

# 'Nimble Fingers' in Electronic Music: Rethinking sound through neo-colonial labour

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**How can historians of electronic music address the factory labour of the global underclass of women building electronics used in sound technologies? How can we speak to the repetitive work of women who are racially and sexually stereotyped as having 'nimble fingers', being 'detail oriented' and 'obedient'? Although women workers in electronics assembly are already de facto entangled in contemporary sound production, scholars have yet to enfold their lives and labour into histories of electronic music. I situate electronic sound technologies since the 1960s in the contexts of the global division of labour and the intimate disciplining of women's bodies, and investigate the discursive fallout of transnational subcontracting in the electronics industry. I argue that rethinking the category 'women in electronic music' is a necessary step for sound studies and musicology, and I call for a new disciplinary understanding of electronic sound and audio as fundamentally neo-colonial.**

## 1. INTRODUCTION

On a 2015 panel called *Improvisation in the Sciences* at Columbia University, American chemist Martin Chalfie told a story of how British biologist John Sulston went to watch the female cashiers at his local Sainsbury's supermarket in order to assess their precision skills and the quality of their repetitive work. Sulston, Chalfie said, approached the most precise cashier and asked if she would like to do the same work for more money working in his lab sequencing the human genome (Chalfie 2015). The audience laughed. I had shopped at a women-staffed Sainsbury's through three years of college in Nottingham, England, and it bothered me that the tedium of the female cashier's work became the punchline of a panel seating four men, moderated by another man, and introduced with a performance by a father-son jazz duo. Chalfie's anecdote also resounded with a question I had been thinking about for some time: how can scholars of sound address the factory labour of the global class of women who build electronics used in sound technologies? How should sound studies address the repetitive work of women who are racially and sexually stereotyped as having 'nimble fingers', being 'detail oriented' and 'obedient', and therefore as being especially fit for assembling miniature parts in highly structured working environments?

My thinking had been prompted by Gayatri Spivak's 1984 lecture 'The Political Economy of Women as Seen by a Literary Critic', in which she asked: 'How are we to get to the paradigmatic subject of post-modern neo-colonialism, the Third World female sub-proletarian?' (Spivak 1989: 223). Conversely, I ask, how have the lives and labour of this workforce affected the way we use sound electronics, listen to audio and understand electronic(ally mediated) sound in the late twentieth and early twenty-first centuries? How can we account for this labour when writing music history? Although these workers are already de facto entangled in contemporary sound production, music scholars have yet to fold their lives and labour into histories and theories of electronic sound, women in music and technologised aurality. I set out to explore ways of thinking across a theoretical chasm between US/Euro-centric feminist theory and Third World/diaspora feminism, as well as across the disciplinary objectives of musicology and the burgeoning discipline of sound studies. Expanding the category 'women in sound' and thus decentering our disciplines is a necessary and revealing step for scholars of sound.

## 2. MAGICAL TECHNOLOGIES AND WOMEN'S LABOUR

The 1960s and early 1970s were the golden age of American-made studio and consumer electronics: names such as Buchla and Moog defined a boutique synthesiser market, companies such as Peavey and Fender appealed to the popular sphere, and a number of companies bought licensing for the Bell Laboratories' invention of the newly portable transistor radio (Théberge 1997; Taylor 2001; Sterne 2003). Connecting these enterprises was the figure of the mastermind white male American inventor who lent his name to a company as a personal guarantee of intelligent design, high quality and signature sound. The gendered and raced dimensions of this image were apparent in the companies' advertising: women only appeared as passive listeners and sexualised props (Théberge 1991: 124). When Japanese companies such as Yamaha, KORG, Casio and Roland entered the market in the mid-1970s, they introduced a lower price point and

ease of use (Théberge 1997: 85). As a result, many American manufacturers faced bankruptcy while others moved manufacturing offshore (Chadabe 1997: 144; Dodge 1997: 402).

Fender's upmarket California-made guitars, for example, could not compete with the lower-priced offerings of Japanese companies, and so the joint-venture Fender Japan Ltd was founded in 1982. In 1987, Fender opened yet another factory in Ensenada, Baja California, Mexico, which produced still more affordable entry-level guitars. In the same year, Sequential Circuits was sold to Yamaha. And while Klipsch famously manufactured only in Hope, Arkansas between 1946 and 1988, the company moved lower-priced production lines to China in 1989. The audio manufacturer Polk, whose products are labelled with the slogan 'American Hi-Fi', now also manufactures offshore. The following notice, which appeared on some boxes from the early 2000s, shows the complex global networks that typically lurk behind 'Made in-' statements:

Polk Audio loudspeakers are constructed with the highest quality materials and components sourced from around the world. This product was designed and engineered by Polk Audio, Inc. at its research facilities located in Maryland (USA). It was assembled at a Polk Audio Assembly Facility located in Baja, California, Mexico, using components made in the USA, Japan, Germany, Mexico & Taiwan, and may also contain parts or components from one or more of the following other countries: United Kingdom, Thailand, Hong Kong, Korea.<sup>1</sup>

For all its transparency, the note testifies to the impenetrability of mixed systems that involve the transnational subcontracting of the manufacture of electronic parts, which are then assembled at a different location (Ong 1991: 279).

The relative affordability of sound technologies manufactured within the new globalised system of labour had a profound effect on the rhetoric that circulated around electronic music-making. By the 1980s, music and sound technologies in the United States began to be marketed as increasingly affordable and as democratising musical production (Théberge 1997: 72–92): 'Surprisingly portable, unbelievably affordable', cries a typical print advert for the Korg Poly 800 ('Surprisingly portable, unbelievably affordable' 1985: 3). Musicality and skill are commonly framed as superfluous, as what you are buying is supposedly that miraculous: 'You've got the whole band in your hand',

vows Casio, adding: 'miracles never cease' ('You've got the whole band in your hand' 1981: 23). 'Beware of false prophets', counters an ad for a synthesiser by Sequential Circuits, which nevertheless depicts an entire cartoon orchestra emerging out of their keyboard ('Beware of False Prophets' 1980: 38–9). The notion of music technologies' democratising powers is a myth and a miscalculation: the tropes of broad access and effortless music-making feed off of labour happening elsewhere. As Spivak puts it, 'the sublation of circulation time is being negated by the exploitation of women's bodies' (Spivak 1989: 223). The epistemic borders of what has been considered human work in electronic music skew our understanding of this new musicality as effortless. But effortless for whom? And whose labour eases this effort?

As documented by Mary Beth Mills, Shruti Rana, and others, the vast majority of workers in the new transnational electronics industry, and specifically in the assembly of high-tech electronics, are Malaysian, Thai, and Chinese, young, unmarried, rural migrant women (Mills 2005: 117, Rana 2013: 273–4). 'In Bangkok, Thailand', for example, 'women constitute the primary workforce for most of the labour-intensive industries – textiles, electronics, food products and more – that have fuelled that country's recent rapid economic growth' (Mills 2005: 117). The same gendered division of labour is typical of Malaysia, 'the world's largest exporter of electronic chips', which employs women in 87 per cent of semi-skilled jobs (largely made up of assembly jobs in plants) to men's 77 per cent in supervisory and managerial positions (Rana 2013: 278, 282). Ong cites a similar figure of 80 per cent female labour in mass-assembly electronics plants located in Malaysian Free Trade Zones (Ong 1991: 283). On American soil, a spike in immigration to the Santa Clara area in California between 1970 and 1990 produced a sister population of immigrant women workers in Silicon Valley making, for example, widely used microchips and, after its invention in 1971, microprocessors (Matthews 2003: 8, 136).

Scholars across disciplines describe the harrowing gender- and racial stereotypes that surround, and often explicitly advertise, this global workforce: nimble fingers, small hands, proclivity for working on the small scale, tolerance for tedium, obedience, docility, innate respect for male authority, patience, the feminine inability to organise – the list goes on (Spivak 1989; Ontiveros 1999; Mills 2005: 117; Mohanty 2002: 514; Rana 2013: 273–5). Foucauldian systems of bodily discipline built on essentialist assumptions about women's nature police posture, movement, productivity, clothing, bathroom use, sexuality, pregnancy, and even conversation, and speech and sound itself at these factories. Manufacturing electronics, writes Ong, 'specifies exact bodily posture and requires tedious repetition of the same finger, eye, and limb

<sup>1</sup>A discussion about the company's lack of transparency regarding sites of manufacturing, which includes a full citation of the above notice by user 'daniam', unfolded in April 2002 on an online forum devoted to Polk Audio. Similar discussions regarding other manufacturers of audio technologies are easy to find: users typically seek collective help with identifying which lines of products are made in the United States, largely on account of perceived higher quality, though differences in workers' pay are also often mentioned.

movements, often for hours on end at the assembly line [...], a form of body discipline especially intolerable to neophyte factory women' (Ong 1991: 290). '[E]lectronics workers from Taiwan to Sri Lanka complain of the detail work that literally wears away at the instruments of production – for instance, eyes fitted to microscopes' (Ong 1991: 290), fingers eaten away by chemicals, 'aches and burns, insufficient sleep, skipped menstruation' (Ong 1991: 299), and even miscarriage (Rana 2013: 298). It is through these extreme degrees of bodily strain that, as Chandra Mohanty put it, 'global capitalism writes its script [...] on the bodies and lives of women and girls from the Third World/South' (Mohanty 2002: 514).

Corporeal choreography and gendered injury is a generative starting point for analyses of global economic (and musical) systems because the focus on bodily gesture, strain and pain strategically resists the Marxist tendency to study economies with a universalist male labourer in mind – a critique of postmodern theory prominently offered by Geraldine Finn (Finn 1993: 132–6; Mohanty 2002: 502–3). This is what Adrienne Rich meant when she wrote: 'Begin though not with a continent or a country or a house, but with the geography closest in – the body' (Rich 1984: 212). The same approach complicates the study of electronic music in terms of technological artefacts that are ostensibly just 'there' for composers/musicians to use. To clarify: our task as music historians is not to pursue what Mohanty calls 'feminism tourism' – a model whereby researchers visit, literally or figuratively, 'Nike factories in Indonesia' – but to reveal the 'interconnectedness' of white and non-white, First and 'Two-Thirds World' women (Mohanty 2002: 519, 522). Expanding the study of electronic music to account for the bodily harm of factory work is then not only ethical and critical, but also instructive about musical discourses and modes of listening.

### 3. TWO WOMEN, ONE COMPANY

Fashion is one creative commercial sphere that has, under activist and consumer pressure, begun to address the labour of Third World women and, writes Shruti Rana, 'has received much more political and scholarly attention [than the high-tech industry]' (Rana 2013: 275). In 1991–92, journalist Jeffrey Ballinger famously reported on poor working conditions in Nike's Indonesian factories (Ballinger 1992). His human rights organisation Press for Change then put out a brochure linking the American Nike athlete and the exploited Indonesian worker (Figure 1): 'A tale of two women. And one company', reads one bifurcated image in this campaign. On the left side, we see a blond 'American, college educated' woman who 'works hard to stay in shape' because 'Nike's slick ad campaigns encourage her to take control and demand more of her

life.' On the right, a tearful-looking 'Indonesian' woman with 'elementary-level education' who 'works full-time in a factory, but is paid so little she is malnourished. Her boss tells her she is worthless' (see also DeWinter-Schmitt 2007: 275 n 315). Protests against Nike broke out ahead of the 1992 Barcelona Olympic Games, and by 1998, CEO Philip H. Knight admitted that 'the Nike product has become synonymous with slave wages, forced overtime, and arbitrary abuse' (Cushman Jr. 1998). The garment industry certainly has a long way to go: only in 2013, an authorised, overbuilt garment factory in Savar, Bangladesh collapsed, leaving 1,127 dead and over 2,500 injured (Yardley 2013). Nevertheless, the term 'fast fashion' is increasingly used critically, and many consumers are keenly aware of the human cost of a \$5 t-shirt. The bursting of the bubble of fast fashion thus offers a model for rethinking our approach to the history of electronic sound and audio. If fashion is to the garment industry what electronic sound is to electronics assembly, what is the equivalent of 'fast fashion' in electronic music?

Apropos to the discipline of musicology, the Press for Change campaign critiques the tendency of neoliberal feminism to highlight the work of exceptional women, the American college athlete being the archetype. Although cross-disciplinary studies of music and sound have seen a surge of interest in analyses sensitive to gender, they have overwhelmingly tended to focus on the work of exceptional women in sound production (composers, DJs, performers and installation artists) and on the intersection of gender and consumption *as* production of neoliberal identity (studies of fandom, musical publics, uses of audio technologies). These modes of inquiry are valuable but they should be contextualised within widespread patterns of women's participation in sound production. The history of women in electronic music is often presented as a history of exclusion of First World women from the technological sphere, but a critical global-thinking perspective reveals a troubling twist to this narrative in the shape of decidedly unexceptional, which is to say infinitely replaceable and staggeringly numerous women workers in electronics assembly.

In *A Feminist Ethnomusicology*, Ellen Koskoff asks: 'What is the basis for a feminist politics if women are no longer a group?' (Koskoff 2014: 150). After all, as Geraldine Pratt and Victoria Rosner put it, 'the fantasy of an unearned global sisterhood is well and truly dead' (Pratt and Rosner 2012: 17). Women, as Koskoff knows, were never a group in the first place. However, since women workers' sexualisation and racialisation can never be addressed in isolation from their oppression as labourers, migrants and subjects of colonial histories (Ong 1991: 280; Lowe 1997: 362; Mohanty 1997: 28), it is also constituted in relation to our own positioning – in my case that of an able-bodied white

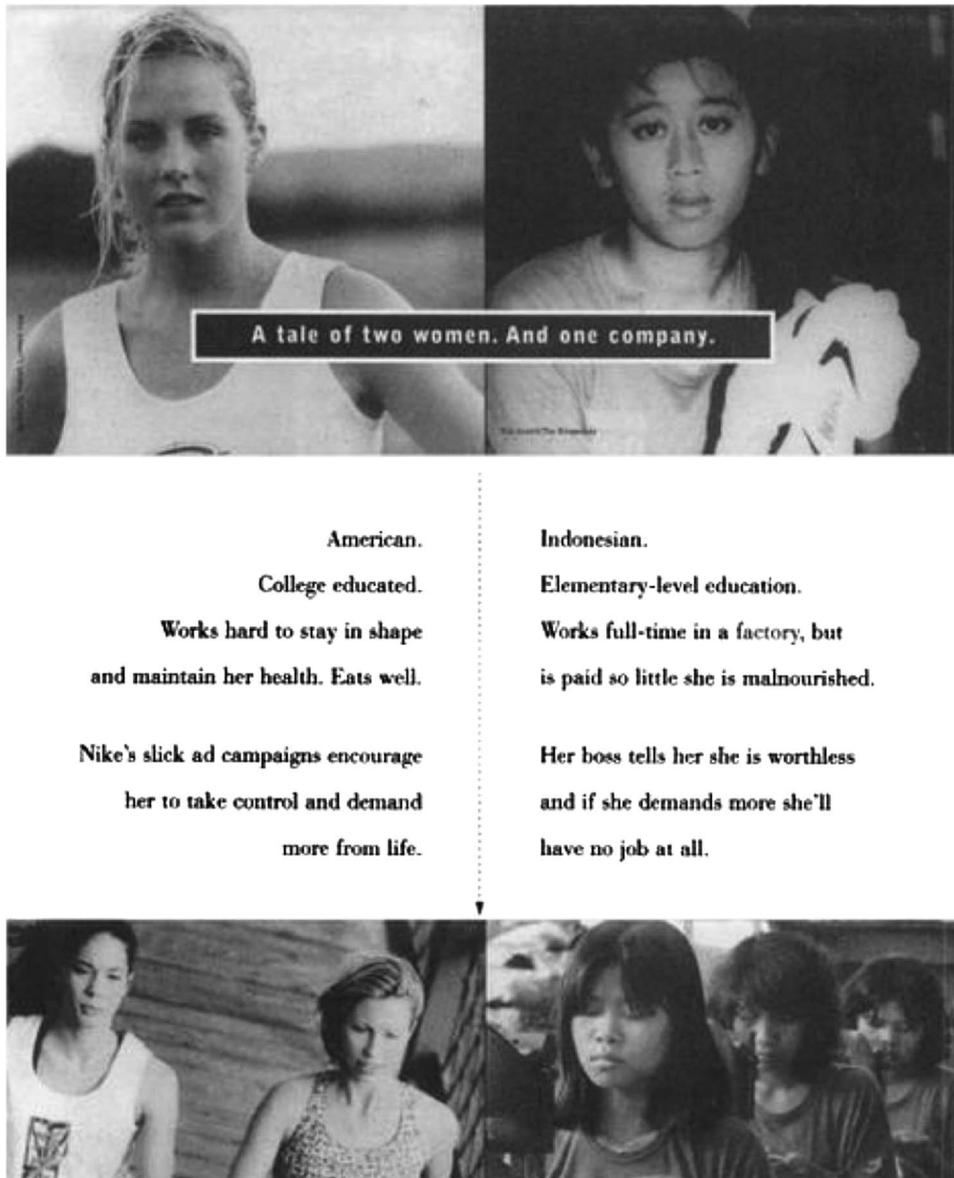


Figure 1. Image from Press for Change brochure.

European woman living in New York City and consuming the products of their labour every day. This is the 'two women, one company' model, whereby we study how subjectivities are produced through transnational flows of material and power. Thus, I write self-consciously as a daily user of a wide array of electronic sound equipment: most of my listening takes place through studio headphones or ear buds connected to my laptop, desktop computer, or smartphone. I often capture ideas and take notes using the Voice Memos app on my phone. I use my three devices almost daily to stream music and multimedia content for research, teaching and pleasure. I own two pairs of room speakers that I rarely use, not to speak of an electric guitar, amplifier and the attendant set of electronic accoutrements.

Particularly as cell phones and laptops emerge as some of the most commonplace electronic musical artefacts, musicology and sound studies should take seriously the transnational networks that produce them. At concerts of electronic music, for example, the Apple MacBook has been an unchallenged fixture for some time, typically perched to the side of the mixer, illuminating the face of its user and obscuring her hands from view. Even as composers, engineers and DJs working with live electronics commonly choose to cover the glowing a/Apple logo with alternative decals, this is a weak gesture of dissociation from the corporation infamous for subcontracting to Foxconn, a manufacturer based in Shenzhen, China. A history of labour rights abuses at Foxconn culminated in over a dozen worker deaths from suicide in 2010,

prompting a number of widely publicised investigations (Fair Labor Association 2012). In light of this present-perfect history, how should music scholars approach the laptop as a musical object, let alone an instrument?

Writers on electronic music often have to resist a certain infatuation with zeitgeisty technological artefacts. Organology, the ‘analytic study of musical technologies’ that has overwhelmingly focused on classical instruments (Théberge 1997: 183), is now being brought up to date with the refreshing critiques of Emily Dolan and Nina Eidsheim, who challenge the discipline to approach instruments as ‘boundary objects’ (Dolan 2014: 14) and as inseparable from networks of discourses, practices, material, and media (Eidsheim 2015: 91–4). The new ‘Critical Organology’ (Dolan 2014: 14; Tresch and Dolan 2013) offers an understanding of sound technologies as nodes of transduction and transmission relationally attached to sounding spaces, bodies and practices. *How* sounding takes place – how it *can* take place – involves particular relational constellations of technological nodes, inputs and interactions, and transmissions through spaces, media and bodies. The mass-manufacturing practices that make something like a pair of ear buds affordable for a large segment of listeners in the First World, and portable between workout, home and office, must be understood as *co-producing* these relational constellations. The way we speak about smartphones in terms of ‘generation’ similarly indicates that we think of them as disposable. Since our listening practices would be undeniably different without these particular attitudes, which would not have emerged without very particular systems of labour, workers’ lives are squarely part of music history.

#### 4. GENDERING SKILL, TIMING WOMANHOOD

It is not only geopolitical distance but also gendered worth that has contributed to the erasure of a workforce from the history of technology. Women might no longer be a group, per Koskoff, but by the 1980s women anthropologists ‘found themselves face-to-face with other women whose “oppression” seemed strangely familiar’, even if it was also very different (Koskoff 2014: 176). Empathy grounded in partial but resonant familiarity – what Donna Haraway calls a relationship of ‘affinity, not identity’ (Haraway 1991: 155) – is thus another vantage point from which to write a transnational history of women in electronic music. Globally, women have long been excluded from activities deemed ‘skilled’ in the technological sphere and particularly the hi-tech arena. In part, this is because women themselves have been considered technologies, essentially predisposed for sexual reproduction and/or essentially predisposed for the (re) production of microchips.

In the assembly of hi-tech microelectronics, the discursive construction of skill is a key pivot point: the assumption of women’s essential proclivity for delicate busywork leads to naming their labour unskilled. This labour is then also always framed as increasing women’s gendered social value: by controlling the timing of adulthood, sexual activity and reproduction, factories contend that they produce better daughters, wives and mothers. Chinese manufacturing plants explicitly use the term ‘factory daughters’ to refer to workers who send money home to repay their parents for raising a child of undesirable gender. Since these women’s jobs are treated as ‘interlude before marriage’ (Ong 1991: 287), their disproportionately lower wages are wrongly assumed to be secondary household incomes and workers’ rights fail to protect them (Rana 2013: 284–5). This system places pressure on traditional Chinese, Malaysian and Thai family structures, showing that this system of gender and labour is the product of a transnational forces, not domestic ones (Ong 1991: 288). Policed by profit-driven heterosexism, this segment of young women’s lives is very much the sublated time in Spivak’s analysis, producing entirely ‘new sexualities and ethnicities’ (Haraway 1991: 166).

Interlocutors of my work on this topic have at times more or less explicitly assumed that the conditions and narratives surrounding women’s labour in electronics assembly indicate something only about the culture of the countries that host Free Trade Zones (FTZs) and Export Processing Zones (EPZs). However, not only are multinational corporations that respond to sexist and racist advertising of ‘the manual dexterity of the oriental female’, as the Malaysian government put it in one brochure, complicit (Ong 1991: 291; Rana 2013: 282), but also the stereotype of women as perfect for electronics manufacturing is quite at home in the United States. One need only look as far as the histories of the aforementioned Peavey and Fender companies. In the 1970s, Hartley Peavey ‘had the impression that women were better at repetitious tasks like building circuit boards; he thought men were too easily distracted’ (Achard 2005: 28). The Fender plant, too, largely employed Hispanic women, who ‘used the same primitive process to wind pickups throughout Leo [Fender]’s career. [Fender] said that properly trained people wound the units tighter – a key to Fender tone – than the machines later used in most modern factories’ (Smith 2003: 69; see also Rodgers 2010: 13). This rhetoric – women’s work as ‘primitive’ (read: unskilled) – tellingly resounds with language that circulates between factories in Southeast Asian FTZs and multinational corporations.

Looking further into the Western past, it is notable that the periodisation of womanhood through nimble-fingered work was already in place in Western nineteenth-century society. Consider Judith Tick’s account of parlour performances by American and

European women pianists, whose choice of instrument was praised because it 'required no facial exertions or body movements that interfered with the portrait of grace' that was required of women, especially those of courting age (Tick 1986: 327). Ivan Raykoff has valuably documented the transformation of piano-playing women into typists. He cites a late nineteenth-century typing manual, which declares that 'the type-writer is especially adapted to feminine fingers. They seem to be made for type-writing[, which] involves no hard labour, and no more skill than playing the piano' (Raykoff 2014: 33). A German publication on women in business from the same period echoes the sentiment: '[Finally] a practical use for [...] piano lessons for young girls: the resultant dexterity is very useful for the operation of the typewriter' (Raykoff 2014: 33). Here, women's piano playing is tellingly deemed unskilled ('no more skill [...]') as opposed to creative, expressive, or technically demanding, let alone virtuosic. The function of finger-work in timing stages of womanhood is made explicit in a 1894 statement from the British Treasury: 'women typists have proved themselves to be an efficient and economical form of labour [but] a woman, as wife and mother, cannot be expected to work [so] her service must therefore cease on marriage' (Treasury Minute 1904: 362). Similar patterns interweaving particular kinds of gestural work and stages of womanhood emerge in the practices of embroidery, needlework, and knitting, which were thought to keep young women's thoughts pure and focused until they marry (Parker 2012: 32). While these patterns no longer govern the lives of white, middle and upper class citizens of the West, the labour and gender of low-income migrant women of colour continues to be structured in similar ways. The viral 2015 *New York Times* article documenting the work of Hispanic and Asian women manicurists in New York, who live in crammed apartments in outer Queens and sleep in bunk beds with their female colleagues, provides one striking example (Nir 2015). To reiterate, the structural production of pre-marital womanhood through gestural patterns has been at home in historically and contextually disparate spheres of leisure and labour. Far from indicating equivalence between bourgeois piano-playing women and Asian workers assembling electronics, the scale of this gendering and age-ing of small-scale gestures is decidedly transnational.

Noise artist Jessica Rylan is one of few electronic musicians who speaks about her creative practice of building electronics in terms of the gendered conditions of electronics assembly. In an interview with Tara Rodgers, Rylan says:

[E]veryone was so into hyping the technology, and hyping computer music. I got really offended by it. Like, your music comes from sweatshop production. You think it's

so great, you carry around this thing that only weighs five pounds and that's all you have to do. But where did that come from? I read a book about Malaysia and the semiconductor industry and all these women staring through microscopes hand-soldering and basically going blind from looking at this small stuff all the time. At the time I was also really into knitting. (Rylan in Rodgers 2010: 146)

Rylan goes on to knit a hat according to a seventeenth-century pattern used by destitute Irish women who engaged in communal knitting for extra income.

Maybe on the surface [the hat] seemed like a knee-jerk, ill-thought-out feminist piece, but the other side of it for me, too, was feeling self-conscious being a woman who builds circuits. Because, actually, all that stuff was built by women. (Rylan in Rodgers 2010: 146)

I was reminded of Rylan's account when teaching a fall 2015 seminar titled 'Sexing Sound Art' at the Institute for Research of Women, Gender, and Sexuality at Columbia University. A student in the class, Sarah Reiter, spoke of using the open-source microcontroller Lilypad Arduino to construct interactive sound works and multimedia systems. Lilypad, designed in the MIT laboratory of Leah Buechley, allows users to embroider circuits using conductive thread instead of soldering. Shaped like a pretty flower, Lilypad is aimed at women users. Reiter admitted she felt conflicted about Lilypad's prescribed feminisation of embroidery, but also relished what she perceived as a trans-historical connection to women's needlepoint and a transnational connection to the work of women in electronics assembly. It also appealed to her that the makers of Arduino Lilypad are conscious of conditions in the transnational electronics industry, and that the controller is made in Colorado. Rylan and Reiter position their respective practices of building sound electronics within genealogies of women's needlework and women's work in electronics assembly by drawing on the poetics of the small scale and the kinaesthetic empathy of particular gestures of assemblage. Insofar as the tools and practices of music-making shape the resultant sounds, these artists' music is in itself about a transnational alliance with women workers in the face of a transnational industry.

## 5. CYBORG, ROBOT, SLAVE

While explicit engagement with issues of gendered and racialised labour is rare in electronic arts and scholarship, the topic is often addressed indirectly. Sound studies, for example, has tended to sidestep a critical engagement with race in favour of the problematic juxtaposition of human and non-human (the synthesised, the technological, the artificial). Meanwhile, the history of technologised sound has long been an exemplary history of Otherness. Theatrically, electronic sound lays claim to difference. The voices of the

dead in the phonograph, the synthesised beeps indexing the Space Age in the American Cold War imaginary, and the swooshing sounds of digitality betray a colonial interest in the afterlife, outer space, and the virtual realm of the Internet respectively. These frontiers, leftist tendencies of science fiction notwithstanding, only overshadow the neo-colonial frontier that is the body of the woman factory worker. As Octavia Butler cautions in her poem 'A Monophobic Reponse', we invent aliens to deflect how we deal with Others in everyday life (Nelson 2001: 99–100).

Donna Haraway has optimistically argued that 'women's enforced attention to the small' might be coming into its own in our world where hi-technologies and biotechnologies operate at the increasingly small scale of microchip and antigen: 'Ironically', she writes, 'it might be the unnatural cyborg women making [micro]chips in Asia [...] whose constructed unities will guide effective oppositional strategies' (Haraway 1991: 154). Even fans of Haraway should be sceptical of her techno-optimistic prognoses, however: where she sees a productive new hybridity in the 'feminization and deskilling of traditional work', Judy Wajcman identifies the 'exploitation of women workers in the global economy' (Wajcman 2004: 97, 98). These *cyborg* women, in other words, might actually be *robot* women, 'robot' being a 1920s neologism with etymology stemming from the Slavic word for serf labour, uncompensated work for a master, servitude and de facto slavery. It is often the very figures of the cyborg and the robot, which appear as colonised Others in the American technologised aural imaginary. Asked 'Are you human?' Siri, Apple's intelligent virtual assistant, often replies 'Sorry, I have been advised not to discuss my existential status.'

The theme of slave labour is always, at least implicitly, at play in Afrofuturist art, which speaks to the intersection of Afrodiasporic culture and technology. Afrofuturist (frame)works therefore provide a generative point of departure for thematising labour and music. The following two examples of recent relational, site-specific art installations each perform a unique Afrofuturist critique of the way systems of labour and systems of consumption intersect. The first is sound artist and DJ Kevin Beasley's 2015 installation *Strange Fruit* for the Guggenheim Museum in New York. The work takes on the title of the song made famous by Billie Holiday, which protests and laments the lynching of black Americans in the American South. The sonified assemblage hangs from the ceiling by a wire and comprises Nike Jordan sneakers and denuded black speakers with exposed wiring embedded in resin, tar and polyurethane foam. The speakers process and amplify the soundscape of their surroundings, returning the voice and gaze of those who came to see this cyborg lynching. The loosely laced Jordans signify black American masculinity, but

an exposed tag on the tongue insists on another origin: made in China. Far afield from Marcel Duchamp's *Fountain*, which repurposed a urinal from a New York manufacturer, the contemporary readymade refers to radically different conditions and spaces of labour. The transatlantic slave trade and transnational capitalism echo each other in *Strange Fruit*. The exposed brown glue, tangled wires, and the abstracted hum of environmental sounds are like herniated matter from the inside of the sneaker/speaker factory. These materials typically remain concealed from consumers, complete with an 'imposed silence among co-workers' in many plants (Ong 1991: 303). Beasley's assemblage, however, challenges us to confront the 'unclean edit', as sound artist Katharine Norman might put it (2004: 113).

Another Afrofuturist anti-monument that speaks to the history of underpaid factory labour is Kara Walker's sculpture titled *A Subtlety, or the Marvelous Sugar Baby* a gargantuan sphinx with Black features made of white cane sugar and installed at the Domino Sugar Factory in Brooklyn (Walker 2014). The piece references the history of underpaid black labour and the sexualisation of black women's bodies in the United States. Its installation in the cavernous hall of a factory about to be demolished delimits an acoustic space where the voices of onlookers reverberate accompanied by the faux shutter clicks of their phone cameras. Beasley and Walker both draw attention to what is typically concealed: the materials, sounds and spaces of the factory as a gendered and racialised space.

Former factories that function as exhibition sites are, it seems, everywhere. The Caixa Forum in Barcelona repurposed the spaces of a former textile factory; the Minsheng Museum of Contemporary Art opened in 2015 in Beijing in spaces that only recently housed a Panasonic plant; the Museum of Contemporary Art in Krakow occupies the site of Oskar Schindler's enamel factory, which, controversially, had once profited from the exploited labour of Polish Jews. The vast Massachusetts Museum of Contemporary Art (Mass MOCA) capitalises on the aesthetics of a New England textile mill turned Sprague electronics factory. Sprague got its start with the Tone Control capacitor that stabilised the sound of radios, which later gave way to the famous Sprague Midget capacitor (Sprague 2015: 11–12), and finally the Sprague Orange Drop capacitor, which reached quasi-mythological status as the supposed secret ingredient to the vintage tone of Gibson guitars (Burrows 2015: 121). As John L. Sprague writes in the history of the company, 'women had made up the bulk of the manufacturing employees at Sprague Specialties and similar companies' (Sprague 2015: 32), and they were stereotyped for the dexterity of their small hands (Heon 2000: 10). During the conversion of the factory complex to an exhibition complex, Mass MoCA director Joseph Thompson was 'haunted' by 'the hundreds

of thousands of women (and men, but mostly women) who worked at Sprague Electric and Arnold Print Works over the past 120 years' (Thompson 2000: 21). Ghosts thus join the ranks of cyborgs, robots and aliens. Often literally whitewashed and mostly empty, factories-turned-museums are resonant, hollow acoustic monuments to the human cost of capitalism, all the bodies spent elsewhere.

## 6. CONCLUSION

'Transnational capitalism', writes Ong, 'has produced, along with microchips, discourses that naturalise the subordination of women in industrial enterprises' (Ong 1991: 291). Some of these discourses take place far away from the Malaysian factory, in domains such as electronic music-making and the consumption of audio. Many of them take the shape of silences, erasures and perceived technological transparencies. If we study the socially constructed sleekness of electronic sound (composition and audio culture) through the prism of the electronics assembly plant, we find that electronic music is transnationally constructed through neocolonial systems of labour. I have suggested several ways of decentring the history of electronic music to account for the tens of thousands of women whose work makes it possible. One, historiographies of consumer technologies that claim to democratise musical production mask a shift in the global manufacturing of electronics. Two, the gendering of work on the small scale is quite at home in European and American history. Three, Afrofuturist (frame)works offer a particularly fruitful point of departure for scholars. Finally, the white box of the factory-turned-museum functions as metaphor for late twentieth-century audio: clean, neutral, pure. This sanitised image of technology, and sound technology in particular, is deeply entangled in issues of race and gender. How we read contemporary multimedia works and practices depends on where our disciplines draw the limits of technology. When we do consider the systems and conditions of technological manufacturing, our readings of electronic musical texts and audio practices answer our underlying questions about the human relationship to technology more readily and more completely.

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