher frequencies travel shorter distances, so they require a greater number of antennae which, although smaller, are more conspicuous as they are attached to building facades and lampposts, in addition to existing masts, making their presence in the city highly visible.<sup>3</sup>

5G is narrated in television commercials, trade fair show homes, and promotional events with residents that promote its ability to bring about the 'smartening' of our world, from production to logistics to entertainment to consumption. Lazarus and

Swindle's soundbites, that the technology enables networking, collaboration and a sense of proximity, align to a wider narrative of technological utopianism.<sup>4</sup> Howard Segal links the emergence of the ideology to nineteenth century doctrines of territorial expansionism and a vision of the United States as a utopian nation. Technology played a major role in enabling utopia, resulting in a blind fate in the inevitability of progress, and technological progress as the only kind worth aspiring to.<sup>5</sup> In its 5G guise, technological utopianism creates a sense of scripted progress — just as soon as one protocol generation is released, the next is already expected. The shortcomings or potential issues brought about by one particular generation of the technology are not important so long as the next one can be trusted to solve them and, eventually, deliver on the promise of an interconnected, better world. In the Global South, the discourse of progress and modernity has found connections with racial discourses, for example equating infrastructure with ideals of whiteness in Latin America, where the expansion of mobile networks is often understood as a prerequisite for countries to join the club of advanced, developed nations.<sup>6</sup>

Technological utopianism makes for powerful promotion. Dhanashree Thorat argues that the development of digital infrastructures is steeped in the rhetoric of modernity and progress, making their development just as dependant on technological possibility as it is on ideas and storytelling.<sup>7</sup> It is not important how whimsical the Lazarus-Swindle collaboration is as the height of 5G potential. What matters is the indeterminate future that the infrastructure promises to bring, a luminous abstraction of an ideal society brought together by technology. Swindle channels this vision when he declared that 'I think that people will discover ways to use the technology in perhaps a way that we can't see right now?'

When associated to ideals of modernity and progress, infrastructure ceases to be technology and becomes a constituent part of an ideological project, one that stretches to the historical dimension of western civilisation. As articulated by Walter D. Mignolo, ideas of modernity and progress are based on an understanding of society as an ordered, hierarchical system that aspires to become a hegemony.<sup>8</sup> Ideals of progress and prosperity makes 5G infrastructure appear self-evident, natural and

indisputable, making any form of opposition vague, indistinct and temporary. Any argument levered to the protocol and its shortcomings pale in comparison with the larger mission of the technology to bring about a better society. Only a fool would reject the inevitable; object progress; demand anything less than utopia.

### **3. Counternarratives, opposition and protest**

Despite ideals of progress and modernity, different generations of mobile network protocols have inspired a diverse set of counternarratives of protest and opposition.<sup>9</sup> Early rollout of 5G was met with stickers affixed to newly installed masts with information on the potential connection between the technology and COVID-19 (Figure 1-2). During the first few weeks of lockdown in the United Kingdom, there were reports of engineers being attacked by members of the public believing a direct causation between the new masts and the pandemic. Some of these rumours circulated in social media and gained prominence when public figures, including musicians and footballers, endorsed them.<sup>10</sup> The sudden popularity of these theories is thought to have motivated a series of arson attacks that took place in April 2020 in London, Birmingham, and Liverpool damaging recently installed 5G masts.<sup>11</sup>

Previous generations of mobile infrastructure motivated similar reactions. James Branch documented a mobile mast in Byron Avenue, Winchester, which was the focus of an intense dispute between members of the local community and Everything Everywhere, the owner of the mast.<sup>12</sup> Branch describes how neighbours used the mast itself to staple posters drawing attention to their campaign and organise marches, vigils and human chains to put pressure on the mobile carrier to decommission the equipment. The 'Action Against Byron Avenue Mast' group mirrors the strategies of several other neighbour associations in the United Kingdom.<sup>13</sup> Some of these associations were linked to Mast Sanity, a loosely organised national group which campaigned against the expansion of mobile infrastructure, mostly on the grounds of potential health risks. The Global South has

seen different rates of mobile infrastructure development, but reported similar cases of action at local, neighbourhood scales.<sup>14</sup>

*Figure 1. "No 5G sign, crazy conspiracy theory - COVID-19 Coronavirus - Belmont St, Alexandria, Sydney, Australia" by neeravbhatt is licensed under CC BY-NC-SA 2.0.*

*Figure 2. "Mainstream Media Liers 5G = Covid" by Matt From London is licensed under CC BY 2.0.*

Most of the campaigns have been short lived, and few succeeded in reversing planning decisions. This is in part due to the legal framework which, in the United Kingdom, gives the ability to object only to the owner of the land in which the mast is to be installed. The Electronics Communications Code 2017 requires operators to reach an agreement with occupiers of the land where they intend to sit their masts, and the Communications Act 2003 prescribes displaying a notice once the equipment has been installed, indicating the procedure to object. When the equipment requires planning permission, local councils consult the community before installation but despite these provisions, local communities often struggle to oppose installation of new masts, partly due to the narrow set of arguments that are considered valid.

As Dennis Rodgers and Bruce O'Neill argue, infrastructure is not only the technical apparatus that enables urban life, but also an interface where notions of state, citizenship, ethnicity and power are configured and brought to bear on reality. The way infrastructure is developed, however, is not neutral but contingent on technical and political factors alike. Marginalisation, abjection and disconnection is operationalised through infrastructure, often by making sure wealthy populations benefit, while underrepresented and marginalised communities are expected to suffer the risks associated with their operation.<sup>15</sup> Manuel Castells suggests this is especially true of digital networks which, despite rhetoric of innovation and revolution, 'diffuse selectively throughout the planet, working on the pre-existing sites, cultures, organizations, and institutions that still make up most of the material environments of people's lives'.<sup>16</sup> The way in which infrastructure follows existing fault lines of income distribution, race and gender is illustrated by our photographic work in East London, which documents how mobile masts are more likely to be

installed at the top of high-rise, social housing buildings, especially those owned and managed by local councils (Figure 3-4).

*Figure 3. 5G Cell tower on top of social housing building at Hackney London. Image by Luis Hernan.*

*Figure 4. Mobile masts atop Ockway House, a social housing complex in North London. Image by Luis Hernan.*

The environmental risks that some populations are exposed to is difficult to quantify. There is no consensus on the effects that living near masts can have for human populations, but epidemiological studies suggest close association with some health effects, including psychological strain scales, brain cancer, stress markers in saliva, anxiety, obsessive-compulsive characteristics, among others.<sup>17</sup>

Scientists have suggested caution as there is evidence that, even below recommended limits, exposure is statistically associated with diseases.<sup>18</sup>

Investigative journalism has also alerted to the effects of corporate funding of research on the health effects of mobile technologies. The American magazine *The Nation* has suggested that the Cellular Telecommunications and Internet Association (CTIA) discredits scientists whose work suggests health risks, or deliberately funds studies to balance out negative results and artificially stifle scientific consensus.<sup>19</sup>

Regulation in the face of inconclusive evidence of ill effects is an ethical as much as a legal issue. Governments around the world have allowed development of successive generations of mobile networks on the grounds of a lack of evidence to suggest they are dangerous. Craig McLean and Alan Patterson suggest, however, that against this approach to risk based on proven effects, governments might assume a precautionary principle, taking decisions erring on the side of the highest safety margins.<sup>20</sup>

The narratives of 5G speak of utopia brought about by telecommunication, while counternarratives point out how development comes at a price to some communities. The relationship between nonhumans and infrastructure, however, is a conceptual blind spot. AbdouMaliq Simone suggests that infrastructure is the

complex surround of human and nonhuman life, and Donna Haraway highlights the interconnection between animals, insects, mammals, microorganisms and human infrastructures, arguing for new categories to theorise them, such as naturecultures.<sup>21</sup> Along the same lines, Lisa Park suggests medianatures as the contemporary conditions where a ‘natural ecology’ is entirely entangled with a ‘technological one.’<sup>22</sup> Narratives of co-existence, entanglement, cooperation and displacement often go unheard in the sitting and operation of mobile masts.<sup>23</sup>

As Lisa Krieg, Maan Barua and Josh Fisher remind us, natural and infrastructural ecologies are deeply intertwined, and infrastructural environments can become a medium of nonhuman inhabitation. There are precedents of cyborg cockroaches used as biosensors, oysters as coast defences, or macaques adapting to the flows of tourist activity in archaeological sites.<sup>24</sup> Similarly, birds nest atop 5G antennas; insects burrow into the tunnels dug for cabling and dwell in the pits excavated for their electric substations; urban foxes roam and climb equipment (Figure 5-6). The urgency of recalibrating our ontologies to produce narratives that speak of the nonhuman entanglements with 5G infrastructure is illustrated by the very real ecological effects that masts have. Scholarship has highlighted the negative effects in urban populations of bacteria, plants, insects, birds and mammals. It has been suggested that the reproductive cycle of birds is affected by proximity to masts, with some species increasing production of eggs while others see a fall in numbers, a higher embryonic mortality rate and deterioration on the quality of eggshells. Other effects include deterioration of plumage, leucosis and tumours in the central nervous system of birds, affectation on movement coordination, reproduction and mortality in reptiles, as well as morphological changes in plants.<sup>25</sup>

*Figure 5. "Flying bird" at Hackney, London. Image by Pierre Bailly*

*Figure 6. "Bird on antenna" at London, St Paul's Cathedral. Image by Pierre Bailly*

#### **4. Infrastructure otherwise**

The narratives of 5G are effective not only because of their connection to wider ideals of progress and modernity, but also to the way they collapse temporalities. Like other digital technologies, much of the promotion of 5G hinges on a permanent

promise of realising the future in the present.<sup>26</sup> Marc Augé suggests that one of the biggest challenges of contemporary democratic life is in the way that technological innovations have been turned into narrative, substituting myths for ‘an ideology of the present, an ideology of the future now’.<sup>27</sup> For Augé, the mythologies of the past were specific to a group of people, connecting them to their origins to make sense of the world. The grand narratives of modernity are articulated by technology and, by focusing on the future, they re-organise our understanding of the world but also paralyse our ability to think of alternatives.

In a similar note, Eugene Thacker suggests that technoscience has eroded our ability to imagine the future through fiction. Drawing on Baudrillard’s simulacra, Thacker suggests that technology and science present themselves in terms of speculative futures, creating simulations which make the process of telling stories about the future unnecessary and redundant.<sup>28</sup> One effect of this constant narration is that speculative genres, such as science fiction, are eroded in their critical capacity. In the service of technology, speculation is used to actualise, imagining likely futures which are the result of extrapolating current developments into a desired timeline that ensures progress.

This is where speculation becomes crucial in our argument. We are highly critical of 5G seeing, as we do here, the entanglements between technology and discourses of modernity, progress and, by extension, western civilisation and coloniality. We would be remiss, however, if we stopped there, pointing to the consequences of thinking about technology without offering, at least provisionally, an alternative. Inspired by Hélène Frichot’s notion of an ecology of practice and a ‘creative resistance’, we understand our work as a practice of defining the current boundaries of 5G, first developing a creative problematization to then push further and experiment by taking speculative leaps.<sup>29</sup> As diagnosed by Thacker and Augé, speculation is at the core of technoscience, using it as a way of obliterating potentialities by collapsing future and present. There is no alternative because the future is here, and it is within your grasp. As soon as 5G was announced and the first pieces of equipment were hoisted atop gleaming masts, the rhetorical machine



of specialised media and marketing departments had begun speculating of a 6G which, unsurprisingly, would deliver even more speed and lower latency. We imagine another 6G, one which might engender radically different ways of infrastructure in the city.

## **5. Speculating 6G**

A good starting point is ownership. The status of existing mobile infrastructure is ambiguous. It can be said to be public, in consideration of the amount of people who benefit from its development. The siting of masts, however, is developed by private capital in most countries, with each carrier placing their own antennae in key locations where they anticipate demand. This results in an unevenly distributed infrastructure that is difficult to locate and understand. The UK government, for example, does not keep a central register of the location of cellular masts, and the only publicly accessible databases are created by online communities of enthusiasts, such as Cellmapper.<sup>30</sup>

But what of a decentralised, open-source infrastructure? There have been experiments on public ownership, notably for example Altán Red Compartida, an initiative of the Mexican government to provide 4G connectivity to areas of the country which are underserved by commercial carriers.<sup>31</sup> A closer example of decentralised infrastructure is Rhizomatica, a Non-Governmental Organisation who has worked with over 5,000 indigenous communities to support the creation of local mobile networks (Figure 7). Rhizomatica offers technical knowledge and helps communities to crowdsource funding to buy, install and operate their own equipment.<sup>32</sup> Current protocols do not prevent communities taking control of their own infrastructure, but interoperability could be streamlined, anticipating the way that devices might 'roam' from one cell to another if they are operated by different neighbourhood associations.

A consideration for the way that communities operate, and use, mobile networks might also bring about a different way of thinking about coverage and frequency

use. Current protocols assume a 'blanket' coverage, delivering the same speed to all areas. Any grading of connection quality or speed is achieved as a result of legacy implementation, with some antennas from previous protocols co-existing with the newest technology. 6G might take this further by considering a more flexible approach where deployment is linked to specific use cases developed by local communities. A community might find it unlikely they would need fast speeds to have VR in the park and, intriguing as the proposition sounds, they might not see the value in providing top speeds across an entire geographical area in the odd chance telesurgery might need to be performed in the main road. The protocol could provide different frequencies to different uses and scenarios, and consider existing provision of other forms of connectivity, such as LAN and Wi-Fi, to decide which is best suited to every sector.

And finally, 6G could consider the deep ecological impact that previous protocols have had in communities of non-humans, ranging from mammals to birds to insects (Figure 8). A protocol for mobile networks need not constrain itself to defining the way that frequencies are multiplexed, but it can also look at the way that sites are picked, the ecological impact assessed, and how any remediation strategies are implemented to generate new ecologies around it. A common superficial fix is the use of camouflage, styling cellular masts as palm trees as a visual strategy to 'hide' them (Figure 6). A more rigorous approach might see masts installed in areas that are less damaging to birds or might consider height and geometry to allow uninterrupted flight paths. In addition to an impact analysis, the design of 6G masts might incorporate deliberate elements that encourage a better understanding and establishment of nonhuman communities around them.

*Figure 7. "Rhizomatica en las alturas" by Palabra Radio is licensed under CC BY-SA 2.0.*

*Figure 8. "This Is Not A Tree" by Russ Allison Loar is licensed under CC BY-NC-ND 2.0.*

## **6. Conclusions**

Severed from the entanglement with discourses of modernity and progress, the prospect of investing millions in developing and deploying a whole new set of

antennas and base stations is difficult, if not impossible, to justify when their case study includes collaboration between two musicians ten minutes away from each other. The promises of 5G hardly stand up by themselves. Here we have aimed to problematise the technology, pointing out its intertwining with techno utopianism to justify disruption. We are interested in evidencing these entanglements while suggesting that there are other ways to imagine infrastructure.

There is an evident imbalance in the narratives around 5G. Stories of promotion benefit from expertise and resources, while narratives of opposition are diffuse in comparison and less visible, told by a variety of storytellers with different formats and a diverse set of meanings and expectations. The challenge for architects and urban designers is to understand the way that infrastructure interfaces communities. It is clear that the technology has been developed so far with the technologically savvy consumer who expects fast connectivity everywhere. The communities around masts, however, are more complex, including homeowners who object on the basis of damage to the value of their properties, to residents who cannot object as they do not own the land. Probing the desires and expectations around 5G requires new tools and methodologies to understand existing narratives and imagine infrastructure otherwise in collaboration with the communities involved.

The same is true for. Species show rich processes of world-making around infrastructure and there is a wealth of design practices and researchers experimenting with ways of narrating their stories.<sup>33</sup> Methods like mapping, role-playing and alien phenomenology can be useful in understanding the way that species of insects, birds and urban mammals interact and are affected by the installation of new mobile masts. It is difficult to imagine a scenario where the technology does not affect, or even benefit, these communities but that is the reason why speculation is crucial. We have gotten used to telling reasonable stories of technology. The challenge is to learn again to tell unlikely stories of preferable futures.

## **Notes**

<sup>1</sup> “A Real-Time 5G Music Collaboration,” Ericsson 5G Cases, last modified August 21, 2020, <https://www.ericsson.com/en/cases/2020/a-real-time-5g-music-collaboration>.

<sup>2</sup> The use cases referenced here are taken from the promotional material by Intel, Huawei and the specialised blog 5Gradar:

Nicola Brittain, “5G Use Cases: 31 Examples That Showcase What 5G Is Capable Of,” *5Gradar*, September 9, 2021.

<https://www.5gradar.com/features/what-is-5g-these-use-cases-reveal-all>

“Top Use Cases for 5G Technology,” Intel, accessed July 20, 2022,

<https://www.intel.com/content/www/us/en/wireless-network/5g-use-cases-applications.html>;

“Wireless X Labs Use Cases,” Huawei, accessed July 20, 2022,

<https://www.huawei.com/en/technology-insights/industry-insights/outlook/mobile-broadband/xlabs/use-cases?page=1>.

<sup>3</sup> Shannon Mattern, “Data Fantasies and Operational Facts: 5G’s Infrastructural Epistemologies,” filmed May 2019 at Designing for the Unknown, Trinity College, Dublin, video, 1:29:33, <https://www.youtube.com/watch?v=TvEA93Q6ETg>.

<sup>4</sup> Ola Söderström, Till Paasche, and Francisco Klauser, “Smart Cities as Corporate Storytelling,” *City* 18, no. 3 (May 2014): 307–20, <https://doi.org/10.1080/13604813.2014.906716>.

<sup>5</sup> Howard P. Segal, “The Cultural Contradictions of High Tech: Or the Many Ironies of Contemporary Technological Optimism,” in *Technology, Pessimism, and Postmodernism*, ed. Yaron Ezrahi, Everett Mendelsohn, and Howard Segal (Dordrecht: Springer Netherlands, 1994), 175–216, [https://doi.org/10.1007/978-94-011-0876-8\\_11](https://doi.org/10.1007/978-94-011-0876-8_11).

<sup>6</sup> For the argument linking modernity and whiteness in Latin America, see:

Bolivar Echeverria, *Modernity and ‘Whiteness’* (London: Wiley, 2019).

For an example of the way that masts are seen as an index of progress, see:

Barbara Anderson, “¿Y las antenas, acá?,” *Milenio*, April 23, 2014,

<https://www.milenio.com/opinion/barbara-anderson/nada-personal-solo-negocios/y-las-antenas-apa>.

<sup>7</sup> Dhanashree Thorat, “Digital Infrastructures and Technoutopian Fantasies: The Colonial Roots of Technology Aid in the Global South,” in *Exploring Digital Humanities in India*, ed. Maya Dodd, Nidhi Kalra (New York: Routledge, 2020), 17–29.

<sup>8</sup> Walter Mignolo, “Cosmopolitan Localism,” *Localities* 1 (2011): 11–45,

<https://doi.org/10.15299/local.2011.11.1.11>.

Walter Mignolo, *The Darker Side of Western Modernity: Global Futures, Decolonial Options*, Latin America Otherwise (Durham, North Carolina: Duke University Press, 2011).

<sup>9</sup> Steve Graham and Simon Marvin, *Telecommunications and the City: Electronic Spaces, Urban Places* (London: Taylor & Francis, 2002)

Stephen Graham, *Disrupted Cities: When Infrastructure Fails* (New York: Routledge, 2010).

<sup>10</sup> Axel Bruns, Stephen Harrington, and Edward Hurcombe, "Corona? 5G? Or Both?: The Dynamics of COVID-19/5G Conspiracy Theories on Facebook," *Media International Australia* 177, no. 1 (November 2020): 12–29, <https://doi.org/10.1177/1329878X20946113>.

<sup>11</sup> James Meese, Jordan Frith, and Rowan Wilken, "COVID-19, 5G Conspiracies and Infrastructural Futures," *Media International Australia* 177, no. 1 (1 November 2020): 30–46, <https://doi.org/10.1177/1329878X20952165>.

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<sup>12</sup> James Branch, "Mapping the Mast," *Communication Design* 3, no. 1 (January 2015): 6–26, <https://doi.org/10.1080/20557132.2015.1057380>.

<sup>13</sup> Michael Siegrist et al., "Perception of Mobile Phone and Base Station Risks," *Risk Analysis* 25, no. 5 (2005): 1253–64, <https://doi.org/10.1111/j.1539-6924.2005.00672.x>.

Frances Drake, "Mobile Phone Masts: Protesting the Scientific Evidence," *Public Understanding of Science* 15, no. 4 (2006): 387–410, <https://doi.org/10.1177/0963662506057246>.

Marie Eve Cousin and Michael Siegrist, "Laypeople's Health Concerns and Health Beliefs in Regard to Risk Perception of Mobile Communication," *Human and Ecological Risk Assessment* 14, no. 6 (2008): 1235–49, <https://doi.org/10.1080/10807030802494550>.

Craig McLean and Alan Patterson, "The Regulation of Risk: Mobile Phones and the Siting of Phone Masts - the UK Experience," *Science and Public Policy* 39, no. 6 (September 2012): 827–36, <https://doi.org/10.1093/scipol/scs055>.

Alexandre Veronese, "The Judicial Debate about Mobile Phone Radiation and Masts in Brazil: Protection by the State against the State?," *Sortuz: Oñati Journal of Emergent Socio-Legal Studies* 10, no. 1/2 (2019): 55–72.

Mateus Habermann and Nelson da Cruz Gouveia, "Environmental Justice and Exposure to Electromagnetic Fields," *Epidemiology* 18, no. 5 (September 2007): S24, <https://doi.org/10.1097/01.ede.0000276488.74508.c3>.

<sup>14</sup> Anibal Del Olmo, "El Conflicto Socioambiental Respecto de las Antenas de Telefonía Móvil. Los casos de Lanús y Quilmes," *Cuadernos de Antropología* 0, no. 12 (December 2014): 191–204.

<sup>15</sup> Dennis Rodgers and Bruce O'Neill, "Infrastructural Violence: Introduction to the Special Issue," *Ethnography* 13 (October 2012): 401–12, <https://doi.org/10.1177/1466138111435738>.

<sup>16</sup> Manuel Castells, *Communication Power* (Oxford: Oxford University Press, 2013), 25.

<sup>17</sup> Christoph Augner and Gerhard W Hacker, "Are People Living next to Mobile Phone Base Stations More Strained? Relationship of Health Concerns, Self-Estimated Distance to Base Station, and

Psychological Parameters,” *Indian Journal of Occupational and Environmental Medicine* 13, no. 3 (December 2009): 141–45, <https://doi.org/10.4103/0019-5278.58918>.

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<sup>18</sup> A. Ozovehe, A.U. Usman, and A. Hamdallah, “Electromagnetic Radiation Exposure from Cellular Base Station: A Concern for Public Health,” *Nigerian Journal of Technology* 34, no. 2 (2015): 355–355, <https://doi.org/10.4314/njt.v34i2.20>.

<sup>19</sup> Mark Hertsgaard and Mark Dowie, “How Big Wireless Made Us Think That Cell Phones Are Safe: A Special Investigation,” *The Nation*, March 29, 2018, <https://www.thenation.com/article/archive/how-big-wireless-made-us-think-that-cell-phones-are-safe-a-special-investigation/>.

<sup>20</sup> Craig McLean and Alan Patterson, “The Regulation of Risk: Mobile Phones and the Siting of Phone Masts - the UK Experience,” *Science and Public Policy* 39, no. 6 (September 2012): 827–36, <https://doi.org/10.1093/scipol/scs055>.

<sup>21</sup> AbdouMaliq Simone, “Infrastructure: Commentary,” *Cultural Anthropology*, 2015, <https://journal.culanth.org/index.php/ca/infrastructure-abdoumaliq-simone>.

Donna Jeanne Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago, Illinois: Prickly Paradigm Press, 2003), 1–5.

<sup>22</sup> Lisa Parks, “Mediating Animal-Infrastructure Relations,” in *Being Material*, ed. Marie-Pier Boucher et al. (Cambridge, Massachusetts: MIT Press, 2019).

<sup>23</sup> Maan Barua, for example, suggests three categories to approach these exchanges: provisioning, ecological, and infrastructures in a minor key. The entanglement of nonhumans and infrastructure is such that it suggests ‘new ways to understand relations between biopower, capital and the governance of life’

Maan Barua, “Nonhuman Life as Infrastructure,” *Society + Space*, November 30, 2020, <https://www.societyandspace.org/articles/nonhuman-life-as-infrastructure>.

<sup>24</sup> Lisa Krieg, Maan Barua, and Josh Fisher, “Ecologizing Infrastructure: Infrastructural Ecologies,” *Society + Space*, accessed July 26, 2022, <https://www.societyandspace.org/forums/ecologizing-infrastructure-infrastructural-ecologies>.

<sup>25</sup> Alfonso Balmori, “Anthropogenic Radiofrequency Electromagnetic Fields as an Emerging Threat to Wildlife Orientation,” *Science of the Total Environment* 518–519 (2015): 58–60, <https://doi.org/10.1016/j.scitotenv.2015.02.077>.

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<sup>26</sup> We have discussed the implications of this collapsed temporality in:

[Forthcoming] Luis Hernan and Carolina Ramirez-Figueroa, "A Home with a Future. Digital Domesticity and the Vague Fictions of Silicon Valley," *Architecture and Culture* 10, no. 1 (2022).

Luis Hernan and Carolina Ramirez-Figueroa, "Time Is out of Joint: Digital Domesticity and Magical Realism," *Journal of Architectural Education* 75, no. 2 (July 2021): 184–91, <https://doi.org/10.1080/10464883.2021.1947672>.

<sup>27</sup> Marc Augé, *The Future* (London: Verso Books, 2015), 3.

<sup>28</sup> Eugene Thacker, "The Science Fiction of Technoscience: The Politics of Simulation and a Challenge for New Media Art," *Leonardo* 34, no. 2 (2002): 155–58, <https://doi.org/10.1162/002409401750184726>.

Jean Baudrillard, *Simulacra and Simulation*, trans. Sheila Faria Glaser (Ann Arbor, Michigan: University of Michigan Press, 1994).

<sup>29</sup> Hélène Frichot, "A Creative Ecology of Practice for Thinking Architecture," *Ardeth. A Magazine on the Power of the Project*, no. 1 (October 2017): 139–49.

<sup>30</sup> "First Time Startup," Cellmapper, accessed July 20, 2022, [https://www.cellmapper.net/First\\_Time\\_Startup](https://www.cellmapper.net/First_Time_Startup).

<sup>31</sup> Dorian Hargrove, "Telecom Battle At The Border Intensifies Between Verizon and Altan Redes," *NBC 7 San Diego*, accessed August 13, 2021, <https://www.nbcsandiego.com/news/local/telecom-battle-at-the-border-intensifies-between-verizon-and-altan-redes/152389/>.

<sup>32</sup> "5G – Una Condición Terminal // Rhizomatica," accessed November 30, 2020, <https://www.rhizomatica.org/5g-una-condicion-terminal/>.

<sup>33</sup> Andy Merritt and Paul Smyth, "What Is Was Could Be. Walking Project, Design Museum", Something & Son, accessed July 23, 2020, <https://www.somethingandson.com/work/what-is-was-could-be>.