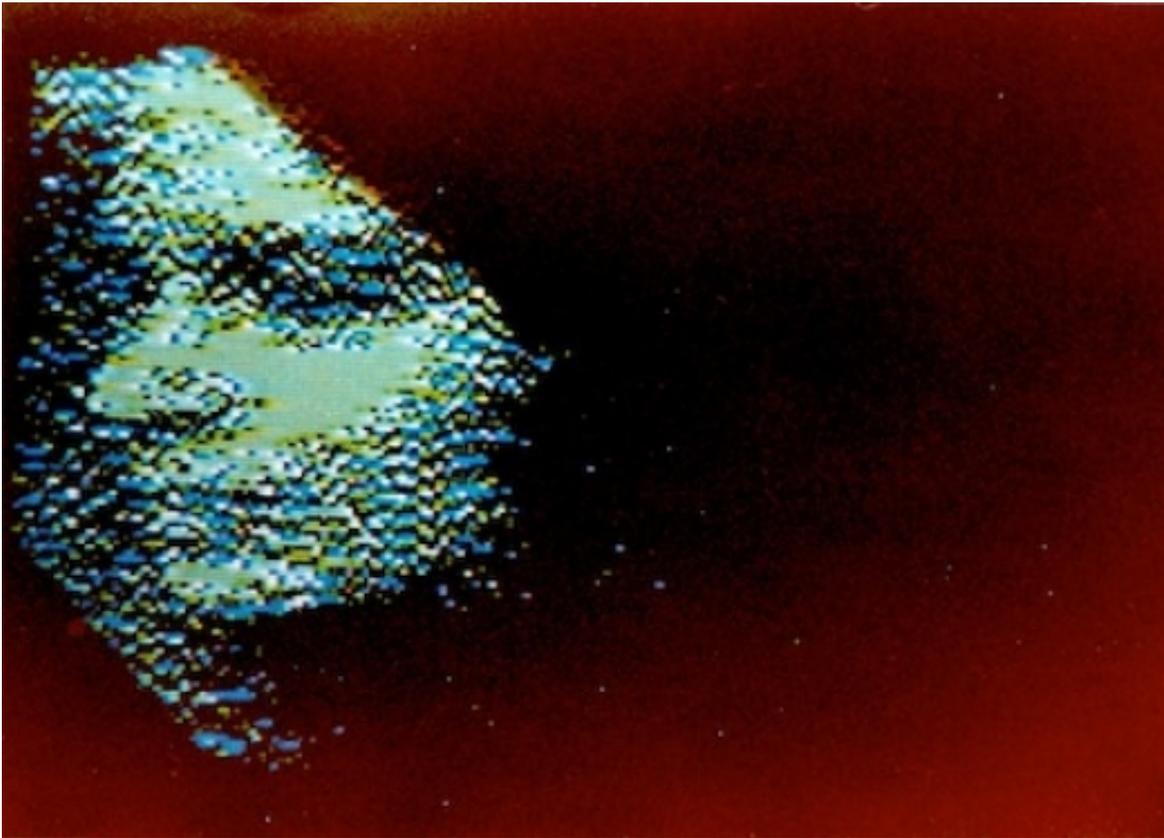# frieze

An interview with Laurie Spiegel

DECEMBER 22, 2012 by Geeta Dayal

Self portrait of Laurie Spiegel, made with an Apple II, c.1980s.

I first found a copy of Laurie Spiegel's *The Expanding Universe* some years ago. I had no idea what it sounded like, but the album cover was startling. Every conceivable inch of the cover of the LP was covered with bright white dot-matrix text, over a gradient of bold colour. The text was an interview with Laurie Spiegel – with both the questions and the answers written by Spiegel herself.

LS: How would you describe your music?

LS: I wouldn't. People often ask me to do that, and it seems impossible. Music isn't verbal or conceptual. I try to get as close as I can to certain qualities, and I've found these in a variety of styles. I have also found that they don't require any known styles.'

Later on in the text, Laurie explains to Laurie:

'Electronics aren't a style or a kind of music any more than a piano is. They're a way of making sounds.'

'You're being pretty evasive about what your music is like,' says Laurie in return.

Laurie Spiegel, 'The Expanding Universe' (1980, reissued 2012)

The Expanding Universe, a tremendous album originally created by Spiegel on a computer system called GROOVE at Bell Labs in the 1970s, was reissued this past autumn by the independent label Unseen Worlds. (The label is named in homage to Laurie Spiegel's 1991 CD *Unseen Worlds*.) The reissue has attracted an avalanche of positive attention in the press, in publications ranging from *The Wall Street Journal* to *The Wire*.

The original record was expanded into a double album, and the original text-covered LP cover was enlarged into a handsome 24-page CD booklet, complete with extensive track notes, archival photos, block diagrams, and FORTRAN punch cards from Bell Labs circa 1973. For Spiegel, 24 pages wasn't long enough.

'I wanted to include a page of source code in the liner notes,' she says wistfully when I visit her in her loft in downtown Manhattan, New York. For over three decades, Spiegel has lived in the same loft in Tribeca, in a building she shares with Richard Serra, a friend since the 1970s. Her life story spans Bell Labs and The Kitchen, film soundtracks and computer interfaces, folk music and analogue synthesizers, a Tribeca loft and a trailer near the Mississippi.

Every conceivable corner of her cavernous space is lined with things: vintage synthesizers, instruments, ancient computers, art, books, papers, tapes, photographs. The windows are wide open; birds fly in and out. A big black dog dozes on a sofa.

Spiegel seems shy about her sudden appearance in the spotlight. She speaks about her music and life carefully and deliberately, in long, densely packed sentences. She is particular about details, and has a strong grasp of the technical aspects of computers and synthesizers, which becomes increasingly clear the longer you talk to her.

Rave about *The Expanding Universe*, originally released in 1980, and she smiles and begins talking about her *Unseen Worlds*. She considers *Unseen Worlds* to be her best work, and hopes more people discover it.

'The sounds on *The Expanding Universe* are really, really simple timbrally,' she says. 'Not that the electronic sounds per se aren't beautiful in themselves, but… it's pretty much raw sawtooth waves, by and large, with filtration and reverb. It was very limited in terms of the amount of control we had.' One of the first Apple II prototypes – gifted to her in 1978 by the late Jef Raskin, inventor of the Macintosh – is perched on a shelf near the kitchen. It was custom-modified by Don Buchla, the legendary synthesizer inventor, who added more video colours. The artifacts around her loft trace the evolution of synthesizers, and the history of personal computing.

''You had this incredible freedom with those early systems,' she says, gesturing to the Apple II. 'The assumption was that you should be free to do everything. You should get the source code for every program you work with in case you feel like changing it. The original Apple II had a disassembler

in ROM, so you could reverse-engineer even the assembly language that was running… it was assumed that you would get to know the machine and want to change how you used it. Now it's such a closed system; there are all these layers of software.'

Spiegel takes a wide-angle view of technology; she has intimate firsthand experience with its history that reaches back four decades. ('When I saw the Apple II,' she says, 'I thought, 'How can you program this? You can't get your hands into the registers!' On the DDP-224 at Bell Labs, we had push-button access to all their individual bits.') She is a prolific writer and, as she terms it, a 'general purpose thinker'. In her numerous essays over the years, she offers keen insights on the process of making music, thoughts on emerging technologies, and music's place within a wider context. Most composers are not great essayists, with some notable exceptions. John Cage's voluminous writings helped to frame and elucidate his groundbreaking approach to sound. Karlheinz Stockhausen had a way with words, offering a more digestible way for listeners to decode his music. Steve Reich and Brian Eno are among the living composers who are as articulate and thoughtful in their words as they are with their music.

Her essays in the 1970s seem almost Utopian in their positivity about the future. 'To some degree in the '70s I emphasized pretty much only the positive, partly because I was extremely excited about it, but partly also to counteract the tremendous hostility, particularly to computers at the time,' she says. Any discrimination she faced for being a female composer was nothing, she says, compared to the discrimination against the use of computers in music back then.

'To do music on computers, most people's initial reaction was, 'How could you? It's completely dehumanizing music, synthesizers are already going too far… but computers?' I didn't want to say anything negative initially; you're talking '70s, really. After the personal computers came out, that whole fear of computer technology began to just ebb away, because people had them and people loved them. And so much creative work was being done at a grassroots level by incredible numbers of people. Once you had the personal computers and you had *Creative Computing* magazine, and little festivals where you'd have two people with stripped-down circuit boards housing little digital processors playing dueling computer sounds back and forth, they were lovable. They were lovable little computers, and it really just swept away the big, corporate, military, threatening image that computers had previously had.'

As a child growing up in Chicago in the 1950s, Spiegel was quiet and introverted. Her mother was a weaver; in a way, looms were the proto-computers of their day. Her father gave her a soldering iron at age 9. 'I would go into my room and read a lot, or play mandolin and guitar secretly by myself,' she says. 'I seemed to be really good at spending vast amounts of time alone and not feeling bad about it.'

By the late 1960s, Spiegel had moved to New York and was studying music at Juilliard. An encounter with Morton Subotnick's Buchla 100 modular synthesizer in his studio on Bleecker Street led to a lifelong interest in analogue synths, and opened doors to the downtown scene.

'The downtown music scene, which the Buchla immediately got me enmeshed in, it was more like where I came from,' she says. 'I came out of folk music, where people get together and they play and there's no right way or wrong way to do things. You do things the way you do it, the way you want to do it; there's a sense of freedom…the downtown music scene was sort of like coming home, in a way compared to Juilliard and the Lincoln Center atmosphere.'

Laurie performed at The Kitchen's first concert, in 1971, organized by Rhys Chatham. The Kitchen was still in its infancy; Woody and Steina Vasulka had recently set up their video studio there. 'Rhys decided once a week, we would have composers just playing music for each other,' she says.

Left to right: Emmanuel Ghent, Ken Knowlton, Laurie Spiegel and Max Mathews. Undated photograph.

Chatham had also invited Emmanuel Ghent and Max Mathews, prominent computer music researchers at Bell Labs, to The Kitchen's early concerts. At The Kitchen, Ghent played music with computer-controlled electronics. Spiegel soon became a visiting artist at Bell Labs, working with Ghent, Mathews, and other researchers.

In 2011, I paid a visit to Mathews – the legendary Bell Labs director of acoustics research best known as the 'father of computer music' – for a frieze article. I didn't realize then that it would be his final interview; he died three weeks later, at age 84. When I asked him about women composers he admired, he immediately mentioned Laurie Spiegel. Mathews was a key mentor, a guiding force when she was a visiting artist at Bell Labs in the 1970s.

The Expanding Universe was created using a system called GROOVE that Max designed with a co-researcher, F.R. Moore, at Bell Labs in the late 1960s. GROOVEwas a clever acronym for 'Generated Real-Time Output Operations on Voltage-Controlled Equipment'. The system, which utilized a circa 1965 'minicomputer', the DDP-224, took up three entire rooms.

The GROOVE system at Bell Labs

GROOVE was a hybrid system, which made it possible to interact with a computer in real time to make sounds. Making digital audio on computers back then was an excruciatingly slow process, but controlling analogue oscillators could be done in real time.

Mathews patiently explained the GROOVE system to me last year. 'Even though I'm not a violinist and I play very poorly, I love to play,' he said, with characteristic modesty. 'I wanted to be able to play the computer live. I was impatient. Now, anyone can play the computer live, because it's fast enough. But in those days, you could use a computer to process the control signals, the key presses for the baton wavings, or any other motions that the performer makes, but you couldn't use a digital computer in real time to calculate the samples of the sound wave, at 20,000 samples per second. 'But analogue synthesizers came out by that time, so you could use these control signals to control analogue synthesizers – the Moog synthesizer and things like that,' he continued. 'So I had a hybrid system where the control end of it, and the recording end, were digital, and then it got sent down… analogue signals that could control the pitches, and other things. And that's how GROOVE worked. We found out a lot that way, and got several good pieces.'

Several good pieces – including *The Expanding Universe*, created at Bell Labs in the mid-1970s. Spiegel took the lumbering, complicated GROOVE system and figured out a way to make it sing.

'The thing I wanted to listen to just wasn't in my shelves of LPs – it was *The Expanding Universe*," she says. "which then, as a do it yourselfer, I made it myself, which to do I had to learn FORTRAN and write all this code.'

Laurie Spiegel at Bell Labs, 1970s

Bell Labs, by all accounts, was an incredible place – the research arm of a massive telephone monopoly, and a home to everything from groundbreaking scientific discoveries to avant-garde art. 'We weren't possessive or territorial about our algorithms or our software back then,' Spiegel says. "People shared and helped each other; this was certainly true at Bell Labs. No one thought the software would have any value. They developed C and UNIX and basically gave them away. The value was in the use of it, in the music. We were in it for the music.'

She picked up programming quickly. 'Max thought I already knew how to program,' she remembers. 'He told me many years later that he just assumed I was a programmer when I first came in… Manny Ghent and Ken Thompson [co-creator ofUNIX] used to help me. I got a book on FORTRAN and I sat there at my desk at Bell Labs and worked through the entire book doing all of the problems, then I sat with people while they were debugging code and watched what they were doing…it was logical. Logic was probably my favorite branch of math, anyway; I really liked symbolic logic when I first ran across it in high school.'

The Expanding Universe has a tranquil, meditative quality. The repeating motifs in some of the tracks recall the Indian classical music that Spiegel was attuned to at the time. 'There's a '60s, '70s feel,' she says. "Coming out of the '60s – an interest in Asian religions, and Indian and American folk music,

and LSD and Zen and everything.' Her work is often characterized as "slow change music', along with the French electronic music composer Eliane Radigue and others. But Spiegel's work tends to be more active, its pace less glacial. 'Patchwork', which opens *The Expanding Universe*, is practically effervescent – a nimble melody that you could snap your fingers to.

'Unlike many of my friends doing slow change music at the time, I was never that good at getting things to slow down and stand still,' she says. 'My stuff tended to always want to move more than everybody else's and have a clear form, so that there is an overall buildup and that piece does have a clear form.'

She launches into a discussion of algorithms. 'The algorithm in 'Patchwork' does use repeating and looping, but it's under immediate manual control,' she explains. In other tracks, such as 'Pentachrome,' 'Music for Dance,' and 'The Orient Express', the algorithms are progressive, more melodic, less contrapuntal.

'You have melodic lines and harmonic content that continually evolve and change. They come out of processes that progress without repeating – information theory, cellular automata theory, stuff which is generative rather than simply iterative. I am hoping that people will pay attention to the logic of how the melodic and harmonic content evolves during these pieces, and also the interactivity — what I chose to control in real time."

Her technical explanations take frequent turns into conversations about art, or the timeless beauty of Bach, or the individualistic beauty of John Fahey's acoustic guitar work. 'For me, music is very much an emotional and sensual medium; it's not just logical,' she says.

Later on, in an email, she recomposes her thoughts. 'What is really distinctive about*The Expanding Universe*…is the compositional logic, the logic by which the melodies, harmonies and rhythms evolve and are constructed by the computer algorithms I wrote,' she writes. 'For example, if you listen to the way 'The Orient Express's melody unfolds and extends itself and how variation is generated within it, to the best of my knowledge it is still completely unique among composed musical works as to musical structure and method of composing, and similar could be said for some of the others.'
Other pieces on *The Expanding Universe*, such as 'Old Wave,' and the expansive 28-minute-long title track, are slower and more introspective – deep pools of sound. The latter track, especially, has a calming, meditative quality.

''There's a phenomenon called sensory inhibition, where if you get a lot of stuff coming at you, you tend to filter out what is relatively constant,' she explains. 'You tend to suppress awareness of that which isn't changing because the cognitive system is largely a change and threshold detector — a contrast-based detection system. So when you play people music which is really slow, very slowly changing, a lot of the filters of the neural cognitive system just relax and go away and you become sensitive to more and more minute changes and transitions and levels of contrast that you would never

have noticed even five minutes earlier in the same piece. And the things that are constant kind of drop out, and you focus on the stuff that isn't constant. You are hungry for change so you find it on subtler and subtler levels."

Her thoughts remind me a bit of Eno's thoughts on how the eyes of frogs connect to how we process music. Eno was inspired by a famous scientific study first published in 1968 titled 'What the Frog's Eye Tells the Frog's Brain.' The paper was co-authored by Jerry Lettvin – a good friend and collaborator of Mathews – with Warren McCullough and others.

'That makes slow change music relaxing; it increases your sensitivity,' she continues. 'I think it's very similar, probably, to the effects of meditation. It can be rationalized either mystically or scientifically.'
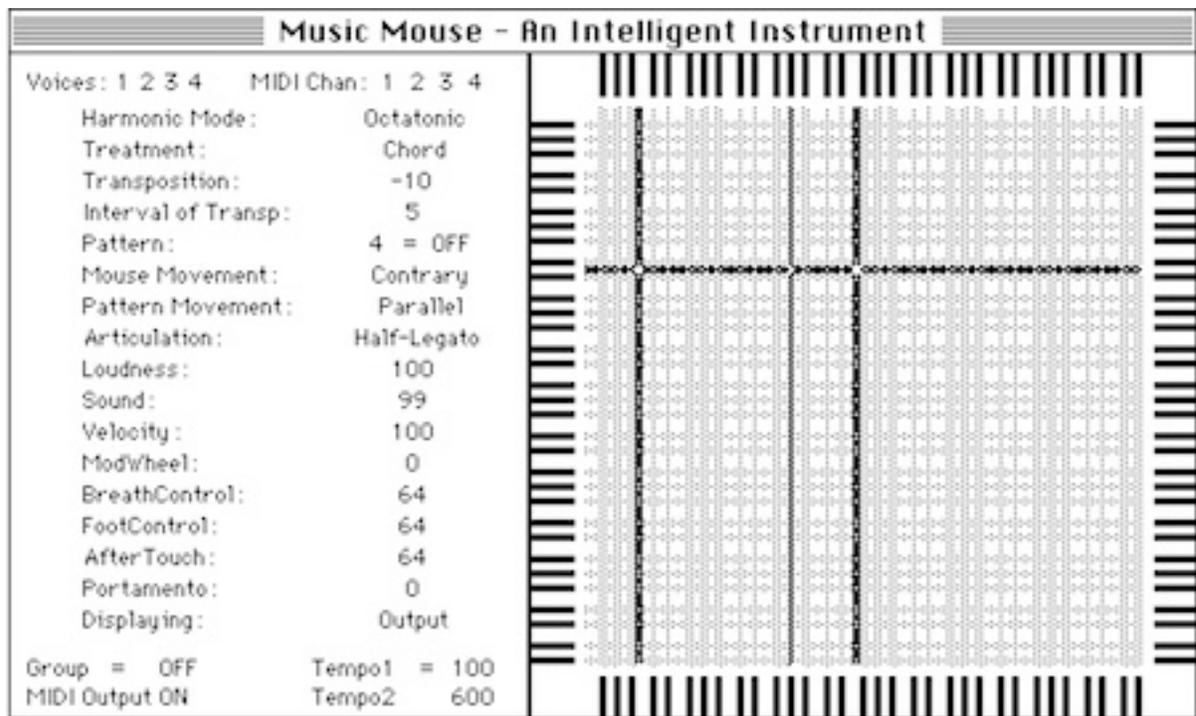
Screen shot of the user interface for Music Mouse: An Intelligent Instrument, originally developed by Laurie Spiegel for the Macintosh in 1985

Mystic and scientific is a good summation of *The Expanding Universe*. Despite the flood of recent attention for the album, the layers of richness in Spiegel's work are only beginning to be uncovered. Go beyond *The Expanding Universe* and delve deep into the essays, the interfaces of Music Mouse, the art made with the oddly-titled VAMPIRE (which stood for 'Video and Music Program for Interactive Realtime Exploration/Experimentation), *Unseen Worlds*, *Obsolete Systems*, *Harmonices Mundi*, 'Sediment', and the stories that Spiegel's life reveals about Bell Labs, the downtown New

York art and music scenes, and more. Her work is vital to our understanding of electronic music and the history of computing over the past few decades, but even more importantly, the music itself has lasting power. Years from now, it will still feel like a mystery.

About the author

Geeta Dayal is a writer based in San Francisco. She is a regular contributor to frieze.