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Edited by Nicholas Cook , Monique M. Ingalls , David Trippett
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1 Digital Technology and Cultural Practice

NICHOLAS COOK

There is no race, there are no genders, there is no age, there are no infirmities . . . Utopia? No, the Internet. 1997 ADVERTISEMENT QUOTED IN BAYM 2015, 39

In the last year, even as surveillance and privacy concerns peaked, music consumers migrated to streaming music services that live in the cloud in accelerating numbers. ANDREW LEONARD[1]

3,155,403,941 YOUTUBE VIEWS OF 'GANGNAM STYLE' AS OF 30 MAY 2018

7,600,000,000 CURRENT ESTIMATE OF WORLD POPULATION

According to author and educationalist Sir Ken Robinson, 'it wasn't until 2007 that the iPhone came out and has pretty much changed the way the planet works'.[2] Of course it wasn't just the iPhone: digital technology has pretty much changed how music works, and the planet remains in a state of not only technological but also social, aesthetic and commercial transition – though quite what it is a transition to is not so clear. Commentators speak freely of paradigm change, though they usually qualify this by emphasising the ways in which the new paradigm (whatever that may be) represents a continuation of pre-digital business by other means.

At one level it is quite easy to say what digital technology has meant for music. Sound – including musical sound – consists of patterns of vibrating air molecules that strike our eardrums and resonate within the ear: mathematicians represent them as continuous wave forms, and as such sound is analogue. In contrast, digital signals consist of a series of discrete numerical values, ultimately made up of 0s and 1s. Despite the difference, digital signals can replicate analogue ones in the same way that the dots of a newsprint photograph replicate the original: with photographs it is a matter of the dots being small enough, and with sound it is one of a sufficiently high sample rate. Digital recording involves measuring sound waves 44,100 times a second, and digital playback outputs numerical values at the same rate. In terms of human perception, the replication is good enough to have been the basis of the international recording industry for the last thirty-five years. And because replicating digital sounds means replicating numbers, there is no loss of quality in digital copies – unlike analogue technology, where the quality degrades every time you make a copy.

The 44,100 samples a second produce a lot of data, and in the early days of digital music this represented a challenge to processing power and storage space. Much of the early history of digital music is conditioned

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by various workarounds. In universities and research institutes music was generated in the digital domain – that is, through purely numerical operations – but it involved the use of mainframes and rarely worked in real time. MIDI (which goes back to 1983, the year after the introduction of the CD) was a standard for computer control of hardware devices such as synthesisers and drum machines: this offloaded the most computationally intensive part of the process onto dedicated hardware devices, so enabling real-time operation. Other approaches included techniques for compressing digital sound files, the most important being the MP3 format, which dates from the 1990s and was key to the development of download culture – the distribution of sound files through the Internet rather through physical carriers such as CDs.

It was rapid advances in both processing power and storage that made this possible, but analogue technologies continued to exert a ghostly influence. Recording media illustrate this. The analogue formats of shellac discs (78s, named after the speed at which the disc spun), LPs (vinyl discs allowing over twenty minutes of continuous playback on each side) and magnetic tape lie behind early digital media. DAT (Digital Audio Tape) recorders, introduced in the late 1980s, used the same magnetic tape as analogue tape recorders, but the sounds were coded in digital form. CDs retained the principle of the spinning disc, as indeed did the hard disc drives built into computers for generic data storage. These vestiges of analogue technology disappeared with the solid-state drive, which became standard in computers during the second decade of the present century, and by this time there had ceased to be any distinction between musical and generic data storage. A more radical development, around the same period, was the take-up of cloud computing, in which – just as with the earlier download culture – the physical storage medium disappeared. Of course the data are still held on physical devices, but these are relegated to server farms: out of sight, out of mind, rather like the mass export of European and American waste to India and China.

Analogue practices also retain a ghostly presence in the terminology of tracks and albums – terms derived from the physical media of the analogue era but still current today. The same applies to software. Early MIDI sequencers such as Cubase were based on the metaphor of the multitrack tape recorder, and the same remains the case with present-day applications based on digital sound: to use Ableton Live, Logic Pro or Sound Tools you lay down music in separate tracks and manipulate them on the model of the analogue mixing desk. Each also uses plug-ins that often replicate the appearance as well as the functionality of analogue sound-effect units. But running alongside these commercial products there has been, and continues to be, a variety of more abstract, experimental and

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flexible software for digital music creation – software that owes less to earlier analogue practices. The mainframe-based systems I referred to include the MUSIC-N series (where N stands for I, II, III etc.), which go back to the late 1950s, with Csound (1985) being a particularly influential member of the family: in essence these were specialised music programming languages with extensive libraries of functions and, as I said, not primarily designed for real-time use. At the other end of the spectrum are such programmes as Max/MSP, a visual programming language also dating from the 1980s and still in widespread use, or SuperCollider (1996), a programming environment specifically oriented to real-time synthesis.

I have sketched these basic elements of music hardware and software because they both embody basic principles of digital music and underlie many digital musicians' working environment. But I said that *at one level* it is quite easy to say what digital technology has meant for music, and that is not the level on which this book focuses. As its title proclaims, it is a companion to music *in digital culture*. Its focus is not on technology but on the social, economic and aesthetic correlates of technology, and here too we can see both new paradigms and the continuation of existing business by other means. One important point to make at the outset is that technology does not simply determine what happens in culture: as Nancy Baym (2015) emphasises, it is the belief that technological changes inevitably result in particular social consequences that lies behind both the prophecies of doom and the equally unrealistic visions of utopia (such as the 1997 advertisement quoted in the epigraph) that new technologies – not just digital technology – have always prompted. At the same time, technologies may facilitate certain cultural developments while standing in the way of others. The best way to think about this is in terms of the cultural developments that particular technologies afford: this puts the emphasis on the choices that societies make in their use of technology. Rather than asking what a new technology does to society, Baym says, one should ask how people use it, what they use it for, and why.

From the Social to the Posthuman

You cannot understand how or why people have used technology to make and consume music without setting this into the context of widespread social changes linked to the development of the Internet (perhaps an even better candidate than the iPhone for the invention that pretty much changed the way the planet works). Originally the preserve of academia and the military, the origins of the Internet can be pushed back as far as the

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1950s, but until the early 1990s it was purely a medium of textual communication. That includes email, invented in the 1960s but increasingly widely adopted from the 1980s, bulletin boards (where users could read and post messages), and also a rather arcane world of text-based role-playing games that developed out of the tabletop game Dungeons & Dragons and are the remote ancestors of today's video games. However, Baym makes the important observation that these were less important as games than as 'simply creative environments in which fictional rooms and landscapes served as spaces for social interaction' (2015, 16), and that too prefigured things to come.

The Internet took on a more recognisable form in the early 1990s with the development of the World Wide Web: the first web browser appeared in 1991, bringing with it the familiar architecture of linked websites, blogs, wikis, and video or photo-sharing sites. As this implies, the World Wide Web was from the start a multimedia environment, and it was at this time that major computer manufacturers agreed a standard specification for the 'Multimedia PC' (including a dedicated sound card with audio mixing and synthesis capabilities): role-playing games were rapidly transformed into the graphically rich, explorable environments that we think of as virtual worlds. Web 2.0 (a term coined in 1999 by Darcy DiNucci) followed in the early 2000s. This was not a technical specification but rather a loosely defined design idea that revolved around interactivity and user content. Some see it as little more than marketing hype consequent upon the opening up of the Internet to commercial users in the second half of the 1990s, and – as we shall see – the idea of user-generated content lay at the heart of the commercial opportunities that a generation of entrepreneurs, most of them based in California's Silicon Valley, saw in the Internet.

So what exactly were the social changes I referred to? Even before the World Wide Web there was a great deal of talk about the Internet's capacity to afford the development of virtual communities. The classic text on this is Howard Rheingold's *The Virtual Community: Homesteading on the Electronic Frontier*, published in 1993 but largely based on his experiences from the mid-1980s as a member of the WELL (Whole Earth 'Lectronic Link), technically speaking a computer conferencing system that was based in the San Francisco Bay area but included members from much further afield. People used their real names – they were not role-playing – and the WELL accommodated a wide spread of activities: members pursued common interests (there were standing 'public conferences' dedicated to different topics from chess or desktop publishing to the Grateful Dead), discussed current issues, and in a spirit of altruism offered many kinds of mutual support, including financial. California was home to many

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real-world communes, as well as groups that saw themselves as communities but lacked a physical base, and among the latter were the Deadheads (the Grateful Dead fan community). Many joined the WELL, and in Rheinhold's words they 'seemed to know instinctively how to use the system to create a community around themselves' (1993, 43). The entire enterprise was pervaded by a technological version of the utopian ethos characteristic of West Coast counterculture. The Internet was seen as offering the model of a better life.

During this period sociologists and anthropologists researching the Internet largely focused on the idea of virtual community and questions of the relationship between the virtual and the real. Such communities persist to this day, partly in the form of virtual worlds such as *Second Life*, where – in accordance with the principle of role-play – participants choose their own names and rarely divulge their real-world identity. That also applies to sites like reddit, in essence online discussion groups devoted to particular topics (the reddit equivalent to the WELL's 'public conferences' are 'subreddits'): here there is no element of role-playing, but anonymity creates a freedom to express views that may be flippant or outrageous in a way that would not happen if people were interacting under their real-world names. However, the World Wide Web and in particular Web 2.0 saw the Internet taking on a quite different sort of social role, in the form of the social networking sites (SNSs) that experienced massive growth in the years after the millennium. MySpace was the largest SNS from around 2004 to 2010, when it was overtaken by the now ubiquitous Facebook.

On Facebook you are yourself (though you may be dead: Facebook sites are not necessarily deleted when you are). The basis of Facebook's architecture is the individual user, and the key action is friending. As well as your profile and photos, your personal pages include messages to or from your friends, and other friends' comments on them. Anyone can see who your friends are and how many friends you (and your friends) have: an unstated principle behind Facebook is that you are defined by the people you know and the discussions you are part of. Internet diehards with roots in the old communality may see this as symptomatic of the egocentricity and narcissism of the millennial 'Me generation', other symptoms of which include celebrity culture and 'possessive individualism' – the idea so central to neoliberalism that, in Crawford Macpherson's (2010, 3) words, the individual is 'essentially the proprietor of his own person or capacities, owing nothing to society for them'. Yet it is a widely acknowledged condition of contemporary life that none of us have fixed, stable selves, but negotiate who we are through our interactions with others. This is sometimes described as 'networked individualism', described by Manuel Castells as 'a social pattern' through which 'individuals build their

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networks, on-line and off-line, on the basis of their interests, values, affinities, and projects' (2001, 131). We define ourselves through the networks we belong to.

The impact of this can be seen in how people use the Internet and reflects computer use more generally. In the days when office software companies created 'turnkey solutions' – integrated software suites that did everything – you might expect to organise your working life largely around one package. That is like what members of virtual communities like the WELL used to do. In some contexts people still do it. As a resident of *Second Life* you construct your online identity – that is what role-playing means – within the context of a single platform. If your musical interests focus strongly on mashup or remixing, then you may use sites like Mashstix.com or Indaba Music in much the same way: as explained by Maarten Michielse (2016, 2013), Mashstix.com is a community dedicated to the development of technical knowhow through mutual commentary, while Indaba Music serves similar ends through its regular remixing competitions. The social networking features built into YouTube, such as user channels, comments and messaging, mean that communities linked by a common interest can exist under its umbrella too.

But networked individualism gives rise to a very different way of living on the web. Facebook or Twitter (where users interact through 280-character 'tweets' and your worth is measured by the number of your followers) are the gateways to many people's online presence, from which they navigate fluently across a wide range of different platforms. You might follow links to Instagram or YouTube, send and receive messages via WhatsApp, keep an eye on what's trending on reddit, and possibly the other eye on the office clock. You multitask between these and other communication channels (texting, email, skyping, face-to-face contact), so integrating them into what Baym calls 'one complex lifeworld' (2015, 156). And both musicians and fans do the same, using a combination of general-purpose SNSs and music-specific sites. In a study of how bands use digital communication, Danijela Bogdanovic (2016, 442) speaks of 'cross-platform interaction, whereby one's Facebook profile features links to videos on YouTube or sound files on SoundCloud and Bandcamp, where Twitter updates are synced with Facebook status updates and so forth'; Justin Williams and Ross Wilson (2016, 594) detail the complex chain of inter-platform responses that may be set off by a fan clicking the 'like' button on a musician's Facebook page. Other than video repositories such as YouTube and Vimeo, and audio repositories such as Soundcloud (which would logically have been the audio equivalent of YouTube but arrived too late), sites of particular importance to musicians and their fans include Reverbnation (aimed at musicians developing their career), Bandcamp

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(which enables musicians to sell their work directly to fans) and music streaming services such as Pandora and Spotify – of which more later. Each of these has at least some social networking features.

All this has many implications for music's role in society. A century ago the consumption of music was strongly tied to place. You went to concerts, or heard (and perhaps participated in) music in pubs or clubs. That changed when radio, 78s and LPs turned living rooms into major sites of musical consumption. Portable record players, battery-powered radios and ghetto blasters took it out of doors, but music on the move remained the exception until the introduction in 1979 of the Sony Walkman – the miniaturised cassette player that inaugurated the concept of personal stereo. With its digital successors such as the iPod (2001) and iPhone (2007), music became ubiquitous, as closely integrated into everyday urban (or rural) life as a soundtrack is into a film, and this further weakened its already tenuous link to place. Concerts still happen, of course – it is an irony that in the digital age live music is almost the only sector of the music business where many musicians can make money – but fans attending an event may use Twitter or phone apps such as iGroups to exchange information or live stream content to fans across the world (Bennett 2012). Or they may use their phones to record and upload videos to YouTube, creating a permanent archive that fans can access in the future; that may detract from the concert experience, but in interviews fans invoke the same kind of altruism I mentioned in relation to the WELL, explaining that they are doing it for the benefit of the larger fan community (Lingel and Naaman 2011).

With the enhanced bandwidth of high-speed data networks and superfast broadband, the making of music has also become increasingly independent of place. Building on the largely standardised design of international recording studios, the so-called 'Rocket Network' was introduced in the mid-1990s to enable multi-sited real-time collaboration between musicians across the globe; this was driven in part by a utopian vision of world musicking, and it is telling that, when the business folded, Digidesign (the company behind Pro Tools) launched its own version, now targeted firmly at the professional market and priced accordingly (Théberge 2004, 776–9). Telematic performance, where musicians across the world play together in real time, is increasingly common: as early as 1998, Seiji Osawa conducted a performance of Beethoven's 'Ode to Joy' from Nagano, Japan, in which the Tokyo Opera Singers were joined by choruses in Berlin, Cape Town, Beijing, New York and Sydney, all electronically linked. And when laptop ensembles do the same (as in the 2012 performance of a composition by Roger Dannenberg that was hosted at Louisiana State University but involved seven other ensembles across two

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continents), the same kind of networking is happening at two levels: in the local coordination of the individual laptop players, and in the remote collaboration of the different ensembles (O'Brien 2016). These examples of telematic musicking all involved specific audience locations. But even that disappears when Avatar Orchestra Metaverse (www.avatarorchestra.org/) – a group of collaborating musicians scattered across Europe and North America – perform on *Second Life* before an audience of avatars, digital stand-ins for real-life individuals who may be anywhere in the world. Here it is not so much that the connection between music and place has disappeared as that place has been re-created in the digital domain – as is also the case in the virtual bars, clubs and other hangouts where 'me-and-my-guitar' singers give live performances. Quite what 'live' might mean in *Second Life* has been a topic of lively discussion among its virtual residents, and in Chapter 7 of this book Paul Sanden asks the same about digital performance more generally.

Pushing still harder at the boundaries of the real is Hatsune Miku, perhaps the definitive icon of music in digital culture. The eternally 16-year-old schoolgirl began as an advertising image for Yamaha's Vocaloid voice synthesis software but developed into a virtual diva known through anime-style videos and holographic performances throughout Asia, North America and Europe. With her computer-generated voice and appearance – Louise Jackson and Mike Dines (2016, 107) speak of 'a wardrobe that could easily be used as a postnuclear school uniform' – she has been interpreted by Western commentators as a harbinger of posthuman culture, but is arguably better understood in terms of two specifically Japanese contexts. One, discussed by Jackson and Dines, is performance traditions such as the puppet theatre genre Bunraku, where issues of reality and illusion have long been thematised; the other is the system of 'idols' (real-world teenage performers whose lives and images are strictly controlled) and the corporate 'offices' that do the controlling. This creates a situation within which human performers are seen as hardly more human than Miku, and Rafal Zaborowski (2016, 123) quotes a fan saying that it is in Miku, rather than the flesh-and-blood products of the entertainment industry, that authenticity is to be found: 'This is real. This is the real freedom of expression. Look at the idols, look at the girl groups. All fake.'

There are subcultural genres that have no existence in the offline world, found mainly on Bandcamp and sustained by online cultures of discourse on platforms such as reddit and Tumblr. The outstanding example of this is vaporwave, a retrofuturist, ironical, and sometimes downright whimsical audio-visual genre often seen as the first to exist purely online (a view complicated by Adam Harper in his contribution to

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this book). Its musical lexicon is a collage of sometimes pastiched or reconstructed jazz, muzak, ringtones and video game soundtracks, while its visual iconography combines classical statuary (perhaps via de Chirico), obsolete computer graphics and Japanese characters. As much an aesthetic as a style, vaporwave draws on the anonymity of reddit and Tumblr (often the music is not attributed to real-world individuals), and its online presence extends as far as the darknet, the region of the Internet that is inaccessible to standard browsers; traditionally associated with organised crime, the darknet is increasingly inhabited by everyday users worried about the inexorable spread of internet surveillance (Watson 2017). It is worth adding that its online-only nature makes vaporwave the first musical genre in history whose very existence is dependent on the server farms and other physical infrastructure of a communication system whose vulnerability to terrorism or cyber warfare is increasingly a source of public concern.

All this adds up to a radically changed environment for both the production and the consumption of music. It affects different traditions in different ways. Lawrence Kramer has complained how download sites such as iTunes and streaming services such as Spotify fragment the works of the Western classical tradition into individual sound files: called 'songs' (a jarring term when applied to sonatas, symphonies and other classical genres), these are divorced from the context of the multi-movement compositions of which they were intended as part – and indeed from any other kind of context, given that the lavish paratexts of LP covers and CD booklets were lost without trace in the transition from offline to online culture. Kramer argues that this represents a loss of the aesthetic distance definitive of classical music as a culture of canonical works. He also argues that it represents a loss of classical music's audience, in the sense that 'the figure of the human, the fiction of "man", to which the music is addressed has become vestigial. Classical music, it turns out, is human, all too human' (2013, 45).

At first blush this might sound simply reactionary. But Kramer's purpose is less to deplore digital culture than to address an issue that confronts many traditions under conditions of technological or social change: the repurposing of cultural heritage within new circumstances. It might be said that Kramer is just being realistic when he acknowledges that the era of 'the fully-fledged work, the supposedly timeless masterwork, was relatively brief and is now essentially over' (2013, 43). Instead of the digital download, he suggests, classical music's best hope may lie in turning itself back into the culture of performance as which it began, so recapturing some of its ritualistic value as something experienced socially, occasionally, no sooner heard than gone – something that lies at a remove from

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everyday life and so constitutes 'an exceptional event' (51).[3] And he adds, 'There could be worse fates'. As the opening chapter of a handbook to new audio-visual aesthetics, Kramer's essay has a valedictory quality, its starting point the passing of a tradition overtaken by the force of history.

Kramer remarks of his reinvented classical concert culture that the music 'would not only be "live"; it would re-mark its aliveness in a complex dialogue with the life of posthuman being' (50). This links to his characterisation of classical music as 'all too human' and opens up an issue that extends far beyond the classical tradition. The integration of music into everyday life is gathering pace through streaming, algorithmic playlisting, and – perhaps the next big thing, if it hasn't already arrived – recommendation systems based not on title, artist, or genre, but on affect. In Chapter 4 Sumanth Gopinath and Jason Stanyek describe facial recognition systems that diagnose your mood. Imagine an app that does this and streams music to reinforce positive and counteract negative mental states, amounting to a kind of personalised sonic therapy. (You can almost hear Alexa's voice: 'You're sad! Just listen.') Actually this would really be just an automated extension of what people do for themselves: Zaborowski (2016, 120) speaks of a Hatsune Miku fan who organises her MP3s into folders such as 'cheerful', 'nostalgic' or 'calm', deliberately using these categories 'in accordance with the time of day, the day's events, or her personal mood'. There are also existing apps like Brain.fm ('an innovative non-invasive digital therapy application' that styles itself 'the future of music'[4]), which generates music specifically designed for mood regulation.

Here a historian might note a precedent in mid-eighteenth-century and earlier ideas of music's capacity to both represent and affect emotions, the humours, and aspects of bodily function. The tradition with which Kramer is concerned goes back to the later eighteenth century and is the product of a new aesthetic system within which music took on the attributes of a fine art and was conceived as the creative expression of a unique artistic personality. That is a historically and geographically delimited conception of what music is that until quite recently dominated what might be called the 'official' musical culture of the historical West, but in reality coexisted with any number of different conceptions of music. By making music of all kinds accessible at the touch of a trackpad, the Internet has undermined that dominance and so reshaped the dynamics of musical culture. And in that way digital technology can be seen as a force for musical pluralism, not the vehicle of some inexorable, technologically determined advance towards Kramer's 'posthuman condition' (as I said, technology does not simply determine what happens in culture).

There is also an issue of how far what Kramer describes is properly speaking posthuman at all. He speaks of earbuds – perhaps the signature

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