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**Suzanne Ciani – The Diva of the Diode**

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## **Article Title: Suzanne Ciani – The Diva of the Diode**

### **Abstract:**

The world of synthesizers and synthesists is historically male-dominated. Women in synthesis tend to be obscured by males, and their contribution suffers from erasure. This article considers Suzanne Ciani within the contexts of art, technology, science and culture and her work in composition, performance and media. In particular, her National Endowment for the Arts report of 1976 is a groundbreaking document that details both her composition and performance process with synthesizers. Her composition approach has parallels with techniques drawn from serialism, yet performed and improvised live using machines. Her performances utilize quadraphonic techniques for spatialized performance as part of the composition and performance. She was the first woman to score a major Hollywood film in 1981. Her work in media and technology highlights a space that women have always worked in but have frequently not been acknowledged as doing so. Ciani's story reveals tenacity in the face of bias and rejection. It is a tale of someone who always has to claim her credentials, always legitimate her mode of expression and always counter the assumption that somewhere in her work there is a man.

**Keywords:** music technology, modular synthesis, composition, electronic performance, music and media, sound systems.

### **Introduction**

*I thought “oh my gosh; with electronic music I'm in control. I can create the pieces and there's nothing between me and hearing it. (These Hopeful Machines 2013: n.pag.)*

Male dominated domains in music and music technology are well documented (Wolfe 2020: 81). As Leonard documents ‘The experiences of female musicians are inevitably tied up with the possibilities open to them’ (Leonard 2007: 52). Regardless of whether women are using synthesizers, performing with them and/or devising new synthesis and composition methods and approaches (Herrera 2021), they still remain under represented and acknowledged, already operating within a gendered environment (Leonard 2007: 51). Women's erasure and absence for these domains leads to what Ciani highlights as a lack of ‘visible representations of possibility’ (TheLabSF 2021: n.pag.). In the practice of composition ‘The world listens to music by women with expectations of its inferiority and simplicity.’ (Halstead 1997: 191) This leads to disparities where women are expected to be performers more than writers or composers. Smith and colleagues document this, noting low numbers of women producers, even lower among minority ethnic groupings, but also that very few successful songs are written by lone women and the industry expectation that women can only write with one or more men (Smith et al. 2023). This article considers one woman synthesist to place her within the contexts of music, music technology, art, as well as art music, science and culture.

### **Suzanne Ciani**

Suzanne Ciani is a synthesizer pioneer who is primarily associated with the Buchla synthesizer (figure 1). Born in 1946, in Indiana USA, she started to learn piano from the age of six, continuing her studies as an undergraduate student at Wellesley College. As Trevor Pinch declared, he had not known about Buchla in the 1970s, which in turn would mean that he did

not know of Ciani's existence, until he started to research synthesizer manufacturer Robert Moog in the mid 1990's (STSUCL 2018: n.pag.).

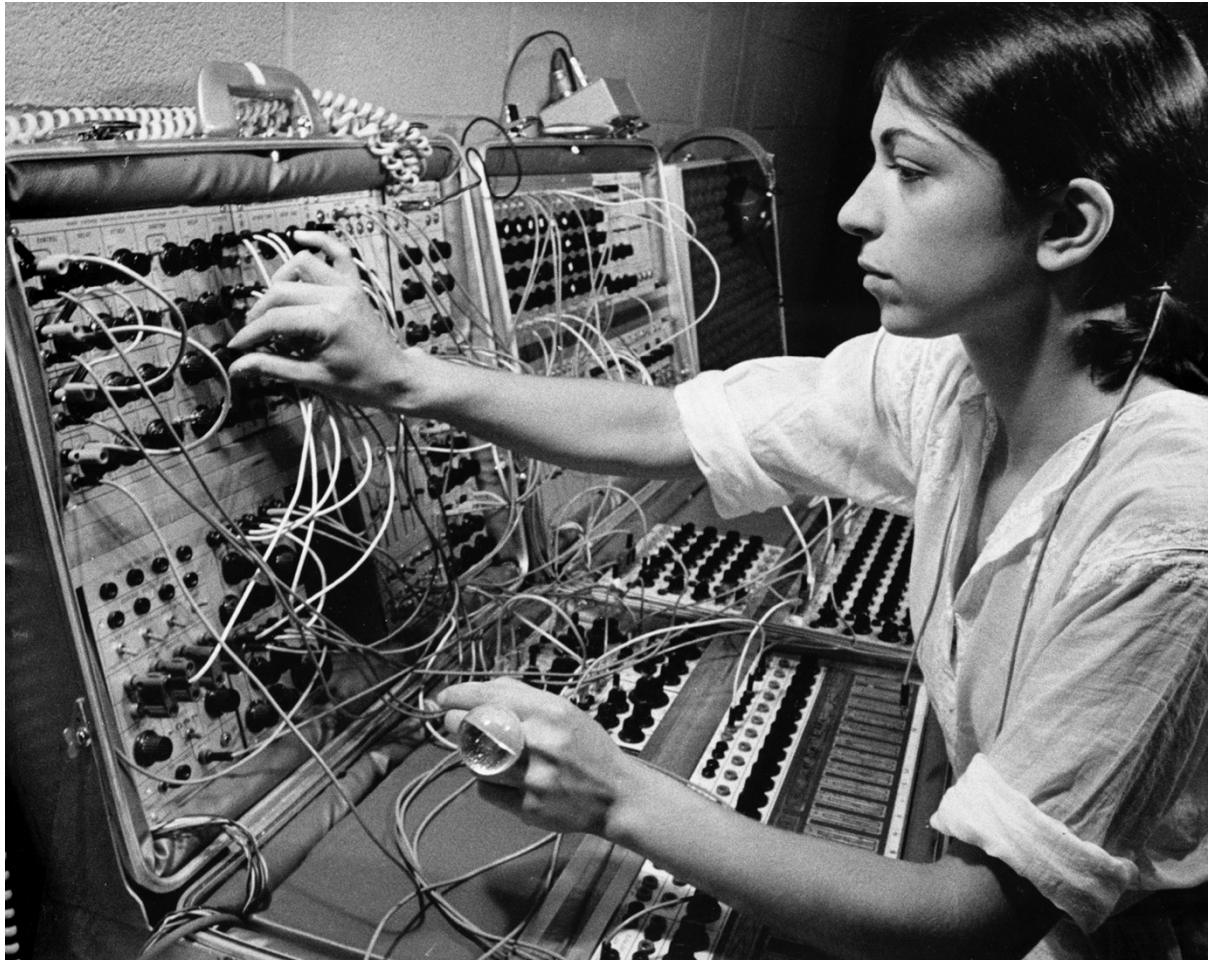


Figure 1: Suzanne Ciani with her Buchla synthesizer. Alix Jeffry, Portrait Dials, 1972. Photograph. New York. Courtesy of Suzanne Ciani.

Buchla represented an avant-garde approach to sound and interfaces such as eschewing the use of a keyboard which was an important part in the success of Moog. However, Buchla's importance is not just for his technological and artistic vision, but also his invention of the sequencer, in 1965, which 'vastly expanded the concept and functionality of a tape loop' (Pareles 2016: n.pag.). As Manning states, these early sequencers consisted of 'a set of constant voltage supplies, each of which may be individually regulated, and a switching system that connects each supply in turn to an output line.' (Manning 2014: 121) The sequencer continues to be at the heart of all (electronic) music productions, not just dance music, whether in hardware or software form. There have been many subsequent adaptations and sequencers can be found on mobile phones and iPads; in software, as plugins and as hardware. As synth-pop pioneer Vince Clarke reveals, the sequencer liberated musicians from limitations based on playing ability alone.

That was the real revolutionary step for me [...] with the sequencer, I could play anything I wanted. That was when the electronic door really opened and I got a glimpse of what was possible. (Clarke 2018: n.pag.)

This liberatory aspect is important for many reasons, especially enabling others access to making music. Yet, as will be discussed later, Ciani's use of the sequencer is also markedly different to the way used by popular music musicians.

## Literature

Academic literature discussing Ciani and her work is quite sparse. There are more YouTube videos, interviews, online articles and podcasts available than published academic texts. For most of the time her importance as a composer, her improvisations using the synthesizer and as a role model, remains largely ill attended to by academia. Some researchers have discussed her preparation of melodic materials in the context of sequencers (Boon 2021: 168) and Pinch and Trocco's chapter places her alongside two other women pioneers, Linda Fisher and Pauline Oliveros (Pinch and Trocco 2002: 158-159). This is perhaps the closest to providing a good starting point. Pinch and Trocco say that she became known as 'the woman who could make any sound' (2002: 155). She had started to undertake commercial work whilst still a graduate student at Mills College at UC Berkley, even though this sort of work was frowned upon by the college. At Mills she experienced various rejections including limited performance opportunities, ridicule when playing a new music piece (Pinch and Trocco 2002: 156) and denied access to synthesizer equipment by Mills' technical staff (These Hopeful Machines 2013: n.pag.). However, this in no way dampened her interest, which she described as not being 'so much the note music as much as it was a poetry of sound' (Pinch and Trocco 2002: 163). Her ability to make sound is ably demonstrated in an early collaborative project with the sculptor Harold Paris called *Voices Of Packaged Souls* which has been recently re-released (Suzanne Ciani 2016). Paris would later introduce her to Buchla, and she would work for him, soldering modules, saving up enough money to buy her own Buchla modules (These Hopeful Machines 2013: n.pag.). For this project Paris gave her twelve ideas, such as:

"The sound of a flower falling," "The sound of an old man loving," "The sound of a dream kissing," "The sound of a nose peeling." All these different imaginary sounds. It was a wonderful playground to just interpret (Allschwang 2017: n.pag.).

These ideas challenged Ciani to generate sound and music to represent them. The provocation to use synthesis in this experimental manner, as a means of generating non-typical collections or units of sound/sonic pieces, as separate elements or varied structures, stood her in good stead, which would eventually lead to her becoming much in demand in media composition, especially for advertising. As she puts it:

What is the sound of a key chain? What is the sound of perfume? And developing metaphors in sound. The feeling, you know, the feeling you got listening to it. Was it soft and warm? Was it hard and cold? You know, so this poetry of sound is what I really brought to the industry (Pinch and Trocco 2002: 163).

Ciani's clients for her commercial work, such as jingles, adverts and logo idents, include an impressive list of companies, such as Coca-Cola (Pinch and Trocco 2002: 164-165). She created all of the electronic sounds and FX used for the film *The Stepford Wives* (Forbes 1975) Her client sound design work included developing sounds for a pinball machine known as Xenon by the manufacturer Bally (Gallerneaux 2021: 135). Here, Ciani demonstrated her commitment to sound design practices which Reeves notes as her desire to 'inhabit,

conceptually and aurally, the object she was commissioned to score' (Reeves 2022: 44-45). Yet her role in developing this new unique sound for a pinball machine is also one that is subject to challenge, namely from misattribution and credit. Firstly, as well as designing the sound, Ciani also used her voice as part of the machine. As such, hers was the first female voice for a pinball machine which is wrongly attributed to a secretary working at Bally (space cavern vision archive 2018). Secondly, Reeves notes disagreements whether the idea to use a female voice is credited to a Bally engineer or to Ciani, which remains open to speculation (Reeves 2022: 56).

As well as being the first female voice for a pinball machine, Ciani was also the first woman to score a major Hollywood film soundtrack (Wilson 2022: 203). The film was Lily Tomlin's sci-fi/comedy *The Incredible Shrinking Woman* (Schumacher 1981) and, given that Ciani was the first, highlights the considerable lack of opportunities given to women to soundtrack major films within mainstream media and Hollywood history (see Faulkner 1983 for discussion and reference to guys, man/men and boys working in film). It would be another fourteen years before a woman would win an Oscar, with Rachel Portman's score for *Emma* (McGrath 1996) in the Best Musical or Comedy Score category. The first woman to win the Oscar for best original score, would be in 2020 with Hildur Gudnadottir for *Joker* (Phillips 2020).

Another pioneering moment in Ciani's career is her involvement in the emergence of what is termed New Age music in the 1980's, which she received five Grammy nominations. Working with technology she was able to produce and release music that featured her classical piano technique, finding new 'commercial success as a recording artist for her feminine style of New Age music.' (Pinch and Trocco 2002: 156). However, this is also not the only instance where researchers describe Ciani as feminizing technology and/or music and is perhaps a less helpful qualifier that imbues 'electronic music ... with a 'masculine aura'' (Jones 2011: n.pag.). Lathrop's discussion with Ciani details her business acumen and how she releases and licenses her work through a range of deals (Lathrop 2013).

Since about 2008 Ciani has also seen a strong upsurge in interest from a younger generation of music fan and independent music maker, such as women artists like Kaitlyn Aurelia Smith (RVNG Intl. 2016). Ciani's presence in recent synthesizer documentary films, such as *I Dream of Wires* (Fantinatto and Amm 2014) which attempts to capture 'The history and resurgence of the electronic modular music synthesizer' (IMDB n.d.), is strangely absent. This calls into question the nature of a documentary history, especially one that self-categorizes as *The* history, yet has significant absences. In a 2020 documentary, *Sisters with Transistors* (Rovner 2020), the focus is women practitioners, where she is recognized and accorded her place alongside other influential figures.

### **The Importance of Control and Owning the Means of Production**

It was during her undergraduate classical piano performance studies at Wellesley College that Ciani was first exposed to computers and sound making at MIT in 1965 (These Hopeful Machines 2013). She took these as evening classes and relates to this experience as 'the first thing that triggered this forward motion in me that I had this idea, and I had to find it.' (Frosty 2016). Whilst there, she found herself working with leading minds at the Artificial Intelligence Lab at Stanford such as Max Mathews and John Chowning, the key developer of FM (Frequency Modulation) synthesis (Manning 2014: 195). Whilst Ciani refers to this as an exciting time, it was also the source of another important reflection about composition 'I

realized that most composers died without ever hearing their works—because it was very political to get performances.’ (These Hopeful Machines 2013: n.pag.) The politics of performance, especially within classical composition, trying to get works rehearsed and played by ensembles and orchestras is treacherous. Halstead points out the implications this can have in establishing a career where ‘Without securing an outlet for performance, many composers fail to develop either the musical or the psychological confidence to undertake large-scale projects’ (Halstead 1997: 192-193). Whilst it affects men and women alike, it affects women at a far greater level. However, the response to these lack of opportunities that Ciani was experiencing during her Masters at Mills College, led her to another conclusion:

And I had this revelation one day—I was in the ladies’ room at UC Berkeley—I thought “oh my gosh; with electronic music I’m in control. I can create the pieces and there's nothing between me and hearing it. I don’t have to solicit an orchestra or try to get somebody interested in my music so that I can hear it.” So as a composer, it was an astonishing possibility (These Hopeful Machines 2013: n.pag.).

There are two points of control to be considered here. The first is controlling the production process, whereby owning the means of production, reduces the number of intermediaries and gatekeepers (Halstead 1997: 193). The second type of control is that synthesizers gave her the capability to play her musical works without seeking permission. She could avoid negotiations with conductors and orchestras to play works as experienced by numerous composers such as John Cage with Leonard Bernstein and the New York Philharmonic Orchestra (Piekut 2011: 23).

Ciani also experienced difficulties when performing her works in galleries and concert halls, as her pieces require a quad setup. Quad is a shorthand for a range of four channel speaker systems known by a variety of nomenclature including ‘Quadraphonic, Quadriphonic, Quadrophonic, Quadrisonic, Quadrasonic, and Tetrasonic.’ (ETHW 2017: n.pag.) Due to Ciani’s requirements for a quad sound system, she gave up playing live because:

people weren't ready for quad. You couldn't go to a major theatre and get quadraphonic and therefore I couldn't play. So I spent some years trying to advance the concepts of performance spaces so that they would include the possibility of spatial sound (Loopop 2018: n.pag.).

When she did perform, audiences responded by asking her whether the music was coming from tape recorders. She saw this as a large gap between what she was doing and what audiences understood about music performed with machines. To remedy this, Ciani used to interrupt her performance and ‘talk to people and be very patient and explain’ (Frosty 2016: n.pag.).

Control continues to be at the centre of all production practices, especially those facilitated by computers. The degree of control afforded by sequencers and computers allowed new practitioners to enter the field who, perhaps, did not need to know how to play an instrument in the old sense but perhaps journey to somewhere new. As Subotnick says:

You didn’t need that superstructure, you didn’t need an orchestra, you didn’t need all that stuff: You could do it. This is what I was looking at. You saw it from your standpoint, but think of a kid who comes to music at 20 years old. They’ve no background, but they can feel empowered (Frosty 2016: n.pag.).

## Report to the NEA

In her 1976 funding report for the National Endowment for the Arts (Suzanne Ciani n.d.) Ciani described what she referred to as a basic performance patch she designed for the Buchla 200 series synthesizer and the ‘various musical ideas that evolved from working with this patch’ (Suzanne Ciani n.d.: 1). She gave these patches names such as “Keyboard Rotations”, “Melodic-Rhythmic Reliefs” and “Vertical Sequencer” (Suzanne Ciani n.d.: 1). As part of her report she provided step by step examples of how to move between these patches to direct a performance with the synthesizer. She notes these as ‘rough maps, but they do illustrate the characteristic facility of musical metamorphosis that the instrument possesses and they also show the kind of playing technique that one has to develop for live performance’ (Suzanne Ciani n.d.: 1). The question of live performance was touched upon in an interview explaining how she took Buchla’s intention to make a performance instrument to heart and therefore implemented this idea but not without a struggle. Subotnick described his discussions on this matter with Buchla:

This was an argument that Don and I had from day one. He wanted to make a musical instrument. I said, “This is not a musical instrument. This is, at best, an instrument to make instruments. It’s to paint.” He didn’t understand the nature of an instrument. He said, “I’m going to make musical instruments.” I said, “Who’s going to play them? How are they going to learn to play them?” (Frosty 2016: n.pag.)

The ideological differences between Subotnick and Buchla were not known to Ciani at that time. By focusing on and realising Buchla’s intention Ciani managed to devise an approach that was very different to approaches at that time demonstrating that ‘Women synthesists broke the mould in more ways than one’ (Pinch and Trocco 2002: 315). Yet, in addition to her performance with Buchla, her initial work with Harold Paris and her sound design work also clearly demonstrate that the system could be used for the painting. As such, it could be claimed that Ciani made use of both approaches, performance and painting with sound.

For the following sections I will briefly describe the basics of a modular synthesizer and discuss two of Ciani’s approaches; composition and spatialization.

### The Modular Synthesizer

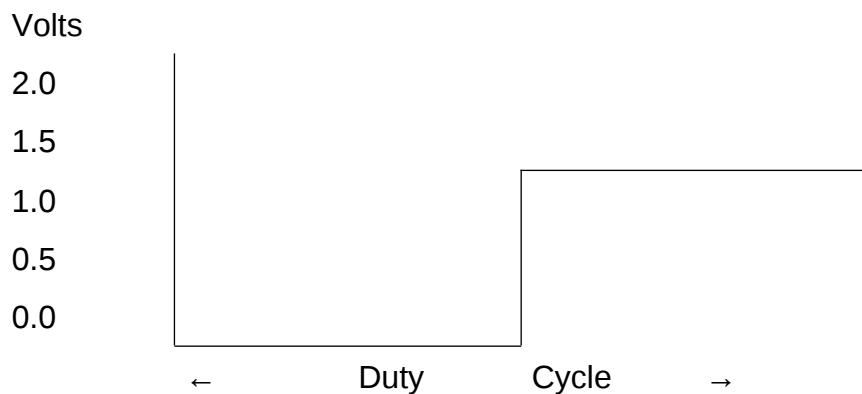
Modular synthesizers consist of discrete modules that can be combined together to make a system. A minimum system would contain a sound source (possibly two) called an oscillator (Osc.), an envelope (often referred to as ADSR – Attack Decay Sustain Release – and its variants AD/AR/ADR/ASR), a modulation source such as an LFO (Low Frequency Oscillator), a VCA (Voltage Controlled Amplifier) and a filter known as a VCF (Voltage Controlled Filter). The Buchla was unusual because it offered a combo VCA/VCF module known as a low pass gate (LPG). The idea was that the LPG mimicked the natural decay characteristics of instruments, therefore the LPG was particularly useful for percussion sounds such as Buchla’s now infamous Bongo patch (Barton 2020: n.pag.).

An Oscillator is capable of generating a variety of waveforms such as Sine, Triangle, Saw and Square. This is achieved by shaping the waveform outputs of what is referred to as the

Oscillator core. Oscillator cores are usually Triangle or Saw and from which all other oscillator shapes, such as Sine and Square are derived. The Buchla oscillator had a feature where this waveshaping was available as on a single output which was under CV control. This capability to waveshape smoothly from one waveform to another, such as Sine to Saw or Sine to Square, can be usefully deployed in compositions. It is also to understand that waveshaping, as described here using a core oscillator, is not to be confused with wavefolding which is another approach to generating rich harmonics from, typically, sine waves.

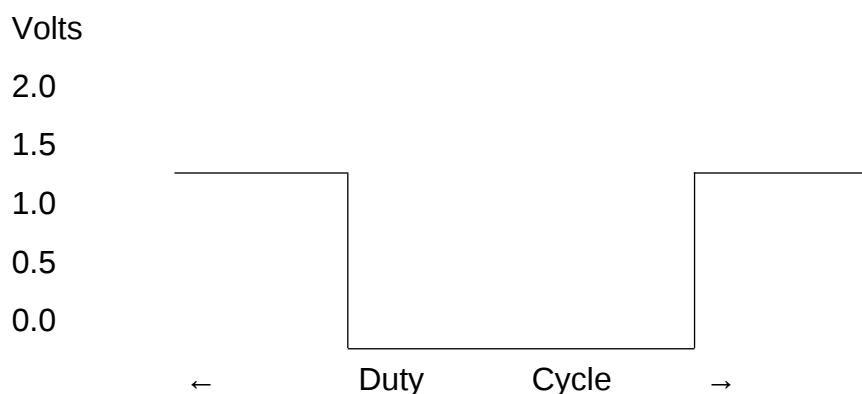
As an example of how different waves can also be combined to create more complex behaviour, in this instance gate patterns, tables 1 through 3 show a square wave with a 50% duty cycle. A Square wave is capable of generating two states on (high) and off (low). The duty cycle is the duration between these on/off states. A 50% duty cycle means that on/off states are equal in duration, which is the square wave. However, when a Square wave is of unequal lengths, between on/off states, then this is referred to as a Pulse wave. Table 1 shows a set of voltages where the wave is off for the first part and on for the second part reaching a peak level of 1.0V (Volts).

Table 1: Square wave 50% duty cycle, amplitude 0V – 1.0V.



In table 2 the Square wave is offset by 25% and shifted to the right.

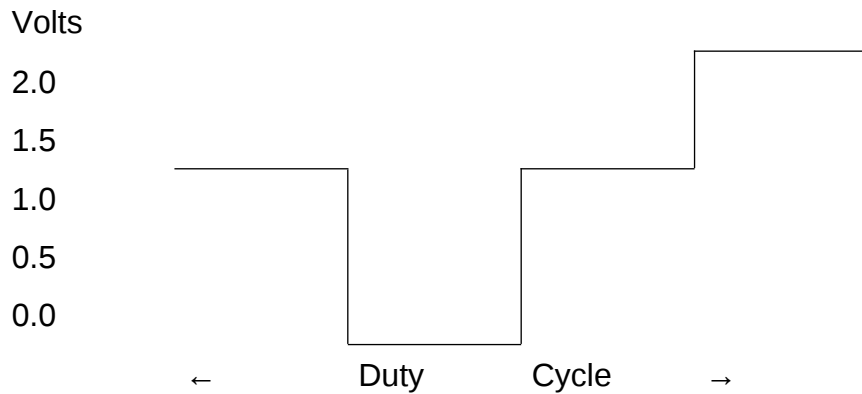
Table 2: Square wave 50% duty cycle phase offset 25% to the right.



When these voltages and offset positions are combined then the result is a new stepped pattern shown in table 3.



Table 3: Combined Square wave outputs.



When both waves are at 1.0V then the cumulative value is 2.0V. Where one goes low earlier than the other then there is a step down to 1.0V. Where both are at 0.0V then, as expected, the cumulative voltage will be 0.0V. It is important to understand this simplified model as it leads to a more complex composition approach and application when using voltage. If voltages are combined of different values (noting that voltages can also be negative implying subtractive rather than additive approaches), different durations (long/short) and at different cycles (speed) then it follows that pieces conceived with this in mind will always exhibit some form of difference or variation from one performance to the next.

One final point to appreciate is that in a voltage controlled system everything is a voltage. It has no meaning beyond this. Therefore, the performer/composer creates a semantic connection between the voltage and some sort of audible artifact or behavioural change within the system resulting in what can be termed a voltage composition.

## Composition Method

I always thought of myself primarily as a composer — that was my identity. When you meet this machine, it's like sculpting. You have a hands-on compositional tool. It kind of ruined me in a way, too. I can write traditional notation, but I'm much happier just in the process (Campbell 2019: n.pag.).

The point regarding difficulties with notation, especially analysis and notating rhythm patterns, is one more strongly made by the compositional pedagogue Joseph Schillinger who said that 'The history of creative experience in music shows that even the greatest composers have been unnecessarily limited in their rhythmic patterns because they thought in terms of ordinary musical notation' (Schillinger 2004: 1).

Ciani's composition method is one that bears a passing resemblance to serialist techniques pioneered by Schoenberg, preparing tone rows (voltages) in advance. She notes this similarity but stresses that her idea was the 'seemingly inevitable consequences of an Arbitrary Function Generator meeting a Sequencer' (Suzanne Ciani n.d.: 8). The sequencer in question has sixteen stages and four rows labelled A, B, C, D and stores a voltage at each stage for each row. Ciani

devised four melodic sequences for her patches with an additional variation for row A shown in figure 2.



Figure 2: Ciani's basic rows for sixteen stage sequencer (Suzanne Ciani n.d.: 8).

The compass of the rows are no more than an octave and the melodic patterns outline a Dorian mode, which is a minor scale with a major sixth and flattened seventh i.e. C, D, Eb, F, G, A, Bb, C. The implication of the alternate row A is a movement between C and F which is known as a ii V chord progression Cm(7) to F(7). In her basic patch she uses two oscillators with alternate row A sent to Osc. 1 and row B to Osc. 2. Osc 1 is sent to a spatializer, which means that the sound of the oscillator circulates around the room (more on this later). The location of this oscillator is managed by a stored random voltage (part of the Source of Uncertainty module) which is sent to the spatializer. Thus, the sound's location is an intrinsic part of the composition process.

For the second oscillator, pitch row B is played using an approach known as strobing. A sequencer like the Buchla can be played in any number of directions from left to right (1-16); in reverse (16-1) or each stage can be addressed via a voltage. It is this fluctuating voltage, whose speed can be controlled independently which is at the core of the technique of strobing. A sequencer's position in relation to which stage is currently active can also be reset by sending a gate signal. This extends the possibilities of sixteen stages, especially if the reset point changes throughout the piece, perhaps under the control of a free running LFO. The consequence of doing any or all of these is to potentially generate any number of melodic variations of these sixteen fixed voltages. As row B has no spaces or rests then the melodic material will be played continuously, which has been referred to as a form of electro-continuo (Boon 2021: 172). With this basic patch, Ciani illustrates how this can be varied to build other patches such as patch titled "Prism Melody" (Suzanne Ciani n.d.: 13). Here the melodic sequences (A, B, C and D) are matched with timbral changes using the waveshaper which shifts the oscillator sound from sine to saw. The change to different wave shapes can be jumped to much like different stages of a sequencer. Depending on when these timbral changes occur in time the aural result of these shifts can produce regular or irregular pattern groupings. Irregular patterns can be used to imply a new rhythm not present in the original sequence thereby creating something of an aural illusion (Suzanne Ciani n.d.: 8).



Figure 3: Ciani's Prism Melody Timbral Reliefs (Suzanne Ciani n.d.: 13).

The darker highlighted notes in figure 3 are where the waveform shifts from sine to saw. Each of these notes can be thought of as the first of each sequence where the timbral shift, as well as performing an audible change in colour or tone, also asserts a new rhythmic identity upon the stream of uninterrupted notes. This results in patterns (phrase units) of 5, 9, 7, 8, 6, 9, 2, 2. It has already been said but perhaps needs reaffirming. These sorts of approaches can be applied similarly to any part of a modular system and effect change(s) at any level.

By way of a simplistic reduction, consider the following sequence of four notes with their stages shown in table 4.

Table 4: Example of a four note sequence.

Stages	1	2	3	4
Notes	C	Bb	C	Eb

A sequence of five gates (on/off) and their stages shown in table 5.

Table 5: Example of a five stage gate pattern.

Stages	1	2	3	4	5
Gates	On	Off	On	On	Off

Finally a three stage sequence of octave transpositions shown in table 6.

Table 6: Example of a three stage octave pattern.

Stages	1	2	3
Octaves	0	0	-12

Combining these three elements results in a more complex piece than the simpler constituent parts would suggest (figure 4).

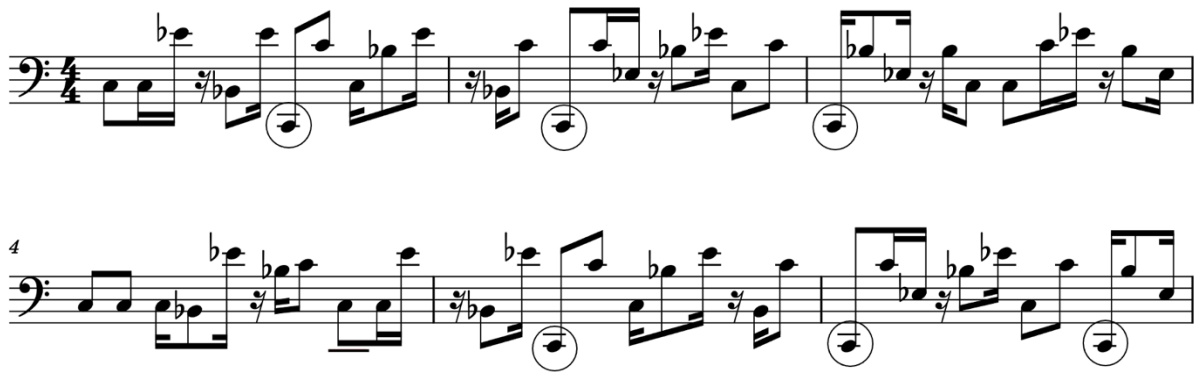


Figure 4: Example result – sequence start is underlined with encircled, registral displacements.

As well as timbral emphasis (waveshaping), Ciani also makes use of registral displacement. This is illustrated in the octave shifts in table 6 which produce registral displacement by shifting notes down an octave shown in figure 3 (with notes encircled). Ciani also uses a number of other compositional procedures such as rotations. Rotations are found in serial composition and, as Krenek points out, rotations represented a means to more closely integrate ‘the actual design of the music with the shapes of the pre-arranged patterns’ (Krenek 1953: 121). In a modular system not only can melodies be rotated (shifted left or right) but rhythms (gates) can be shifted similarly so and both can also be shifted in opposing directions. As Ciani also incorporates touch via her controller then sequence stages can also be held (similar to a wait or pause). The variety of gate and timbral patterns therefore are capable of highlighting any of the 16 stages and changing the way these patterns are perceived. Thus, complexity of musical output within a modular system is one that is predicated upon the combination of simple elements either in sync or not, running at the same or different time bases and/or subdivisions, including variations based on combinations, whilst playing rows horizontally, diagonally or, as Ciani notes, obliquely (Suzanne Ciani n.d.: 4). This composition approach, transformed into live process, Ciani has successfully achieved.

## Spatialization

As Ciani performs only in quad, this causes issues because most (popular music) concert sound experiences are either stereo or what is known as dual-mono. For most club sound experiences, these tend to be mono or dual-mono. Some clubs, such as Ministry of Sound in London, stage some events using a Dolby atmos system (Francy 2016: n.pag.) similar to cinema systems. This innovation allows for individual speakers to be addressed to spatialize sound in a fixed space. As Sam Inglis notes multi-channel speaker experiences, when realized correctly ‘could be magical; but in practice, such spaces and setups were few and far between.’ (Inglis 2022: n.pag.) Despite these developments, most concert sound systems in the seventies, whether stereo or some variant of mono, the speaker cabinets tended to be positioned facing the audience. Ciani makes an important distinction between her, and Buchla’s, approach to quad and the available cinematic and home cinema sound systems such as 5.1 surround sound. She points out that for film, and other forms of media, the sound/space is mapped onto the medium as part of a post-production process and distributed amongst the various speaker locations. This generally means that speech is in the foreground (centred) and location sound is spatialized around it. The key difference with her performances is that:

with electronic music the space is generated live as part of the performance and it is a parameter just the same as you know a filter or a pitch or an amplitude (Loopop 2018: n.pag.).

Whilst Pink Floyd have been using a quad system since in concert since 1967, it does have some differences. In their setup, speakers encircle the audience and sound is moved around via a controller called an azimuth co-ordinator (V&A 2003: n.pag.). For Pink Floyd this meant the band could be heard from the front of the stage (dual-mono or stereo) with keyboards and sounds on prepared reel to reel tape circulated around the room (Calore 2009: n.pag.). However, for Ciani the concert becomes a different experience of quad and therefore is not 'about distributing sound after the fact' (Campbell 2019: n.pag.) and, instead, becomes one of generating 'illusionary spaces' (Campbell 2019: n.pag.) This is a concept where how close or far away a sound is from the listener is controlled via the use of reverb to create depth perception.

In figure 5 both performer and audience are in the space, enclosed by the speakers labelled A to D. I have given each speaker a nominal voltage for illustration purposes.

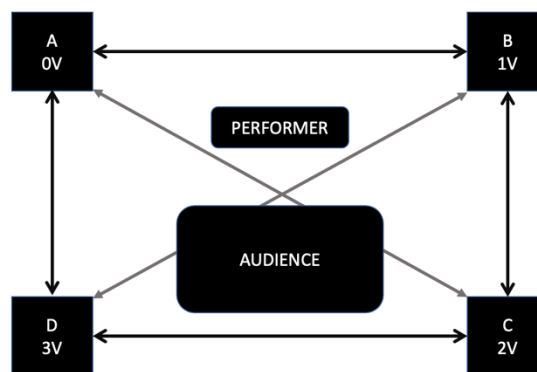


Figure 5: Quad performance example – note voltage to address each speaker.

The differences between Ciani's system and the more usual concert sound systems are not merely just about directionality but are also about performability. The speakers in a Quad system are under voltage control and, therefore, individually addressable. Sound can circulate clockwise, anti-clockwise, between neighbouring speakers and as opposites. To achieve this, Ciani uses four quad modulators, which offer her a number of algorithms (Loopop 2018). These include:

- moving the sound continually, in a circular manner;
- discrete where the sound jumps from speaker to speaker;
- random discrete where the location is a product of a random generator.

The algorithms can be left to run as free running LFOs or be synchronized with other musical parameters and pulses generated by the system (see Loopop 2018 for Ciani's explanation and video demonstration). As Ciani states clearly, the system requires continuous interaction and is not a set and forget type environment 'your process is to continually interact with the Machine [...] in a feedback system' (Loopop 2018: n.pag.).

## Discussion and Summary

Ciani is often referred to as being among a number of ‘Proto-synth-pop progenitors and precursors’ (IASPM 2022) which elides much of what her experiences have to show the worlds of academia, of technology, performance, the arts, recording and media production. Stockton highlights that ‘lived gender fails to conform to normative ideals and expectations’ (Stockton 2021: 10). Philip Glass referred to her as a woman who ‘had a synth, which was good because I could take lessons from her’ (Prendergast 1991: n.pag.) but not as a fellow composer. As a woman, Ciani challenges the stereotypical roles expected of gender not just in the 1960s but beyond. As the first woman to score a major Hollywood film this highlights how significant her achievement was, even if not acknowledged widely at that time. That Ciani experienced issues in the academy as a woman who transgressed the boundary of expected roles is also self-evident (see Pinch and Trocco 2002: 156 for one such account). As long as she remained playing the piano –a normative expectation– then she fulfilled her role. Once she stepped outside of this, first as a composer, then to gain access to synthesizers and then the challenge to build and figure out how this technology worked so that it could be performed with, then she was confronting the patriarchy in all contexts.

Her composition work can be thought of as examples of using well established methods i.e. notation, tone rows and improvisation, but organized and adapted for new purposes (Hobsbawm 2012: 5). Improvisation encompasses not just the notes but also the movement of the sound, its spatial qualities, as its timbral qualities. As much as she might be conveniently grouped as a member of proto-synth progenitors, this can have the effect of making her appear to be from a bygone era. Yet her performance approach, far from being a curiosity from the past, or as some sort of retrospective re-enactment of former glory, is in fact still in advance of where spatial sound currently is as an integral aspect of live performance.

Alongside the resistance she experienced at Mills College, she also encountered similar situations in the commercial music domain. She would visit record labels looking for a record deal. They advised her to sing, play the flute or piano, essentially another version of the normative role she had escaped from academia. When playing her recordings to record label executives, she was asked whether her husband wrote the music. When record deals were offered, these were only available if she would make a synthesizer classical music album like all of the others to further saturate the market. Whether rejection was institutional or commercial, she has persisted and endured with a complete sense of agency. Yet this persistence and endurance also comes at a price. Piekut’s ‘Žižekian paradox’ (Piekut 2011: 55) can be used to understand that where Ciani’s career outcomes might be viewed as choice and alternative career path i.e. making the best of limited opportunities, the Žižekian paradox suggests that this is no choice at all. To be considered a choice, the various paths must be available for selection as equally available trajectories. It then follows that limited choices, where the practitioner must either conform to such a degree so as to secure the job or to give up and return to the normed expected gender role, is actually no choice at all.

Her work in media defined a space that women have always worked in but frequently not been acknowledged as doing so (Jones 2011: n.pag.). She used technology in this media space, deploying it in ways that meant that she could capitalize on the advantage gained. As she says in her brief interview with Eventide, using their technology she could pitch her voice down to sound male if required (Eventide Audio 2021: n.pag.). Yet despite all of this she was always breaking down doors, always having to establish her credentials, always legitimating her mode

of expression and always countering the assumption that somewhere in her work there was a man.

Her NEA report of 1976 is a rare artefact. It stands as a document of design based ideas and materiality. A still revolutionary approach to make synthesizers genuine performance vehicles rather than something attached to a piano keyboard or as an imitator of pre-existing sound. Ciani cites all of these as limiting thinking about synthesizers thereby arresting the development of ‘unique, electronic control voltage, compositional techniques’ (Zuegel 2022: n.pag.). Rothenberg highlights that irrespective of what tools and technology will do to ‘change the range of humanity’ there ‘must remain some goal outside of technology which machines should help us reach.’ (Rothenberg 1993: xiii) Ciani’s performance and composition work can be situated precisely within this domain.

## References

Allschwang, Marielle (2017), “‘Is there any real sound?’” A conversation with electronic composer Suzanne Ciani’, *Milwaukee Record*, 2 October, <https://milwaukee-record.com/music/conversation-electronic-composer-suzanne-ciani/>. Accessed 24 August 2023.

Boon, Hussein (2021), ‘Improvising Songwriting and Composition Within A Hybrid Modular Synthesis System’, in R. Hepworth-Sawyer, J. Paterson, and R. Toulson (eds), *Innovation in Music Future Opportunities*, Abingdon: Focal Press.

Calore, Michael (2009), ‘May 12, 1967: Pink Floyd Astounds With ‘Sound in the Round’’, *Wired*, 12 May, <https://www.wired.com/2009/05/dayintech-0512/>. Accessed 24 August 2023.

Campbell, Madeleine (2019), ‘Suzanne Ciani’, *Women in Sound*, 4 February, <https://www.womeninsound.com/issue-6/suzanne-ciani>. Accessed 24 August 2023.

Clarke, Vince (2018), interviewed by Computer Music, *Music Radar*, 9 July, <https://www.musicradar.com/news/vince-clarke-im-not-a-good-enough-keyboard-player-to-write-on-the-synth>. Accessed 24 August 2023.

ETHW (2017), Quadrasonic Stereo, *Engineering and Technology History Wiki*, 12 April, [https://ethw.org/Quadrasonic\\_Stereo](https://ethw.org/Quadrasonic_Stereo). Accessed 3 September 2023.

Eventide Audio (2021), ‘Suzanne Ciani on the H949 Harmonizer®’, YouTube, 26 August, <https://youtu.be/vl5npxABfUM>. Accessed 24 August 2023.

Fantinatto, Robert and Amm, Jason (2014), *I Dream of Wires*, Canada: Waveshaper Media .

Faulkner, Robert (1983), *Music on Demand*, New Brunswick: Transaction Publishers;

Forbes, Bryan (1975), *The Stepford Wives*, United States: Palomar Pictures.

Frosty (2016), ‘Encounters: Suzanne Ciani & Morton Subotnick’, *Red Bull Academy*, June 24, <https://daily.redbullmusicacademy.com/2016/06/encounters-suzanne-ciani-morton-subotnick>. Accessed 24 August 2023.

Gallerneaux, Kristen (2021), *High Static, Dead Lines Sonic Spectres & the Object Hereafter*, Cambridge, MA: MIT Press.

Halstead, Jill (1997), *The Woman Composer*, Farnham: Ashgate.

Herrera, Isabella (2021), 'The Secret History of Women in Electronic Music Is Just Beginning to Be Told', *Pitchfork*, 29 April. Available online <http://mamonu.weebly.com/east-coast-vs-west-coast.html>. Accessed 24 August 2023.

IASPM (2022), 'Just Can't Get Enough: Synth-Pop and Its Legacies', *The International Association for the Study of Popular Music*, date and month, <https://www.iaspm.org.uk/just-cant-get-enough-synth-pop-and-its-legacies/>. Accessed 24 August 2023.

IMDB (no date), *I Dream of Wires*, *IMDB*, <https://www.imdb.com/title/tt3636334/>. Accessed 24 August 2023.

Inglis, Sam (2022), 'An Introduction To Immersive Audio', *Sound on Sound*, January, <https://www.soundonsound.com/techniques/introduction-immersive-audio>. Accessed 24 August 2023.

Jones, Daniel (2011), '“Woman” is not a genre of music', *Electronic Beats*, 22 November, <https://www.electronicbeats.net/woman-is-not-a-genre-of-music/>. Accessed 24 August 2023.

Krenek, Ernst (1953), 'Is the Twelve-Tone Technique on the Decline?', *Musical Quarterly*, 39:4, pp. 513-527.

Lathrop, Ted (2013), *This Business of Global Music Marketing Global Strategies for Maximizing Your Music's Popularity and Profits*, Berkley, California: Clarkson Potter/Ten Speed Press.

Leonard, Marion (2007), *Gender in the Music Industry*, Farnham: Ashgate.

Loopop (2018), 'Part 1: Quadraphonic Master Class with Suzanne Ciani', YouTube, 9 August, [https://youtu.be/\\_wuOTXgRibQ](https://youtu.be/_wuOTXgRibQ). Accessed 24 August 2023.

Manning, Peter (2014), *Electronic and Computer Music*, 4th ed., Oxford: Oxford University Press.

McGrath, Douglas (1996), *Emma*, United States: Matchmaker Films and Haft Entertainment.

Pareles, Jon (2016), 'Don Buchla, Inventor, Composer and Electronic Music Maverick, Dies at 79', *New York Times*, 17 September, <https://www.nytimes.com/2016/09/18/arts/music/don-buchla-dead.html>. Accessed 24 August 2023.

Piekut, Benjamin (2011), *Experimentalism Otherwise The New York Avant-Garde and Its Limits*, California: University of California Press.

Pinch, Trevor and Trocco, Frank (2002), 'In Love With The Machine' in T.J. Pinch and F. Trocco (eds), *Analog days: the invention and impact of the Moog synthesizer*, Cambridge, MA: Harvard University Press



Phillips, Todd (2020), *Joker*, United States: Warner Brothers.

Prendergast, Mark (1991), 'Philip Glass The Making Of A New Music Supremo', *Sound on Sound*, November, <http://www.muzines.co.uk/articles/philip-glass/7522>. Accessed 24 August 2023.

Reeves, Chris (2022), 'Multiball and Multiplicity: Suzanne Ciani and The Voice of Xenon', in T. Funk (ed.), *Video Game Art Reader*, Amherst, MA: Amherst College Press, pp.43–57.

Rothenberg, David (1993), *Hand's End: Technology and the Limits of Nature*, California: University of California Press.

Rovner, Lisa (2020), *Sisters with Transistors*, United Kingdom, France and United States: Willow Glen Films.

RVNG Intl. (2016), 'Sunergy [Documentary]', YouTube, 15 September, <https://www.youtube.com/watch?v=j5Xaw5r43n0>. Accessed 24 August 2023.

Schillinger, Joseph (2004), *The Schillinger System of Musical Composition*, Harwich Port, Massachusetts: Clock & Rose Press.

Schumacher, Joel (1981), *The Incredible Shrinking Woman*, United States: Universal Pictures.

Smith, Stacy, L., Pieper, Katherine, Hernandez, Karla, and Wheeler, Sam (2023), 'Inclusion in the Recording Studio? Gender & Race/Ethnicity of Artists, Songwriters & Producers across 1,100 Popular Songs from 2012 to 2022', *USC Annenberg Inclusion Initiative*, <https://assets.uscannenberg.org/docs/aii-inclusion-recording-studio-jan2023.pdf>. Accessed 30 August 2023.

space cavern vision archive (2018), 'Suzanne Ciani on Omni', YouTube, 16 February, <https://www.youtube.com/watch?v=Cb2W75VbYCM>. Accessed 17 October 2022.

Stockton, Kathryn Bond (2021), *Gender(s)*, Cambridge Massachusetts: MIT Press.

STSUCL (2018), 'JBS Haldane Lecture - Trevor Pinch - Moog Synthesiser as Technological and Sound Object – STSUCL', YouTube, 2 July, [https://youtu.be/sGTNiFm\\_kg](https://youtu.be/sGTNiFm_kg). Accessed 24 August 2023.

Suzanne Ciani (no date), 'Suzanne Ciani's Report to National Endowment [1976]', <https://www.sevwave.com/product-page/suzanne-ciani-s-report-to-national-endowment>. Accessed 24 August 2023.

Suzanne Ciani (2016), 'Voices Of Packaged Souls', *Bandcamp*, <https://suzanneciani.bandcamp.com/album/voices-of-packaged-souls>. Accessed 24 August 2023.

TheLabSF (2021), 'The Forum // Suzanne Ciani & Lisa Rovner', YouTube, 14 March, <https://youtu.be/27ZjulZVI0A>. Accessed 24 August 2023.

These Hopeful Machines (2013), 'Interview - Suzanne Ciani', *RNZ*, 13 July, <https://www.rnz.co.nz/concert/programmes/hopefulmachines/audio/201812321/interview-suzanne-ciani>. Accessed 24 August 2023.

Todd Barton (2020), 'Inside the Buchla Bongos', YouTube, 31 October, <https://youtu.be/To8jx24MRCQ>. Accessed 24 August 2023.

V&A (2003), 'Azimuth Coordinator', <https://collections.vam.ac.uk/item/O76817/azimuth-coordinator-sound-equipment-bernard-speight/>. Accessed 24 August 2023.

Wilson, Sean (2022), *The Sound of Cinema Hollywood Film Music from the Silents to the Present*, North Carolina: McFarland Inc.

Wolfe, Paula (2020), *Women in the studio: creativity, control and gender in popular music production*, Abingdon: Routledge.

Zuegel, Devon (2022), 'Suzanne Ciani explains the composition of her sensory career', *Notion*, January 4, <https://www.notion.so/blog/suzanne-ciani>. Accessed 1 September 2023.