Communication technologies

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Communication technologies might seem to be a quintessential foundation of global connections. Yet such technologies also disconnect by building networks (→ **Networks**) that only integrate certain places, cater to certain types of users, or facilitate certain sorts of interactions. Moreover, communications technologies do not necessarily follow the logic of waves of globalisation. I suggest, instead, that they facilitate undulations by enabling increased flows of information at the same time as other aspects of globalisation, like the movement of people or goods, decrease.

What do we mean by 'communication' and by 'technologies'? These seemingly simple questions have complex answers. Scholars have offered multiple definitions and almost all emphasize the importance of context in time and space for understanding how communication operates in society and how it is defined. Communication is 'the overarching term denoting a universe in which media are operative and which is altered by media', according to Wolfgang Behringer (2006, 368).

Other definitions have focused on the role of communication within culture, noting that it can serve at least two very different functions. First, communication can be viewed as a form of transportation (→ **Transport**), seen as a top-down phenomenon from senders to receivers. This was the type of communication that many Germans meant when they talked about *Weltverkehr* (or 'world traffic', meaning the movement of goods and information) around 1900. Second, communication can be a form of common experience, consolidating community, and sustaining shared beliefs (Carey 1989). For that second definition, media may not need to exist; communication could happen in religious services, for example.

Feminist (→ **Feminism**) and post-colonial (→ **Postcolonial**) theorists stress that definitions of communication have often privileged white, male forms of information exchange, though some also emphasize the 'centrality of media, in all its forms, to understanding the postcolonial condition' (Llamas-Rodriguez and Saglier 2021). Meanwhile, Indigenous forms of communication including drums and smoke signalling could connect across long distances, moving far faster than goods and people, to achieve multiple goals, including to resist colonialism in places like Australia in the nineteenth century (Seifart et al. 2018; Kerkhove 2021). Still other definitions take us beyond the human, emphasizing that trees, for example, may communicate via fungi, with a popular pun calling this a 'wood-wide web' (for an overview of this debate, including critiques, see Immerwahr 2024). Given the multiplicity of definitions, it may make more sense to discuss communications in the plural as I do in the rest of this essay.

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The idea of 'technology' too can be framed narrowly or broadly. A narrow view might only count 'electric media' like the telegraph. A broader view might include infrastructures (→ **Infrastructure**) that enable communications, such as roads or standardized time. This wider lens shifts the timeline of when communications technologies globalised from the mid-nineteenth-century world of submarine telegraphy back to at least the thirteenth-century postal relay system created by the Mongol Empire in Central Asia which influenced early European systems (Gazagnadou 2016).

Such logistical innovations could very much alter understandings of time and space, creating by 1500 a 'Taxis Galaxy' (referring to the Thurn and Taxis postal system in the Holy Roman Empire) that was much more important than the vaunted 'Gutenberg Galaxy' and that kick-started perceptual changes often more readily associated with nineteenth-century communications technologies like railways or telegraphs (Behringer 2006, 365). In some cases, like the United States in the eighteenth and nineteenth centuries, dependable postal infrastructure was the most important factor for connection, not newer technologies (John 1994, 105).

Yet, these types of technological infrastructures could disconnect as much as they connected. Such infrastructures were not equally reliable nor accessible for everyone. To take an obvious example, women, unfree people, and Indigenous peoples in the United States could hardly mail letters in the same way as enfranchised white men, whether because they could not write, could not pay for the post, or were not allowed to access networks. Thinking about the deliberately disconnected means including histories of how communications technologies were used, how exclusionary (→ **Exclusion/Inclusion**) uses emerged, and how use was imagined (Müller and Tworek 2016).

Communications technologies worked to connect empires in the nineteenth century, but to disconnect colonized subjects. This continued into the twentieth century through the overlapping networks of the post, telegraphy, wireless, radio, and roads. To take examples from four different empires: Travellers relied upon the post for news in nineteenth-century French colonial Africa (Dulucq 2018). By the 1890s, many British officials saw an 'All-Red Route' around the world of submarine cables landing on British imperial soil as a crucial pillar of empire. German officials, in turn, both laid cables to duplicate British routes that they increasingly saw as a geopolitical instrument of competition and invested prior to and during World War I in an All-Wireless Route around the world as an alternative to cables. During and after World War II, the Portuguese Empire tried to use radio to consolidate its hold over Angola and Mozambique (Ribeiro 2022). What united all these empires and more, including the Belgians and Italians, was their reliance upon infrastructures like roads for the colonizers, often built by the colonized, but not for their use (Denning 2024).

Communications technologies could also enable connections at the exact same time as the movement of people and goods decreased. This occurred in the 1920s and 1930s with the emergence of spoken radio. During the 1920s in particular, some Europeans and Americans developed utopian visions about what radio could achieve both internationally as a peace-builder and nationally as a unifier. But those visions were undergirded by empire and by state control, which disconnected many amateur users and cut off alternative possibilities for non-imperial networks (Potter et al. 2022). As the 1930s progressed, radio became entangled in imperial competition over radio propaganda with the creation of institutions like BBC Empire. States also began to invest in methods to disconnect listeners from other broadcasters, particularly by jamming radio frequencies from competing states. At the same time, these states continued to contribute their wireless infrastructure to cooperate within the League of Nations' international epidemiological information system (Tworek 2019). These simultaneous dis:connective (→ **Introduction**) uses of communications technologies support Frederick Cooper's argument that globalisation theories fail to recognize that the 'key variables of transition did not vary together' (Cooper 2005, 97).

Globalisation, then, might not occur in 'waves', as the classic metaphor would have it. The notion of 'waves of globalisation' implies synchronous rises and falls in the movement of people, goods, and information. The maritime metaphor implies the importance of oceans and indeed, much scholarship on communications and global history has focused on submarine cables and technologies connecting across seas. Waves also imply a connection to communication through the air with wavelengths. For economists, using the term waves continued the long-standing tradition of borrowing from physics, principally nineteenth-century physics (Mirowski 1989).

But what if we need a metaphor that emphasizes disconnections as well as connections, disentanglement as well as entanglement? (McManus and Tworek 2022) I suggest we consider the notion of 'undulations'. This retains an oceanic flavour, and rightly so, when bodies of water cover over seventy percent of the planet's surface. At the same time, undulation provides a greater sense of oscillation, of simultaneous increases and decreases.

Finally, this metaphor incorporates a nod to the undulator, a technical device in physics that uses alternating magnets to push an electron into a particular curve. At certain wavelengths, the undulator produces peaks of light and at other wavelengths, it produces no light at all. The alternating magnets in the undulator point towards the simultaneous forces of connection and disconnection within any 'peak' of globalisation. The undulator can only produce light, and thus energy, through opposing magnetic forces that alternate the direction of the magnetic field. So too, communications technologies do not simply connect. Each technology, whether

radio, the internet, or something else, contains the seemingly opposing forces of connection and disconnection. In fact, they function like contrasting magnets in an undulator: both are necessary to focus a wavelength and create energy.

Just as an undulator requires multiple sets of opposing magnets, any understanding of communications technologies also needs to move beyond a focus on any one technology. Instead, the communications landscape is additive, with new opposing magnets of dis:connection created with the advent of anything from steamships to satellites. Perhaps these new additions simply make the undulations more extreme.

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