

# 11 The Political Economy of Streaming

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## Introduction

New technologies of listening are not simply signs that can be interpreted; they are not direct determinants of economic or political power; and they are not straightforwardly technical innovations. Any discussion of the economics of music in the early twenty-first century must intersect the question concerning technology – big data storage, distributed network technology, programmable artificial intelligence (AI), and so on – with the question concerning contemporary markets – the merchandising of desire, taste and sensibility within a surveillant attention economy, and its concomitant labour ethics. This chapter attempts to historicise musical labour practices in the current age of technological automation.

As inter-corporate struggles turned toward control of the ‘Internet of Things’ – an industry coinage that refers less to *things per se* than it does to internet-enabled *platforms* for learning behaviour and gathering user information in service of technologically-assisted interactions and experiences – we witnessed an expanding dialectical gap between the heterogeneous, disseminated habits of everyday practice and the incrementally ordered corporate infrastructures that monitor, and increasingly automate, that practice. In other words, in the first decade of the twenty-first century, collaborative peer-to-peer networking and music file-sharing – with direct links to a kind of progressive cyber-politics, demonstrably indifferent to extant economic reward systems – had become dominant sociocultural techniques. By the second decade, however, these very practices had been deftly co-opted by new corporate intermediaries, who successfully monetised a widespread *habitus* by way of a new conveyor-belt delivery system for audio and video.

While official revenues associated with them were perplexingly limited, streaming services had transformed into large-scale privatised spying services, licensed by users to harvest personal data, which – crossed with advertising agencies – could manufacture opinion, generate consumption and modify behaviour. In other words, these new music intermediaries were designed to leverage sophisticated technologies to aggregate user attention and sell advertising. This raised a host of questions, the first of which concern data privacy, data security, the management of user data, and

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procedures for third-party requests for data and metadata. The second set of questions concern the redistributions of revenue that took place – almost noiselessly – across the contradictory terrain of music licensing, copyright and digital rights management. By investigating the social, technical and legal dimensions of this shifting terrain, the chapter suggests that their impact on cultural labour practices in the digital age, in the final analysis, bears an uncanny resemblance to that in a pre-technological one.

### **From Disintermediation to Hyper-Intermediation**

By the end of the second decade of the twenty-first century, the decentralised Internet – arguably open and public in the 1990s and 2000s – had given way to an unprecedented centralisation of data and platforms ownership within the global digital architecture. What was once considered a disintermediated network (no middlemen), assisted by new efficiencies in search functionality and peer-to-peer connectivity, had modulated within ten years into a de facto system of central nodes, which controlled and coordinated large swaths of the network. Music distribution had likewise shifted decisively from the unruly, but ubiquitous, practice of informal downloading and file-sharing toward music streaming, facilitated by a concentrated group of large-scale streaming services – including Beats (later bought by Apple), Rhapsody (later bought by Napster, which had rebranded itself as a legal entity), Deezer, Rdio, Pandora, Google Play, Apple Music, and Spotify, a European-based service that launched in the United States (initially in partnership with Facebook) in 2011. As high-speed mobile devices became widespread, users gradually discontinued the process of syncing and transferring musical tracks from a variety of sources in favour of streaming music from a central source. This historical transition marked a large-scale *relicensing* of musical content in accordance with traditional legal obligations toward rights holders, even as the mode of music's consumption had fundamentally shifted from an ownership model to a *rental* one. Instead of purchasing (or downloading) music on the basis of discrete units – which were once ordered by the producer (or playlisted by the consumer) – music was now largely consumed as a kind of auto-playing sequence, hitched to various algorithmic procedures. Paradoxically, the very user-generated activities that had once delinked music from its commodity form – the art of generating personalised playlists from free content, for example – morphed into the raw material, or data points, for an automation of curation procedures that re-secured its commodity form.

The promised disintermediation of music's industrial sector by the digitally networked environment in the first decade of the twenty-first

century was upended, in a twofold sense, in the second decade. First, by licensing the music delivered by streaming services, the more traditional conception of music as a unit-based commodity was paradoxically resurrected in the very moment that attendant listening habits were cultivated by technical platforms that had shifted *away* from unit-based music delivery systems. Second, by securing a percentage of the profit derived from actual plays, the newer conception of music as a service was *additionally* monetised by the delivery systems themselves. In other words, just as had happened in the first decade of radio broadcasting in the 1920s, streaming services elided what were formerly distinct systems of distribution, producing what economists call ‘option value’ blurring (Wikström 2009, 90–1; see also Chapter 2). Where disseminating technologies, such as radio and television, had functioned primarily as marketing or promotional tools to guide consumption – delivering audiences both to advertisers and to retailers – streaming services functioned as promotional/marketing vehicles *and* simultaneously doubled as an on-demand conveyer-belt of content. If the Internet of the first decade of the twenty-first century could still be construed as a ‘gigantic copying machine’, it had transformed by the second decade into its antithesis, a zero-copy machine – a library bank that technically required no more than single master copies, accessible via rental on all internet-enabled devices (Nimmer 2003, 157).

By 2010, the transition from local to remote access musical playlists had reached a tipping point. A generation of young listeners had effectively been steered away from file-sharing and downloading, and had become accustomed instead to online music streaming. Already in 2009 a study detected the trend, revealing that ‘many teenagers (65%) are streaming music regularly, with more 14 to 18 year olds (31%) listening to streamed music on their computer every day compared with music fans overall (18%)’.<sup>1</sup> By 2013, new subscribers to services such as Spotify had more or less stopped downloading or file-sharing pirated music. A year later, the overall global recorded music industry revenues declined once more, but revenues from streaming surpassed, for the first time, those of compact discs, digital downloads and other physical media. For the remaining decade, overall industry revenues increased steadily and streaming services dominated the market share. Between 2013 and 2015, Google Play, Spotify and Pandora streaming services grew by double digits. After 2016, most Americans were listening to music via streaming services, which now constituted the bulk of the industry’s revenues. Just as monopolies converged around radio in the 1920s – in the early 1920s, various corporations initially coalesced into the National Broadcasting System (NBC), and in the late 1920s into the Columbia Phonograph Broadcasting Company (CBS) – streaming services in the 2010s consolidated into a handful of

dominant platforms – YouTube, Apple Music and Spotify in America; Tencent in China; and Mdundo in Africa. In the face of terminal losses, smaller ('indie') services, like SoundCloud, shifted their focus toward selling digital compositional tools to musicians (rather than delivering playlists to listeners), and others, like Groove Music (Microsoft), became entirely obsolete. Even Pandora, one of the pioneers in the streaming industry, found itself unable to compete against Spotify and Apple and so merged with the satellite radio provider SiriusXM in 2018. While their ascendant market value indicated a new direction for music consumption, even the dominant streaming platforms (running *licensed* content) operated at a significant loss in their early years. More than 80 per cent of earnings at Spotify, for example, were directed toward rights holders. Annual reports indicated that net losses at Pandora and Spotify in the early 2010s ran into hundreds of millions of dollars. By 2018 Spotify had about 160 million active users (with nearly half paying monthly subscriptions), but simultaneously reported losses of \$1.5 billion.<sup>2</sup> Despite these evident losses, Spotify was successfully listed on the New York Stock Exchange in April 2018, buttressed by an unorthodox capitalisation process grounded in characteristically aspirational language resonant with the idea that new media were somehow paradigm-shifting. Goldman Sachs, a multinational bank and financial services company, for example, predicted that revenues from music streaming would quintuple by 2030.

This was the age of speculative capitalism, reflecting a latent demand for viable new technology companies: with a large enough visitor base, the thinking went, profits would somehow follow. Streaming platforms were a new kind of corporate entity – technical intermediaries between music labels and the listening public – without an evident business model, but whose stock was nonetheless heavily capitalised (by advertisers, insurance holders, credit agencies, and so on). The streaming platforms followed a contemporary pattern of growth for growth's sake. After all, the world's biggest online retailer in the second decade of the twenty-first century, Amazon, had already demonstrated staggering growth, even though it ostensibly generated only meagre profits. Amazon's basic model was to price below cost and expand widely by diversifying its services into as many realms as possible. In addition to being a retailer, it had become a marketing platform, a delivery and logistics network, a payment service, a credit lender, an auction house, a major book publisher, a producer of television and films, a fashion designer, a hardware manufacturer, and a leading host of cloud server space. In its attempt to capture global audiences, Google, too, had evolved beyond a search engine and included an array of free services, including news, maps, streaming, and cloud storage for documents. Likewise, the struggle for dominance of music streaming was geared toward building a diversified media platform that would eventually move beyond

music alone. YouTube's multi-tiered system for streaming media included entire films (on YouTube Premium, initially known as YouTube Red) as well as download functionality. Likewise, Apple Music branched out into video programming (such as James Corden's 'Carpool Karaoke') at the same time that Instagram introduced long-form video onto its platform. Spotify's signature playlists, such as RapCaviar, also began to include video in 2018. By 2019, further acquisitions and partnerships propelled Spotify beyond its music streaming origins into podcasting and film. The inclusion of aspects of virtual reality into the platform would soon follow. As Spotify's CEO Daniel Ek put it: 'The question of when we'll be profitable actually feels irrelevant. Our focus is all on growth. That is priority one, two, three, four and five.'<sup>3</sup> Sasa Zorovic, analyst at the investment bank Oppenheimer & Company, noted in relation to the world's largest music streaming service, YouTube, 'In the real estate business, it's about location, location, location. On the Internet, it's about traffic, traffic, traffic. If you have traffic, you will be able to monetize it one way or another' (Lee 2007). The endgame for streaming platforms, especially as they tended toward diversified media platforms, was to secure a proprietary network-based monopoly with a global reach. These would become the hyper-intermediaries that controlled the contemporary Internet. By the second decade of the twenty-first century, the Internet was dominated by a few titanic platforms, which could leverage the market at scale. Even without China, for example, Google accounted for nearly 90 per cent of global online search. Likewise, Facebook, the social network behemoth, serviced over two billion monthly active users, exceeding the scope of MySpace (at its peak) by a factor of twenty. In China, the messaging app WeChat (owned and produced by the company Tencent) had incrementally metamorphosed, through a series of iterative updates, into a multi-faceted infrastructure for handling personal finance, games, news, shopping, employment, customer service and more. Music streaming, now the dominant music delivery system, was consolidating into a similarly monopolised economic space.

Given the seeming indifference to traditional revenue streams, it is once again tempting to attribute these shifts in online musical consumption to technological factors alone. However, while digital technologies abetted the transformation of listening habits, they did not drive it. This applies to the exponential increase in bandwidth as a result of improvements to fibre-optic communication infrastructures in the 1990s and 2000s, as well as the emergence and large-scale global dissemination of high-speed mobile phones and tablets. Both developments were responses to commercial imperatives: the first, a demand for bandwidth-intensive consumer services, including music and video streaming on demand (recapitulating the experiential conditions created by the practice of playlisting in the era of downloads); and the second, a demand for affordable mobile connectivity, and its structural integration into economic networks of production and exchange (recapitulating the enormous

collections of music downloaded on personal computers and mobile devices). Cloud-based services effectively rendered hard drives obsolete by delivering immense databanks of musical content to multiple devices. Streaming could thereby bypass the technical inconveniences of hard-drive malfunctions, the limitations of memory chips on computers, and the possible legal consequences associated with engaging P2P networks. In short, the practices of downloading (via torrents and other means) withered in the context of all-access virtualised playlists controlled by music streaming companies.

From the point of view of the early adopter, the economic difference between downloaded playlists and those offered by a streaming service was minimal. Spotify, for example, offered unlimited access to its online music library either for a small monthly fee or by way of an advertising-based ('free') service. In a gesture that recapitulated the technological upheavals in the music industry of the past (such as the replacement of vinyl LPs with digital CDs in the early 1980s), early incarnations of the website encouraged users to devalue their current digital playlists in favour of the service: 'Think of Spotify as your new music collection. Your library. Only this time your collection is vast: 8 million tracks and counting.' Along with the promise of a kind of limitless collection, Spotify emphasised its efficiency (against that of physical downloads); its convenience (deploying only a temporary data buffer instead of permanent memory on a hard drive); its social functionality (its playlists were 'free to share'); and its suitability for portable devices (which could store playlists also while offline). The revolution in music consumption associated with the electric phonograph and broadcast radio in the 1920s was finally upended and reconfigured a hundred years later in the context of the Internet. Music had moved from the bookshelf for LP records to the CD holder; then it moved from the computer to the external drive; and, finally, from local storage sites to virtualised music collections stored on a remote server. Users no longer collected songs, but accessed vast, and highly organised, playlists using always-connected computers and ever-relocating smartphones. Streaming music would be experienced less in terms of a sequence of discrete units of content and more as a conveyor-belt of affect, algorithmically bound by considerations of genre, style, mood, weather, geolocation, personal history and current activity. It is a curious paradox of the shift from downloading to streaming, that it would mark the shift from a kind of free access to (formerly) commodified units of music to a commodified access to free-flowing streams of music. It is as if the new technologies mirrored the musical experiences afforded by the piracy they, in turn, eliminated.

### **The Contested Stylistics of Financialised Streaming**

Given the archaic marketing and promotional techniques of the traditional music labels, industry leaders began to experiment with a variety of release

strategies – from limited releases on specific streaming services (such as Tidal in the case of Kanye West’s 2016 release of *Life of Pablo*) to premium hardware companies or cable channels (such as Apple in the case of Beyoncé’s 2015 ‘visual’ album; or HBO in the case of Beyoncé’s 2016 release of *Lemonade*). In practice, the very concept of the music *album* became digitally de-ontologised – melting, in Ben Ratliff’s words, ‘into the water world of sound’ (Ratliff 2016). The attempt to redefine new media realities to archaic, or real-world, counterparts – dubbed ‘skeuomorphism’ in media studies – ruled the day. For example, by 2016 the decreasingly relevant album concept – itself a kind of forced bundling of songs to boost revenues in the age of the LP and CD – was redefined by the RIAA as 1,500 on-demand audio streams. Even though the relationship of a particular number of downloads to the conceptual commodity structure of an *album* was entirely derivative, the industry persisted in its attempt to retain its traditional selling structures and attendant reward programmes. Likewise, two years later, Billboard differentiated the streams constituting their Hot 100 charts according to whether they had been accessed, on the one hand, by subscription-based streaming, or, on the other, by advertisement-based streaming. But the late-twentieth-century consensus about how music’s value should be evaluated had broken down. YouTube – with direct roots in UGC a decade earlier – rejected Billboard’s idea, for example, claiming that the charts should reflect actual engagements with music instead of simply paid streams. Artists too responded in diverse ways to the changing economies of music. On the one hand, streaming services were regarded with suspicion. Radiohead, for example, removed their work from Spotify, opting instead to make it available on BitTorrent; while Taylor Swift temporarily removed her album *1989* from Spotify, which resulted in the sale of two million albums by traditional means. On the other hand, artists and labels mobilised diverse release strategies that tactically deployed streaming services. Rihanna, for example, released an album exclusively on Tidal, but then also included a million free downloads; while The 1975 waited two weeks after the release of an album before placing it on a streaming service.

Commentators were divided on the effect streaming had on the stylistics of musical listening. In his book *Mashed Up: Music, Technology, and the Rise of Configurable Culture*, for example, Aram Sinnreich (2010) extolled the virtues of the new non-linear modes of intertextual music-making, whose patterns deftly recapitulated the networked architectures of new digital technologies. Likewise, in his *Sonic Warfare: Sound, Affect, and the Ecology of Fear*, Steve Goodman celebrated the manifold new genres blossoming in the context of digital remixes, mashups and musics grounded in samples from ‘the riddim method of Jamaican pop, to the sampladelia of US

hip-hop, the remixology of disco, house, and techno, and the hyperdub methodologies of the hard-core continuum' (2010, 162). From the perspective of music listeners, the cornucopia of online listening could delink the musical ear from stratified conventions of old definable coordinates. Ratliff, for example, observed: 'There is a possibility that hearing so much music without specifically asking for it develops in the listener a fresh kind of aural perception, an ability to size up a song and contextualize it in a new or personal way, rather than immediately rejecting it based on an external idea of genre or style'. Not surprisingly, Ratliff praises the logics of remix and mashup, the fusion of 'elements of two different songs', and their 'stark musical oppositions' (2016, 5, 6). For these writers, the convergence of consumer electronics and digital music distribution and consumption proffered a culture of productively disoriented creative praxis anchored in rich intertextual fields of independently launched musical expression.

While the sheer quantity of online musical production made it difficult to assess, the artistic value of such recent trends in new music was as much praised as it was contested and in doubt. Far from detecting genuine creativity in the artistry of remix, mashup, and other genre-defying flows that build critical 'question marks . . . into our hearing', writers like Jaron Lanier detected a logic of decontextualised fragments in an assemblage to be exploited by others: 'Pop culture has entered into a nostalgic malaise. Online culture is dominated by trivial mashups of the culture that existed before the onset of mashups, and by fandom responding to the dwindling outposts of centralized mass media. It is a culture of reaction without action'; 'Where is the new music? Everything is retro, retro, retro' (Ratliff 2016, 6; Lanier 2010, 20, 129). One symptom of the nostalgic turn was the paradoxical emergence of musical genres like glitch art, which aestheticised technological failures and malfunctions, and vaporwave, which engaged outdated sounds (from advertising jingles and video games to retro musical styles) to expressive effect. Arguably, by leveraging a kind of reflective *techno-terroir*, these genres critically engaged with the consumer culture upon which they depended. Lanier, however, would regard this kind of artistic practice as derivative and reactionary. He connected the reactive musical culture to the reduction of personhood to illusionary bit-matrices, such as the 'multiple-choice identities' prescribed by social-networking platforms like Facebook, and the erasure of viewpoints by 'hive-mind' collaborations like Wikipedia (2010, 31, 48). Where Sinnreich and Goodman observed an explosion of new online creativity, Lanier detected a reactionary cultural soundtrack to recombinant, semi-automated processes that diminished qualities of human expression.

What is clear is that – whether construed *pro* or *contra* – the stylistics of algorithmically determined playlists did not merely reflect the popularity



of a song, but also increasingly played a role in constructing it. The real-time feedback between users' behaviour and the algorithmic procedures generating playlists had the potential of becoming an eddy-like loop, eventually also leaving an imprint on the aesthetics of production, vocal performance, tempo choice, global reference set, sample types, and so on, for music designed for streaming. This kind of mediatic intrusion on music's stylistics bore the marks of a lengthy history, including the musical effects of phonograph records, the recording techniques and devices of music studios, the types of speakers used in homes and concerts (whether mono or stereo, etc.), the audio–video relations in the era of television, and the quantitatively calibrated standardisations associated with radio consolidation, to name but a few. For example, the evolution of the standard length for the popular song (which ranged approximately between three and five minutes) – occasionally attributed to the length of the early 45 RPM 7-inch phonograph record – was calculated in the context of marketing strategies characteristic of the early phonograph era in the United States of America. By the mid-1920s, standardised verse – chorus formulas, gradually compressed from about six to seven verses (with eight to ten lines) to two to three verses (with a maximum of four lines), had become the preferred structure for songs crafted in Tin Pan Alley. In comparison to the lengthy, complex, lyricised storytelling found in frontier ballads, children's songs and cowboy songs of nineteenth-century American vernacular (or folklore), the songs of Tin Pan Alley were short, simplified and formally standardised. Additionally, music became increasingly vested in property rights during this period. After the passing of the Copyright Act of 1891, songwriters, lyricists, arrangers, and particularly publishers, reliably received royalties for music. This constellation of industrial imperatives encouraged the high-speed production of short standardised songs synchronised to thematic fashion. The standard song structure and moderate length of a copyright-protected popular song was well suited to a retail strategy that bolstered sales by limiting the life of a product (a strategy termed 'planned obsolescence' during the Great Depression), and predominated for the ensuing century (see Suisman 2009).

In the context of music streaming a hundred years later, the music stylistics inherited from the popular verse–chorus structure had shifted in certain significant ways. To begin with, the first thirty seconds of a song were anchored in a series of enticing hooks, a memorable or familiar sample, or even an arresting chorus.<sup>4</sup> This is because skipping ahead before reaching the thirty-second mark of a song was not considered to be a legitimate 'play' of that song by streaming services. The thirty-second format for streaming was even hacked by the American funk band Vulpeck on their album *Sleepify*, consisting of ten silent tracks of approximately

thirty seconds long. The band requested that fans play the album on repeat throughout the night, raising approximately \$20,000 in royalty payments. Hogan argued that, in addition to ‘reverse-engineered’ songs that strategically produce sonic allure in the first thirty seconds – Katy Perry’s opening sample of Fatboy Slim on her song ‘Swish Swish’ (2017) was a classic example – the signature sound of streaming was characterised by a host of additional techniques such as slower tempi, abbreviated use of three or four chords, rave-like synthesiser sounds, and so on. The songwriter Dr Luke, for example, deployed what he called the ‘stuttering’ effect, whereby a short syllable was electronically repeated to rhythmicise a word, exemplified by Rihanna’s ‘Umbrella’ (2009) or Ke\$ha’s ‘We R Who We R’ (2010). Another technique was the so-called millennial whoop, a sequence of notes that alternated between the fifth and third notes of a tonic chord in a major scale, typically starting on the fifth, exemplified by Katy Perry’s ‘Teenage Dream’ (2010) or Carly Rae Jepsen and Adam Young’s ‘Good Time’ (2012). The songwriter John T. Harding drew attention to another technique – the ‘pop-drop’ – whereby a vivid bass synth sound from EDM was suddenly introduced into the song’s otherwise melodic texture, exemplified by Justin Bieber’s ‘Where Are Ü Now’ (2015). Hogan even argued that this kind of technique came to characterise the genre-blending tropical house – a genre fundamentally shaped by streaming technologies. What differentiated these techniques from the traditional standardisations associated with popular music was that they were designed specifically for music streaming platforms (and their attendant output devices). Songs were generally shorter, Hogan argues, choruses appeared earlier in the structure, and artists created songs with playlists in mind, often pre-empting their technical mode of transmission. Relatively unknown artists emerged – like Lawrence, Sloan and Nesbitt – who nonetheless amassed millions of streams on Spotify. Their music, orientated towards the data-driven systems of mood-enhancing playlists, bore the marks of these stylistics.<sup>5</sup> By 2010, in other words, musical tracks had become tailored for streaming.

While the way the format and the medium weigh upon the sound and the content of music could be readily detected in the context of engineering and marketing of music for streaming, the actual economics of early streaming were vexingly opaque. Nearly a century earlier, Theodor W. Adorno had detected a link between the economics and the aesthetics of popular music in the context of the then-emergent technology of radio (Adorno 2009). Adorno argued that popular music had become largely standardised – with intermittent pseudo-differentiating details to sustain listeners’ interest – in the context of ‘post-competitive’ (monopoly) capital. However, although early radio was dominated by monopoly networks – controlled, in turn, by advertisers, investors and advertising agencies – the

philosopher's analysis was significantly complicated by the fact that it was federal licensing and regulation of radio (instead of censorious corporate impulses alone) that constrained the freedom and diversity of musical broadcasts from the 1920s to the 1940s. In other words, as it was for radio, the monopolised nature of streaming platforms in the second decade of the twenty-first century do not sufficiently explain the way a technical format shapes the sound of music. In fact, the way music became monetised in the context of streaming technologies was an innovation that equally bore the marks, as discussed above, of an era of informal downloading and file-sharing as it did the later era of corporate consolidation and monopolies. It was in the curious conjuncture of freely exchanged culture online and the emergent corporate control of digital platforms that the measurable revenue streams toward actual artists indicated remarkably meagre returns. Mode Records, for example, received less than one-third of a penny for every stream on Spotify.<sup>6</sup> In 2013, many prominent artists began to testify to, and then protest against, the failures of the streaming model, and the implications of its overall fiscal disenfranchisement of artists.<sup>7</sup> The peculiar monetisation practices of music streaming related to the unique ways that content providers engaged service providers. In other words, instead of monetising *per stream*, music labels tended to be invested in equity shares in the streaming services themselves. This meant that revenues generated by advertising and subscription fees were proportionately divided among equity holders and only then distributed to artists, according to variable agreements between artists and labels. As with consumption, remuneration in the era of streaming was delinked from its central legal *raison d'être*, the unit-based song, which was meant to guide its financialised circulation. The utopian aspirations of early internet pioneers – such as Paul Borrill, Jim Herriot, Stuart Kauffman, Jaron Lanier, Ted Nelson, Bruce Sawhill, Lee Smolin, Eric Weinstein and others – were challenged by this model. Nelson's early ideas concerning the economics of the Internet, for example, respected the monetary (labour) value of creative content, however much this content had been transformed into digital bits. Nelson proposed the idea that when a digital bit of music, journalism, video art, and so on, was accessed by a user, the maker of that expression should be able to command a direct payment of a moderate sum. The libertarian idea was to eliminate the content brokers, or intermediaries, that separated audiences from creative labourers. Lanier updated Nelson's ideas by arguing for a simple universal system for making fluid payments online, ultimately to be administered by elected governments (2010, 105–7). The idea that internet companies that logged and analysed user data to improve customer retention, product design, advertising initiatives, and so on, should actually *pay* their users for their data gained some traction beyond the circle of cyber-libertarians and in the mainstream

press.<sup>8</sup> For all their technical insight, however, neither Nelson nor (the early) Lanier could foresee the turn away from content-based consumption toward service-based delivery systems – a shift from parsed units of sound (known as songs) to seemingly endless muscscapes on the model of an infinite-seeming conveyer-belt. If *units* were the de facto basis for music's traditional economic exchange, then *streaming* – which emerged directly within listening practices cultivated in the context of free music – created the conditions for a radical revision of its financialisation.

The heated discussion in the second decade of the twenty-first century about the potential use of blockchain technology (an open, indelible ledger of transactions recorded in real time) in contexts outside the financial services sector, notably the music industry, emphasised the distributed nature of the global database for music, as well as the possibility of paying creators, songwriters and musicians efficiently and equitably. According to Rakesh Sharma, 'Blockchain's distributed ledger can be used for a variety of applications within the music industry, including ensuring direct payments to artists and establishing large digital rights management services run by artists themselves.'<sup>9</sup> In this worldview, technological efficiencies marched in step with libertarian economic ones. Blockchain was wholly in sync with the libertarian ideals of Nelson, Borrill, Lanier and others. By coordinating the ledger of transactions across a distributed network, and then encrypting the record-keeping, blockchain promised to cut out a swath of intermediaries – from artists' agents and marketing professionals to music studios, record companies and financing institutions. More precisely, blockchain promised a system of self-executing 'smart contracts', which automated the transparent payment of royalties for licensed or copyrighted digital music.<sup>10</sup> To this extent, blockchain could enact a kind of limited digital rights management for the efficient processing of micro-payments. Some blockchain-powered platforms emerged during this period – Voise, for example, promised a platform for artists to upload and monetise their creations within the context of a P2P network – but, in general, the fundamental antagonism between the experiential flow of streaming music and a (micro-) payment scheme that relied fundamentally on *unit*-based music seemed to annul the challenge posed by blockchain. Aside from concerns regarding the sheer computing power required to process blocks of sound containing complex layers of copyright protection – itself a lurking site of powerful intermediaries – music streaming was increasingly tethered to the algorithmic processing of genre, style, mood, weather, geolocation, personal history and current activity, rather than to individual songs and their attendant author-figures.

As a result, far from facilitating a networked world of micro-payments through technologies such as blockchain, the Internet had mutated into a new kind of hierarchy, controlled by a handful of large companies that effectively acted as intermediaries between users and musicians. Given the

mismatch between the flow of investment capital and tangible profits, it was not surprising that the most powerful music streaming platforms of the second decade of the twenty-first century – YouTube, Apple Music and Spotify – were also the lowest revenue-producing platforms for artists. As a result, even stars like Lady Gaga were locked into recording label deals that generated no appreciable remuneration (for the artist) from online plays or streams. Far from tending toward disintermediation, the old industrial intermediaries had effectively been transformed into, and substituted by, a handful of cloud-based hyper-intermediaries. It would not be an exaggeration to say that the turn toward streaming was not unlike a return toward the impresarios of the eighteenth century, or the publishers of the nineteenth century, who extracted great surplus from, and exercised outsize control over, individual composers and musicians. A decade of freely available music on open networks had created the conditions for its own undermining; a commons-based culture of sharing on open networks had tragically mutated into a business model that incubated vast privately owned online monopolies.

### **Internet – Dragnet: Music’s Surveillance Economy**

The financing of streaming services generally followed the classic model of advertising. The world’s largest streaming service, YouTube, also offered an advertisement-free alternative (by subscription), but advertising was a central component for generating revenues. By 2008, YouTube featured homepage video advertising, standard banner advertisements with embedded links (toward the base of the video screen) and in-video advertisements (preceding the play of the searched video). YouTube had also mounted ‘Sponsored Channels’, ‘Promoted Videos’, ‘Spotlight Videos’, and categories such as ‘Most Viewed’, which could technically be manipulated by those who could pay for it (van Dijck 2009). In many ways, the steady encroachment of advertising recapitulated the age of radio, which gradually shifted from commercial-free broadcasting to a model of insistent advertising, by way of branded content. Despite early enthusiasm for the Internet as a likewise non-commercial public space, YouTube had transformed into a mega-media outlet supported by advertising. Although YouTube split its advertising revenue with those content providers with whom it had signed licensing deals, much of their content creation fell outside the rubric of official culture. Even if users were drawn to the platform because of user-generated content, compensation for users posting audio-visual content on YouTube was limited to those who had signed on as media partners. In other words, even while ascendant

streaming services like Spotify mounted licensed content, most uploads on YouTube were simply circulating as free audio-visual content.

The benefit to YouTube of the ‘safe harbour’ provision of the DMCA should not be underestimated (see Chapter 2, p. 44). This is because the platform could not strictly be held liable for unauthorised distribution of protected works, or excerpts of works – which included ‘derivative’ works that somehow included sound, image or text of a licensed work. Although Google possessed the web-tracking technology to automatically detect licensed content (known as its ContentID system), the onus was on the licence holder to issue a takedown notice in the case of infringing material. Most of the industrial content providers (such as Universal, EMI and Viacom) felt compromised by their partnerships with YouTube. The conflict between content provision and content promotion placed the industry squarely in the horns of a dilemma. To take a simple example, among many: when the band OK Go – which, by 2006, was already a self-launched YouTube success – signed a deal with EMI for their second album, the company repeatedly vacillated between removing their music videos from YouTube and then, noticing no significant shift in revenue, uploading them again. On a larger scale, clashes between Viacom and YouTube reached epic proportions, ranging from demands to remove hundreds of thousands of videos from the site to high-stakes litigation pertaining to the economics of copyrights and licences. For content providers, it was a losing battle, for it seemed that traffic to official sites for content did not appreciably increase when videos were removed from YouTube. At the same time, YouTube continued to attract more and more visitors; in the weeks that Viacom had initially removed its clips, for example, YouTube had grown from 17 to 19 million users. Given the sheer size of YouTube, the content industry had no choice but to capitulate to its business model. The court battles between Google and Viacom were finally settled in 2014, but the distrust between the content industry and YouTube persisted. The official 2018 report of the International Federation of the Phonographic Industry (IFPI), representing the recording industry worldwide, claimed there was a ‘value gap’, or a mismatch between the ‘value that uploader services, such as YouTube, extract from music and the revenue returned to the music community – those who are creating and investing in music’. The IFPI further argued that this was the result of ‘inconsistent applications of online liability laws’, which had ‘emboldened’ services such as YouTube: ‘Today, services such as YouTube, which have developed sophisticated on-demand music platforms, use this as a shield to avoid licensing music on fair terms like other digital services, claiming they are not legally responsible for the music they distribute on their site.’<sup>11</sup>

While content industries complained about the reduced revenue streams generated by the ‘value gap’, individual users and uploaders were largely factored out of the financial accounting altogether. This led to widespread critique from both libertarians and Marxist commentators alike. On the one hand, commentators like Jaron Lanier and Kevin Kelly noted that the ‘open culture’ of the Internet, characterised by ‘hive-mind’-oriented cognitive surpluses, were highly profitable for large companies like Google, Amazon and Netflix, but ultimately of limited value for individual creators. The new arrangements between creative labour and finance would result in a new kind of social contract:

The basic idea of this contract is that authors, journalists, musicians, and artists are encouraged to treat the fruits of their intellects and imaginations as fragments to be given without pay to the hive mind. Reciprocity takes the form of self-promotion. Culture is to become precisely nothing but advertising . . . Meanwhile creative people – the new peasants – come to resemble animals converging on shrinking oases of old media in a depleted desert. (Lanier 2010, 83, 86)

Lanier here argued that free culture would in fact lead to the demise of a creative class of people – most prominently what he called the ‘musical middle class’ (89) – which proffered a steady supply of free content for centralised cloud-based servers. As paradoxical as it seemed, ‘ardent Silicon Valley capitalists’ encouraged ‘more and more services on a volunteer basis’ (104), and Lanier explicitly connected the ideal of free music with the contemporary demands of speculative finance: ‘Silicon Valley has actively proselytized Wall Street to buy into the doctrines of open/free culture and crowdsourcing’ (97). For Lanier, this was a case of ‘privatizing benefit while socializing risk’ (Lanier 2014, 278). In short, there was no contradiction between free culture and capitalist accumulation; in fact, the former was the elusive alibi of the latter.

On the other hand, commentators like Mark Andrejevic argued that the productive activity on sites like YouTube should be regarded as an “‘affective” form of immaterial labor’ – subject to a process of exploitation (2009, 416). Andrejevic’s commentary drew on theories of cognitive capitalism, immaterial labour and biopolitical production, which recognised the prevalence in contemporary capitalist markets of flexible labour forces cooperating in a kind of communalist (or commons-based) sphere of production. Building on the work of Maurizio Lazzarato, Paolo Virno (2007) demonstrated how the ideological demands of post-Fordist neoliberalism necessitated new modes of subjectivity that upended traditional Marxist theories of alienated labour in the context of capital’s abstract industrial imperatives. Far from reducing, or disciplining, the socially interpellated subject (imbricated in collective norms, familial relations,

kinship networks, ethical systems, historical debates, etc.) to an abstract, autonomous self (internally motivated, asocial and apolitical), the neo-liberal subject was in fact enjoined to pursue work that was communal, authentic, expressive, spiritual and collaborative. Andrejevic recognised the uncanny connection between the Marxist critique of alienated labour and the cool twenty-first-century rhetoric of ardent capitalists:

To return to producers control over their creative activity (to overcome the estrangement of the product), to build community (to overcome the estrangement of others), and to facilitate our own self-understanding (to overcome the estrangement of ourselves). If anyone is directly invoking the language of Marx in the current conjuncture, it is not the critical theorists, but the commercial promoters of the interactive revolution. (2009, 419)

The traditional Marxist critique, it seemed, hereby encountered a limit. Indeed, it was in this peculiar post-Marxist sense that musical production – grounded, practically by definition, in free, authentic expressive values, communal reciprocity, friendship networks, and so forth – lay at the vanguard of immaterial production for information/knowledge workers generally. As shown earlier, digital media in the twenty-first century ushered in widespread new online *habitus*, which, in turn, proffered new networked socialites. In the large-scale context of enhanced digital efficiencies (in delivery, experience, etc.), musical production became a kind of model for the self-employed creative worker. In fact, it could be argued that the general transformations of labour socialisation in the digital age were beginning to look more and more alike. The production of information and knowledge work – including journalism, telecommunication, information technology, design, and other cultural communities – began to coalesce around a single model. All work, as the saying goes, seemed to approximate the condition of *musical* work.

Of course, the new context of consumption did not entail what Marx regarded as exploitation – understood, strictly speaking, as ‘*forced, surplus and unpaid labor, the product of which is not under the producers’ control*’ (Marx, in Holmstrom 1997, 87). Far from being coerced, online productivity was an extension of a traditional desire for community and interaction, amplified by new technical efficiencies in social connectivity, search functionality and streamlined content delivery. Furthermore, music streaming became more popular than downloading because it was fast, simple, efficient, and – despite being largely free – it was legal. One of the great advantages for the listener of streaming music, for example, was a function of option-value blurring – a kind of flexibility that permitted users to call up specific content on demand. This enhanced functionality was precisely what led Michael Fricklas, general counsel for Viacom, to



argue that ‘when everyone gets a free pass to the movies, it’s no longer promotional’ (McDonald 2009, 400). In other words, online productivity was experienced less as alienation or exploitation, and more as a free pass to content that could be modified, engaged with, and shared. On the other hand, the exploitation of users’ labour came in an invisible (or, more precisely, a partially visible) form, namely, the corporate capture of detailed information on users’ behaviour and response patterns online. While the Internet was fundamentally grounded in a traditional model of advertising, it was newly tethered to capacious technologies for tracking, managing and then subjecting users to targeted marketing. As Calvin Leung predicted in 2008: ‘There’s [...] going to be a lot more analytics beneath Internet advertising. In the future, advertisers will come up with 10, 100, or 1,000 creative messages for their products and services, then run, test and optimize them in real time’ (Leung 2008). Large platforms like YouTube had become gigantic psychology laboratories running controlled experiments using sophisticated surveillance technologies. These data-gathering methods were derived from techniques found in technologies of control – criminology, policing, psychology and psychiatry – in the nineteenth and twentieth centuries. Automatic web-tracking services embedded in viewers’ web browsers could track purchasing habits, while aggregated click-patterns could discern their backgrounds, tastes and behaviours. The creative chaos of the interactive economy of a decade earlier had mutated into a gigantic reservoir of rich new data sets, which were now being formatted for analytics-based metrics for marketing and advertising. The aim was to harvest users’ own activities – whether consciously shared or not – and channel them toward targeted consumption.

A second tragedy of the creative commons could be detected in the shift from user-generated content to user-generated *data*. Once again, music offered an ideal conduit for tracking data. The low-stakes affective investments generated by a user’s interactions with music could extrapolate data points well beyond the matter of musical preference alone; they included mood, location, activity and identity of the user. In general, the algorithms for corporate spyware acted on many inputs. On the one hand, they were specific to the particular product of the company. Spotify, for example, tracked the popularity of songs, how frequently they were shared, contexts for songs, such as text around them, and patterns of meta-tagging. On the other hand, the collection of user information extended well beyond the ostensible remit of the company, including any data that documented users’ characteristics, behaviour and activities. This information did not need to be associated with the user’s account, and included personal correspondence, user-generated content, account preferences and settings, log and access data, data concerning a user’s activities, likes, and

preferences collected from third parties either through behavioural tracking, the purchasing of data or any form of metadata. To date, the privacy policies of both Google and Spotify, for example, grant extensive permission to collect user data, including personal information, device information, log information, location, local storage data, and information from cookies and other tracking technologies.

Privacy policies tended to obfuscate some of their more important details in at least two senses. First, important details were often tagged onto the end of long lists, buried in the depths of the policy. For example, in Sections 3.2.4 and 5 of Spotify's privacy policy, the company acknowledged that it collects 'technical data, which may include URL information, cookie data, your IP address, the types of devices you are using to access or connect to the Spotify Service, unique device ID, device attributes, network connection type (e.g., WiFi, 3G, LTE) and provider, network and device performance, browser type, language, information enabling digital rights management, operating system, and Spotify application version', as well as 'motion-generated or orientation-generated mobile sensor data (e.g., accelerometer or gyroscope)'. It is difficult to discern from this list alone what kind of data may be *off-limits* to the company – a list appended as a single line in the remote regions of a privacy policy. Second, it is equally difficult to assess what policies actually regulate the *handling* of this kind of user information. While Google's privacy policy, for example, stated that the company shares 'personal information' (defined as 'your name, email address or billing information, or other data which can be reasonably linked to such information by Google, such as information we associate with your Google account'), it did not disclose what the company does with the six *additional* types of data it permitted itself to collect. Without offering a further close reading of them, it can already be noted that – notwithstanding both the plain-seeming language as well as the design format that ostensibly encourages understanding (with section headers, bulleted lists, readable font size, and glossaries) – standard privacy policies were mired in ambiguities, elisions, vague formulations, generalised language, and outright incoherence. Unsurprisingly, they were infrequently read, and thus not likely to be challenged in the context of legal proceedings. When click-through agreements are unread, 'they basically do not exist', in the words of Lanier, 'except for setting the basic rule everyone understands, which is that the server takes no risks, only the users of the server' (Lanier 2014, 184). The new habituations of contemporary subjects had been enjoined toward agreements, defaults and presets that underwrote the political economy of music. Could one detect here a brave new world ordered by naturalised embodiments of the attention economy – a form of *digital entrapment*?

## Afterword: Automatic Music and the Peasant's Dilemma

It could be argued that the dominant cultural logic of contemporary computing engaged online labour as a kind of *dis*-alienated production, informally exchanging free-seeming services for extensive data dossiers on individual users. The internet-wide surveillance network had produced data as the central commodity for digital capital. Musical production and consumption had played a central role in consolidating this overall one-way-mirror structure. Not only were users being tracked to be targeted, but also to generate data for the recommendation ecosystem. Instead of investing in on-the-ground research, a streaming service could now intercept, and even predict, trends and fashions simply by tracking users. In 2016, for example, Spotify launched a product called 'Fresh Find', which used its surveillance technologies to track hipsters – defined, more or less, as people who were actively listening to songs before they became hits – to generate metrics for recommendation algorithms and playlists. Again, this form of labour capture could not simply be described as alienated; instead, these were subjects who had (voluntarily) agreed to terms and conditions that wired them into an affective circuit of *dis*-alienated labour. Whether it was streamed on YouTube, Apple Music or Spotify, music had become what Eric Drott (2018) called a full-scale 'technology of surveillance'. For Drott, the aggregation of data points – tastes, emotions, dispositions, and so on – were no more than a kind of algorithmic assemblage (a 'data double' (following David Lyon) or 'Dividual' (following Gilles Deleuze)) that functioned as a kind of proxy for the living user. Social life was being rewired according to a problematic new computational logic. The first problem with extrapolating this kind of composite algorithmic identity was that it strapped individuals to statistical predictors grounded in pre-existing datasets and computational routines. In other words, algorithms assembled identities according to an unremarkable list of statistical correlations between billions of information bits. While it is true that machine-learning increasingly extrapolated seemingly fixed aspects of users' identities – their political affiliations, sexual orientations, gender, race and musical tastes – it nonetheless pragmatically bundled the diversity of individuals into what amounted to complex assemblages of market-ready clichés. The second problem with algorithmic identities concerns the risks posed to users' privacy in the pervasive context of predictive technologies. In an age where machine-driven assessments of health, creditworthiness and marketability were becoming the norm, web tracking for data was, legally speaking, surprisingly unmonitored for both quality and content.

The third, and most important, problem associated with algorithmic trawling for data was the systematic way it created highly segregated – almost

ad hoc – modes of financialisation of large-scale collaborative labour online. On the one hand, big corporate entities in the business of music distribution owned central, private servers with profitable internal data that effectively controlled people's networked connectivity. These third-party surveillance services created automated and persistent wealth from information that was used, copied and shared by others. On the other hand, users of streaming services – and especially musicians themselves – were increasingly restricted to what Lanier called 'real-time economic life' in a kind of peasant's dilemma (2014, 51). With royalties for recorded music reduced to a trickle, musicians were more and more locked into a life of *performance*. It is an irony that live performance – precisely that modality *not* intrinsic to the promise of networked digital technologies – was the only sector said to be economically viable for artists in the era after Web 2.0. By 2010 musicians were earning considerably more from touring than they were from recording. Live events, including large-scale integrated music festivals headlined by a variety of acts – such as Bonnaroo, Coachella and Ultra – became the primary income streams even for established artists. It is as if artists in the age of the digital network were paradoxically thrust back into the roles of performing musicians – the *troubadours* and *trouvères* – of a pre-modern time. Perhaps it should come as no surprise then that live performance was in fact the most monopolised sector of the music market by the second decade of the twenty-first century. The 2010 merger between Ticketmaster and Live Nation (the largest concert-promotion company in the globe, and a spin off of the radio monopolists Clear Channel Communications) opened the door to exclusive deals with artists, such as '360' deals (with Jay-Z, Madonna, U2 and others), and centralised control of ticket pricing for music concerts. In 2010, the *New York Times* reported that the 'average price of a ticket to one of the top 100 tours has soared to \$62.57 last year [2009] from \$25.81 in 1996, according to Pollstar, far outpacing inflation'.<sup>12</sup> It is as if the digital network's much-lauded decentralised distribution networks, newly unhinged from the control of the majors, suddenly betrayed their own promise, metamorphosing instead into a kind of auto-generative marketing tool for massive centralised companies who controlled the commodified 'communal' live 'experience'. Herein lay one of the great paradoxes of the Internet – its contribution to the concentration of economic power in the hands of monopolistic intermediaries, both online and offline.

Critics have described this economic condition in ultra-modern terms, arguing that post-Cold-War neoliberalism had produced a new 'precarious cognitariat' (Miller 2009, 435). But, for musicians, this was actually a dramatic throwback to a pre-modern (pre-Marxist?) era; an era in which composers struggled in an informal economy of barter and reputation,

while wealth was concentrated in the hands of a fistful of feudal overlords. As it was for composers before the age of Beethoven, musicians in the twenty-first century were increasingly coerced into performance-only careers, severed, in practice, from the traditional levies once provided by royalties and copyrights. It is as if musicians had become seventeenth-century travelling songsters once more, additionally enjoined to the labour of making their mark on the digital network. Of course, even live music may be gradually diminishing as we enter the third decade of the new century. In fact, if trends at Spotify are an indication, compensation arrangements hitched to *any* licensed music may come under additional strain in the future. In the 2010s, for example, the streaming service dedicated considerable resources to crafting playlists that did not reflect individual artists, or even clusters of artists, but rather affective states attuned to factors like place, weather and activity. Their 2017 product 'Climateune', for example, synced weather data with listening data to generate playlists that varied by geolocation. Likewise, Spotify's application for jogging and running, launched in 2016, was algorithmically attuned to the rhythm of moving feet. By analysing the raw signal of steps per minute, and then filtering it for an average tempo, the application could launch a non-stop playlist that provided professional-grade transitions between a beat-matched stream of trendy electro-pop.

Search queries are likely to become more refined, transforming from keyword-centric sorting mechanisms to algorithms responsive to more embodied perceptual cues derived from data-streaming sensors on networked subjects. Subjective musical experiences, in other words, will be reconfigured by the hyperactive solicitude of algorithmic routines transcoding subjective embodiments. Above all, however, with the turn toward supervised and unsupervised machine listening and machine learning technologies, the future of music playlists on streaming consumer products is itself likely to be short-lived. In fact, by 2018 artists had already begun artificially to extend their technological presence on streaming playlists by creating albums that covered twenty or thirty songs. Likewise, in various attempts to trick the word-based logic of search algorithms a host of songs with similar titles emerged during this era. The title of the song 'Demons' by Imagine Demons (a band with only a single song on Spotify), for example, seemed to hitch its fortunes on the same song by Imagine Dragons. This recalled the practice of *faux*-versions of songs that dates back at least to the Tin Pan Alley era. Charles K. Harris's massively popular song 'After the Ball' (1892), for example, spawned a host of knockoffs with titles like 'Fatal Night of the Ball'; just as the 1909 hit 'Meet Me in Dreamland' produced imitations like 'In All My Dreams I Dream of You' and 'Sweetheart of My Dreams'. On the other hand, the three-minute

song, crafted during the Tin Pan Alley era for explicitly commercial reasons – materially linking the ephemera of sound to specific artists and publishers – is likely to become obsolete. Instead of algorithmically delivering audiences to playlists – or sequences of short, distinct, licensed songs – future streaming could witness a radical shift toward seamless algorithmically generated muscscapes – multi-authored, layered and variable – attuned to geolocation technologies, as well as data aggregating user interests and behaviour, for fine-grained contextual information.

In 2017 Spotify was accused of mounting ‘fake’ music, embedded in playlists attuned to genres, moods and experiences. For example, the playlist ‘Ambient Chill’ featured music by the German composer Max Richter, followed by Deep Watch, probably a non-existent artist, with over one million streams. Likewise, on the ‘Sleep’ playlist, one found Enno Aare, also unknown outside Spotify’s algorithmic ecosystem.<sup>13</sup> Perhaps streaming services could experiment with making upfront payments to in-house musicians to circumvent fees associated with licensing and copyright. They could follow the example of movie content-providers like Netflix, which had reduced its reliance on Hollywood content by producing its own hits in the 2010s. The point about the ‘fake’ songs on Spotify is that they were less *fake* (in the sense of deliberately misleading) than they may simply have been differently licensed, or even *unlicensed* – embedded within playlists containing more well-known, licensed songs. While this episode represented a brief public backlash – gaining traction from the then-circulating concept of ‘fake news’ in the years of Donald Trump’s presidency – it is likely that streaming algorithms will, in future, design music autonomously and automatically. Tristan Jehan, founder of The Echo Nest and currently senior scientist at Spotify, remarked that when it came to teaching computers how to listen and make music on their own, ‘engineers will lead the way’ (2017, personal communication). Music’s automatic generation will, of course, be mediated by machine-human interactions – including collaborative filtering and deep learning algorithms – but instead of responding to searches for (rights-holding) artists and songs, the application could increasingly respond to metrics attuned to mood, place, weather, activity or affect. Search and discovery terms are likely to become more semantic and intuitive-seeming as artificial intelligence is integrated into streaming services. Likewise, neural networks in the context of unsupervised learning will translate musical styles and genres across different sets of instruments, or take informal musical cues from listeners, and, by way of a complex mode of auto-encoding, generate new and personalised songs.<sup>14</sup> Ever-attentive to search query tokens – video and song identities, demographics of listeners, watch times and click probabilities – developments at the intersection of music, machine

learning and signal processing can coordinate the connection between personalised/customised audiences and open-ended audio streams. Could this usher in a period where music is delivered as a stream of automated sonic affect; where the algorithmic service is no longer merely a conduit for content and consumption, but a genuine creator of data-driven content itself? Could the creativity of listening computers finally mark the total eclipse of autonomous music by automatic music?

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