

13 | Case Studies of Women in Electronic Music: The Early Pioneers

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While composers and engineers had experimented with electronic instruments and music since the beginning of the twentieth century, work really began in earnest in the 1950s with the availability of magnetic tape. *Musique concrète* ('concrete music', or music that involved the manipulation of preexisting sound into a new form) had been developed in the 1940s by engineer Pierre Schaeffer at the Radiodiffusion-Télévision Française (RTF), France's national public broadcasting system, through the alteration of sonic materials on shellac phonograph discs. But magnetic tape, besides being much cheaper than shellac discs, was a vastly more flexible medium, allowing for cutting, rearranging, looping, slowing down or speeding up, playing in reverse, and layering sonic material much more easily. This music wasn't inherently 'electronic' (*musique concrète* merely implied the use of any recorded sound as its material), but from the beginning composers applied electronic treatments to their sounds such as filters and ring modulators. For example, husband-and-wife team Louis and Bebe Barron combined tape manipulation with sound-generating electronic circuits to compose the first fully electronic film score, *Forbidden Planet* (1956). Around the same time, cutting-edge computers began to be used to generate compositions. In the early years of electronic and computer music composition, however, the cost of the equipment (tape recorders, echo machines, sound generators, electronic filters, main-frame computers) made working as an independent composer prohibitively expensive. Almost all experimentation and composition happened from within government-funded institutions such as radio and television networks and universities. Without institutional backing, it was practically impossible to gain a foothold in electronic music.

Nevertheless, women were involved from the very beginning. Daphne Oram, one of the earliest pioneers of tape music, was a co-founder of the British Broadcasting Corporation's (BBC) electronic music studio, the Radiophonic Workshop, in the United Kingdom. The influential Delia Derbyshire also began her career at the BBC's Radiophonic Workshop. Often, women were able to triumph over institutional bias by moving laterally from other positions; both Oram and Derbyshire (like their

colleague Maddalena Fagandini) began by doing other things at the BBC before making the transition into composing. Pauline Oliveros had the support of the University of California to fund her work, enabling her co-founding of the San Francisco Tape Music Center in the early 1960s. With the emergence of less expensive sound synthesisers around the same time, Wendy Carlos benefited from an ad hoc sponsorship from the Moog synthesiser company for the acquisition of their equipment. Suzanne Ciani also struggled for institutional support, but by working at the San Francisco Tape Music Center had access to Don Buchla's new synthesiser system. These five pioneering women were certainly not alone in the early years of electronic music, but can serve as case studies for some of the ways in which women were able to position themselves in a field that was (and still is, to some extent) not friendly to the inclusion of women. These case studies are a small sample of the many women who had an important part to play in the development and incorporation of electronic sound into mainstream musical culture.

Daphne Oram (1925–2003)

Initially, the BBC hired Daphne Oram as a 'music balancer' during the Second World War because of her background in classical music, a job that required her to control the various input and output levels from microphones during broadcast. At the same time, she trained as a recording engineer and by the early 1950s had been promoted to the role of studio manager, responsible for recording and playing back music and sound effects during broadcasts.

Already by 1956 she was working towards the creation of an electronic music studio at the BBC and had been privately experimenting on her own with the limited resources available to her, including tape recorders and primitive noise-generating equipment. Her engineering training and interest in electronics allowed her to make adjustments to this equipment to suit her own needs, as well as to supplement these with hardware of her own construction, such as sound-altering filters. In 1958 she contributed tape effects to several radio broadcasts as well as to the first television programme to contain electronic sounds in Britain, *Amphitryon 38*. When the decision was made to open a dedicated electronic music studio at the BBC, she was the first person considered to run it. Her classical training and experience gave the Workshop a much-needed dash of musical credibility. Staffing for the opening of the Radiophonic Workshop also included

another woman, Jeannie MacDowell, as a junior engineer. Initially, Oram operated as the Workshop's only full-time composer, which newspapers announced at the time of the studio's opening as: 'A team of enthusiasts, led by musician and technician Daphne Oram', who would 'yet dazzle their continental counterparts by their independent discoveries and ambitions'.¹

From the start, Oram struggled with the lack of autonomy that she faced at the Workshop, particularly the requirement that the studio provide what she considered insignificant sound effects (what the BBC called 'Special Sound') rather than more substantial music. Consequently, Oram left within six months of the studio's opening, and spent the rest of her career building and refining her own private music studio in her home. In particular, she focused on a project she called 'Oramics', a process of creating electronic music from fluctuating light patterns. Oram's specially crafted instruments consisted of photoelectric cells that read an image drawn with black ink onto plastic sheets, converting that image into sound. Eventually Oram adapted this technology to personal computers, developing software to exploit the possibilities of Oramics. Oram's position on the process of composition and her ideas about music in general can be read in her fascinating autobiography, *An Individual Note*, written as she worked through the implications of her Oramics system.²

Throughout the 1960s and '70s, Oram divided her compositional output between occasional 'concert' pieces such as 'Four Aspects' (1968) and music for art installations and exhibits such as *Pulse Persephone* (1965), incidental music for theatre, like the soundtrack for Fred Hoyle's and John Elliot's play *Rockets in Ursa Major* (1962), and more commercial work. In the commercial field she achieved a great deal of success, contributing music and sound effects to advertisements for Lego, Schweppes, Nestea, and others; mainstream films such as *The Innocents* (1961) and *Dr. No* (1962); and commercial films like *Power Tools* (1965) for Atlas Copco, *Rotolock* (1967) for Rayant Films, and *Costain Mine* (1977). She also composed music for two fascinating projects, *Electronic Sound Patterns* and *Listen, Move and Dance* (both 1962), a collaboration with educator Vera Grey, intended for teachers to use as an instructional aid, with Oram's electronic swoops, dips, and whooshes imaginatively mirrored by the movement of children.

While until relatively recently Oram's contributions to the history of electronic music have been neglected, after her death in 2003 a resurgence of interest led to several commercial releases of her music.³ Her Oramics machine is on permanent display at the Science Museum in London, and Goldsmiths, University of London has been digitising the hundreds of

reel-to-reel tapes she left to them.⁴ Future research will hopefully give a fuller account of the profound influence that Oram had on the field of electronic music.

Delia Derbyshire (1937–2001)

While the BBC had historically hired women in primarily clerical roles in the 1950s and 1960s, as Oram's colleague Fagandini acknowledged, there had also been a tradition of employing them as engineers during the Second World War. These same women, however, faced 'quite a cutback after the war when the surviving gentlemen came back and wanted their jobs'.⁵ Certainly these prejudices were still very much in place in the early 1960s when Delia Derbyshire arrived at the Workshop. She had studied mathematics and music at the University of Cambridge, recalling that: 'There were only a few women at the University at that time and so we were treated terribly. But I had the solace of my music'.⁶ After an unsuccessful application to Decca Records, where she was told that 'they didn't employ women in the recording studio', she toured for a time with the Pembroke University Players' production of *Julius Caesar*, providing off-stage electronic sound effects, before being hired at the BBC as a studio manager.⁷ After discovering the Radiophonic Workshop, she requested a three-month attachment, and once employed there, she quickly earned a reputation as one of the studio's most talented and original composers; one who combined her love of music and mathematics to create revelatory new sounds.

Derbyshire was still new to the Workshop when she was assigned what would become her most famous contribution to electronic music: realising the signature tune for the new television series *Doctor Who* (1963). One of her standard methods involved analysing complex concrete sounds using an oscilloscope, then reconstructing the sounds using banks of Jason valve oscillators. For *Doctor Who*, composer Ron Grainer is said to have 'scribbled a melody and bass line on a piece of paper',⁸ leaving it to Derbyshire and engineer Dick Mills to 'realise' his score completely using electronic sound. Producer Verity Lambert, one of the first women at the BBC to fill that role, wanted the signature tune to 'use music, whether electronic or otherwise that had a melody rather than just *musique concrète*'.⁹ Derbyshire took Grainer's melody and slowly pieced together the tune: 'I was dead into using as much electronic sound as possible. The boss was on record as saying that it was impossible to make a beautiful

sound electronically and it was my pleasure to prove him wrong'.¹⁰ The result, however, was worth the effort. She recalled later, 'In those days people were so cynical about electronic music and so *Doctor Who* was my private delight. It proved them all wrong . . . [Ron Grainer] said "I can't believe you've been able to do this! I want you to have half my royalties". Unfortunately, that wasn't allowed'.¹¹ While she may not have received the financial compensation she deserved, her arrangement helped bring electronic music to a larger, mainstream audience. With the subsequent success of *Doctor Who*, everyone had heard electronic music.

After *Doctor Who*, probably the most important project Derbyshire worked on at the Radiophonic Workshop was the four *Inventions for Radio* (1964–65), collaborations with playwright Barry Bermange. 'The Dreams', 'Amor Dei', 'The Afterlife', and 'The Evenings of Certain Lives' each used a similar collage technique to explore single themes. For the premiere *Invention*, 'The Dreams', like the others on different topics, Bermange interviewed a diverse group of ordinary people on their thoughts related to dreaming, recorded their comments, and edited and shaped the responses into a cohesive whole. The resulting product resembled a scripted work. Specially composed radiophonic music by Derbyshire then provided the background to these spoken-word collages, often occupying quite a substantial role in them, with purely musical interludes separating individual sections and topics, and, more importantly, creating an electronic musical glue that held together and unified the often disparate voices.

In 'Amor Dei', ('The Love of God'), Derbyshire was responsible, as she had been for 'The Dreams', for constructing the radiophonic accompaniment to Bermange's collage of voices, who were this time discussing the role God has in ordinary people's lives. It was agreed that all radiophonic sound would be derived from the sound of the human voice. Perhaps due to her study of mathematics at Cambridge, Derbyshire loved using complex formulae to construct elaborate structures for even the simplest of signature tunes. This may have been an attempt for her and her works to be taken more seriously. At the top of the first page of notes for this work is outlined the 'Dies Irae' melody, but she quickly settled on a library recording of the more expansive Advent antiphon 'Rorate coeli desuper et nubes pluant justum' ('Drop down dew, ye heavens, from above, and let the clouds rain the just').¹² In her notes for the construction of this piece, she writes on the first day: 'Take "rorate", make detailed analysis, serial, statistic and linguistic, rebuild a fragmented variation, serially organised fragments of voice. Find best tech for cutting fragments: normal cut, switched,

scanned, long cut, spaced fade up, etc. Very very fast at first in short groups, then in breathtakingly long complex dramatic sections'.¹³ From these basic ideas, throughout the last weeks of May 1964, she began working with the prerecorded chant, first rerecording it, isolating each individual pitch, and rearranging them into a new musical utterance.

By the early 1970s, Derbyshire, like Oram before her, had grown tired of the limited opportunities for making her own music at the BBC, and she left in 1972. By that time she had developed a reputation as a skilled, witty, and effective composer of electronic music in her own right, having worked on projects outside the BBC, including scoring Yoko Ono's short film *Wrapping* in 1967; written a song, 'Moogies Bloogies', with the West End singer Anthony Newley in 1966; composed the electronic score for Peter Hall's film *Work Is a Four-Letter Word* (1968); and, with David Vorhaus and fellow Radiophonic Workshop composer Brian Hodgson, had formed the band White Noise and released an album, *An Electric Storm*, in 1968 on Island Records. As 'Kaleidophon', Vorhaus, Hodgson, and Derbyshire moonlighted an album of television stock music and scored incidental music for several other stage plays in the late 1960s. Upon her leaving the BBC, she worked with Hodgson as 'Electrophon Ltd.', composing the music library for the 1970s British children's science fiction television series *The Tomorrow People* for Thames Television. But by the mid-1970s, she had almost entirely retired from music.¹⁴ According to Hodgson, Derbyshire's primary frustration had always been with inflexible equipment, and the consequent inability to see a vision through:

She always felt the limitations of the technology. It was so difficult, you were wrestling with it the whole time, and the deadline would be creeping up and there was no time if you had an idea and it wasn't working. There would come a point where you couldn't go back and try a new idea because the deadline was going to be there. It just took so long to do anything.¹⁵

In the 1990s, Derbyshire's non-*Who* work was rediscovered by a new generation of popular electronic musicians, and she began collaborating with younger composers. Sadly, her untimely death in 2001 ended any new projects she had been working on, but since her death her reputation has grown exponentially. Numerous recordings of her works, as well as documentaries and a radio play based on her life, have all helped restore her legacy to its rightful place in the history of electronic music. In 2013, Delia Derbyshire Day was established as a registered charity to 'advance the art of British electronic music via the archive and works of Delia Derbyshire'.¹⁶ Finally, in 2017 Derbyshire was honoured by a commemorative blue

plaque placed on her home in Coventry from the British Plaque Trust which reads 'BBC Radiophonic Workshop pioneer who influenced the course of electronic music lived and worked here'.

Wendy Carlos (1939–)

Women composers of electronic music have consistently faced institutionalised obstacles to success, particularly a feeling by studios that audiences wouldn't be receptive to music known to have been produced by women. At the BBC both Oram's and Derbyshire's work was almost always credited to the generic 'Radiophonic Workshop' rather than by their names. And things were no different in the United States. According to *Switched-On Bach's* record jacket (1968), the album-length Columbia Masterworks collection of some of Johann Sebastian Bach's most popular works interpreted on the new Moog synthesiser was produced by the anonymous, corporate-sounding 'Trans-Electronic Music Productions, Inc', or 'TEMPI'. In actual fact, this project was a collaboration between electronic music pioneer Wendy Carlos and jazz-singer-turned-producer Rachel Elkind, with contributions made from musicologist and musician Benjamin Folkman. Wendy Carlos – who was identified as 'Walter Carlos' on subsequent albums until the mid-1970s, when her identity as a transgender woman was acknowledged with the credit 'Wendy Carlos' on album covers – had started her studies at the Columbia-Princeton Electronic Music Studio in 1962, working with the famous composer Vladimir Ussechevsky. However, Carlos found herself frustrated by the constraints under which composers were then held, with the contemporary academic trend for techniques like serialism and other dissonant styles.

Carlos and Folkman were both graduate students at Columbia and together worked on a simple electronic arrangement of Bach's 'Invention in F', amongst other experiments. When Elkind heard this, it seemed like the perfect way for the composer Carlos to show the public that electronic music could be accessible, and hopefully pave the way for original compositions in a less dissonant style. The problem, however, was that before Robert Moog's synthesiser innovations, there was no practical way, economically or artistically, to get the kinds of nuanced performances required of Bach's works. Carlos had been looking for a way to demonstrate the power and potential musicality of the electronic music equipment coming out of Robert Moog's studio.

Carlos had met Moog at the annual meeting of the Audio Engineering Society in 1964, and they immediately became friends, with Carlos frequently testing Moog's latest products. Meanwhile, Carlos was building a small studio of her own. She assembled an Ampex 8-track tape recorder out of spare and used parts, and gradually acquired other pieces of equipment. Unlike today's more compact digital keyboards, the so-called 'modular' analogue synthesisers of this time were custom-built and often had very large combinations of components. Carlos's small studio apartment eventually housed an assemblage of oscillators, filters, a white noise source, an artificial echo generator, and an envelope generator for constructing more complex sounds, as well as a chord generator, which chained a series of oscillators together to form harmonies, created by Moog for Carlos to realise Bach's continuo parts. The final innovation was a touch-sensitive keyboard that enabled greater sensitivity in performance.

All was not perfect, however. Tuning was the notorious bugbear of early synthesisers; the slightest change in temperature could affect a sound's pitch. In the notes to her *Switched-On* boxset, Carlos remembers the agonising process behind achieving a perfectly tuned synthesiser melody:

Each recorded take on our first albums had to be tediously checked for pitch immediately before and after. You'd practice the line you were about to play, then do a precision tuning, quickly hit record and perform the note or notes, hit stop and recheck the tuning. If it was still near correct pitch, you assumed the take was too.¹⁷

Carlos and Elkind organised the first album, originally titled *The Electronic Bach*, in such a way that each track highlighted a different strength of the new synthesiser. Bach's music was the perfect candidate, in their eyes, for this project, since, as Carlos explains on her website, 'It was contrapuntal . . . it used clean, Baroque lines, not demanding great "expressivo" (a weakness in the Moog at the time), and it was neutral as to orchestration (Bach freely used many variations on what instruments played what)'.¹⁸

Carlos, Elkind, and Folkman weren't prepared for the massive success of the album upon its release, and had no immediate plans for a sequel. Folkman went on to a career as a successful musicologist and composer. Carlos and Elkind, for their part, took the opportunity of making a follow-up to perfect their techniques, and for their second album, they took and expanded the repertoire to include contemporaries of Bach's, as well as a version of his Fourth Brandenburg Concerto. This too, achieved both notoriety and success, with the Canadian pianist Glenn Gould declaring that 'Carlos's realisation of the Fourth Brandenburg Concerto is, to put it

bluntly, the finest performance of any of the Brandenburgs – live, canned, or intuited – I’ve ever heard’.¹⁹

Over four albums from 1968 to 1979 (*Switched-On Bach*, *The Well-Tempered Synthesizer*, *Switched-On Bach II*, and *Switched-On Brandenburgs*), Carlos and Elkind successfully produced electronic interpretations of the works of Bach and other Baroque composers, using each album to refine their equipment and techniques, though the joyous spirit of experimentalism is strong throughout all of the recordings. They all display a level of virtuosity unheard of in electronic popular music up to that point, and the relative paucity of Carlos and Elkind’s output can be traced to their methodical approach of assembling each track.

Elkind left music as a producer in the early 1980s and now lives in France. In her later work, Carlos continued to expand the boundaries of electronic music, perhaps most memorably in the film scores to Stanley Kubrick’s *A Clockwork Orange* (1971) and Disney’s *Tron* (1982). She, more than anyone else, was responsible for acclimating audiences to the sound of the synthesiser, to showing music lovers that there was more to electronic music than science fiction and scary movies, and that electronic music could both convey a sense of the modern and the beautiful.

Pauline Oliveros (1932–2016)

As a representative of the academic side of music, Pauline Oliveros is unique amongst these case studies. While electronic music formed only a small part of Oliveros’s total compositional output, what she did write has had an outsized influence on later composers, through both her technical procedures and in her philosophy of music as expressed through her works and writings. Oliveros developed an interest in electronic music in the 1960s through her composition teacher Robert Erickson at the San Francisco Conservatory of Music (although influence undoubtedly flowed in both directions) and was a member of the San Francisco Tape Music Center from its founding in 1962. There, alongside fellow composers Ramon Sender, Terry Riley, and Loren Rush, Oliveros explored electronic and electroacoustic music in relation to improvisational techniques. In 1967, both she and Erickson accepted positions at the University of California, San Diego, where she went on to teach composition for twenty years, directing the university’s Center for Music Experiment for four of those years. One of Oliveros’s most important contributions to music in

the second half of the twentieth century was her emphasis on focused listening, particularly to the musical background of modern life. Drones, especially, are a persistent theme of both her own works and her writing. In 1970, she recalled how the ubiquity of drones began infiltrating her own works:

Drones of all kinds (such as motors, fluorescent lighting, freeway noise), are ever present. The mantra of the electronic age is *hum* rather than Om . . . I began to seek out drones of all kinds and to listen to them consciously, allowing myself to hear the myriad shifting, changing partials of a constant tone, broad and narrow band noise. My subsequent music, both electronic and instrumental, reflected this interest. Whole pieces became single tonal centers or noise bands with characteristic timbral shaping. I was quite satisfied with this work emotionally and intellectually, although I had apparently abandoned Western harmonic practice.²⁰

In electronic works such as *Bye Bye Butterfly* (1965) and *I and II of IV* (1966) slowly shifting electronic notes foreground static and repetitive bass figures. But by gradually adding up and removing musical elements, these works generate a sense of forward motion and momentum in a familiar way that makes them accessible rather than alienating for audiences. Indeed, investment and involvement on the part of audiences (and in fact, the removal of the boundaries between ‘audience’ and ‘musician’) was of vital importance to her.

The prejudice she faced as a woman composer was a persistent theme in her writings, and in an essay for the *New York Times* entitled, ‘And Don’t Call Them Lady Composers’ (1970), she mused that,

Women have been taught to despise activity outside of the domestic realm as unfeminine, just as men have been taught to despise domestic duties . . . Many critics and professors cannot refer to women who are also composers without using cute or condescending language. She is a ‘lady composer’. Rightly, this expression is anathema to many self-respecting women composers. It effectively separates women’s efforts from the mainstream.²¹

Despite her initial frustration at the perceived separation between male and female composers in academic circles, she later came to embrace that difference, and throughout the 1970s and ’80s, with her ♀ ensemble, Oliveros brought her ideas of ‘sonic awareness’ to large audiences through workshops and lectures. Towards the end of her life, Oliveros returned to electronic sound as part of her ‘deep listening’ project, an extension of her lifelong interest in ambient music.

Suzanne Ciani (1946–)

Walking in the footsteps of Oliveros, Suzanne Ciani also began her electronic music career in the San Francisco area. But it was a career that moved in a very different direction; whereas Oliveros chose an academic path, Ciani has spent the majority of her career in the commercial and media realm. Ciani's interest in electronic music began in earnest while studying for a master's in music composition at the University of California, Berkeley, where she was able to merge her classical music education from her undergraduate years at Wesleyan with her passion for cutting-edge technology. Mills College owned a new Buchla synthesiser, and Ciani's discovery of this instrument cemented her commitment to electronic sound. Whereas the Moog, primarily through the work of Carlos, encouraged music that followed a standard tuning system and emulated the sounds of traditional instruments, the layout of the Buchla promoted a more inherently abstract style. She recalls:

I think that awareness of the future for me being a composer as a woman [sic], and when I met Don [Buchla] and I entered this room of walls of toys and all those things, just crystallised right there that this was my path. I could be independent. I could do it. I didn't need anybody else, I didn't depend on the political system, I didn't have to please anybody. All I had to do was make enough money to get one of those things.²²

This she did by working at the San Francisco Tape Music Center, where she built instruments for Buchla and continued her own composing: 'From the moment that I was able to actually get my hands on one, that was my sole possession. I had a Buchla, I didn't have anything else. That went on for ten years. It was my constant companion. It was on all the time. I never shut it off. It was like a living being in my space'.²³

As was made clear in Ciani's release of *Buchla Concerts 1975* (2016), her work with the Buchla, while tonal and diatonic, has more in common with the drone music of Riley or Oliveros than the pop sensibility of Carlos's Moog work. Ironic, then, that Ciani had her first big successes writing electronic commercial jingles for companies such as Coca-Cola and Energizer, with distinctive sound designs and accessible timbres appealing to a wide audience. Film scores have also formed a significant component of her output. Indeed, her work on *The Incredible Shrinking Woman* (1982) made her the first woman to score a major Hollywood film, and with its alternation between the sound of gratingly cheerful advertising jingles, abstract electronic textures, and comforting tonal synth pads, the score can be seen as a demonstration of her primary stylistic technique.

That same year, Ciani released her first solo album, *Seven Waves*, a recording of electronic synthesiser music which started a long and successful career in the New Age genre (an umbrella marketing term to describe largely instrumental music perceived as relaxing, meditative, or inspirational). Over the course of twenty-three solo albums, Ciani's music frequently employed the acoustic piano in combination with banks of synthesisers for a commercial, accessible sound that made her one of the most important contemporary New Age musicians in America. In recent years, Ciani has returned to the Buchla, presenting a quadrophonic Buchla concert in San Francisco in 2016 with a limited-edition vinyl release, releasing old recordings she had made in the 1970s and never released, and composing new works for the instrument.

Conclusion

While these case studies, by necessity of space, have been limited to English-speaking countries, there have of course been women from all over the world who have made huge contributions to electronic music's early years. Else Marie Pade (1924–2016) was Denmark's first electronic musician, and like Oram, experimented from within her state-run radio station, where she worked from 1952. Influenced by her studies with *musique concrète* inventor Schaeffer at France's RTF in the late 1950s, she presented a series of radio lectures on *musique concrète*, and composed Denmark's first electronic score for a television programme. She is remarkable, like the British composer Elisabeth Lutyens (who is discussed in Chapter 2, 'Women in Composition 2: The Cold War in Music'), for her adoption of serial techniques in composition, and participated in the summer programme at Darmstadt in the 1960s and 1970s. Likewise, French composer Éliane Radigue (1932–) began her career studying with Schaeffer in the late 1950s, but since the mid-1970s, the course of her career has been influenced more by her adherence to Tibetan Buddhism. In particular, her music, as realised primarily through the ARP synthesiser, explores the meditative aspect of subtly evolving drones. In works like the *Adnos* trilogy (1974, 1980, 1982), she clearly articulated her ethos, which she explained in an interview: 'For me, maintaining the sound did not interest me as such; it was primarily a means to bring out the overtones, harmonics and subharmonics. This is what made it possible to develop this inner richness of sound'.²⁴ The work of Kaija Saariaho (1952–) of Finland – discussed further in Chapter 4, 'Still Exceptional? Women in Composition Approaching the Twenty-First Century' – initially explored the combination of acoustic and electronic sounds within the context of serialism, but after

attending the Darmstadt summer course in 1980 and later working at IRCAM, her style evolved into a more textural and abstract language.²⁵ For example, *Jardin Secret I* for tape (1984–85) superficially resembles Karlheinz Stockhausen's mathematically rigorous *Gesang der Jünglinge* (1955–56) but upon closer examination reveals itself to be far more interested in contrasting timbres and an exploration of shifting textures.

Women have had a permanent and lasting influence on the development of electronic music. Some of the most essential contributors to its history have been women, and the individuals discussed in this chapter have made it possible for subsequent generations of composers and innovators of any gender to continue the pioneering work begun in the 1950s and 1960s. The fact that their accomplishments have only been acknowledged relatively recently does nothing to diminish their importance, and in the future, as the full scale of their contributions are better understood, their reputations can only grow in prominence.

Notes

1. Madeau Stewart, 'Is It Really Music?', *The Tablet* (26 April 1958), n.p.
2. Daphne Oram, *An Individual Note of Music, Sound and Electronics* (Wakefield: Anomie Academic, 2016).
3. Oramics (Paradigm Discs, 2007). *The Oram Tapes, Volume One* (Young Americans, 2011). *Electronic Sound Patterns/Electronic Movements* (Trunk Records, 2013). *Pop Tryouts* (Mondo Hebden, 2015).
4. See Daphne Oram Collection, www.gold.ac.uk/ems/oram/ (accessed 11 December 2020).
5. Louis Niebur, *Special Sound: The Creation and Legacy of the BBC Radiophonic Workshop* (New York: Oxford University Press, 2010), 73.
6. Austin Atkinson-Broadbelt, 'Soundhouse: Delia Derbyshire', *Doctor Who Magazine*, no. 199 (12 May 1993), 14.
7. Interview available at www.delia-derbyshire.org/interview_surface.php (accessed 11 December 2020).
8. Atkinson-Broadbelt, 'Soundhouse: Delia Derbyshire', 14.
9. John Tulloch and Manuel Alvarado, *Doctor Who: The Unfolding Text* (New York: St. Martin's Press, 1983), 19.
10. *Ibid.*, 14.
11. Marcus Hearn, 'The Dawn of Knowledge', *Doctor Who Magazine*, no. 207 (22 December 1993), 15.
12. The original recording is labeled in the script for the work as 'Plain Song Antiphon, unaccompanied. Back, band 1, Lib. No. LP 27101'.

13. Delia Derbyshire, undated notes. Delia Derbyshire Archive, Centre for Screen Studies, University of Manchester.
14. Although, as David Butler has recently shown, she did contribute to a few projects in the later 1970s and early 1980s, including collaborations with the film-makers Elsa Stansfield and Madelon Hooykaas, and Polish artist Elisabeth Kozmian. David Butler, 'Whatever Happened to Delia Derbyshire?: Delia Derbyshire, Visual Art, and the Myth of Her Post-BBC Activity', *British Art Studies*, vol. 12 (May 2019). Available at: <https://dx.doi.org/10.17658/issn.2058-5462/issue-12/dbutler> (accessed 13 December 2019).
15. Interview with Brian Hodgson, quoted in Niebur, *Special Sound*, 142.
16. Delia Derbyshire Day, 'About', <https://deliaderbyshireday.com/about/> (accessed 17 May 2020).
17. Wendy Carlos, *Switched-On Boxed Set*, East Side Digital – ESD 81422 (1999), 72–3.
18. See Wendy Carlos's website, www.wendycarlos.com/+sob.html (accessed 11 December 2020).
19. *Wendy Carlos Switched-On Boxed Set Book One: New Notes*, 15.
20. Pauline Oliveros, 'On Sonic Meditation', reprinted in *Software for People: Collected Writings 1963–1980* (Baltimore, MD: Smith Publications, 1984), 147.
21. Pauline Oliveros, 'And Don't Call Them Lady Composers', *The New York Times* (13 September 1970); reprinted in *Software for People*, 47–8.
22. Aaron Gonsler, 'Instrumental Instruments: Buchla', *Red Bull Music Academy* (14 October 2016); taken from original interview, Frosty, 'Encounters: Suzanne Ciani and Morton Subotnick', *Red Bull Music Academy* (24 June 2016).
23. Ibid.
24. Julien Bécourt, 'Eliane Radigue: The Mysterious Power of the Infinitesimal', <https://daily.redbullmusicacademy.com/specials/2015-eliane-radigue-feature/> (accessed 11 December 2020).
25. Kimmo Korhonen, *Finnish Composers since the 1960s* (Helsinki: Finnish Music Information Centre, 1995), 74–9.

Further Reading

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